Rejecting acceptance: learning from public dialogue on self-driving vehicles

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Abstract

The investment and excitement surrounding self-driving vehicles are huge. We know from earlier transport innovations that technological transitions can reshape lives, livelihoods, and places in profound ways. There is therefore a case for wide democratic debate, but how should this take place? In this paper, we explore the tensions between democratic experiments and technological ones with a focus on policy for nascent self-driving/automated vehicles. We describe a dominant model of public engagement that imagines increased public awareness leading to acceptance and then adoption of the technology. We explore the flaws in this model, particularly in how it treats members of the public as users rather than citizens and the presumption that the technology is well-defined. Analysing two large public dialogue exercises in which we were involved, our conclusion is that public dialogue can contribute to shifting established ideas about both technologies and the public, but that this reframing demands openness on the part of policymakers and other stakeholders. Rather than seeing public dialogues as individual exercises, it would be better to evaluate the governance of emerging technologies in terms of whether it takes place 'in dialogue'.

Key words: emerging technologies; self-driving cars; automated vehicles; public dialogue; governance; public engagement with science and technology.

1. Introduction: frame-breaking

Developments in artificial intelligence and robotics have led some innovators to conclude that driving, a task previously considered impossible to automate, is now solvable (Stilgoe 2018). The momentum and the scale of investment mean we can anticipate with some confidence profound changes to people's mobility, the structure of industries and, eventually, the design of public space, even if we cannot predict the distribution, shape, or direction of such changes. Much of the mainstream debate on the possibilities and pitfalls of the technology has taken place in terms of safety, focussing either on the lives that could be saved by the technology or the potential risks and ethical dilemmas posed by automated decision-making (Cohen et al. 2020).

Once the opportunities and uncertainties are opened up to scrutiny by stakeholders, the range of possible issues that might affect or be affected by the technology looks much broader (Cohen et al. 2018). The trajectories of technologies and associated policies are not set. The case for broad democratic debate about the technology is therefore strong. However, the structure of this debate, its appropriate participants, and the content of the conversation remain contested.

In this paper, we analyse how innovators' and policymakers' views of the public are tied to their views of automated vehicle (AV) technology. A technologically determinist presumption of the inevitability of self-driving is coupled to a diagnosis of public acceptance as a major problem. We review

the literature on public engagement in innovation and transport in order to understand the construction of this frame. We then consider the potential of deliberative public dialogue exercises as experiments in frame-breaking.[1]

Our findings come from stakeholder workshops, more than 50 interviews with stakeholders and technology developers as part of the Driverless Futures project, and our experience helping to design and run public dialogue activities. We have two major case studies of public dialogue, both of which we helped design, facilitate, and analyse. The first was run under the aegis of Sciencewise, on behalf of the UK Department for Transport (DfT). In partnership with Traverse, a specialist public dialogue organisation, we won the contract for this project and worked with policymakers and other stakeholders to design the process, help facilitate the sessions, and report on the findings. The second exercise—the Citizens' Dialogue on Driverless Mobility—was part of an international dialogue programme initiated by Missions Publiques and the Consortium for Science Policy and Outcomes at Arizona State University. We worked with Involve, a participation think tank, to bring Transport for Greater Manchester (TfGM) into the process. We then helped run the day of public dialogue. We both have long histories doing, analysing, and advocating for public dialogue in policymaking. We might therefore be characterised as action-researchers.

These early experiments in organised public dialogue offer a sense of the possibilities and constraints for public engagement. Such exercises are typically pulled in opposing directions: towards relevance and towards an authentic

representation of public values and priorities. Managing the tensions demands careful negotiation. Our conclusion is an optimistic one, that public dialogue can contribute to constructive movement of debates about the means and ends of technology, as part of a process of social learning. But it is important to first recognise the institutionally-embedded assumptions that might make such movement hard. In doing public dialogue, we wanted to learn, first, how citizens imagined futures involving AVs and, second, how more democratic approaches to governance might enable greater alignment between technological visions and public values.

1.1 The public as a problem in innovation and transport

The relationship between new technologies and the public is a prominent concern for both innovation policy and transport policy. Widely-invoked models of innovation diffusion start from the assumption that the success of new technologies depends upon their uptake by users. Everett Rogers (1983) sees innovation moving through phases of knowledge, persuasion, decision, implementation, and confirmation (See also Davis (1989) and Sovacool and Hess (2017)).

The recognition that new technologies do not sell themselves has led to innovators to problematise the public, but this attention has tended to frame the public as passive consumers of innovation. Prospective users, from this view, may be demarcated into 'early adopters' or 'laggards', but the presumption is that the laggards are only delaying the inevitable and the task is therefore to accelerate their acceptance. The problem of acceptance has its roots in studies of change management with new technologies in business. Venkatesh (2003)'s 'unified theory of acceptance and use of technology' focuses on employees' use of workplace information technology (IT). Another influential analysis considers acceptance as a triangle, with socio-political, community, and market aspects (Wüstenhagen et al. 2007). The notion of 'acceptance' has been adopted, turned into a target, and spread far beyond its original analytical location with little critical analysis (Batel et al. 2013). Shove (1998) considers, in the case of energy-saving technologies, how the identification of 'gaps' between actual and potential technology use contributes to a separation between the technical and the social aspects of innovation. A techno-centric view sees the potential of technologies like insulation, smart meters, and wind turbines as unarguable, so the problem becomes one of public uptake. The behaviour of the public is seen as the limiting factor: an uncertainty to be resolved as part of the managed transition to more sustainable systems. This leads to the prioritising of social research aiming to understand the public as a 'barrier' to widespread adoption (Shove 1998).

