Autonomous Vehicles:
What can Social Science offer?

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In partnership with:

UCL

CATAPULT
Transport Systems

This document has been produced following a day-long workshop co-convened by Transport Systems Catapult and researchers from University College London, held at UCL on 30th April 2018. The event brought together around 30 social scientists from 16 academic institutions[1], and self-identifying with at least 12 social science disciplines, to discuss priorities for involving the social sciences in the move towards autonomous transport systems. For the morning session, policymakers and representatives from industry, funding bodies, and publishers were also present to discuss their needs and priorities.

A wide range of opportunities, challenges and knowledge gaps relating to autonomous vehicles were discussed, and specific topics included those of governance, public acceptance, and sharing. It was evident from the discussions that the social science community has an important role to play in ensuring successful and responsible AV innovation, and that further explorations into the social and behavioural dimensions of AVs are warranted.

Lovisa Eriksson and Stephen McConnachie, from the TSC Insight Team, initiated, co-organised and facilitated the workshop in collaboration with UCL.

EXECUTIVE SUMMARY

Following on from the workshop, this booklet sets out how collaboration with social scientists can benefit the autonomous vehicle industry and those working to develop policies related to these technologies. In it, we argue that engaging more closely with social scientists can help policymakers shape policies that more effectively and equitably benefit society and the AV industry; and can enable industry to develop products and services more aligned to individual and societal needs and wants, therefore helping bring success to the industry.[2]

The report also outlines some of the key questions about autonomous vehicles that social scientists are currently asking, and explains why – as someone working in the AV industry or with policy making – you should care about the answers.

Key Messages

- **Involve social scientists** early in the policy, product, or service design process and keep them embedded throughout in order to maximise societal and economic value.

- **Budget appropriately** – high quality social research takes time. If you are limited on time, social scientists can also provide valuable advice based on existing knowledge about people and society.

- **Policy makers** – seek advice and evidence from a range of disciplines. This will give you a broader view of the societal implications of different policies and interventions and helps anticipate unexpected effects.

- **Industry** – embrace the constructive criticism from social science. Social scientists will likely challenge you to explain the why and how of your innovation, ultimately helping you develop better products and services.

- **Industry** – While understanding human-machine interaction is imperative, consider also more broadly how products or services fit into society. In particular, this knowledge will help ensure that your future customers will accept, adopt, and desire what you bring to the market.

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[2] The views expressed in this report are based on the discussions that unfolded during the *"What can social science do for autonomous vehicles?"* workshop on 30th April 2018. They do not necessarily represent the perspectives and policies of Transport Systems Catapult.

INTRODUCTION

There continue to be exciting developments in autonomous vehicle (AV) technology, however the move towards increasing automation is also a profoundly social matter. The roll-out of AV technology will lead to significant changes not only to how people and goods move around, but to how society functions. Furthermore, the mere process of developing AVs is both shaping and being shaped by its social context, which affects the way we think about the technology and what we make of it.

This document is aimed at policymakers and at those working in industry. Closer collaboration between social scientists and organisations working directly or indirectly to further the development and deployment of AVs offers opportunities to create and launch products and services that more effectively meet individual and societal needs and wants, thereby ultimately benefiting the UK economy.

After reading this document, you will have a clearer idea of:

1 What social science is and what are some of the most pressing questions social scientists are currently asking about AVs.

2 Why you should involve social scientists in the development process; how you can do so successfully; and what you can expect of such collaborations.

> **People are excited about, and sometimes fearful of autonomous vehicles because they see that they might transform our lives. This means government and industry need to think hard about not just what these vehicles can do but how people might use them. The social sciences will be indispensable in helping get the best from the opportunities that this technology can bring.**

Paul Campion, CEO, TSC

Autonomous Vehicles | What can Social Science offer?

WHY ENGAGE WITH SOCIAL SCIENCE?

The success of AV technology will depend on the extent to which it can align with the needs and wants of individuals and society. Social science is well placed to help you understand those wants and needs, which ultimately benefits your work to develop successful products, services, and policies.

Equally, the risks of not including a social scientific perspective in the development of AV technology are manifold, ranging from launching vehicles or services that people do not want to use, to developing legislation, policies, and governance frameworks that are unethical or inequitable.

For industry: A better understanding of individual and societal needs and wants, and of people's concerns and fears, will enable improved design of products and service offerings, ultimately helping the AV industry achieve success.

For policymakers: Similarly, better understanding how AVs will fit into

> **The mass deployment of driverless vehicles is on the horizon. It is vital that we understand the societal impact of this technological leap to maximise the benefits for all.**
>
> **Nick Colledge,** Meridian

society will help you develop better policies and also avoid a potentially costly public backlash. Social scientists can provide valuable advice and evidence prior to implementing new policies, and they can also help evaluate the effectiveness of policies post-implementation.

