



Contents lists available at ScienceDirect

## Energy Research &amp; Social Science

journal homepage: [www.elsevier.com/locate/erss](http://www.elsevier.com/locate/erss)

## Perspectives

## Disrupting mobility

Frances Sprei

*Physical Resource Theory, Chalmers, 412 96 Göteborg, Sweden*

## ARTICLE INFO

## Keywords:

Shared mobility  
Autonomous vehicles  
Electrification

## ABSTRACT

Personal mobility is facing three major innovations that have disruptive potential: electrification, shared mobility and automation. In this perspective I present each of these on their own and look at their role in disrupting the auto industry, the transport system and energy system. The largest disruptive potential lies in the combination of these three innovations, i.e., in the shared autonomous electric vehicles (SAEV). While shared mobility per se might not have the potential to truly disrupt the transport system it is necessary to steer electrification and automation in a more sustainable direction. Technology and innovations alone will not be sufficient to create a new sustainable transportation system, regulations will also be necessary.

## 1. Introduction

The other day I attended a brainstorming lunch with researchers and experts initiated by a major bus manufacturing company. The company wanted input into the question: ‘What size will future vehicles have with more autonomous vehicles on the roads?’ More specifically they were interested to know if large capacity busses would still be needed, or if they had to rethink their vehicle model portfolio. The discussion clearly reflected how uncertain the future of the market and the mobility space is. Opinions and views varied and one of the experts said: ‘I don’t believe that people will give up private vehicle ownership’. In sharp contrast to this statement Arbib and Seba [1] predict the end of individual car ownership. Even other reports highlight that the relation to the personal vehicle may change due to innovations such as shared mobility, connectivity and automation [1–6]. No doubt it’s a hot subject that engages several actors in the community ranging from car manufacturers, researchers and city planners. And the truth is that nobody really knows what the answer will be. What can be said is that there are a number of innovations that have the potential to disrupt mobility as we see it today with consequences for the transport system, energy system and city development. The trends and innovation that are highlighted are electrification, shared economy, and automation. But how disruptive are these trends and how disruptive are the implications for the transport system and the energy system?

If we look at the trends so far none of these new innovations have actually made any major dent in the personal vehicle dominated mobility. While there have been some indications during the previous years of a decline of motorization making some researchers talk about a possible ‘peak-car’ [7,8], more recent trends shows a ‘recovery’ indicating that the main cause of the decline has been economic factors

[9]. Research in Sweden has even shown that attitudes towards cars and car use have not changed during the last ten years [10]. This is also shown in record high vehicle sales and the number of two-car households increasing [11]. Still there seems to be the emergence of niches, especially in major cities where membership in car sharing services is increasing [5,12], young people are taking their driving license later, and vehicle ownership is decreasing (even if in moderate numbers) [13,14].

Interestingly enough the transport sector has already experienced a disruptive change from horses to motorized transport dominated by cars. This transition went fairly rapidly. Data for the US shows that the car replaced the horse in around 12 years, even if it took 30–50 to completely phase out [15]. What is also interesting is that the motorization of the transport sector led to a growth beyond the previous usage and application areas. Cars did not only replace the typical trips carried out by horses but also enabled an increase in the overall demand for mobility and played an essential part in developing our society to what it is today [16,17]. History often has lessons to teach, still we must keep in mind that the socio-technical system surrounding the automobile today is much more complex than the one surrounding the horse 100 years ago, involving many actors in different sectors and with many vested interests [18], indicating that a transition might be harder to achieve today.

## 2. Interpretations of disruption

Before trying to address the question of how disruptive the innovations are I’m going to discuss the term disruption and how it can be interpreted. According to Christensen [19] disruptive technologies are those that from the start have worse performance and lower price than

E-mail address: [fsprei@chalmers.se](mailto:fsprei@chalmers.se).

<http://dx.doi.org/10.1016/j.erss.2017.10.029>

Received 12 September 2017; Received in revised form 16 October 2017; Accepted 17 October 2017

2214-6296/ © 2017 The Author. Published by Elsevier Ltd. This is an open access article under the CC BY-NC-ND license (<http://creativecommons.org/licenses/by-nc-nd/4.0/>).

the mainstream technologies but given their convenience and with technological improvement they can take over the market. This can be seen as a disruption from below, i.e., from the lower end of the market. Arbib and Seba [1] point out that there can be disruption from above as well, i.e., technologies that are superior in performance to the main stream but are more expensive. These enter and disrupt the market through cost reductions.

Both types of disruption look at the phenomenon from a management and industry point of view. Given the role of transport in a larger socio-technical system it is interesting to look at disruption from a broader perspective and its systemic effects. It might be so that an innovation has a disruptive effect on the automotive industry but not on, e.g., the transport system. To be fair Arbib and Seba [1] look at the broader perspective as well and also emphasise the convergence of various technologies that might enable a major disruption.

In the next sections I will go through three of the major innovations that are currently being discussed when talking about future mobility: electrification, shared mobility and autonomous vehicles. For each of these I will analyze how disruptive they might be for the car manufacturers, the consumers, and the transport and energy systems. I will end by examining the disruptive potential of the combination of these three innovations. In general I will interpret the term disruptive as the ability to create a major change and interrupt the normal course of a system. For the transport system this implies a shift away from a mobility mainly based on privately owned vehicles as we have today. For the energy system it implies a major shift away from fossil fuels to more renewables but also a shift toward less centralized power production. I also want to point out that I am mainly focusing on personal mobility and not looking into freight and transportation of goods, even if there are many synergies between these and the interactions probably will increase.

