

Full title

Understanding the positioning of ‘the electric vehicle consumer’: variations in interdisciplinary discourses and their implications for sustainable mobility systems

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Abstract

The discursive category of ‘the consumer’ has multiple characterisations, connected to varied accounts of social action, relations and change. This paper is interested in the implications of these varied characterisations for understanding the interdisciplinary knowledge about mobility systems being marshalled in the pursuit of social change. It focuses upon the case of electric vehicles (EVs), examining the varied representations of consumers in three fields – psychological and economic, consumer culture, and transitions management research. It identifies that the EV consumer is positioned within these fields as a purchaser of an inferior ‘car’, a user of multiple materialities, and as one among many important social actors. In order to further consider the implications of these strategically contrasting cases, it considers two questions about how ‘the EV consumer’ is discursively positioned in each: How does this imagined consumer shape what the EV needs to be in order to be widely adopted? What action is required to steer change towards a future of EVs? Doing so highlights how assumptions about ‘the EV consumer’ can establish problematic comparisons between EVs and internal combustion vehicles (ICVs) and exclude the analysis of how EVs and electricity are simultaneously consumed. The usage of ‘the consumer’ as a floating signifier within transitions management literature is argued to provide both risks for interdisciplinary dialogue and potential opportunities for both EV research and steering change towards sustainable mobility systems.

Keywords

Consumers; electric vehicles; infrastructures; sustainable mobilities; users; interdisciplinary knowledge

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Author bio

Allison Hui is an Academic Fellow in Sociology and the DEMAND Research Centre at Lancaster University. Her work considers transformations of everyday life in the context of shifting global flows, and draws in particular upon theories of practice, consumption, and mobilities literature. By using a range of empirical cases to extend conceptual vocabularies and challenge predominant assumptions, her work aims to encourage new dialogues and spaces for alternative performances of the social. Her publications have appeared in the *Journal of Consumer Culture*, *Social and Cultural Geography*, *Global Networks*, *Mobilities*, and *The Routledge Handbook of Mobilities*.

Consumers are presented as central actors in many discussions of how to develop more sustainable and lower carbon mobility systems. Yet clearly articulating the nature of their action can be difficult because consumers are multiple and complex. This is not just to say that people are diverse – with varied personal histories and engagement in different social and cultural practices that affect their individual consumption. More importantly, it is to recognise that the category of ‘the consumer’ is itself enacted in multiple, sometimes contradictory, ways. Understandings of ‘the consumer’ emerge in different historical contexts and in relation to particular state and commercial interests (Trentmann, 2006). Over time, a range of “unmanageable” characterisations of the consumer have been enacted in both academic and popular discourses, including those that position consumers as choosers, victims and activists (Gabriel and Lang, 2006). Yet despite calls to recognise these multiplicities, there have been limited efforts to explore their implications for the politics of sustainability (though see Evans et al., 2017). In particular, this paper is concerned with the relationship between the multiple characterisations of the consumer that have been articulated within consumption literature and the interdisciplinary approaches that are being marshalled in research on sustainable mobility systems.

The interdisciplinarity that undergirds the new mobilities paradigm and many discussions of sustainable mobility systems has been extremely generative, providing opportunities for collaboration across the social sciences (Adey et al., 2014). Yet it also sets up particular challenges. As Faulconbridge and Hui (2016) discuss, some of these challenges relate to the production of knowledge itself, and how academics within the field interact around shared themes or approaches. Challenges also exist in terms of how particular concepts and approaches might be brought together, the extent to which they provide coherent or competing analyses of social dynamics, and the consequences of acting on the basis of these analyses.

These challenges are discussed by Shove in relation to the social scientific concepts that are used within climate change policies and interventions (2010). She carefully traces how the concepts of attitude, behaviour and choice (ABC) that are widespread in policy discourses have both a particular disciplinary heritage (within psychology and economics) and specific consequences in terms of understanding social change. By highlighting contrasting theoretical approaches, such as those found in transitions management literature, Shove establishes that concepts such as attitude, behaviour and choice are not only theoretically embedded – they also offer “a template for intervention” (2010, p. 1280). She therefore concludes that the disproportionate attention given to the paradigm of ‘ABC’ should be challenged, in order to encourage engagement with additional social scientific concepts in order “to make better use of the much more extensive range of intellectual resources on offer in the social sciences” (Shove, 2010, p. 1274). Her argument foregrounds the incommensurability of and competition between theoretical traditions in the social sciences, and asserts that given the significant consequences of acting on the basis of particular analyses – for example finding ways to encourage better choices – a rebalancing of disciplinary influence is required in order to open up additional possibilities for change. Shove’s discussion is compelling, however it presumes that social scientific disciplines are discussing entirely different concepts, rather than multiple characterisations of one category – such as the consumer.