CASE STUDY: Better policies and infrastructure to stimulate cycling

Increased cycling has clear economic and social benefits,[3] and provides ample opportunity for innovative new business models to emerge. Social scientist Rachel Aldred's research on barriers to cycling has helped transform Transport for London's cycling policy and improve guidance on cycling infrastructure design.[4] The findings from this research have informed the development of an online tool (www.pct.bike) that helps transport planners and policymakers make smarter investments to encourage more people to cycle.

[3] Raje, F. Saffrey, A. (2015) 'The value of cycling' www.gov.uk/government/publications/the-value-of-cycling-rapid-evidence-review-of-the-economic-benefits-of-cycling

[4] Summarised from ESRC's 'Impact Case Studies' – Original at https://esrc.ukri.org/news-events-and-publications/impact-case-studies/changing-the-policy-mindset-on-cycling/

WHAT IS SOCIAL SCIENCE?

With its diversity of specialisms and approaches to studying society and human behaviour, social science is well placed to examine social and behavioural questions associated with AVs.[5]

The social sciences can, for instance, tackle questions of how culture, social norms, habits, and human responses will affect how we interact with AVs, to questions of governance, economics, ethics, and equity.

They also have the capacity to look at AV developments holistically, through a cross-cultural or historical lens, or as something that is interwoven with parallel technological and societal developments.

> Understanding the attitudes, behaviour and wider public acceptability of transport users will be critical to the success of [autonomous vehicles]. Government cannot do it alone and we anticipate contributions towards the social and behavioural agenda from academia, industry and other stakeholders.
>
> **John Hayes MP,**
> Former Minister of State for Transport[6]

On the opposite page, researchers from a selection of social science disciplines outline some broad questions that give an insight into each discipline's particular concerns regarding AVs.

[5] More information about social science is available from the Economic and Social Research Council's website: https://esrc.ukri.org/about-us/what-is-social-science/

[6] In Cohen, T., Jones, P. & Cavoli, C., 2017, Social and behavioural questions associated with automated vehicles. Scoping study by UCL Transport Institute. Final report, London: Department for Transport.

SOCIAL SCIENCE DISCIPLINES

Anthropology
How might culture affect how people relate to AVs, and, in turn, what effects might the technology have on culture and society?

Economic and Social History
What can we learn from comparable historical examples (e.g. the transition to the motor car, or the advent of the internet) about what impacts AVs may have?

Economics
How will markets develop and behave and how will actors respond?

Human Factors (and Ergonomics)
How do humans interact with AVs amongst other elements within the wider system? How will AVs influence human well-being and overall system performance, and can they be designed to enhance these?

Human Geography
How might the relationships between people, cultures, (socio) technologies, ideas, and places be reconfigured by way of AV innovation?

Law
Are existing legal frameworks capable of effectively regulating AVs, and if not, what would the appropriate legal framework look like? How can we ensure sufficient compliance?

Politics
How might the transition to AVs redistribute power and resources within the mobility system, and what implications might this have for achieving outcomes in the public interest?

Psychology
How will users and non-users interact with AV technology? How will the technology change behaviour, and how will the ways users interact with the technology change the trajectories of its development?

Science and Technology Studies
How are knowledge and innovation shaped? How can we anticipate the opportunities and uncertainties around new technologies? How can technologies be governed responsibly?

Social Policy
How might governments, the private sector, and citizens come together to ensure a fair and transparent transition towards AVs?

Sociology
What consequences will AVs have on society and people's day to day lives, and how will social structures affect the way the technology is being developed?

PRIORITY QUESTIONS

Autonomous Vehicles provoke a vast array of social questions.[7] The below is not meant as a comprehensive list, but highlights some of the questions that emerged during the workshop as most prominent or pressing at the current time from the perspective of social scientists.[8]

An overarching theme recurred around what kind of autonomous future we want – **Why is AV technology being developed and how ought it be integrated into society?** There was a sense that the process is currently predominantly 'technology-led', but that it should rather be socially-led, thereby helping to ensure it is developed in a way that offers real value to individuals and society.

AVs for whom?

This is a crucially important question that serves to identify what social groups are most likely to adopt and benefit from the technology, but also what groups are likely to lose out. Investigating whose needs will be considered in the design and implementation of AVs may help developers understand whose needs are not being addressed and to adopt a more inclusive approach.

Research has so far largely focused on restricted demographics, such as urban residents, early adopters, and commuters/Uber users. Future research must be more inclusive, examining different social groups, cultural contexts, and geographies (e.g. rural as well as urban).

