Democratising Driverless Futures: Five Lessons for Public Dialogue on AVs

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Abstract. Self-driving cars (automated vehicles or AVs) are no longer just a laboratory experiment. In some parts of the world, prototypes are starting to appear on public roads. The thoughts of developers have understandably turned to their relationship with the members of the public who could become the users of the technology, stakeholders in its development or interested bystanders. The people involved in innovation are likely to have confidence in their technology and emphasise its potential benefits and its safety. Members of the public may see things very differently. With past technologies, the tendency has been to reject the views of members of the public as ill-informed or seek to change public attitudes. The evidence from previous controversies is that just talking without listening represents a bad approach. There is a need for ongoing public dialogue, not just top-down salesmanship. This is particularly important when a technology is being developed, as AVs are, not just in private laboratories, but in public.

1 Technologies in Public: From Deficit to Dialogue

1.1 Introduction

Towards the end of the 20th Century, genetically modified (GM) crops were a technology full of promise. Scientists were excited about the possibilities of more precise crop improvement, and companies saw clear economic opportunities. Alongside realistic proposals for incremental improvement ran hyped-up claims that the technology would benefit everyone, particularly the world's poorest people. In the US, the market for which most of the new varieties were developed, the technology was largely successful. Monsanto, the agricultural chemicals giant, was one of the first big players to spot the financial potential of developing new varieties of crop that could then be patented and sold to farmers. In Europe, some citizens and interest groups took issue with Monsanto's model and the claims they were making. The controversy that ensued took companies and scientists by surprise. From the 1990s onwards, supermarkets in the UK responded to a public backlash by refusing to stock genetically modified foods.

In France, where systems of agriculture are very different from those in the US, field trials of the technology came under huge public pressure. While there had been more than 1,000 trials in 1998, by 2004 there were fewer than 50, half of which were destroyed by protesters (Bonneuil, Joly and Marris 2008).

So while genetically modified foods have become a fact of life in the US, in much of Europe it is all but impossible to grow, sell or buy them. A public controversy meant that companies have missed out on markets, scientists have missed out on research opportunities and farmers and consumers have missed out on new innovations. Until the GM crops controversy, the dominant way in which scientists and policymakers thought about the public and public trust was to presume that if citizens knew more about science and innovation, they would support scientists' and innovators' vision of the future. This approach has been labelled the 'deficit model' (Wynne 1991). The diagnosis was that members of the public lacked scientific understanding, which explained their scepticism of new technologies. The suggested solution was to teach them science. In both the US and Europe in the 1980s and 90s, scientific bodies created programmes for science communication and the 'public understanding of science'.

The problems with the assumption that to know science was to love it quickly became apparent. With technologies like nuclear power that were in some places extremely controversial, the more citizens learnt, the more worried some became. People, often the most educated people, were unwilling to just accept the answers that scientists were offering. They had their own questions. Policymakers began to realise that not only was there a need for genuine public dialogue, but also a need to have this dialogue early, while the technology was still in development (Wilsdon and Willis 2004). Our project – *Driverless Futures?* – is trying to put this idea into action, bringing public views and social science to a debate that has until now been dominated by technological questions. The history of the public debate around genetically modified crops can help inform the choices society might make about self-driving cars. In simple terms, we should pay attention to five big lessons.[1]

1.2   Lesson 1: Debates About New Technologies are Never just About Science and Technology

The first generation of genetically modified crops suggested a profound disruption to people's everyday lives. The people developing the technology were understandably excited about the benefits for consumers, farmers and food producers. But these groups and other citizens saw the technology in the context of their own lives and wanted to ask about what it meant for the future of farming, trade, the economy, the rural landscape and more.

Food is something everyone can relate to, as is mobility. When non-experts talk about AVs they should therefore not be expected just to stick to technological questions. They may be excited about the possibilities, but they will also want to ask how

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[1] The social research on public attitudes to GM crops is wide-ranging, but an important early example is (Grove-White et al. 1997). A summary of insights from public dialogue on GM is in this report: https://sciencewise.org.uk/wp-content/uploads/2018/12/Talking-about-GM-published.pdf.

their commutes, their families' lives and the places in which they live could change in a world in which AVs are normal. Some will also wonder, as people did with GM foods, who really benefits from the technology. It is vital to remember that the general public are more than just a pool of potential consumers.