'Acceptance' implies a problem, locates it outside technology, and suggests that the role of the public is reactive and necessarily fatalistic. The language has echoes of psychotherapy, in which patients are asked to understand and surrender to their circumstances, with acceptance being the final stage of dealing with grief. In the context of emerging technologies, this therapeutic fallacy contributes to a sense of fatalism that impedes good governance. With new technologies, 'acceptance' is a function of technological determinism, which limits 'the scope of enquiry to monitoring the social adjustments… required by technological progress' (Williams and Edge 1996: 866). Where members of the public express doubts, this is

often labelled 'resistance' (e.g. Juma 2016), which, from the technocratic standpoint, looks 'irrational, morally bad or at best understandable but futile' (Bauer 1997: 2). This problematisation of the public overlooks the potential of members of the public to constructively challenge, co-create, or innovate.

This construction of a public for innovation reflects the 'imagined lay person' (Maranta et al. 2003) that acts as a working model for scientists and their institutions when they enter the public domain. A 'deficit model' of the public (Sturgis and Allum 2004) that prescribes programmes of scientific literacy with the hope of increasing public trust still dominates (Rayner 2004; Wynne 2006). Scientism—the definition of public issues in terms of science and the lack of consideration of values within science (Welsh and Wynne 2013; Rommetveit and Wynne 2017)—is rife.

A growing concern with understanding the nature of public resistance to science and innovation has meant that earlier attempts at one-way science communication have been displaced by new forms of two-way deliberation in Northern Europe, the USA, and elsewhere. In the UK, public participation has been a part of many areas of public policy for decades, particularly at a local level. The use of mini-publics (Goodin and Dryzek 2006)—small groups of citizens whose discussions are assumed to reflect those of the wider public—is more recent but has become common, particularly in policy areas involving science and technology. In 2002–3, a large British public dialogue exercise—GM Nation—attempted to understand public views on the highly contested technology of genetically modified crops but, according to Jasanoff (2005), it revealed:

> a dilemma confronting state efforts to democratise the politics of new and emerging technologies: on the one hand, interacting only with identifiable stakeholders may simply strengthen the traditionally cozy relations between business and government; on the other hand, the public that needs to be engaged in broader debates about the pros and cons of technology is elusive and, in the absence of reliable precedents, hard to engage in deliberations whose very authenticity and purpose are widely questioned.

As public dialogue has begun to be institutionalised in the UK and elsewhere (Wilsdon and Willis 2004), concerns have been raised about how dialogue exercises are framed. Attempts at public dialogue have been tightly constrained and occasionally asphyxiated by the people who commission, design, and conduct them (Irwin 2006). Given the uncertainties of new technologies and the political commitments held by some groups, including businesses, policymakers, and non-governmental organisations, who may invest in public dialogue, there is a risk that dialogue exercises constrain citizens' participation by imposing particular framings of technology, of democracy, and of the public themselves (Chilvers and Kearnes 2015). Public dialogue can, as well as cementing rather than challenging existing power relations (Bickerstaff and Walker 2005), contribute to reifying technologies that do not yet exist.

Processes for public participation often work with idealised conceptions of 'ordinary' citizens, when the reality is far more complicated (Powell et al. 2011). Institutions and members

of the public may have contrasting ideas of the public-in-general and publics-in-particular (Michael 2009). The theory behind democratic deliberation presumes that citizens are able to change their opinions in the face of evidence and contact with others and able to reach cogent, balanced conclusions (Chambers 2003). The reality often falls short of the neat ideal. Even established models such as Consensus Conferences may still produce ambiguous or conflicting outcomes. This is not to say that such processes are not valuable—as we discuss below, we think that they can contribute vital insights if their findings and framings are interpreted reflexively—but we should recognise that different actors' motivations for deliberation may be unresolved and conflicted.

One–off public dialogue exercises have been criticised on the grounds that they have made little actual difference to decision-making (Smallman 2018). Such exercises have historically been constrained by policymakers' desire to control the scope of discussion, avoid controversy, reach closure, and generate insights that they feel would be most helpful (which often means least disruptive) to them and their stakeholders. Deliberative processes can be used by policymakers to delimit or control debates by, for example, circumventing entrenched stakeholder views (Lezaun and Soneryd 2007). Having been involved with many such exercises as facilitators, external experts, evaluators, and members of oversight groups, we have often seen public participants attempt to understand and Sustainable Urban Mobility Plans then resist the roles that have been imagined for them.

A meta-analysis of 17 earlier Sciencewise dialogues found that, while each brings particular issues to the fore, public concerns about science and innovation can be derived that are common to all, relating to the purposes of science; trust; inclusion; speed and direction of innovation; and equity (Macnaghten and Chilvers 2014). These general messages have led some to conclude that such exercises should not be seen in isolation, but rather as part of an ongoing experiment in governance, with the apparatus expanded to include institutions of science and policymaking (Braun and Könninger 2018; Chilvers and Kearnes 2015; Chilvers et al. 2018). Smallman (2019) has shown that, even if systematic public dialogue has had minimal impact, it has revealed a gulf between public and elite visions of what science can and should do for society. The context of a particular public dialogue is therefore as important as its process, otherwise it risks being, as Thorpe (2020) argues, just a new way to legitimise new science and technology. Public dialogue can be seen in the context of a 'higher order game' (Irwin et al. 2013: 131) or a democratic experiment (Laurent 2011). When it comes to transport, debates about innovation must contend with some well-established political interests and models of public participation.

