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More friends than foes? The impact of automobility-as-a-service on the incumbent automotive industry

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ABSTRACT

This paper examines the scope for network platform business models offering 'automobility-as-a-service' to disrupt the existing automotive market and industry. The paper uses three examples (Getaround, BlaBlaCar and Uber) to illustrate distinct versions of the network platform business model concept. Despite expectations that automobility-as-a-service, enabled by digital platforms, may erode the market for new cars and the existing model of individual car ownership, the paper argues that it is not necessarily disruptive to the incumbent automotive companies. Rather, network platform business models via automobility-as-a-service are argued to be one mechanism by which the primacy of the car may be retained. In turn this has important implications for the durability of the automotive industry, and of the unsustainable aspects of platform business models.

1. Introduction

This paper asks whether new network platform business models for companies acting as intermediaries in the provision of automobility will constitute a disruptive threat to the established automotive industry. Apparently, there is an acceptance of the idea that the industry currently known for making cars is in a process of morphological shift into mobility services, in part powered by new entrants acting between vehicle manufacturers and their customers (Pallaro et al., 2015). This shift is thought to have the potential to redefine the relationship between vehicle manufacturers and their customers, and hence the future of automobility in general.

These new options for personal mobility can take a variety of forms (Münzel et al., 2019a). In this paper three distinct forms of 'automobility-as-a-service' (AaaS) are defined: peer-to-peer car sharing; ride sharing; and ride hailing. All three offer a means to travel, but there are significant potential differences in terms of ownership of the assets, the platform provided by the intermediary, and the fit with user mobility requirements. There is a dearth of information on this potentially important and diverse population of new automobility service providers that could transform individual mobility, urban transport systems, and the totality of automobility. AaaS is thus a classic 'nascent' market (Santos and Eisenhardt, 2009) in which there is experimentation and uncertainty over the definition of products or services provided, competition, and economic structures. As Casprini et al. (2019) observe following their study of BlaBlaCar, more research is needed into the multiplicity of start-ups and business models emerging around mobility services.

In principle, different approaches to automobility provision could be combined along with public transport to create integrated 'mobility-as-a-service' systems (Ambrosino et al., 2016). The concept of *mobility-as-a-service* (MaaS) is well established (Kamargianni and Matyas, 2017). It is all-embracing in that it combines multiple possible modes of travel with public and private provision. MaaS is often seen from a transport planning perspective as having the potential to disrupt the current automobility system of private car ownership towards a more sustainable 'post-car' system (Audouin and Finger, 2018). In this paper the concept of 'automobility' is as defined by John Urry as a "…self-organizing autopoietic, non-linear system that spreads worldwide, and includes cars, car-drivers, roads, petroleum supplies and many novel objects, technologies and signs" (2004, p. 27).

Automobility-as-a-service (AaaS) is narrower than MaaS, entailing the provision of personal passenger car transport services. Users of this service may or may not own a car as well, though mainstream car sharing is considered to result in a reduction in car ownership levels (Kim et al., 2019; Becker et al., 2018; Meijer et al., 2019). The asset (the car) is not owned by the platform company or the vehicle manufacturer, it may be owned by an intermediary (including a finance provider or car hire company) or by the driver. Drivers are not regarded as employees or even necessarily as self-employed (see BlaBlaCar below).

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However, car sharing per se, whether provided by a vehicle manufacturer or third party, does not constitute a network platform business model - which involves digital intermediation between many suppliers and many users. The example of car sharing used in the paper (Getaround) was explicitly chosen because it is a peer-to-peer digital platform business model.

Emergent technologies in electric traction, connectivity, autonomous control, big data, and the Internet of Things are enabling the realisation of novel automobility services (Bohnsack and Pinkse, 2017; Merfeld et al., 2019; Skeete, 2018). The implications for vehicle manufacturers, their supply structures, and their attendant business models are profound, but uncertain (Bidmon and Knab, 2018). However, the scope of the incumbent automotive industry to absorb the disruptive threat of independent network mobility business models has not been explored in the literature. Previous research by Bergek et al. (2013) has argued that incumbent industries may have the potential to integrate new technologies into existing capabilities. We address this research gap by trying to answer the following question: what is the expected impact of AaaS on the incumbent car industry?