1.3   Lesson 2: People are Citizens as Well as Consumers

Social research with members of the public on attitudes to GM crops revealed not just individual concerns, but collective ones. People were worried about what futures were being created with new technology and whether future worlds were ones in which they wanted to live. When it comes to transport, which has obvious planning implications, people are used to being consulted. If AVs are going to change the world, people will want to have a say, and they will not expect the market alone to realise the opportunities they see or resolve their concerns. They will want to discuss who could benefit, who could lose out, who should be in charge, and who will take responsibility. One only needs to compare the vastly different transport systems in the world's cities to anticipate that one-size-fits-all AV approaches are likely to elicit very different public responses in different places.

As with other parts of public life, citizens won't just engage as voters, nor only when they are asked their opinion. Some groups may feel that their interests are served or threatened by AVs. Some NGOs have already taken strong positions even while the technology remains uncertain. Many others have not yet worked out their relationships with AVs, but the range of possible issues is likely to be wide.

1.4   Lesson 3: It's About More Than Safety

With GM foods, the developers of the technology assumed that public concerns would be dominated by questions of risk: Will they be safe to eat? Where environmental NGOs were involved, developers presumed that questions would centre on environmental risk. In either case, these questions were seen as scientific ones, and therefore negotiable in scientific terms. Public misunderstandings of the science were used as a pretext for rejecting public concerns. Developers were therefore surprised by the expansion of public controversy into areas of politics.

The novelty of GM foods meant that members of the public did have concerns about regulation for safety. People wondered how, if the technology was so new, we could be sure of its safety. Here, GM food developers were stuck in what Steve Rayner (2004) called a 'novelty trap': the benefits were advertised as radically exciting but the risks were seen as incremental and straightforward. (The vociferous argument about the labelling of GM foods was a product of this novelty trap).

Members of the public were also concerned that new interventions in complex ecosystems challenged existing scientific understanding. The perceived 'unnaturalness' of GM technologies is one common manifestation of such concerns. Finally, the GM controversy raised issues of economic inequality. People and NGOs were concerned about intellectual property, patenting and the livelihoods of developing country farmers. Given these concerns, people lacked confidence in in the ability of scientists, companies and governments to understand and regulate full set of concerns about new technology.

At the height of the controversy, around 1999, there was a damaging collapse in public trust. A survey of European citizens found that only 6% named universities as institutions they trusted to tell the truth about genetically modified (GM) crops, while 26% of people named environmental NGOs (Haerlin and Parr 1999).

1.5   Lesson 4: People in Power Need to Listen as Well as Talk

The developers of new technology are understandably enthusiastic about what they have to offer, but innovation cannot be a monologue. Innovation is a conversation between needs and possibilities. For AVs, there is a need to understand what people's real hopes and fears are. The uncertainties are huge. Companies and policymakers are at the moment making some assumptions about safety, but we still have no idea how safe is safe enough. The acceptability of risk is not something that can be decided by engineers. Do people think being safer than a human driver on average is acceptable? The social science of risk perception would suggest not. Levels of acceptable risk can vary by orders of magnitude even among different transport modes. People tend to magnify risks that they feel are catastrophic, out of their control, new and with little connection to benefit (Slovic 1987). But the point is that we don't yet know. We don't know whether people will have concerns about who owns AV data. We don't know how people will balance values like privacy against convenience. We don't know what people think about the interpretability of machine learning. We don't know whether it matters to people if this is public transport or private, personal or shared. We don't know how all of these things will vary from place to place. So we need to listen. But the conversation can't end there. If innovators are going to ask people what they think, they need to say how they are going to change direction in response. Otherwise it is public engagement for engagement's sake.