The aim of this paper is therefore to identify how different understandings of ‘the consumer’ are put to work within social scientific analyses of mobility systems and to make explicit some of the implications that working with these conceptualisations has for developing and using interdisciplinary knowledge in the pursuit of social change. This aim is taken up using the case of electric vehicles (EVs), which have been given significant attention as technologies that might form part of more sustainable mobility systems. Informed by IPCC reports on rapidly changing climactic conditions, countries around the world have committed to reduce greenhouse gas (GHG) emissions, in part through significant investment in EVs. In the UK, the Committee on Climate Change (CCC) has suggested that:

it is feasible and desirable to have up to 1.7 million electric cars on the road in 2020 on the path to widespread deployment required to meet carbon budgets in the 2020s. (2010, p. 23)

In the CCC’s appraisal, such EV adoption is not only feasible, but also cost-effective compared to projected future carbon prices (2013a, pp. 98-99). Other countries have adopted similarly ambitious targets for EV ownership and use. In 2013, Germany hoped to have 1 million EVs by 2020, China was aiming to have 5 million EVs (approximately 2.5% of its vehicle fleet) by 2020, and eight states in the US had a joint target of 3.3 million low emission vehicles by 2025 (Committee on Climate Change, 2013b, pp. 47, 43, 45). Such targets have prompted governments to try and influence consumers through investment in EV charging infrastructure, promotional efforts and subsidies for new vehicle purchases (e.g. Committee on Climate Change, 2014, p. 46).

While these targets highlight how electric vehicle technology has been prioritised in the policies of many countries, consumers have often been seen as a problem for making them a reality. Despite decades of predictions that millions of electric vehicles would soon be on the road (Cowan and Hultén, 1996, p. 62), by the end of 2015 there were only 25,100 registered full EVs and 247,700 hybrid electric vehicles in the UK, 0.1% and 0.8% of the total vehicle stock, respectively (UK Department for Transport, 2016). Potential reasons for this have been widely discussed, and include not only social dynamics of ‘lock in’ (Cowan and Hultén, 1996), but also specific problems with consumers – they expect long-range vehicles even if they don’t normally drive long distances (Golob and Gould, 1998), are resistant to new technologies (Egbue and Long, 2012), are reluctant to pay more (Axsen et al., 2013), don’t have appropriate knowledge on which to base decisions (Tran et al., 2012, p. 331) or need to have certain characteristics to become ‘early adopters’ (Campbell et al., 2012). An example of a typical assessment is provided by Tran et al.:

The lack of willingness to pay a premium for fuel savings and environmental benefits suggests that many consumers are poorly informed over the cost savings of BEVs [battery electric vehicles] and the causal link between fuel efficiency and CO₂ emissions.

(Tran et al., 2012, p. 331)

While these concerns are frequently referenced and even *de rigueur* when discussing the future potential of EVs, this paper turns to ask which disciplines and characterisations of the consumer are implicated in these assessments. It starts from the assumption that in order to understand how “social issues related to consumers” (Egbue and Long, 2012, p. 718) might be a significant problem for developing more sustainable mobility systems, one needs to first understand what kind of consumer is being marshalled in these discussions.

The analysis proceeds by focusing upon ‘the EV consumer’ in three fields of social scientific research: psychological and economic, consumer culture and transitions management. The first and last were selected due to their inclusion in Shove’s (2010) discussion and their relevance to discussions of sustainable mobility systems, and the second was included because it connects to contrasting issues of lived experience and material culture that have been central to wider discussions of the consumer (Gabriel and Lang, 2006). Having selected these fields, the first step was to identify which characterisation of ‘the consumer’ identified by other authors (Evans et al., 2017; Gabriel and Lang, 2006) was most relevant in this field, based on both existing commentaries (Shove, 2010; Slater, 2014; Warde, 2005) and a reading of key texts within the field. This characterisation of ‘the consumer’ was then applied and adapted to a consideration of ‘the EV consumer’. Two questions were posed about how ‘the EV consumer’ is discursively positioned in each case: How does this imagined consumer shape what the EV needs to be in order to be widely adopted? What action is required to steer change towards a future of EVs? The aim was not to arrive at a comprehensive evaluation of explicit themes in published EV literature, or comprehensive categorisations of the many ‘EV consumers’ at play in academic research. Instead, the paper identifies the implications of existing conceptualisations of consumers for the case of EVs, and uses examples to highlight key variations in how ‘the EV consumer’ is produced in different fields. This facilitates reflection upon the implications of these variations for interdisciplinary collaboration to realise sustainable EV systems. As such, the discussion is inevitably limited, providing accounts of only some dynamics related to the category of ‘the EV consumer’. It does not provide space, for example, to highlight what Gabriel and Lang call ‘the consumer as citizen’ (2006), a characterisation that highlights different possibilities for shaping mobility systems. The objective, however, is not to document all characterisations of EV consumers, but rather to reflect upon interdisciplinary struggles over how concepts shape and delimit both knowledge and possible interventions in the pursuit of change.

Using relevant examples, each of the following three sections makes explicit how characterisations of the EV consumer are tied to particular lines of social scientific enquiry, privileging some actions and social relations rather than others. Key implications for EVs and for future interventions are then drawn out, in order to highlight how understandings of the EV consumer delimit and help to justify very different processes of transformation, wherein the consumer is attributed with varying levels of responsibility for realizing targeted future EV ownership and use. The paper concludes by discussing how the production of EV research and the articulation of interventions can be understood in light of these different disciplinary characterisations of the EV consumer.

To begin, the first section turns to the positioning of EV consumers within psychological and economic research, arguing that the predominant characterization of the consumer as ‘chooser’ has specific consequences for how EV consumption is understood.