1.2 Engaging with transport

New transport schemes or modes are unavoidably public. Their success rests in many cases on willing users or citizens who are supportive of infrastructural upheaval. Transport modelling has been criticised for encoding a view of the public that is methodologically individualistic (Timms 2008; Lovelace et al. 2020), with transport outcomes seen as an aggregate of the choices of individual users operating on *homo economicus* principles of rational self-interest. Within such models, social science is imagined to play a walk-on part in explaining what Shove (2010) calls the 'ABC': attitudes are

assumed to lead to behaviours and then to choices. This creates a contrasting picture of the transport user as only partially rational and prone to habitual and emotional choice-making (Michie et al. 2011). Meanwhile, the extrapolation of user choices in a mode that has been called 'predict and provide' remains the dominant approach to transport policy (Owens 1995; Goulden et al. 2014). People, in this view, are characterised as users of transport rather than citizens with multiple, layered interests and concerns. In some places we can see a more nuanced approach to policymaking, involving co-design, and a growing emphasis on citizen participation (e.g. the Sustainable Urban Mobility Plans (SUMP) development process in European Union states (Rupprecht Consult 2019) is gradually moving practice towards more inclusive methods). But, as Bergman et al. (2017) describe, when debates about transport meet those about new technologies, a paradox is created. 'Disruptive' technologies such as electric or self-driving vehicles are assumed to radically refashion transport choices and yet the public are assumed to be consistent in their behaviours. This creates incentives for the development of new technologies to straightforwardly substitute for existing technologies rather than genuinely transform systems in sustainable ways.

For technological transitions in transport, the public are seen as a necessary component in the transition to improved (safer, greener, more efficient, and fairer) transport systems. Policymakers may desire behaviour change while also needing behaviour to be predictable. The imagined public (Walker et al. 2010; Maranta et al. 2003) hold substantial sway over transport and infrastructure decisions, but they are seen as resistant, conservative, emotional, NIMBYish, selfish, scientifically ignorant, and unaware of the greater good (Bergman et al. 2017; Ryghaug and Toftaker 2016; Walker et al. 2010). In the case of electric vehicles, policymakers tend to regard the public as ignorant of 'whole life costs', emotionally attached to conventional cars (Bergman et al. 2017), or suffering from 'range anxiety' (Ryghaug and Toftaker 2016). The tendency to problematise or even pathologise the public rather than hold a mirror up to technology is an endemic feature of a lack of institutional reflexivity (Wynne 1993). All too often, innovators' genuine interest in understanding what the public might accept slips into a normative project of seeking to build acceptance.

1.3 Awareness, acceptance, and adoption

In 2019, a new public relations initiative for the nascent self-driving industry was announced at a giant technology conference in Las Vegas. According to their web site, the Partnership for Automated Vehicle Education (PAVE) is a coalition with 'one goal: to inform the public about automated vehicles and their potential so everyone can fully participate in shaping the future of transportation.'[2] For PAVE, the technology is inevitable if not yet complete, and it is held back by a lack of public acceptance. According to Kelly Nantel, the co-chair of PAVE, the moment that focussed PAVE minds on 'the public acceptance challenge' was a survey from the American Automobile Association finding that almost three-quarters of the US public were afraid to get into a self-driving vehicle. She told in a large AV conference, 'That's the problem that PAVE is designed to solve.'[3]

In the UK, a policy body tasked by the Government with 'accelerating the self-driving revolution' published a

'Roadmap' in 2020 that identified the need to 'inform the public so that ultimately there is understanding, acceptance and adoption' of AVs. The document provides targets 'Widespread awareness of CAM [connected and automated mobility] by 2028… Public acceptance at 85 per cent by 2029… Solid uptake of CAM-enabled services by 2030'[4] without further explanation of what is being measured or why. This framing, in which the challenge is seen as first public *awareness*, then public *acceptance*, and finally public *adoption* of new technology, has quickly become the dominant way in which technology developers and policymakers think about the role of the public in the development of self-driving vehicles.

An analysis of 22 German policy and stakeholder documents related to autonomous driving (Graf and Sonnberger 2019) found a similar pattern. One of the reports from BMVI (the German ministry of transport) mentions the need for an 'active societal dialogue', but only in the service of 'creating acceptance' (ibid.). KPMG, a consultancy firm, has produced an Autonomous Vehicles Readiness Index that suggests 'consumer acceptance' as an ingredient for national economic success. Their assessment is that 'Indians, closely followed by Mexicans, are the most accepting of AVs… Britons then Americans are the least accepting.' One of their key metrics is the proportion of the population living in areas where AVs are being tested, the assumption being that familiarity will breed acceptance (KPMG 2019).

Framing the public in terms of 'acceptance' prompts us to ask 'acceptance of what?' Some proponents would argue, as the CEO of Waymo, an AV developer, has done, that 'Fully self-driving cars are here,'[5] but there are no viable business models or off-the-shelf technologies for consumers or transport planners to accept, let alone adopt. Prototype self-driving vehicles currently on the streets are highly constrained in where and how they can safely operate. In most cases, 'safety drivers', remote operators, or dedicated infrastructures support systems that are far from 'autonomous' (Tennant and Stilgoe, forthcoming). When neither the means nor ends of a set of technological visions are settled, a project of building 'acceptance' is hard to understand.