In an extreme vision of the implications, Airbib and Seba (2018) argue that the private ownership of vehicles will cease, and the total fleet required will fall to 18% of current levels alongside much greater vehicle longevity. Different approaches to automobility-as-a-service may have different impacts on the automotive industry. Digital platform businesses, made possible by advances in mobile telecommunications and smartphone technology, are potentially the sort of disruptive force that could destabilise existing economic structures, redefine markets, and render the existing incumbent vehicle manufacturers as residual suppliers. In short, automobility services are an emergent phenomenon, part of a wider dynamic within the automotive socio-technical system (Geels, et al., 2011). While often hailed as offering the business mechanism behind a sharing economy, and hence enhanced sustainability, recent research has started to identify the potential for undesired rebound effects associated with platform business models (Warmington-Lundström and Laurenti, 2020).

Nonetheless, rather than comparing different car sharing schemes, we analyse different approaches to automobility-as-a-service, of which car sharing may be one, as enabled by platform business models. The paper, consequently, has three main contributions. First, we offer the concept of 'automobility-as-a-service', as distinct from 'mobility-as-a-service' (MaaS). This is an important distinction because with AaaS there is no necessary and causal link to public transport or to transport policy in general. The automobility element of MaaS is generally assumed to be an integral component of a multi-modal and inter-connected transport system wherein the cars are intended primarily as feeders into and out of public transport nodes. Second, we identify that automobility-as-a-service can be provided in a variety of formats, as illustrated in part by our three examples. Each format carries specific implications for automobility. Third, and more speculatively, we propose that automobility-as-a-service need not presage the decimation of the automotive industry, nor contribute to more sustainable mobility, and suggest reasons as to why that may be so.

The paper proceeds in the following manner. Section two provides an account of academic research into network platform business models with a focus on how the business acts as an intermediary between providing a product-service, and those desiring a product-service offering (Gawer, 2014; Hagiu and Wright, 2011). Section three offers a definition of three categories of AaaS. Section four outlines the methodology adopted to inform section five which provides three vignette examples: Getaround; BlaBlaCar; and Uber. These respectively represent peer-to-peer car sharing, ride sharing, and ride hailing. Section six offers analysis of network business models at a theoretical level, and in terms of the impact of these models on the transformation processes underway in the automotive industry. We argue that the business models are not as disruptive as is often assumed, at least to date. Conclusions for future research are drawn in section seven.

2. Network platform business models

To classify different automobility service companies, the present paper builds on the value-network business model (Stabell and Fjeldstad, 1998; Fjeldstad and Snow, 2018). The value-network business model is one owned by an individual firm and regards networks as part of the content of the business model. Value creation follows the principle of network externalities and increases as more participants join. With direct network effects, value increases as the membership increases. Indirect effects occur when participants use complementary products that increase the value of the network. As network externalities affect value creation (Farrell and Klemperer, 2007), network lock-in is important.The 'platform' business model whereby supply and demand are mediated in an internal market, hosted by the focal firm and usually accessible from a range of digital devices, is a specific variant of the value-network businss model (Gawer, 2014; Thomas et al., 2015). All three examples discussed in this paper are versions of 'platform' business models.

The value-network business model has been unevenly applied in different industrial contexts such as the banking (Fjeldstad and Sasson, 2010; Sasson, 2008), insurance (Fjeldstad and Ketels, 2006); telecommunications (Andersen and Fjeldstad, 2003; Fjeldstad et al., 2004); and newspapers (Burkay, 2012). In addition there has been empirical study of the logistics and transport industry including shipping companies (Lorange and Fjeldstad, 2012) and logistics service providers (Huemer, 2006; Huemer, 2012; Wang et al., 2016). The value-network model has been cited in studies on digital service platforms (Ruutu et al., 2017; Vendrell-Herrero et al., 2017).

In terms of the research topics, existing studies focus on relational connectedness and network embeddedness for firm performance and survival (Fjeldstad and Sasson, 2010; Sasson, 2008), strategic actions (Fjeldstad et al. 2004), competitive advantage (Fjeldstad and Ketels, 2006), business models (Lorange and Fjeldstad, 2012; Fjeldstad and Snow, 2018), and strategy tradeoffs (Fjeldstad and Haanæs, 2001). In addition, there is some research into the launch of mediating network platforms and subsequent network development strategies (Burkay, 2012; Fjeldstad and Jakobsen. 2005; Schilling, 2002) as well as strategizing scope and value-network firm functions (Huemer, 2017). There are some studies applying the model in situations where the focal firm is an intermediary between many suppliers and many users in the provision of mobility, notably for UBER (Zeng et al., 2019; Min et al., 2019; Guda and Subramaniana, 2019). However, there is a lack of comparative studies on different typologies of network business models in automobility services. Hence, this paper seeks to fill the research gaps in terms of the application to automobility services, the significance of different network business model typologies in this application, and the impact on the mainstream automotive industry.