1. EV consumer as purchaser of an inferior ‘car’

Within psychological and economic research, the consumer is, as Gabriel and Lang phrase it, a ‘chooser’ (2006). This characterisation, Shove argues, stems from the trio of concepts that she calls the ‘ABC’ (attitude, behaviour, choice) – which inherently “locates citizens as consumers and decision makers” (2010, p. 1280). Consumers’ most important social actions, those worthy of study and targeted for change, are seen to be related to choices that are a part of varied purchasing decisions. In addition to being ideologically tied to consumer capitalism and economic growth (Gabriel and Lang, 2006, p. 26), the notion of the consumer as someone who chooses to purchase goods is therefore important because it enacts particular relationships between people and the goods they consume. To highlight that choice is focused in this literature upon purchase, and not choices about how to use things after purchase, at times this section makes use of the term consumer-purchaser.

Locating examples of this characterisation within EV literature is not difficult, as a great deal of research has focused on what leads to the eventual purchase of EVs. Researchers have been concerned with how people develop opinions about EVs, how much they will pay, what makes them choose EVs over ICVs, how they can be persuaded to buy EVs, and how inaccurate knowledge can discourage purchases. For example, Tran et al. suggest that consumers are “poorly informed” (2012, p. 331), “can be incentivized” (2012, p. 331), and need their “acceptance” courted (2012, p. 330). Rather than treating these as apparent ‘facts’, they can be seen as consequences of how consumers are theorized. In this framing, consumers are topics (not subjects) of discussion, and are addressed within a “deficit model” of knowledge that privileges the ‘better’ knowledge of experts (Wynne, 1991; Ziman, 1991). As a result, the failure to buy EVs is attributed to the inadequate knowledge on which purchase decisions are made, and more knowledge becomes the solution to realizing different purchase decisions. Occasions when potential consumers act against (presumably superior) expert knowledge are treated as either evidence of individual failings or of failings by experts to educate and incentivize what they deem ‘appropriate’ purchases. The limitations of such models have been addressed elsewhere in relation to both their partial account of consumers (Gabriel and Lang, 2006; Southerton et al., 2004) and their reliance upon limited understandings of social theory (Shove, 2010). Nonetheless, the figure of the EV consumer as someone whose relevant actions culminate in a decision to purchase an EV remains prevalent within this field of research.

More differentiated accounts and models of consumers’ characteristics and experiences have been incorporated into some understandings of purchase decisions, for example in discussions of early adopters as a unique group. There is therefore some differentiation of types of consumers within this characterisation – for example in terms of demographic groups occupying market niches or groups such as late adopters who are seen to have similar approaches to and patterns of purchasing. But these alterations do not unsettle the prioritization of the EV consumer as purchaser, and the moment of purchase as of primary (and sometimes sole) importance, often remains. In effect, by treating the EV consumer as a chooser, the assumption is that, since EVs are already available for sale as commodities within capitalist markets, a future filled with greater numbers of EVs would be sparked by their purchase in these markets.

This assumption may seem commonplace, but it has particular consequences when it comes to how EVs themselves are understood. Privileging consumers' actions in relation to markets leads to a further assumption that EVs feature in a market place wherein they are similar to and distinct from other cars. As Slater notes:

the very idea of a market and market relations relies on the disambiguation of goods, and this is formalized in neo-classical economics: the idea of a market in cars or cameras or computers or music files requires the assumption of things that are consistently identifiable as cars or cameras or computers or mp3s with the same properties, which can be treated as 'the same thing', and therefore as substitutable and competitive. (2014, p. 101)

A consequence of presuming and even privileging the purchase of EVs within a market is therefore that the consistency and similarity between EVs and ICVs is emphasized. Indeed, Newman et al. suggest that "the presumption of electric car research is toward carrying on with existing patterns of car consumption" and an apparent support for "the replacement of like for like" (2014, pp. 29-30). This assessment indicates that the comparison between presumably substitutable vehicles is already well established.

Treating EV consumers as 'choosers' therefore has consequences for how EVs are compared and evaluated. Imagining that consumers would purchase EVs instead of ICVs – that they are items to be chosen within a market of 'cars' – paradoxically establishes a relationship wherein EVs are assumed to be comparable to and substitutable with ICVs at the same time that governments encourage and incentivize them due to their difference from ICVs. Moreover, comparisons routinely made between EVs and ICVs do not place them on even terrain. ICVs are positioned as the benchmark, against which EV performance is judged. For example, the Energy Technologies Institute makes this kind of comparison when suggesting that full battery EVs would need to be capable of driving "for at least two hours of high speed motorway driving (on a very cold and wet winter night)" in order to compete with ICVs (2013, p. 36). Rather than imagining that driving in such conditions might be a negotiable capability of a car, it is taken as a standard that EVs must now attain.

While this assumption about the superiority of ICVs is now widespread, it has not always been so. When looking at the decline of what had been a quite successful German electric fire engine fleet, Mom notes the emergence of what was then an unusual point of agreement between proponents and opponents of electric propulsion: "both [of the] parties had begun to define the electric car from the perspective of the gasoline car" (2004, p. 194), deriding the inability of EVs to travel the same distances as ICVs. Whereas other characteristics of EVs and ICVs were treated as simply different, here the range of ICVs was deemed superior, and on this basis "electric propulsion was put aside as an 'inferior technology'" (Mom, 2004, p. 195). This highlights how the presumed superiority of ICVs is historically specific. While some characteristics may today seem 'obviously' superior, such as the range of ICVs, these meanings emerged at particular historic moments and have the potential to change again in the future.