One of our interviewees, from a company that is testing AV technology in the UK, claimed, 'society is the biggest barrier to widescale adoption and acceptance'. The inconsistency is clear, given that 'society' is vital for the technology's uptake, but the comment reflects an established view of the public as a problem. AV proponents typically imagine the technology as a solution to a problem of human error: humans are unreliable drivers and they are unaware of their own limitations. One paper (Sparrow and Howard 2017) calls this the 'drunk robots' view of humans. A commonly-invoked statistic is that more than 90 per cent of road deaths are caused by human error.[6] There is a longer history of carmakers lobbying for a focus on a diagnosis of human error and a prescription of driver training as a way to push back against proposed regulations aimed at technological safety improvements (Irwin 1985; Albert 2019). In the context of self-driving vehicles, the public are also often discussed as though they are unaware of what is good for them, too attached to the idea of driving, unable to understand the hazards of roads, and irrationally afraid of automated systems.[7]

1.4 Assembling a public

The problematisation of the public has meant that social science, particularly psychology, is often involved or invoked in the prototyping of AVs. AV developers see public displays of the technology as opportunities to impress and dispel the fears of the public. 'Trust' is seen by the developers of the technology in narrow terms (Stilgoe 2021), or in abstract ways, and there is little research on people's actual experience with the new technologies (Raats et al. 2020), in part because public displays of AVs are tightly stage-managed (Marres 2020; Haugland and Skjølsvold 2020).

Declan McDowell-Naylor (2018) conducted an ethnographic study of GATEway, one of the first UK government-funded AV projects, which involved a public 'trial' of low-speed driverless pods. He asked 'what GATEway's trial was in fact a test of' and concluded that, rather than being a test of a technology, it was the public who were on trial. The potential for technological surprise was restricted to give public participants the impression that the pods were up to the job. Meanwhile, GATEway collaborators working at the Royal College of Art were asking 'how design can support or influence people's attitudes towards adoption and acceptance' (Interview in McDowell-Naylor (2019)). The assumed deficit here is a psychological inability to engage with something distant, in this case a future technology. Public engagement is not just as an attempt to understand the public, but to assemble a public (Felt and Fochler 2010). In the GATEway case, the public was made to suit a pre-existing strategy, which limited the scope of what the research project could hope to learn. Even if the aim is to understand rather than change public views, the weight of such theoretical baggage can prevent reflexivity. McColm's (2017) survey of attempts to understand public views of AVs reveals how narrowly social research has been framed, largely because such efforts have been led by people with economic interests in the technology.

Some social scientists have been willing to play a role that Wynne (2007: 493) characterises as delivering 'the Holy Grail of public acceptance for whatever technoscience might throw up'. Research based on Venkatesh's (2003) 'unified theory of acceptance and use of technology' has started to explore the conditions for people's acceptance of early automated vehicles (Nordhoff et al. 2016; Nordhoff et al. 2018). Some of this work sees the public as citizens (e.g. Milakis (2019)), but in most cases social research has followed the dominant pattern of seeing public attitudes as user or consumer attitudes (Tennant et al. 2019).

Shariff et al. (2017) see public trust in the technology as hindered by 'psychological roadblocks'. Their view of the public depends on a view of the technology as inevitable if not complete:

> Manufacturers are speeding past the remaining technical challenges to the cars' readiness. But the biggest roadblocks standing in the path of mass adoption may be psychological, not technological… Achieving the bright future promised by autonomous vehicles will require overcoming the psychological barriers to trust. (Shariff et al. 2017: 694).

These authors' concern is that public reactions could 'derail the adoption of autonomous vehicles' (Shariff et al. 2017: 695). Another paper from the same group rejects the possible contribution of members of the public, arguing that 'regulations of ethical trade-offs should be left to policy experts, rather than resolved by referendum' (Awad et al. 2020).

The language of acceptance suggests a category mistake. AVs are nowhere near as mature as Shove's (Shove 1998) sustainability technologies or Venkatesh and Bala (2008) IT systems, nor are the ends to which the technology suggests a means clear. With such poorly-defined technologies, the language of 'acceptance' demands additional explanation. In conversations with AV proponents it becomes clear that the public are being asked to do more than just welcome the technology; they are being asked to help demand it into existence, bringing stability to the many uncertainties faced by the technology's developers. These uncertainties relate not just to the technology, but also to models of profitability. As with other technologies, the success of AVs will depend on much that is beyond the control of the developers, many of whom have a narrow focus on software (Tennant and Stilgoe, forthcoming). An insistence on public 'acceptance' reveals a neurosis on the part of technology developers, that the technology will not work as they wish, so it must be made to work by others. 'Acceptance' talk suggests a naïve approach to 'heterogenous engineering' (Law 1987), in partial recognition of the social changes that will be required to adapt to AV technologies that will be inevitably limited in their scope and function.

The focus on public acceptance reflects a failure on the part of technology developers and some policymakers to accept the immaturity or limitations of the technology. This is not a straightforward deficit model, or even a 'deficit model of innovation' (Pfotenhauer et al. 2019), because the relevant information or action is not specified. It seems that the public are being asked to accept not a particular technology but a particular model of innovation, involving a set of actors, power structures, and governance arrangements. The public are conjured in order to fit an assumed model of a technological transition to a self-driving future that will happen, following Rogers, first through enthusiastic early adopters and then through what Bickerstaff et al. (2008) call 'reluctant acceptance' among the rest. Developers imagine external 'roadblocks' or 'barriers' to disguise their technology's limits.