3. Business models of AaaS

This paper defines three main categories of AaaS network platform business models: peer-to-peer car sharing; ride sharing; and ride hailing. While all three models offer a means to mobility there are important characteristics that define and separate them. In car sharing, the vehicle is provided to a user and the 'service' offered is essentially one of connecting users to vehicles, while users provide the actual mobility service themselves. In ride sharing, the user is offered a service whereby they are connected to a car and driver, but the trip the driver is taking is not necessarily undertaken just for the users' benefit. In ride hailing, the service provided connects users to drivers, and the trips generated are expressly to suit the purposes of the user. Table 1 (in Session 5) provides details of the characterisation where the focus is on the basic value proposition; how the mobility service is offered (vehicle ownership; whether users are drivers); the basis upon which costs are charged (time, distance, or some combination; coverage of secondary

Table. 1
Characteristics of the Automobility-as-a-service examples

	Getaround (formerly Drivy)	BlaBlaCar	UBER
Type of scheme	Car sharing	Ride sharing	Ride hailing
Primary value proposition	Asset utilisation for owners; lower total cost of travel for users	Cost-spreading for owners; lower total cost of travel for users	Income generation for owner – drivers; flexibility and low cost for users.
Source location	France, 2010	France, 2006	USA, 2006
Scale	Claims 5 million users, 20,000 cars and active in 300 cites	Claims 1.5 million users and 50,000 cars in Europe	Claims 65 million users in 22 countries
Car ownership	Car owned by an individual or third party	Car owned by driver.	Car owned by driver or third party.
Car driving	Car driven by customer.	Car driven by owner.	Car driven by owner - driver.
Car insurance	Car insured by Getaround during the rental period. Also car recovery.	Insured by BlaBlaCa while there is a ride share occupant.	Car insured via UBER during the period when the driver's app is on.
Fare basis	Fare determined on a time basis.	Fare determined on a distance basis.	Fare determined by a time / distance calculation.
Revenue model	30% taken by Getaround for own costs and insurance. Car owners set the price.	Drivers only recover costs. BlaBlaCar takes 12%.	20–25% taken by UBER.
Target market	Repeat drivers taking longer trips	Riders taking longer trips	Short-range, urban trips.

costs notably insurance; the revenue model); the target market(s); and the scale / scope of the case. The three models are therefore not only different from each other, they are also different to the 'traditional' means of accessing automobility via personal ownership; daily rental; or taxi. Note that 'value' can entail more than intrinsic monetary (economic or financial) value. There may be an extrinsic social or environmental element, as has been emphasised in early treatments of the sharing economy and as appears to be the case in BlaBlaCar where ride sharing substitutes for traditional hitchhiking (Casprini et al., 2019; Jang et al., 2020).

3.1. Car sharing

Car sharing can take a variety of forms (Münzel et al., 2018; 2019b). The essence is that cars are provided for shared use, for which usually membership and some form of per-use payment is required from users. Peer-to-peer car sharing via a digital intermediary platform is a distinct subset of the car sharing market that may serve different constituencies and geographic markets than mainstream car sharing (Hampshire and Gaites, 2011)

The membership and per-use payment rules provide for the first defining parameters of the car sharing scheme in question. Lower cost and simplicity may be traded off against flexibility over use for example. Time constraints, the need to book ahead, and a larger variation in travel times have significant negative effects on people's intention to use a shared car (Kim et al., 2017a, 2017b). Other 'external' or contextual factors that might constrain the acceptance of car sharing business models include socio-demographic considerations with younger people more likely to adopt car sharing (Prieto et al., 2017), or households already owning a car (Nijland and van Meerkerk, 2017). While there is a substantial body of research on consumer or user attitudes to car sharing (Becker et al., 2017; Kent et al., 2017), and some research on the implications for vehicle manufacturers (Bellos et al., 2017), there is little on the business model aspects of the peer-to-peer car sharing (AaaS) schemes themselves (Guyader and Piscicelli, 2019; Meijer et al., 2019) or their impact on the automotive industry.

A significant consideration for peer-to-peer car sharing is that there are people with assets (i.e. cars) who are also willing to share those assets (Wilhelms et al., 2017). The recruitment of vehicle owners is as crucial as the recruitment of users. Thereafter, sharing patterns need to be matched asymmetrically against personal use patterns. Schemes like Getaround act as intermediaries between car owners and members who would like to use a car. This is similar in principle to Airbnb for example, with the intermediary taking a service charge fee. Hence a high proportion of the budget is likely to be taken by advertising to recruit cars and member drivers. These systems absolutely rely upon the robustness of all the support systems that surround vehicle use e.g. vehicle licensing, insurance, driver licensing, roadworthiness testing and related issues.