The assumption that EV consumers engage with a market of 'cars' therefore can be seen to perpetuate social understandings that privilege characteristics of ICVs as 'normal' cars. As a result, EVs are routinely discussed in terms of how they could become more similar and better live up to this ideal of a 'car'. The longstanding

suggestion that a “miracle battery” will arise to solve the problems of EVs (Mom, 2004, pp. 54-55, 91, 102), also rests upon the assumption that the affordances of ICVs are a taken-for-granted target (Mom, 2004, p. 195). Emphasis is thus put on the technological potential for EVs to ‘catch up’ to ICVs. Such assumptions of inferiority constrain the evaluation and development of EVs, making alternative paths of development seem implausible. As Mom notes:

this hope for a miracle has always diverted attention from the real-world facts that, on the basis of proven electric vehicle technology, electric taxicab fleets and truck fleets could outperform all rivals. The question then, is ... *why* is it that we prefer expectation above reality ... ? (Mom, 2004, p. 300)

In my view, it is not expectation *per se* that is the problem, but the particular expectations generated from understandings of the EV consumer purchasing a ‘car’ in the market. When the EV is assumed to be a car competing on the basis of its equivalence with ICVs, then this sets up a situation in which it has not reached its potential until it is more like the comparator ICVs. Focusing upon the consumer as the chooser of the superior car, combined with the historically-specific assessment that ICVs are better cars, sets up particular expectations of how EVs must change before they could be more widely purchased or used.

Characterizing the consumer as ‘chooser’ is also problematic because choices are often addressed in isolation, which obscures the complexity of how EVs and ICVs may or may not be deemed ‘similar’. Take for example the case of multi-car households, which in 2014/5 represented 33% of households in England (Department for Transport, 2016). While theories of consumer choice would address each car purchase in isolation, for families these decisions are likely to be interrelated, in that the potentials of one vehicle can be seen as complementary to another. Some early car owners in the 19th century owned both EVs and ICVs – as EVs were better suited for city driving and ICVs for country adventures (Mom, 2004, p. 62). So too studies have highlighted the potential for higher rates of EV ownership amongst those with more than one vehicle (Kurani et al., 1996). In the context of multi-vehicle households, the potential relationships between EVs and ICVs may not therefore be premised upon their similarity within one market for ‘cars’, but rather a more complex negotiation that takes into account the consumption of multiple things.

In terms of the action required to steer change towards a future of EVs then, we can see a tension between the implications of the theoretical approach wherein consumers are ‘choosers’ making purchase decisions within a market and the aspects of consumption that exceed moments of choice. There are also tensions between treating EVs as either the same as or different from ICVs. While discussions of multiple markets or market niches allow for alternative imaginings of comparison and competition between modes of transport (Geels, 2005, p. 448), these do not address the fact that EVs are being encouraged by governments and activists due to their potential to address problems created by ICVs. That is – if EVs don’t become substitutes for ICVs, they won’t have been successful in addressing emissions targets even if there are millions on the road.

It is therefore difficult to separate the EV consumer-purchaser from the assumption that an EV is being purchased *instead of* an ICV. However, rather than expecting that people will only purchase EVs *instead of* ICVs, it might make better sense to also imagine that, as in the case of mobile phones and land line phones, obtaining the

newer technology might be considered *independently of* existing ones, but with eventual impacts upon the total pattern of purchases. This image of the future would need to include space for EV+ICV consumers, EV taxi drivers, and EV workplace fleet drivers, wherein relationships between consumers, purchases, markets, EVs and ICVs are initially ambiguous and, because of that, offer opportunities for multiple trajectories of development.

Reflecting upon these potentials, it becomes quickly apparent that even if the ability of consumers to shape markets is taken into account (Webb, 2007), attending to consumer purchases and markets does not provide a sufficiently differentiated picture of how EVs are positioned within different worlds of consumption and use. The privileging of purchasing as consumers' predominant social action is tied to an emphasis upon their social relations to markets, purchasing information and 'cars' that are comparable at moments of purchase but then largely ignored during moments of use. Yet many other social dynamics that are important for a future filled with electric vehicles, such as those discussed in ensuing sections of this paper, are absent from these considerations. For example, those who drive EVs from company or taxi fleets will not necessarily have purchased them. The experiences of these drivers, however, are important for thinking about how EVs might fit into patterns of mobility in the future. It is therefore important to recognize that literature drawing upon psychological and economic characterisations of the EV consumers as purchasers of inferior 'cars' is limited. It privileges certain assumptions and knowledge about social life, and provides a limited assessment of what change is required (e.g. different purchasing decisions, EVs that have similar affordances to ICVs). In order to explore other assessments of social dynamics and processes of social transformation, different understandings of the EV consumer must be considered. The next section explores those found within consumer culture research.