The prevailing views of both technology and the public that we have described are the backdrop against which our attempts at public dialogue took place. Part of our interest in dialogue was to see if such things could be destabilised and opened up to scrutiny. In the following section, we analyse two public dialogue exercises in which we were involved.

1.5 The CAV public acceptability dialogue

In the UK, public dialogue on policy issues that involve science and technology has been institutionalised through Sciencewise. Since 2004, this government programme has supported more than 50 dialogue projects, each involving between 30 and 200 members of the public.[8] The Sciencewise 'CAV Public Acceptability Dialogue' was commissioned by the UK Department for Transport in mid-2018 and took place between October and December that year. The idea of the dialogue began as a recommendation in a report (Cavoli et al. 2017) (of which one of us an author) on 'social and behavioural questions relating to autonomous vehicles' for the Department for Transport (DfT).[9] Officials at the DfT agreed that Sciencewise would be an appropriate model and began commissioning a dialogue process.

The framing of the dialogue involved multiple parties and a mix of purposes, some opaque and some crossed. The DfT's interest was in future transport systems. For the DfT, AVs represented both opportunities and concerns. The Centre for Connected and Autonomous Vehicles,[10] a newly-created body that crossed between DfT and the Department for Business, Energy and Industrial Strategy, had a mission 'to help ensure that the UK remains a world leader in developing and testing connected and autonomous vehicles'.[11]

The Centre for Connected and Autonomous Vehicles (CCAV), as a servant of two masters, found itself navigating some tensions and paradoxes, which meant its policy commitments could not be total. CCAV leaders began with an open-minded approach to public dialogue. One senior civil servant told us,

> quite a lot of public engagement work, particularly polling, was bunk, basically, and very clearly designed with a prior message in mind, and it felt to me that it was too important an area of exploration to leave to people who were not necessarily motivated by a genuine desire to explore… the full range of questions.[12]

The invitation to tender for the dialogue project said 'most of the public are unlikely to have any experience of CAV technology, therefore DfT considers public dialogue as the most useful way for exploring the public acceptability of CAVs.' Although the shift from acceptance to 'acceptability' may seem merely semantic, it at least problematises the technology rather than the public. At early meetings, CCAV staff expressed an interest in the substantive benefits of deep engagement with public views. However, the project brief included more instrumental aims, including, 'helping to realise any perceived benefits of CAVs (such as improved road safety) as well as mitigate against any potential disbenefits (such as cybersecurity fears)'. And there remained in the brief a presumption that acceptability was a function of awareness: 'This dialogue will explore how, why and in what circumstances acceptability increases or decreases, particularly in relation to information and greater exposure to the issues.'

Starting in mid-2018, we worked with Traverse, a social research and public deliberation organisation, to design and conduct the dialogue exercise. As the dialogue process was being planned in detail and the policy team consulted stakeholders with AV interests, the language of 'acceptance' and the casting of citizens as users began to creep back in. Civil servants demanded the inclusion of a session designed to assess how willing people were to share vehicles with one another, because this was seen as a potential barrier to people's acceptance of AVs.

The dialogue exercise consisted of five groups in locations across the UK, each with 30 participants, who were recruited to reflect the diversity of their local populations. It took place over three days spread over a few weeks, starting with a set of evening focus group discussions and continuing on two Saturdays, during which participants spoke with expert visitors and took part in a mix of structured and unstructured small group exercises. In three of these locations, participants were asked to try out AV technology, variously in a driverless shuttle, a prototype automated car, and a simulator.

By the time the dialogue sessions began, the topic guide represented a compromise between the facilitators' desire for openness, policymakers' desire for relevance and control, AV developers' desire to measure public acceptance, and other stakeholders' interests in issues such as road safety, planning,

and disability rights. The tensions were also apparent in some of the groups' interactions with experts. At one point during a small group discussion facilitated by one of us, a university scientist told the participants they should use the word 'trial' only to describe public demonstrations of the technology, as opposed to actual tests. Later, a policymaker who was there to observe the sessions interrupted a group to introduce the 'trolley problem', an applied ethics thought experiment. We had intentionally steered clear of this, knowing that it would constrain participants' discussion of other possible issues. At an earlier group discussion, the same policymaker had suggested that the move to a self-driving future could happen in a matter of years, like the move from horse-based to car-based cities (The actual history, as Peter Norton et al. (2011) explains, is far more complicated and owed as much to government policy as to technology). At another session, an expert 'corrected' the group discussion with reference to the Society of Automotive Engineers levels, which are a problematic prescription for technological progress (Stayton and Stilgoe 2020). These well-meaning attempts to inform the discussion in fact closed it down, dampening the agency of the participants, which we and the other facilitators had made great efforts to encourage.

As facilitators, our fear was that others' insistence on participants experiencing the technology would also act to close down the discussion by making the technology seem fixed and ready to deploy. Some of the participants who rode in the prototype AV were impressed with what it could do, but others wondered about its limits. One talked about how a bird had walked across the test track in front of the vehicle she was in. The safety driver had taken control of the car in order to avoid the bird. This incident generated a rich discussion about whether an AV should always follow the rules of the road, which could mean killing the occasional bird, or if they should be more careful. To our surprise, the experience generated an important discussion about the gap between hype and reality. It also revealed a paradox of acceptance: if the technology works, its users may be briefly impressed but quickly bored. The technology's opacity (we cannot see how or why it is doing what it is doing) make it oddly unimpressive. Its possible benefits (safety and efficiency) are almost always invisible. Also, any reductions in cost are only likely to come at scale rather than upfront. The acceptance frame asks people to be awed by the novelty of a technology while being also convinced of its equivalence with technologies they know.