3.2. Ride sharing

Ride sharing has long existed at an informal level, from hitchhiking to office-based schemes whereby commuters with similar patterns agree to share a ride. Ride sharing may be actively promoted to reduce the carbon and congestion impact of commuting and other travel (Santos, 2018), though the concept is often conflated with car sharing or ride hailing.

The principle of ride sharing is simple. A driver with a vehicle going on a specified route may take another person or people on that route, or a part thereof. Similar concepts now exist with respect to the delivery of parcels, whereby the driver picks up a parcel and delivers to an address or person. In either case, the driver may be remunerated at cost or for profit (see for example https://www.nimber.com/). As with peer-to-peer car sharing, the recruitment of vehicle owners is therefore as crucial as the recruitment of users. Riding in a car with strangers may entail personal risk for example and thereby deter recruitment of users. Some services offer women drivers for women passengers, or attempts are made to conceal the locational identity of riders (Aïvodji et al., 2016).

3.3. Ride hailing

Ride hailing is an updated version of traditional taxi services, in this case mediated via a digital platform. Again, in principle the operation of ride hailing is simple enough. Users and providers both subscribe to the platform. Users then request rides as required, and available drivers can respond along with a quote for the anticipated journey cost, their time of arrival, and the duration of the trip. A critical mass of drivers is required to provide a service, while drivers need a critical mass of subscribed users in order to have sufficient business. Episodes of peak demand or under-supply can be managed by differential pricing mechanisms. Users and providers can in principle be subscribed to one or more services to maximise their chances of getting the ride desired.

Ride hailing as a peer-to-peer proposition may readily meet opposition from established taxi service providers. Depending upon local regulations, there may be a difference between so-called 'black cab' taxi services, where potential users can literally hail a passing but empty cab and request a trip, and pre-booked taxi services where such drivers and vehicles are not allowed to collect passengers without having a pre-booked order.

3.4. The disruptive potential of AaaS

In the study presented in this paper, we searched for evidence that the application of AaaS via third-party network platform business

models has disrupted the incumbent automotive industry, using the examples as illustrative of differing formats for AaaS. The assessment requires that AaaS operators be identified as new intermediaries between vehicle manufacturers and car users, and of a scale that constitutes a substantive challenge.

This approach entails three elements. First, evidence is needed on the specific application of the platform concept in the delivery of AaaS for each example. Evidence is also needed on the value proposition in each case: The nature of the mobility service offered, the ways users can access and pay for the service; the ways the service is delivered. The evolution of the business model is suggestive of learning processes, so where such evolution is identified it can be implied that earlier versions of the business model were in some respect defective and / or that later iterations more precisely segmented the market. As with other platform business sectors, there is unlikely to be a single business model to dominate the AaaS market (Täuscher and Laudien, 2018). Second, the significance of the example is required – by which we mean identifying indicators of the scale of the example in terms of business indicators such as turnover or growth rates, or the attraction of finance capital. Here scale is used as a proxy for potential disruption to the established automotive industry, but caution is needed. That is, it might be that AaaS becomes a very significant part of the future landscape of automobility and yet is not meaningfully disruptive of the automotive industry. Further to this issue, it is important to understand how network effects create barriers to competitors, including those created by the established automotive industry. In two-sided platform businesses a vital consideration is how easily suppliers and users can be recruited and then locked in, as these features will be important in determining whether there are, for example, first-mover advantages or whether quasi-monopoly rents can be extracted in the future. Finally, indicators are needed on the impact on the automotive incumbents, or alternatively how far AaaS can be accommodated within existing production and retail practices. This last area is the most problematic in terms of tracing cause and effect, either for the automotive industry as a whole or for individual vehicle manufacturers. Other incumbents in contemporary automobility may also suffer disruption: car rental companies or taxi companies for example. Alternatively, public transport services or other modes may face substitution effects.

4. Methodology

The methodological approach adopted for this paper is that of 'longitudinal immersion', an over-arching, iterative, multi-contextual and reflexive means of developing a richly textured understanding of a phenomenon or set of related phenomena (Wells and Nieuwenhuis, 2017). The underlying aim of longitudinal immersion is to be engaged with the social subjects of research, typically over a protracted time period and with multiple points of engagement with the intention of accumulating theoretical insights and empirical knowledge. There are both critical and self-reflective aspects to this process which may include testing research assumptions and understandings against and through a wide range of social actors or agents. These actor or agent can include other academic researchers, regulators, consultancies, NGOs, businesses, and policymakers for example.