### 3. Shared mobility

Shared mobility is a term used to describe transportation services that are shared among users. It includes a variety of options from services where the vehicle itself is shared, i.e., various forms of car sharing ranging from the traditional (or station based) to free-floating, as well as bike-sharing, to services where the ride is shared. The latter includes traditional shared modes such as public transport and taxi as well as car-pooling, ride sharing and ride hailing. There are various attempts to define all these services (see e.g. [20]) however, this is becoming more and more challenging since new services are emerging and the distinction between the services are also to a large extent blurring. For example the free-floating car sharing service ReachNow allows their vehicles to be used for ride hailing services such as Uber [21].

While some of these services are new, shared mobility is actually nothing new: car rental, taxis and public transport have been available for a long time. The public transport company in Western Sweden actually highlights this in one of their commercial ads showing that a lot of the features that are praised in the next generation of mobility, especially in autonomous vehicles, actually already exist in public transport.<sup>1</sup> Car sharing was first established in Switzerland in 1948 [22]. A poster from the U.S. Government aiming at saving resource during WWII reads “When you ride alone you ride with Hitler! Join a car-sharing club today!”. The difference today is that through the advance of information and communications technology, GPS and smart phones these services are much more accessible and convenient. The convergence of different technological advances has made it possible to dramatically improve existing services and offer new ones. There has also been a professionalization of the car sharing companies providing improved services and reaching a larger group than environmentally conscious consumers or those attracted to the sharing economy as a

concept [23].

It's not only technological improvements that have made car sharing services more attractive, even municipalities have played a role in creating prerequisites through e.g. favorable parking regulations [24] or as in Paris where the city council started the electric car sharing service Autolib. Municipalities can also choose not to support a specific type of service if there is a fear that the drawbacks are larger than the benefits. In San Francisco the city decided not to give preferential parking to free-floating car sharing services (i.e., a car sharing service where the vehicle can be returned anywhere within a specified area) since they thought that it might induce more vehicle use by substituting public transport and bike trips [25]. The ride hailing service Uber has been banned or partially banned in a number of cities and countries, even if the reasons have not been environmental but rather related to not complying with regulations [26].

In what way can shared mobility be disruptive? Looking at it from Christensen's framework, they can be seen as a service that has lower costs, and lower product performance than the main stream. But can they improve and outperform the personal vehicle over time? We have already seen that there has been improvement and that the customer base is increasing beyond the early niche [5,12]. Still comparing personal vehicles and car sharing is not straightforward. If we start with costs the structure is different. In personal vehicles the upfront costs are high while the perceived running costs are lower and many vehicle owners don't have the full cost picture in mind when they purchase a vehicle [27]. For car sharing there are only running costs and possibly a monthly fee, depending on the service's pricing model. This can make it economically favorable for users who don't drive on a regular basis [28], while in some cases the price structure is seen as a barrier if the vehicle is rented for a longer time [29]. Users of car sharing services often highlight the avoided costs of ownership of vehicles and an increased transparency of costs of car use as one of the advantages [30,31].

When it comes to performance it depends on what attributes are valued and how they are interpreted. The use of the term flexibility is illustrative. It can be used to highlight the advantages both of private owned vehicles and car sharing services. Normally the personal vehicle is seen as the most flexible option since it is available for the user all of the time, still flexibility is also pointed out as one of the advantages of car sharing [32–34]. In the case of car sharing the flexibility consists of a wider range of vehicle models [25], providing a fit-for-purpose mobility solution [6] and having to pay for a vehicle only when you actually need it [32].

Both costs and the term flexibility illustrate that car sharing implies a different view of mobility and what attributes are valued. A major disruption of the transport system will probably have to imply a shift in attitudes. Today the car is more than just a transport mode, it also carries a lot of symbolic value [35] such as status, political views as well as emotional values [36–38]. Bardhi and Eckhardt [32] point at the difference between ownership and access, where ownership is related more to a sense of responsibility and attachment while access is more related to a utilitarian view of the object or service. It should be pointed out that there can be a perceived sense of ownership in access and legal ownership is not necessary for psychological ownership [39]. Studies so far find that car sharing often attracts people with low sense of ownership of vehicles and a more utilitarian view of mobility [32,31,34]. While Bardhi and Eckhardt [32] don't find that the car sharing members they've interviewed reject car ownership, they see that car sharing can have other signaling values such as being ‘an economically savvy and a more flexible form of consumption’.

Members that do give up a vehicle often have other reasons than just joining car sharing such a new job, a car that broke down or increase in costs related to their car such as insurance [30]. Thus it might not be car sharing alone that makes users give up the car but it facilitates the decision [31]. Other studies don't go as deep into the perceived reasons and instead focus on quantifying the number of avoided

<sup>1</sup> [www.futuremobility.se](http://www.futuremobility.se) (Accessed 4 September 2017).

Download English Version:

<https://daneshyari.com/en/article/6557671>

Download Persian Version:

<https://daneshyari.com/article/6557671>

[Daneshyari.com](https://daneshyari.com)