2. EV consumer as user of multiple materialities

Quite a different characterization of the consumer can be found within literature on consumer culture, which is concerned with how people interact with commodities, technologies and cultural objects in varied settings. While Gabriel and Lang (2006) differentiate several different consumer roles at work within this literature – the consumer as communicator, explorer, identity-seeker and hedonist – after consideration, it was deemed most effective to refer more generally to what these characterisations share – the uses of goods for various social aims (Douglas and Isherwood, 1979, ch. 3). This section therefore focuses upon the implications of the consumer-user for thinking about EV consumers and EVs themselves.

The ideas and approaches within consumer culture literature have been incorporated into studies of EVs in varied ways. For example, just as other consumer goods are crafted into new objects (Campbell 2005), disassembled and repaired or recycled (Gregson et al. 2010; Gregson et al. 2009; Wheeler and Glucksmann 2013), moved across miles or continents (Author A; Cook 2004; Walsh 2006), and involved in meaningful practices (Walsh 2006), so too EVs and ICVs are tinkered with (Franz 2005), disassembled and repaired (Dant 2008; Harper 1987), moved via other modes of transportation (Vannini 2011), and involved in meaningful practices (Sheller 2004; Moorhouse 1991). As these examples might suggest, understandings of the EV

consumer-user situate both consumers and EVs in relation to the myriad spaces of everyday practice. From this point of view, consumption is “beyond commerce” (Douglas and Isherwood, 1979, p. 37) and:

a process whereby agents engage in appropriation and appreciation, whether for utilitarian, expressive or contemplative purposes, of goods, services, performances, information or ambience, whether purchased or not, over which the agent has some degree of discretion (Warde, 2005, p. 137)

Moments of consumption occur throughout life, as people use and interact with EVs in the course of everyday practices. What consequences then does this positioning of the EV consumer as a user have for understanding the relationship between EVs and ICVs, as well as identifying trajectories of future change?

While EV and ICV consumers can be deemed quite similar in the context of markets and purchase – the processes each are assumed to be engaged in are largely the same and are independent of the good being purchased – they are marked by significant differences in the context of practices and use. This is because rather than being considered in relation to questions of similarity and substitution, EV consumer-users are considered in relation to variable settings and practices, wherein the good being consumed fundamentally affects consumption. This ability for goods to affect consumption means that changing uses – such as early moves from using ICVs for adventure to taking family-oriented outings (Mom, 2014, pp. 312-313) – can be seen to prompt changes in the technical capacities of cars, with designers and users co-producing evolving understandings and materialities of ‘normal’ driving (Gjøen and Hård, 2002). Variations in the use of vehicles can thus be seen to evolve alongside variations in vehicles themselves.

This co-evolution of use and technologies applies to the embodied activity of driving as well as to how driving fits into daily life. EVs and ICVs can both be used for similar ends – such as driving to work or getting groceries – but studies of EV users have demonstrated that EVs require and help to build different types of knowledge, skills, and embodied activities (Ozaki et al., 2012). The need to charge EVs also requires activities not involved in ICV use. As Caperello et al. note, this creates tensions for users, who for instance encounter ambiguity (2013, p. 157) around questions such as: When is it appropriate to unplug someone else’s car or to ask to plug in at a private residence? Experiences of charging away from home both “contribute to the creation and spread of systems of etiquette... [and] highlight a need for etiquette to resolve ambiguities” (Caperello et al., 2013, p. 158). The figure of the EV consumer-user is thus enrolled in different sets of activities than that of the ICV consumer-user, including learning new skills, interacting with technological interfaces and embodied activities, and producing etiquette and shared understandings around interactions at charging points. These differences are extremely consequential when thinking about what kind of changes would be required to embed EVs in the everyday lives of millions of people. The insights discovered through studies of EV consumer-users suggest that it is not only a matter of choosing a different product, or even being able to attain the same goals or visit the same places, but also a matter of investing time and energy in new processes of learning, coordination and cultural development.

The processes of social change associated with the EV consumer-user are thus quite different than those associated with the EV consumer-purchaser. Not only are a broader set of social and cultural changes important, but the trajectory of change is

not dependent upon direct comparison with ICVs. Indeed, the characterization of the EV consumer-user leaves space to consider a wider range of social relations and their impact upon the future of EVs.

In addition, while, as noted above, it is not necessarily standard to take into account multiple cars and their interlinked purchase when discussing the decision making of EV consumer-purchasers, studies of consumer culture regularly consider sets and collections of objects (Basu and Coleman, 2008; Campbell, 2005; McCracken, 1988). As a result, it is possible to consider EVs as not a single object but rather part of a collection of related ones. The “appropriation and appreciation” (Warde, 2005, p. 137) of EVs depends upon the simultaneous and coordinated appropriation of many materials besides the vehicles themselves. Some of these are shared with ICV use – keys, tyres, drivers’ licenses, road signs, traffic surveillance cameras – while others such as cords, plugs and electrical outlets are not. The consumption of EVs only occurs as a part of the consumption of a set of materials – both mobile goods and the “material arrangements” (Schatzki, 2010) amidst which activities proceed. The expansion of the materialities of concern that the characterization of consumer-users allows thus has a profound effect upon what is seen to matter for the consumption of EVs. The EV consumer is never only interacting with an EV – she is simultaneously a consumer of a range of other related objects, without which the EV would either not function at all or be appreciated and appropriated quite differently.