Longitudinal immersion therefore recognises that research in social settings can proceed in a discursive manner via irregular and sometimes complex engagements with social actors in combination with a wide range of secondary sources. In this manner there may be reflexive and instrumental components to the knowledge created in the research process (Robinson and Kerr, 2015). As expressed by Thorpe et al., (2011) '…scholarship as a product is generated across a career of research, user-group engagement, teaching and professional citizenship' (Thorpe et al., 2011). The research team behind this paper combines those with the longitudinal experience noted above, and those with the deeper, more vertical immersion in a specific topic area (in this case, car sharing) to create example vignettes (Barrus et al., 2016; Heim et al., 2019) over a period of 36 months. Reflexivity was achieved by periodic research team discussions over the emergent examples and their impact.

As noted by Robinson and Kerr (2015) reflexivity seeks to embrace the idea that researchers are not simply neutral bystanders who impartially observe events but can directly or indirectly effect research processes by virtue of deliberate participation in society and the specific phenomenon that they seek to understand. This is evident in the participation of the researchers in a H2020 project (see www.stars-h2020.eu/), the purpose of which is to encourage car sharing. Moreover, the attempt to be engaged with the subject of study means that the research seeks to be informed of the values, views, ideas, concerns, and understandings of the subjects of research (Evered and Louis, 1981). The research becomes embedded in a domain in which via both primary contacts and secondary sources there is a greater 'feel' for the ways in which behaviours and outcomes can be understood.

Longitudinal immersion is combined with qualitative research which is particularly suitable for studying embryonic network platform business models and the impact on the automotive industry as it helps us to better understand emergent, socially grounded, phenomena involving complex relationships (Eisenhardt and Graebner, 2007). Qualitative research produces findings resulting the natural unfolding of the phenomenon under study emerges in contemporary contextual settings (Yin, 1994; Patton, 2001).

Document analysis was employed as it is applicable to qualitative research (Yin, 1994; Corbin and Strauss, 2008). Previous studies seeking to produce rich descriptions of a single phenomenon, event or organisation have relied solely on document analysis as it allows the researcher to develop understanding by uncovering meaning and insights relevant to the research question (e.g., Wild et al., 2010). In support of this approach, the paper draws upon multiple sources of evidence, which allows for data triangulation. Triangulation is defined as '…a validity procedure where researchers search for convergence among multiple and different sources of information to form themes or categories in a study' (Creswell and Miller, 2000: 126). Triangulation is important because when data from different sources converge, the research offer greater confidence in the trustworthiness of the findings (Bowen, 2009). For the examples chosen, the research triangulated corporate documents and website material with a wide range of specialist and general press sources such as Financial Times, Automotive News, Electrive.com, Fleet News, and 'grey literature' sources, along with the authors' own experiences of the services. A pre-established understanding of the automotive industry helped to evaluate the significance of the different network business models for the industry, in for example remarketing schemes and the residual value of vehicles.

5. Automobility-as-a-service: the examples

The purpose of the examples presented here is to compare the different formats of AaaS offerings, with the intention of highlighting the implications for the automotive industry. None of these examples have stations at which cars are necessarily parked, unlike many car sharing schemes or taxi services for example. Table 1 summarises the examples.

5.1. Getaround car sharing

Drivy was a for-profit company founded in 2010 in Marseille. The core concept is to allow car owners to hire out their vehicles to other users. It spread to several European countries and was acquired by Getaround in 2019. Unlike its counterparts in the car sharing market, Getaround does not try to capture drivers who need to take short trips inside a city – it focuses instead on having repeat customers, and drivers who need a car for longer trips (McLellan, 2018).

5.1.1. Application of the network platform business model in peer-to-peer car sharing

There is no subscription fee in this model, and a deposit is not required. At the end, drivers can leave reviews of their experience, helping to ensure members are honest and fair. The insurance cover is key to success in that it allows an individual to insure (and hence use) an asset they do not own (Ralph, 2017). Cars must be under seven years old. One value proposition that the company offers is that new members are offered training on how to get started. Car owners can rent their car out to other members, setting their own price with the help of an algorithm provided by Getaround. Getaround sets a minimum (of £37 per day) and maximum (of £202 per day) for car use. Getaround will also install a box that provides a GPS and makes the car connected. This box (called Drivy Open) also allows cars to be handed over to users without the owner being present (Middleton, 2018). Car owners get to keep 80% of the rental amount, as Getaround keeps 13% and 7% goes to Allianz for insurance costs. In the UK Getaround uses the AA roadside rescue service, and other similar entities in other markets.

When starting in the UK market in 2017 Drivy offered guaranteed monthly payments of £250 to the first 300 owners registering their vehicle on the site. This is an indication of the significance of recruiting vehicle owners. There are several other entities with related car sharing offers. In the UK these include Zipcar (owned by Avis), Turo, and HiyaCar (Elliot, 2018). Others are emerging in other markets, indicating low barriers to entry. Each offers a portfolio of vehicles and pricing structures that effectively act to segment the market for car-based mobility.