1.6   Lesson 5: Be Clear on Why You are Doing Public Engagement

When it comes to public engagement, there is often more emphasis on the *how* than the *why*. Organisations need to be clear on why they want to tell the public something or ask for people's opinions. If it's to sell a particular technology, or to lobby for policy change, be honest about that. People will see right through it if not. Is it to persuade or is it to empower? Is it to open up the debate to new perspectives or to close it down? We can talk about the broad motivations for public participation being normative (it's the right thing to do), instrumental (it helps us do what we want to do, by creating more trust) or substantive (it gives us social intelligence that helps us make better decisions or better technologies) (Fiorino 1990). Often, organisations have instrumental motivations. They think that being seen to reach out will convince the public they are trustworthy. And often, if this is the aim, the activity backfires. Good engagement costs money and time. It's only worth an organisation paying for it if they are going to learn something. A useful reflective question is whether public engagement is intended to open up debates or to close them down (Stirling 2008).

In the UK, the controversy over GM crops convinced policymakers and scientists of the need for new forms of institutionalised public dialogue. In 2004, the UK Government created a new organisation, Sciencewise, to commission and organise

deliberative exercises on issues of new science and technology. Over the last 15 years, Sciencewise has supported more than 50 dialogue exercises on topics ranging from data science to decarbonisation, from flooding to the future of cities.

2   Public Insights on Driverless Futures

In 2018, Sciencewise and the UK Centre for Connected and Autonomous Vehicles commissioned a public dialogue exercise that brought together more than 150 members of the public in five parts of Britain to discuss, over three days, the possibilities and concerns of AVs. In three locations, participants were able to experience AV technologies, riding in, variously, a low-speed driverless shuttle, a prototype self-driving car and a simulator. At the end of the third day, having heard from experts, studied information about AVs, conducted their own homework and discussed among themselves, the participants provided recommendations for policy.

Summarising such lengthy and wide-ranging is challenging. The first thing to note is that public opinion is, as with other new technologies, ambivalent. People are both excited and worried. Individuals may, without contradiction, be both enthusiastic users of a technology while also being sceptical its development and its place in society. We only need to think of our relationships to our smartphones to interpret this ambivalence as normal, but it is often seen as paradoxical or problematic for policy (Kearnes and Wynne 2007). For AVs, there was real enthusiasm among the Sciencewise participants for the potential of the technology, particularly to bring mobility to people who for reasons of disability, location or income, lacked good transport options. But there was also a real concern that these benefits might not be realised if the technology was developed and managed badly.

The full report of the dialogue exercise highlights a few specific issues that provide a constructive challenge to dominant ways of thinking and talking about AVs. Participants were sceptical of the idealised vision of the driverless future offered by AV developers. To pick one example, Waymo promises to: "improve the world's access to mobility while saving thousands of lives now lost to traffic crashes" without requiring changes to public infrastructure. People wondered how realistic such claims were. They thought that the technology would arrive first in the places where the infrastructure, road conditions and potential markets were already set up. Other places and people would therefore lose out. They also saw the technology's potential to worsen problems, such as increased congestion, while alleviating others. These participant thought the technology would realistically only come to urban or suburban places:

"I live in a rural area, so I can't see those pods impacting me, I would still need a car."

"Is there a need for it in a village? If they don't have it, they'll be stuck."

"So what you're saying is that people in the countryside can't get one of your motors [AVs]? That's a bit unfair isn't it?"

Others questioned who would really benefit and who would foot the bill:

> Participant A: "Infrastructure has been my biggest issue."
>   Facilitator: "Will the infrastructure need to change?"

> Participant B: "It'll have to."
> Participant A: "Significantly."
>   Facilitator: "Who should pay for the infrastructure?"

> Participant A: "Users should pay. I don't think taxpayers should pay."

Some participants thought that access to the technology was likely to highly unequal, and were concerned about injustice:

> "They are also putting a lot of money into this technology, so I don't think they are going to be spending money on public transport. So I think there will be effects. So we need a guarantee that going forward it's not going to deplete [public transport investment] further."

Concerns about inequality also extended to questions about employment for professional drivers. Participants wondered…

> "What about people who are employed to drive?"

> "How can we avoid people losing their jobs?"

> "If I was a lorry driver I wouldn't be happy"

People also challenged the conventional narrative of AV safety benefits by asking how we would know if the technology itself was safe. There was a recognition that testing would need to happen in public, but this would not be straightforward. As one person put it,

> "There will be risks, we will learn from accidents, but I don't want my family to be those on the back of which the learning happens."

The participants wanted to see independent systems for understanding, improving and verifying the safety of new AV technologies. They were concerned not just about the risks of crashes, but also the risks of system failure, both malicious and unintentional, and (particularly for women) the personal security dangers of travelling without a driver, potentially on vehicles shared with others.