All Sciencewise dialogues are evaluated by independent contractors. At their best, these evaluations go beyond questions of process and compliance with the Sciencewise guiding principles to ask what the dialogue achieved. This is a vexed issue because dialogues take place within the complex and fast-moving world of policy and because policymakers are reluctant to give credit to citizens for policies that they take forward. The evaluation report notes that the project was timely and well-placed to influence policy.[13] We were told that our report[14] was widely read within government, and we have been invited to present the work within DfT twice. One of the senior officials who commissioned the work described in an interview its value in giving policymakers:

> a broader view about the importance of speaking to members of the public than just building acceptability of technology… what they probably got was a bit more of a vocabulary that they could use and a bit more of an

evidence base they could use to help explain why that might be a useful and beneficial thing to do.

This official saw their role in making the case for, as well as learning from, public dialogue:

> I've promoted it to various colleagues who work in similar teams around the world and they're really excited about the fact that this sort of work is going on… It still feels like the start of things and it still feels a little bit like walking into headwinds but I think it's been relatively successful so far.

They went on to describe the value of dialogue in communicating with politicians:

> Ministers… generally spend quite a lot of their time engaging with members of the public for one reason or another, and take their representative role quite seriously. And if you present them with something which allows them to do that in a methodical way… they'll be pretty receptive to it… One thing it does do is it gives you an opportunity to actually present that to a Minister and to engage a Minister.

Their conclusion was that the public dialogue, as with other forms of policy input, would have more impact 'if the stars align', that is, if its insights fit rather than clash with existing political priorities. The Sciencewise CAV dialogue was constrained by its policy connections, but these connections also allowed it to help advance some new policy possibilities, while challenging the views some of the more naïve views of public engagement that had been allowed to circulate. Our second dialogue was rather different.

2. Citizens' Dialogue on Driverless Mobility

The Citizens' Dialogue on Driverless Mobility is, at the time of writing, an ongoing international project involving deliberation events in 17 places across nine countries. The initiative came from a collaboration between Mahmud Farooque of Arizona State University and Yves Mathieu, founder of a French organisation, Missions Publiques. With encouragement from the Kettering Foundation, which supports citizen participation, the aim was to try public dialogue without a pre-imposed structure. Farooque's suggested topic was AVs. He had previously led two free-form dialogues on the subject in American cities. He and Mathieu, a long-standing collaborator, proposed holding a set of deliberative events on the same topic, at the same time, in a range of locations in France. The idea of simultaneous deliberation had been part of the World-Wide Views initiative and had generated media interest in the process and its outcomes.

The project was motivated by a desire to get past superficial discussions that had, up to that point, been dominated by industry representatives who stood to benefit from keeping the topic narrow and protecting some of the hype from critical assessment. The project's leaders also envisaged that dialogue, even if it asked critical questions, could contribute to the building of trust among stakeholders, citizens, and policymakers. The desire to increase reach and relevance meant placing limits on its free-form design. The project leaders wanted to recruit partners and advisors in cities across the

world and they attracted supporters with a range of standpoints. Some, including PAVE, were strongly committed to the development and use of AVs, but they were part of a broad group that included proponents of citizen participation, local authorities, and other organisations without a defined position.

We were approached in 2018 by Involve, 'the UK's public participation charity', which had itself been approached by Missions Publiques to run the UK arm of the global dialogue. We wanted to centre the dialogue on a particular place so that we could meaningfully bring local issues and policy agendas into the discussion. Of the city authorities we approached, TfGM was interested and able to fund such an initiative through a European Union project. Even with TfGM's enthusiasm, it took a year to agree and plan a 1-day dialogue event. The 'Citizens' Conversation' took place in October 2019, involving 50 residents of Greater Manchester, recruited via mass mailout, and selected to ensure a diverse sample. The event was led by Involve, with TfGM staff, after a short training session, facilitating small group discussions. We both acted as expert resources, giving short talks during the day, observing discussions, and standing by to answer questions.

The day followed the same structure as events taking place in other cities, moving through five sessions, and using standardised presentation videos and discussion materials:

(1) Your transportation routine today and how driverless vehicles might affect it.
(2) Trust and confidence in automated systems.
(3) Future automated transportation scenarios.
(4) Who is in charge?
(5) What are the priorities for your area?

The content of the first four sessions had been agreed by a steering group, of which one of us was a member, to enable comparison across all of the participating cities. The fifth session was aimed at, and framed by, TfGM. TfGM staff used this session to test participants' views on a set of five AV use cases.

The Manchester Citizens' Conversation has been summarised in a report published by Involve.[15] Our own interview with a TfGM policy lead suggested that the day had been useful, but the timing was not ideal. By the time the Citizens' Conversation took place, TfGM had already established a set of policy principles, including, for example, an insistence that AVs must improve safety for all road users and complement conventional public transport. There was therefore no expectation that the Conversation could shape TfGM's policy on AVs. Instead, it merely 'developed and refined' the organisation's principles. TfGM had developed a set of 'personas'—descriptions of potential users of AV technology. Our interviewee was pleased that 'Most of [the participants] fitted within the six personas…but there were also some anomalies… So we can identify the gaps that we have in this process.' In this case, the exercise served to largely confirm the organisation's view of the public.