5.1.2. Significance of this application

The organisation had several public-private shareholders, such as Nokia Growth Partners, Cathay Innovation, Index Ventures, Via ID, and BPI France. Drivy raised £28 million in 2016 from venture capitalists, and in 2017 claimed 1.5 million users and 50,000 cars across France, Germany, Austria, Spain, Belgium and the UK (Gerrard, 2017; McLellan, 2018). In April 2019 Drivy was purchased by Getaround (US) for US$300 million and rebranded as Getaround EU. Getaround has a partnership with UBER in the US called UBER Rent. It has also attracted investment from Toyota and Ford. This shows that the model has been able to attract investment, and to grow in scale quickly without the need for the business to invest in actual vehicles.

The business is very small compared with the new car market, or even with the annual purchases of the daily rental industry. Its significance rests on the relative ease of expansion and replication by other businesses, and that it is a profitable business model. Examples of other independent peer-to-peer car sharing platforms include Turo, HiGear, MoObie, and Nabobil. Maven, owned by GM, offers a similar service.

5.1.3. Impact on the incumbent automotive industry

An important feature of the service is that it allows car owners (or prospective owners) to underwrite the cost of purchase in whole or in part (Smith, 2018). It therefore acts to stimulate demand. The company claims that users will be able to abandon the idea of car ownership once the network reaches a critical mass – but has not provided evidence for this claim. An issue has been the difficulty of recruiting private asset owners to allow their cars to be used by others. This problem can be somewhat resolved by Getaround users accessing traditional car hire companies via the app (Middleton, 2018). The automotive incumbents have long used the daily rental industry as a route to market, and thus far Getaround appears to be an unproblematic variation on that route. Hence Getaround constitutes a slight variation in traditional routes to market (as shown in Table 2, Section 6 below) along with enhanced asset utilisation that is broadly beneficial to the automotive industry. Peer-to-peer car sharing is too small in scale to be disruptive to the industry.

5.2. BlaBlaCar ride sharing

BlaBlaCar is probably the largest and most successful ride sharing platform in the world. It started in France in 2006, but then expanded into other European markets and beyond, including India but excluding the US (Rodriguez, 2014; Cook, 2015). It could be argued that ride sharing is a 'natural fit' for the network platform business model, and the growth of BlaBlaCar is illustrative of its appropriateness.

5.2.1. Application of the network platform business model in ride sharing

The basic proposition is very simple: passengers seeking a trip from one point to another are quoted a price by BlaBlaCar. The price includes VAT and the margin for BlaBlaCar (typically about 12%). Drivers get the fee minus the VAT and the margin but are not expected to make a profit. Drivers are not charged a fee by BlaBlaCar. A quirky feature from which the platform derives its name is that drivers and passengers are rated (and self-rated) on how conversational they are. BlaBlaCar was initially used for longer-range trips, not intra-urban travel – an average trip distance of 220 miles according to Chen (2015). Entry costs for drivers and passengers were therefore very low, making network expansion viable.

The expansion costs include significant marketing outlays, and the hardware and software needed to run the platform. However, BlaBlaCar does not own vehicles or stations. Recruitment of drivers and potential passengers is key to the initial base of the proposition, but changes had to be made to the operation of the service from a 'pay on use' system to a 'pay in advance when booking' system. The platform started initially as a business-to-business proposition with paid-for advertising on the website, but this proved cumbersome and expensive. Farajallah et al. (2019) report that experienced drivers expanded the number of successful trips offered by lowering the price requested, thereby increasing overall net revenue both for themselves and for BlaBlaCar. Furthermore, Jang et al. (2020) argue that users consider both intrinsic and extrinsic measures of quality when deciding to use BlaBlaCar. In other words, in AaaS the transaction is evaluated as personal service, and extends beyond a simple price comparison. However, as Barbe and Hussler (2019) show, the imposition of predetermined decentralised evaluation systems by companies does not necessarily support pluralism among users (drivers and riders).

Furthermore, operational security must be underwritten by insurance, and hence key to this has been partnership with insurance providers such as Axa. This is in line with the requirement of new entrants to seek complementary assets (Dyer and Singh, 1998). The provided insurance is free of charge to drivers, additional to their existing insurance, and applies as long as a BlaBlaCar passenger is in the car. BlaBlaCar undertakes checks to assess identities including the use of social media (e.g. Facebook) and verifying personal details such as telephone numbers, bank accounts and email addresses. When a ride is posted, the driver must declare that he or she holds a driving licence and insurance, but this is not checked by the platform. Passengers must trust the system and the drivers, for without this the service would fail (Rose and Wheeler, 2017).