Researching the future – Scenario Analysis

Researching the future, as any research about AVs requires, is challenging. However, social scientists have a variety of methods to do so. One technique discussed at the workshop was scenario analysis. This method offers a productive way of examining various alternative future scenarios with varying degrees and forms of AV technology.

For each scenario, researchers should pose questions such as:

1 What would this future look like?

2 What would the social norms be?

3 What would happen in the transition period and how could we best handle it?

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[7] E.g Cohen, T., Jones, P. & Cavoli, C., 2017. Social and behavioural questions associated with automated vehicles. Scoping study by UCL Transport Institute. Final report, London: Department for Transport.

[8] For those interested, the research topics and questions discussed at the workshop will be outlined in greater detail in a forthcoming academic article, coordinated by Jack Stilgoe (UCL).

What will be the positive and negative effects of AVs?

Social science is well placed to explore not only the short-term, proximate effects AV technology may have on individuals and society, but also the potential ripple effects it may have on the wider society in the medium and long term. Investigations of the positive and negative effects of AVs help industry and policymakers avoid making detrimental mistakes, and support more realistic and nuanced discussions of what the technology can offer. At present, the AV discourse is often focused on generalised potential benefits of AVs (such as accessibility) and social science research ought to help balance this by considering the range of implications of AVs and how they relate to specific contexts or groups.

Are fully autonomous vehicles the best approach to improving safety?

Picking apart and examining common assumptions about autonomous vehicles and their benefits is necessary to establishing a prudent approach to AV development. For instance, safety is often cited as a/the key driver for AVs, but is full automation the right way to go about it? Would it be preferable or more efficient to change the culture of enforcement in existing safety measures? Is the assumption about safety issues becoming redundant when automation is properly implemented used as an excuse to forego the development of policy and regulations?

How should AVs be governed?

Without appropriate governance, it is unlikely that autonomous vehicles will successfully reach the market. What ought governance aim to achieve and what are good examples and models of governance? Can the UK provide a good model for governance? What role should government play at different levels and how should trials and experiments be governed?

Other topics that social scientists are keen to address

- Acceptability
- Sharing
- Ethics
- Accessibility
- Equity
- Sustainability

SOME GUIDANCE ON ENGAGING WITH SOCIAL SCIENCE

When?

For optimal value, social science should be involved as early as possible and then throughout the process of developing products, services, or policies. It should not be difficult to get social scientists on board: the workshop demonstrated an appetite amongst social science researchers to collaborate with industry and policymakers to optimise the benefits from this evolving technology.

For industry: Social scientists can help you brainstorm ideas, challenges and possibilities early on; research the appetite, need, and unintended consequences of ideas in the concept stage; test and help you tweak your solutions in the development phase; and finally evaluate the impact of the product or service after launch.

For policymakers: Social scientists can help you understand the complexity of the wider societal landscape when scoping and planning policy interventions. They can also not only help with holistically evaluating the repercussions of policy, but can also help guide the implementation of policy from their understanding of society.

If you work with social scientists, what will they do?

- Holistically study AVs as part of a wider social system.

- Utilise a range of qualitative and quantitative research methods, expertly designed to capture social and behavioural aspects of a phenomenon.

- Challenge you! They question prevailing (and your own) beliefs, assumptions, and discourses around AVs (e.g. AVs will improve elderly mobility).

- Draw on existing knowledge about human behaviour and social processes to understand and anticipate how the technology will be adopted into society.

Some points to consider

- For social science, technology is neither innately good nor bad. Instead, what matters is how a technology is incorporated into existing contexts and practices, and what are its wider impacts on society and human well-being.

- Social science is primarily about **understanding**, and to a lesser extent about attempting to anticipate, predict, or shape behaviour. Social science is of greatest value when used to help shape products, services, and policy as opposed to being seen as a marketing tool.

Connecting with social scientists

You can find potential collaborators by approaching dedicated university transport or mobility departments (such as at Leeds and UCL), however many relevant researchers are not attached to such departments.

Through its academic network (and a planned sub-network for social scientists working on AVs), Transport Systems Catapult can help connect you with social scientists, and can advise on what disciplines may be of most value for you.[9] The Innovate UK Knowledge Transfer Network may also be able to help you get in touch with social scientists.

The workshop forming the basis for this report involved academic social scientists and the content therefore reflects this. However, there are also trained social scientists working in other settings, including in think tanks, consultancies, government, and some industry settings – indeed employing social scientists is perhaps the best way of ensuring they can be embedded throughout the process, although may limit the breadth of approaches you can engage with.

[9] Contact us on academia@ts.catapult.org.uk

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