This process fell short of some ideals of deliberative democracy for two reasons. First, the requirement for all cities to follow the same structure limited Manchester's capacity to design an event tailored to its context. Second, poor timing meant the event missed a window of opportunity to contribute to local policy on CAVs. The strength of the model, an off-the-peg deliberative exercise, was also its main weakness. The irony was that the lack of a strong top-down policy framing led to an emphasis on standardisation, which restricted the exercise's responsiveness.

2.1 Conclusion: public dialogue as social learning

These two public dialogue exercises took place against the backdrop of a narrative that diagnosed public acceptance as a major problem for future self-driving vehicles. This framing of the public and their potential engagement was also a framing of the state of the technology and its possible future trajectories. Our normative and analytical position was that this frame needed to be challenged and we wanted to see if, through public dialogue, we could test and then shift assumptions held by others about both the public and the technology.

Our experience of two dialogues, one with a policy agenda in search of a public and one with a process in search of a policy agenda, revealed the potential and limits of dialogue as a frame-breaking exercise. The Sciencewise dialogue was driven by a mix of motivations: some instrumental and some critical. It was pulled between twin desires to test future users' acceptance and to unearth a broader range of public issues. The Missions Publiques initiative had an ideal of participation, but its efforts to ensure relevance and standardisation meant inevitable compromises that had the effect of narrowing participation and fixing a particular image of the technology. Although one was ostensibly top-down and the other ostensibly bottom-up, both raised a serious question for upstream public engagement: does organised public dialogue necessarily reify the technologies under discussion? Do attempts to break the frame of public acceptance end up reinforcing it? We recognise the risk, but would conclude that public dialogue can, if done with care, disrupt the definition of issues as part of a process of social learning. The 'success' of public dialogue depends to a large degree on policymakers putting their own assumptions at risk and trusting in citizens' ability to contribute new framings. Public dialogue can be a safe space in which to realise the possibility of surprise.

Comparing the two dialogues tells us something about the processes that seem to enable open participation. The length of the Sciencewise dialogue allowed the discussion to be deep, and to cover many issues, but also allowed the participants to feel empowered. Participants were, on the whole, able to frame their own questions to experts rather than feel cowed by their expertise. The Missions Publiques exercise in Manchester was shorter and the expert resources more limited, but the participants still felt empowered. However, the most important lessons are not about dialogue processes. Indeed, in many discussions of institutionalised public dialogue, questions of how it should take place sometimes obscure more important conversations about why it should take place (Stilgoe et al. 2014). Both of our dialogue exercises were products of compromises between multiple parties, whose motivations were sometimes conflicted. As facilitators, we saw part of our job as navigating and sometimes resolving these institutional constraints and tensions. The seemingly simple act of asking people to engage in a conversation becomes radical once we consider the institutional assumptions that offer resistance to genuine dialogue. Ensuring that dialogue opens up rather than closes down debate

(Stirling et al. 2012) represents an ongoing challenge that requires constant attention. In our case, there was a need to resist and seek to correct naïve assumptions about AV technologies and imagined public attitudes towards them.

The first challenge to the mental model of 'awareness, acceptance and adoption' is an empirical one. As would be predicted by critiques of the deficit model of public understanding, greater awareness of the technology does not seem to be leading to greater acceptance.[16] But the more profound critique is that innovators cannot ask people to accept a technology that does not yet exist. Innovators' and policymakers' concern with public acceptance of self-driving vehicles reflects a view not just of public deficits, but also of technological certainty and the appropriate governance of technology. This discourse separates the means and ends of technology, postponing the question of what the technology is for. This technological determinism casts policymakers as mere enablers for the technology and social scientists as advisers to this process. Our experience of having been involved in arguing for, setting up, and running experiments in public dialogue has revealed the potential for and the constraints on rethinking policymakers' agency in a process of social learning. The paradox is that the real value of dialogue seems to come once policymakers relax their assumptions about what it can achieve. Public dialogue asks for open-mindedness (or, more formally, institutional reflexivity (Wynne 1993)), but it can also encourage open-mindedness, destabilising views of the public and of technology that have been allowed to ossify.

We are under no illusion that our reasons for doing public dialogue may not be shared by all the other parties involved. There is a clear need for clarity on the motivations of public engagement (Weingart and Joubert 2019; Stilgoe et al. 2014). However, there is a pragmatic case for clarity of purpose to be an emergent outcome of rather than a precursor to the process of deliberation. We recognise that some of the relevant policymakers surrounding our dialogue processes had instrumental motivations for engagement. Others, however, were more open-minded. We wanted to explore the potential for dialogue as what Andy Stirling (2011) calls 'political judo', using others' power as a way to move them to a new place. In framing public dialogue, policymakers are at least asked to articulate why they are doing what they are doing, which can bring assumptions and contradictions to the surface.