While AVs are often framed as offering additional mobility options, much of the discussion reflected a concern about a loss of freedom and control. Some of this was about giving up control of a vehicle to a car, but the bigger issue of people's control over how they got around was a more important recurring theme. One participant, reflecting on conversations they had had after an earlier session, was surprised that, in reacting to AVs, people expressed "a sense of losing their independence, not having their car in the garage and being able to use it when they wanted." The paradox was that greater autonomy of vehicles was frequently perceived as a loss of autonomy for humans, as suggested in the following quotations:

"I wouldn't want to go completely with it. I would still want to be able to take control of the car [...]. I wouldn't want to abandon my car altogether."

"Cars were liberating for the working classes and older people. This seems to be restricting choice."

"What if someone doesn't want a driverless car?"

"Why would I agree to a system that restricts my choice to go where I want when I want, and with my dog?"

"It will be for the greater good, but it worries me. I don't know if I personally can make all the changes required to adapt to this world."

The final concern, about how the changes individuals may need to make to their own lives, should not be downplayed. Most of the participants recognised that technologies do not just plug-and-play; they work in particular conditions and often the conditions need to change in order for them to work. For AVs, participants quickly realised that the issue went beyond just who or what was doing the driving. Questions of individual and shared mobility and public and private transport quickly became relevant. The participants' recommendations therefore focussed on the conditions they would like to see for the responsible development of the technology. In summary, people felt that they would be more comfortable…

- If the technology is proven to be safe and secure
- If the benefits of the technology are widely available
- If the technology is good for society and jobs
- If we're in control of our transport
- If there is clear guidance on accountability
- If new regulatory bodies are created[2].

Given the potential benefits and concerns, most participants were reassured that the dialogue exercise had been initiated by Government, suggesting that companies would not be left to their own devices. As one of the more enthusiastic participants said in a video recorded after the dialogues,

"I didn't know that we are not left alone. It's not left alone in big corporations' hands. Government knows about this and they're doing something, and I'm really, really happy about that".[3]

Taken together, these attitudes present a substantial challenge to developers, most of whom are currently focussed on the technical challenge of safely navigating complex environments and the economic challenge of identifying profitable business models for

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[2] These principles and other conclusions are in the CAV public acceptability dialogue Engagement report, Sciencewise, 24 July 2019, available here: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/837958/cav-public-acceptability-dialogue-engagement-report.pdf.

[3] CAV Public Acceptability Dialogue – Video of workshop participants, 7 Feb 2020, https://www.youtube.com/watch?v=_BKm0o16ofA.

products and services. But public opinion need not and, if the lessons of GM crops are to be heeded, *should* not be seen as a barrier. Instead, it can be a resource to empower good policy and good system design.

2.1   Governing AVs

Public dialogue can be a useful prompt for policy and innovation, but it should not just be seen as a one-off exercise. Policymakers, companies and others should ask themselves how to make open, deliberative public engagement a normal part of their activities. The regulation of new technologies can take many forms. We do not yet know whether an AV will be regulated like private cars, like transport systems, like data-driven technologies or like something else. We could see a standardisation of international approaches, or national governments could take very different approaches to technologies that seem otherwise identical.

By the time of the genetically modified crops controversy in Europe, much of the regulatory apparatus in both the US and Europe had already been constructed. US policymakers had, in the 1980s, chosen to regulate the *products* of genetic modification, asking whether the need strains of crop were substantially equivalent to their conventionally bred counterparts. European regulators had adopted a more precautionary approach to the process of genetic modification, emphasising novelty and inviting additional scrutiny (Pollack 2010).

With AVs, many of the rules that will govern their development are not yet written. Given the uncertainties, open dialogue is important. In this mode, developers' one-way communication of information remains important. It will be vital to tell members of the public what is happening and why. But developers should not expect members of the public to trust them just because they are told to. Responsible companies can help explain the limits of technology as well as the potential benefits. Clarity about expectations will be important at a time when confusion suits the companies that are most prone to hype. Building a healthy conversation around AVs is not easy, but the alternative could be bad for developers, bad for governments and bad for the public.

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