5.2.2. Significance of this application

In 2014 BlaBlaCar raised US$100 million (£60m) from venture-capital firms led by ISAI, Index and Accel. It reportedly raised $160 million (£104 million) in new funding, which brought its valuation to $1.2 billion (£780 million) in 2015, despite having only 2 million regular monthly users (Chen, 2015; Cook, 2015). By 2015 total membership was 10 million, and by mid-2018 a reported 65 million registered users in 22 countries (Petzinger, 2018).

As the drivers do not make a profit the platform is able to avoid some of the regulatory concerns that have applied in e.g. UBER and AirBnB. BlaBlaCar itself may make a profit as an intermediary. This outcome resonates with the view of Querbes (2018) who argues that shared-economy business models cannot succeed on monetary

Table. 2
Routes to market and remarketing in the automotive industry.

Route	Share of total new registrations	Discount rate	Ownership length	Return route
VM sale to management	5–10%	Up to 40%	6–12 months	1. Approved Used
VM sale to staff		Up to 35%	12–60 months	1. Approved Used 2. Independent auction and dealers
VM sale to suppliers		Up to 30%	36 months	1. Approved Used
VM marketing cars (National Sales Company)		Up to 40%	6 months	1. Approved Used
VM franchised dealers demonstrator cars	8–12%	Up to 40%	6 months	1. Approved Used
VM franchised dealers service cars		Up to 40%	12–36 months	1. Approved Used
VM franchised dealers pre-registered cars		Up to 40%	90 days	1. Approved Used
VM franchised dealers in-house rental cars		Up to 30%	12–36 months	1. Approved Used
Rental cars	8–10%	Up to 40%	6–12 months	1. Approved Used
Large fleets	10 -20%	Up to 30%	12–36 months	1. Approved Used 2. Independent auction and dealers
Small and medium fleets	10–15%	Up to 30%	36–60 months	1. Approved Used 2. Independent auction and dealers
User-chooser and 'grey' fleets	10–15%		36–60 months	2. Independent auction and dealers
'White' fleets and local authority; government agency, etc.	10–15%		36–60 months	2. Independent auction and dealers
Special category e.g. Motoability in the UK	Up to 5%			
Retail customers	20–50%	0 - 15%	36–60 months	2. Independent auction and dealers
VM AaaS schemes including those run by franchised or owned dealerships	Less than 1%	Up to 30%	12–36 months	1. Approved Used 2. Independent auction and dealers
Independent AaaS schemes	Less than 1%	0–15%	36–60 months	2. Independent auction and dealers

(Source: Derived from industry interviews, trade press, franchised dealerships)

motivations alone. However, it also resonates with the view of Dal Zotto et al. (2018) that customers contribute to the value proposition – in the case of BlaBlaCar via the mutual rating system. Ride sharing companies include Hitch-A-Ride and Carma, albeit on a much smaller scale than BlaBlaCar.

5.2.3. Impact on the incumbent automotive industry

By the end of 2015 the strategy of geographic market expansion was struggling, with only Russia offering significant growth (Schrieberg, 2017). The response was to instigate short-range trips (circa 30 miles) in selected French cities as part of a wider strategy to diversify the service into regular daily trips – and to compete directly with public transport and providers like UBER. BlaBlaCar further struck a deal with a French finance company to allow drivers to purchase low-cost leases for Opel cars, and thus to offer rides via the platform (Auchard and Frost, 2017). BlaBlaCar helps car owners underwrite car ownership costs, and thereby indirectly stimulates the market. The agreement with Opel illustrates even closer ties as an alternative route to market that is not disruptive to the automotive industry incumbents. Ride sharing, as with peer-to-peer car sharing, allows asset owners to spread the costs of ownership and therefore resolve concerns over total cost of ownership. The automotive industry has long adopted finance innovations to expand the market, and ride sharing seems to be one more addition to this portfolio. The impact on the industry appears to be further limited by cultural or other factors that limit the number of asset owners prepared to participate.

5.3. UBER ride hailing

UBER is a ride hailing platform that connects drivers with passengers, mostly for short-range trips. It is recognised as disruptive to the traditional market and regulation of taxi services (Zwick, 2018).

5.3.1. Application of the network platform business model in ride hailing

Rapid expansion is key to the business model and to strategy. The expansion rate ensures that the growth in customer numbers is matched by drivers, and an area can be saturated with available cars. Instrumental to UBER's success has been the ability to connect drivers to customers in a short period of time. Moreover, by saturating an area UBER can overwhelm competitors and thereby create barriers to entry to other platform ride hailing concepts.