In discussions with the civil servants overseeing the Sciencewise process, we offered reminders that the technology did not yet exist and was not inevitable and that talk of public acceptance was, if nothing else, premature. The move from talking about the social acceptance of technologies to talking about 'acceptability', while it might seem subtle in policy terms, is therefore important (Fournis and Fortin 2017) even if it represents an incomplete shift in framing (Marris and Calvert 2020). With emerging technologies whose social constitutions are still up in the air and whose benefits are unproven, we could perhaps make the point more clearly by asking whether technological systems are willing to accept public values. For AVs, this means imagining public concerns beyond those of safety, including questions of accessibility, fairness, and privacy, all of which emerged from our dialogues. For public dialogue, this means providing space for the consideration of emergent concerns. Dialogue processes should give participants the time and resources to deliberately challenge dominant views of the technology. Rather than thinking about public dialogue as a one–off exercise, we

could better reimagine governance as taking place 'in dialogue', demanding ongoing conversation with the general public and particular public groups. Governance would also benefit from disciplinary diversity. As described above, the use of social science in debates about self-driving vehicles is currently instrumental and tilted towards psychology. The case for more diverse, more critical perspectives seems clear (Cohen et al. 2020).

If we see public dialogue as part of a 'higher-order game' (Irwin et al. 2013) involving the politics of technological progress, we can see 'acceptance' talk in a new light. Rather than being asked to place their trust in a technology, the public are being asked to place their trust in technologists. Their imagined role is first as compliant consumers, helping to ensure the technology's success, and second as supportive citizens while the technology is being tested in plain sight. This speaks to two prominent AV policy agendas—support for innovation and enabling of testing—but not to a third, which we would argue is just as important but is often postponed: the question of what place AVs could have in future mobility.

Our dialogues played out during a period when the early hype surrounding self-driving vehicles was subsiding. As research in science and technology studies would predict, this has led to an increase rather a decrease in social uncertainty (Borup et al. 2006). The more society learns about a technology, the clearer its uncertainties become: the hype is tested by its encounter with reality. Public dialogue can be an important part of how policymakers make sense of new technologies, while challenging their own views of who the public are and what they think.

Funding

Notes

1. The original frame-breakers were of course the Luddites. 'Luddite' has become a pejorative term for people perceived as anti-technology, but the Luddite cause was actually, as Hobsbawm (1952) shows, about the rights of workers to defend themselves against exploitation by capitalists.
2. https://medium.com/pave-campaign/about, accessed 10 March 2021.
3. Quotes taken from a talk at the Automated Vehicles Symposium, Orlando, 2019.
4. Zenzic Roadmap, https://zenzic.io/roadmap/, accessed 5 November 2020.
5. John Krafcik at the Lisbon Web Summit, 2017.
6. A key source of this statistic notes the complexity of separating out causes of crashes. Crashes are products of multiple causes, but humans, as the parts of the system with clear agency, get

the blame far more often than the environment or mechanical failure. Each crash is ascribed a 'critical reason', but, as the report clarifies, the 'critical reason… is not intended to be interpreted as the cause of the crash.' (NHTSA 2015) https://crashstats.nhtsa.dot.gov/Api/Public/ViewPublication/812115.

7. The narrative of AV acceptance has a longer history. In an early paper on 'Computer-controlled cars' John Macarthy argued, under the heading 'Public acceptance', 'Automobiles without qualified human drivers will require changes in the law. Fortunately, testing such systems with a driver present to take over if necessary does not. Moreover, computer driven cars will not be able to obey oral instructions from policemen, so a digital system will have to be developed. A general resistance to technological innovation on the part of the literary culture will have to be overcome, but it seems to me that after the test phase the advantages will be clear enough so that this will not be difficult.' A version of this paper is available at http://jmc.stanford.edu/commentary/progress/cars.pdf, accessed 10 March 2021.

8. The Government's Approach to Public Dialogue on Science and Technology, http://sciencewise.org.uk/wp-content/uploads/2019/11/Guiding-Principles.pdf.

9. The project was commissioned with the word 'autonomous' in its title but the final report replaced this with 'automated'.

10. The CCAV is a joint venture between the UK's Department for Transport and its Department for Business, Energy and Industrial Strategy. CCAV aims to 'make everyday journeys greener, safer, more flexible and more reliable by shaping the safe and secure emergence of connected and self-driving vehicles in the UK [by] investing in innovation and skills and engaging the public to realise the benefits of new transport technologies and to create a thriving connected and self-driving vehicle sector in the UK.' https://www.gov.uk/government/organisations/centre-for-connected-and-autonomous-vehicles/about, accessed 10 March 2021.

11. https://www.gov.uk/government/collections/driverless-vehicles-connected-and-autonomous-technologies, accessed 10 February 2021.

12. Readers should bear in mind that policymakers who talk to us know we are enthusiasts for and participants in public dialogue, so respondents' views may be coloured by enthusiasm and politeness.

13. 3KQ, CAV Public Acceptability Dialogue Final evaluation report, 2019 https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/875436/cav-public-acceptability-dialogue-final-evaluation-report.pdf, accessed 10 March 2021.

14. CAV public acceptability dialogue engagement report, https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/951094/cav-public-acceptability-dialogue-engagement.pdf, accessed 10 February 2021.

15. What could the future of driverless vehicles look like in Greater Manchester? Involve, https://www.involve.org.uk/our-work/our-projects/practice/what-could-future-driverless-vehicles-look-greater-manchester, accessed 12 February 2021. At the time of writing, there is no published meta-analysis of all of the dialogues, but more information is available at https://themobilitydebate.net/, accessed 16 July 2021.

16. See, for example, a small survey reported with the headline 'Autonomous Vehicle Awareness Rising, Acceptance Declining, According to Cox Automotive Mobility Study' https://www.prnewswire.com/news-releases/autonomous-vehicle-awareness-rising-acceptance-declining-according-to-cox-automotive-mobility-study-300697862.html, accessed 15 February 2021.

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