This provides different openings for understanding the action required to steer change towards a future with greater EV use. Acknowledging the consumption of multiple materials creates space to acknowledge that it is not really the appropriation of EVs that is important for greenhouse gas reductions (which undergird the EV growth targets noted in the introduction). It is rather the consumption of electricity instead of petrol or diesel that is consequential. Amongst the many different things that are consumed during the use of vehicles, it is the fuel that matters for emissions targets. It is therefore only by virtue of being an electricity consumer-user that an EV consumer-user is a promising figure for the future. While there is a precedent for discussing the consumption of multiple materialities within consumer culture literature, it has not yet been well developed in relation to the EV consumer-user. One reason for this is that, as Shove argues (2010), policy discourses heavily rely upon the ABC framework, and therefore even when discussing the use of EVs, attention often remains upon the vehicle itself due to its position as a presumed instrument of GHG emissions reduction.

My point here is that although representations of the EV consumer-user create different possibilities for analysis than those of the EV consumer-purchaser, and facilitate explorations of a wider range of social actions and relations, they can still be focused more narrowly on the vehicle itself. This is, I argue, a limitation when it comes to envisioning and evaluating potential social transformations. At a minimum, it is important to emphasize that EV consumer-users are always simultaneously consumer-users of other things – particularly (sustainably generated) electricity. This move effectively recognizes that all social actors are (sometimes simultaneously) multiple types of consumers. It also highlights that multiple types of social relations – between people and objects, and amongst objects – are consequential for thinking about the present and future use of EVs.

In the next section of the paper, the importance of multiple types of social relations is explored further by looking at how the consumer is understood within transitions management literature.

3. EV consumer as one among many

While consumers are explicitly named and regularly foregrounded in psychological, economic and consumer culture research, within discourses on socio-technical transitions (e.g. Geels, 2007; Hughes, 1983; Mom, 2004), the consumer is not privileged in a similar manner. Rather than the consumer being the primary actor responsible for taking action to address sustainability, there is instead an acknowledgement of “distributed responsibility”, wherein other actors and organisations are seen to have important powers to affect change (Evans et al., 2017, p. 1404). In the context of distributed responsibility, consumers are thus one group among many, and may not be particularly prominent within discourse.

Literature on socio-technical transitions has contributed a significant set of insights to discussions of social change and the dynamics underpinning transportation systems and their transformation. A core facet of this work is the acknowledgement that no one technology or type of social actor is solely responsible for socio-technical change – rather a network of actors co-produce both technologies and wider infrastructural and cultural systems. As a result, transforming infrastructures, as well as the uses and norms of technologies they facilitate, requires complex and coordinated actions by variously-related members of policy, industry and public spheres. This has, for example, been diagrammed within the multi-level perspective through the use of multiple and varied arrows indicating diverse processes and changes within and across different levels of society (Geels, 2002). It has also been demonstrated through excellent historical analyses of how inventors, industrialists, engineers, enthusiasts, politicians and other actors worked together to shape electricity systems and the development of EVs (Hughes, 1983; Mom, 2004). What this literature so clearly demonstrates is that in order to represent processes of social change, attention must be devoted to a range of relevant actors and their evolving social relations. The consumer may be important at some times, but not at others, and while the aim of many actors may be to encourage consumption (of electricity, EVs, etc.), this consumption often occurs after a long and complex set of interactions that establish necessary infrastructures to support it. In terms of both their status as social actors and their influence upon social change, consumers are resolutely one of many.

The positioning of EV consumers as only one of many groups influencing change is thus related to a similar shift in the centrality of EVs – the question of how they might transform in order to be more widely adopted is replaced by the question of how infrastructural systems might transform in such a way that EVs become embedded as part of a predominant mobility system. This leads to different types of discussions about how change occurs. Bakker et al., for example, have shown that attempts to develop standards for EV plugs have been shaped by diverse networks of collaborators and varied local regulations (2015). Thus far this has resulted in the emergence of multiple types of plugs, and prevented the aggregation and global standardization that might support further EV use. This case illustrates a particular intertwining of different actors and practices:

electric vehicle recharging plugs are literally at the interface between the automotive and the electricity regime. Especially the formation of new actor networks show that these formerly separate industries are now completely intertwined (Bakker et al., 2015, p. 10)

As the authors demonstrate, creating a system of EV public charging involves changes within industries and between them – with processes of negotiation emerging that can reveal not only competing technologies or infrastructural visions, but also competing interests and priorities. Moreover, the results of these negotiations will have significant consequences for the courses of action that subsequent EV users can take. Treating the EV consumer as one among many therefore involves not just acknowledging infrastructure – for example by noting that EVs will only become appealing once issues of charging infrastructures are addressed (Tran et al., 2012), or highlighting that these charging infrastructures will only help with problems of GHG emissions if the electricity system is also decarbonized (Committee on Climate Change, 2013a) – but emphasizing that the aims and practices of varied groups are interwoven with power and potentially sites for change.

While the interaction of multiple actors around EV-specific infrastructures has been well discussed, other aspects of infrastructural development can be similarly consequential for how EVs are used and culturally positioned. The design of motorway service areas, for example, has anticipated and limited what goes on within them. Policies established when UK motorways were first developed in the 1960s limited what can be included in service areas in order to discourage people from stopping for very long: “the Ministry of Transport and Civil Aviation were adamant that motorway service areas must not serve as destinations for motorists” (Merriman, 2007, p. 180). Keeping people moving along motorways, rather than stopped for longer periods at service areas, was a key policy priority, and one that Lawrence suggests has been re-articulated by more recent governments (1999, p. 97). As a result, regulations around service areas and the types of services offered at them can indirectly discourage EV use and charging because the temporalities of this practice do not fit with a quick stop off for food or to use the toilet. By contrast, charging an EV might seem ‘easy’ and ‘convenient’ if it occurred whilst ‘users’ were fully engaged in other activities over a longer period. Actors who interact with and shape understandings of traffic flow, the zoning of appropriate land uses, or appropriate (re)designs for service areas thus embed ideas of ‘normal’ (ICV) cars and driving into infrastructures that support their use. Looking ahead, the future challenge is one of facilitating consumption that builds comparable (but obviously very different) infrastructures for EV charging and other related practices.

As these examples highlight, extending attention beyond the spheres of purchasers or end-users highlights different social dynamics surrounding EVs. When technologies are seen as part of a network of diverse social relations, it becomes apparent that:

Interwoven with political and economic interests of particular kinds, technology is far from neutral. Like other political and economic forces, it can be labelled as conservative or liberal—or even radical. Furthermore, acute [sic] politicians, businessmen, and other decision-makers can sense—even if they do not articulate their perceptions—that a conservative technology will maintain the existing structures and trends and that liberal ones will bring changes in the direction of societal development. (Hughes, 1983, pp. 318-319)

Technologies, like EVs, may therefore fit well with technological configurations, but not with the social or political configurations of a particular period or place. They may also develop particular meanings because actors anticipate that they would challenge existing structures and trends, necessitating adaptation and new practices.

Thinking about the relationship between EVs and ICVs, it is immediately apparent which might be labelled ‘conservative’ and which ‘liberal’. ICVs are the ‘normal’ technology for business people and politicians who have spent years developing infrastructures and business plans that presume, support and reproduce “systems of [ICV] automobility” (Urry, 2004). The potential mass introduction of EVs would create new opportunities for businesses producing them, but would simultaneously generate considerable uncertainty about how much ‘normal’ business practices would have to change. Particularly for those already doing well in the current system, this uncertainty could seem undesirable, as it would require considerable investments of time and resources into processes of learning new skills, adapting existing systems and producing new shared understandings and etiquette.

In terms of the action that would be required to steer change towards a future with greater EV use, seeing the consumer as one among many opens up attention to many more potentially necessary transformations in not only purchasing patterns or processes of use, but also in how a range of actors including professionals and policymakers create rules, standards, materials and meanings through infrastructural processes, which then shape other consumers’ actions. These processes continue to evolve, but have historical roots and future implications that are important to recognize and attend to. While some of the infrastructures that could support EVs already exist, many require some kind of adaptations in order to better support the widespread use of EVs – whether in terms of public charging networks, local EV parking, or destinations where EV charging fits easily with the temporality of other activities. Making these adaptations will in some cases require collaborations between groups which are both unused to working together and which hold potentially conflicting interests. Exploring and understanding the social dynamics that might be entailed in different future scenarios thus depends on much more than the EV consumer. Other actors – including providers, cities, network managers, and manufacturers – are also involved, as are existing infrastructures – roads, homes, parking places and differentially-spaced destinations. A future of widespread EV use depends upon reconfiguring this entire network of relations.

It is important then to recognize that ‘the consumer’ can be a red herring (Evans et al., 2017, p. 1406). Indeed, while I have already suggested that the literature on socio-technical transitions treats consumers as one of many social actors with power to affect processes of change, to leave it at this would risk overstating their importance. This is because within this literature the very term ‘consumer’ is used as a floating or empty signifier that has and needs no definition or description. Rather than being supported by accompanying assumptions and concepts, it is one of many descriptors used to refer to and distinguish groups of people. In two classic socio-technical transition accounts of EVs and electricity infrastructures (Hughes, 1983; Mom, 2004), for example, those referred to at one point as consumers are also classed as private persons, customers, taxpayers, individuals, motorists, owners, drivers or users. Even industrial companies are discussed as consumers or customers, despite being organisations and not individuals. The terminology varies according to the specific

practices or actions being discussed, and in many cases alternate terms could be used just as effectively to make the desired point. The term consumer thus becomes one of many labels for people who sometimes purchase or use a range of things – electricity, EVs, roads – but are more interesting, in terms of processes of social change, in their roles as managers, engineers, research funders, journalists or politicians. It is not therefore that this literature fails to study people – it is just that it does not have a narrow delimitation of the actions or relationships that might be of concern. It could consider the purchasing or using activities that would be of concern within the two cases discussed above, but equally it could look beyond these to other social dynamics that affect how mobility systems emerge and become entrenched.

4. Discussion and conclusion

This paper has been concerned primarily with reflecting upon the stakes of knowledge production related to EVs and how conceptualisations of the EV consumer are not neutral, but rather invest particular social actors and relations with power, marking them out as responsible for instigating change or necessary targets for particular types of interventions. The three cases discussed above are not exhaustive, but highlight the varied manifestations of this in social scientific literatures. Approaching the EV consumer as purchaser is tied to a narrow set of actions and relationships that position EVs as inferior alternatives to the ICV. The consumer-purchaser therefore needs to be educated and the EV made more like the ICV in order to encourage widespread adoption. By contrast, treating the EV consumer as user is less restricted in terms of the sets of activities, sites, and times that are deemed relevant for social analysis, and creates space for EVs to be considered as one of many materials that are consumed. Applications of this characterisation, however, often fall back into a concern for the replacement of ICVs with EVs, and thus can limit discussions of the social change required for establishing a widespread system of EVs. The question of change must be entirely reframed when discussing the EV consumer as one among many. The problem, after all, may not reside with EVs, or with consumers. It could be that business people, managers, engineers, research funders, journalists or politicians, among others, are creating obstacles to a future of widespread EV use, due in part to their worries about how this radical technology would transform social life. Seeing the EV consumer as one among many suggests that problems could lie not only with consumers or EVs, but also with a much wider set of social actors and relationships that affect in myriad ways how a social system of EVs would operate.

It is not only then the conceptual divergence within the social sciences, highlighted by Shove (2010), that is important to recognize and evaluate when addressing challenges of sustainability. Apparent terminological agreement must also be questioned and evaluated. The absence of conceptual divergence or disagreement – as in the agreement among many authors that ‘the EV consumer’ is worth study and comment – does not necessarily point to shared understandings about social actors, relations, change, or analysis.

Acknowledging that conceptualisations of EV consumers are accompanied by different understandings of social dynamics and of change highlights that interventions cannot be evaluated independently from the knowledge that produces

them. Seemingly feasible systems of EV use emerge from the application of particular disciplinary understandings of consumers, EVs and social relations. ‘Unfeasible’ paths of future transformation may therefore be re-assessed in light of competing academic disciplines and the potential for interventions to be incompatible with some conceptualizations of the EV consumer.

While acknowledging different characterisations of the EV consumer is important, it is not enough to simply note that interdisciplinary research continually reproduces such variation. In order to avoid settling for a form of relativism, Gabriel and Lang address the problematic multiplicity of consumers by introducing the concept of the “unmanageable consumer” that is recalcitrant both in terms of being a category that privileges complexity and in terms of representing real people who can resist and push back against representations of themselves (2006, p. 4). The use of the consumer as a floating signifier, however, identified above within transitions literature, raises questions about the feasibility of such re-badging. After all, when in some discourses the consumer has and needs no definition or description because it is not a centrally important figure, efforts to re-frame or re-characterise it may seem pointless and have little effect.

In terms of the politics of knowledge, the use of the consumer as a floating signifier is therefore worthy of further reflection. When ‘the EV consumer’ is open to a variety of interpretations, different understandings of social action, change, and the power of the consumer can remain unspecified yet unquestioned. Floating signifiers can obscure the variation of different social analyses by allowing work with very different ontologies and epistemologies to be brought together without acknowledging the potentially contradictory logics underpinning them. This can perpetuate and encourage the obscuring, rather than the highlighting and confronting, of contradictory assumptions and implications underlying ‘the consumer’. There is a risk then that the use of the consumer as a floating signifier facilitates knowledge circulation across disciplinary fields without acknowledging that at times apples are being compared to oranges. In the face of these risks, reflexivity around the situated production of knowledge about consumers within interdisciplinary discussions – taking into account how the category of the consumer is being enacted and employed – becomes a crucial practice in order to guard against the misuse of data and conclusions, as well as incongruous assessments of potential interventions and pathways for change.

Yet while the use of the consumer as a floating signifier holds some potential dangers in terms of the misunderstandings it might foment, given the remaining challenge of steering change towards more sustainable mobility systems, it can also be seen to hold potential opportunities. Shove’s (2010) call for further engagement with alternative concepts, and in particular engagement with those found in transitions management literature, is based in part upon an assessment that social science has said much more about social change than is currently being investigated and applied within climate change research and policy. By marking out a varied and broad set of social processes as of relevance to the diffusion and use of new technologies, the conceptual framework of transitions management research provides space for generating ‘feasible’ paths for transformation that have thus far been given less attention than behavior-change initiatives. These paths might take into account not only moments of purchase and moments of use, but also how these depend upon and interlink with the

simultaneous consumption of many things and the processes of social and infrastructural re(construction) involving multiple actors. As this paper has suggested, engaging with transitions literature also opens up possibilities for what EVs 'need' to be in order to be successful – repositioning them not as inherently inferior alternatives but as a potentially disruptive threat to established networks and interests because of the adaptation and negotiation that their embedding within current infrastructures would necessitate. This approach to understanding EV consumption and systems therefore suggests opportunities for steering change that are not apparent when working with other approaches. The de-centering of the EV consumer within transitions literature, and the use of the consumer as a floating signifier, thus provide an important opportunity for generating new approaches and interventions. Analytically, moving beyond the figure of the EV consumer draws attention to the wider politics at stake, identifying actors that steer processes of consumption through policies or industrial processes, but are often written out of the picture, despite the significant influence they wield.

The challenge that remains is thus not one of re-characterising or replacing the EV consumer-purchaser or consumer-user, but of asking questions that do not start from or presuppose the existence of the consumer at all. Though such questions may be unconventional for some researchers, they are worth exploring. They would also help to move emphasis away from the category of the EV consumer, about which researchers have assumed both everything and nothing within discussions of sustainable mobility.

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