UBER can and does adjust the fares charged by drivers and the share of such fares taken by UBER. Over time UBER has reduced the fares charged, and increased the share taken (typically 20–25%). Inevitably, this has put pressure on UBER driver earnings, but the over-supply of drivers has ensured the service continues to operate. There is evidence that actual per-hour earnings for drivers can be below 'minimum wage' rates (Henao and Marshall, 2019). Labour relations has been an on-going area of concern for UBER and for regulators. The stance that drivers are 'self-employed' adopted by UBER has not been universally accepted. In some instances, UBER has agreed to subsidise pensions and health insurance as a compromise (Sullivan and O'Connor, 2018).

UBER operates with four levels of service. UBERX is the basic package at the lowest cost and can be offered by all drivers. UBERPOOL is a lower cost service whereby customers share rides for a 25% discount (and hence integrates ride hailing with ride sharing). UBERXL is a service offered by drivers with larger vehicles, able to accommodate larger groups. Lastly, UBEREXEC is a luxury package with higher fares and newer, premium-brand cars. Given the public profile of the business it is unsurprising that research has been undertaken into the socio-demographic characteristics of the users (e.g. Alemi et al., 2018) and the impact of UBER on issues such the existing taxi fleet (Chang, 2017), the rest of the mobility system (Kim et al., 2018), and workers (Fleming, 2017; Zwick, 2018).

5.3.2. Significance of the ride hailing platform

This model of service delivery is readily understood by both sides of the platform market. UBER has become a 'household name', emblematic of market disruption that redefines the offer to consumers. The long-run viability of UBER in ride hailing is still to be demonstrated. UBER has several significant competitors, at least at the regional level, with Didi Kuaidi and Yidao Yongchi (China); Lyft (US), OlaCabs (India), and Grabtaxi (Thailand) as prominent examples (Chen and Huet, 2015). It is notable that some messaging apps have sought to enter the ride hailing market around the world such as Line (Japan) and Daum KaKao (South Korea).

Up to 2018, the focus on revenue growth allowed UBER to increase the valuation of the business despite returning successive losses. UBER subsidises rides and drivers in a bid to capture market share (Hook, 2017), and the strategy has attracted significant tranches of investment such as the Saudi Arabia sovereign wealth fund providing US3.5 billion in 2016. The wider significance of UBER may reside in the

ability to leverage the brand into other horizontal markets in mobility. Of note is the expansion of UBER into bicycle and kick-scooter sharing schemes, helicopter rides, and into fast-food delivery (UBEREats).

UBER competitors mostly have a smaller geographic reach, but they are increasing in number and scope as time passes (see for example https://ride.guru/content/resources/rideshares-worldwide). Major competitors as noted above are indicative that the fundamental model is attractive to users, but also mostly disruptive to the existing taxi industry rather than the automotive industry.

5.3.3. Impact on the incumbent automotive industry

It is possible that UBER has slightly reduced new car sales (to conventional taxi fleets), but it has probably expanded the overall market by adding more purchases from prospective UBER drivers, lowering ride hailing costs and displacing public transport. More research is needed on this, though the study by Ward et al. (2019) suggests a small reduction in total new car sales might be an outcome.

UBER has been one of the pioneers of autonomous cars. As early as 2016 UBER announced that it was using a Ford Fusion car fitted with multiple sensors to test autonomous driving (Morby, 2016). This car was the product of collaboration between Carnegie Mellon scientists and an UBER robotics lab (the UBER Advanced Technology Center) in Pittsburgh (Mundy, 2015). It was reported that passengers in the autonomous cars were required to sign waivers to keep UBER free of liabilities for injury or death in the event of a collision (Nunez, 2016). UBER was involved in a long-running dispute with Waymo (the autonomous car business owned by Alphabet) despite Alphabet owning 7% of UBER stock at the time (Harris, 2017). Thus far the relationships have been mutually beneficial, while the non-car business of UBER remain marginal. Furthermore, because UBER does not purchase the core assets (the cars) it has no volume leverage with vehicle manufacturers. UBER drivers remain free to choose from the usual range of cars available within broad limits of affordability and practicality, so the 'normal' new car market is not unduly changed.

6. Discussion

The illustrative examples show there are multiple types of network platform business models, even within the same broad market of application. There is a dearth of data on the operational aspects of these business models. There is also an evolutionary character to emergent AaaS and the business models to provide such services. However, contextual framing is significant in the case of automobility, which is deeply embedded as a socio-technical regime and hence more able to 'manage' potential disruption.

With platforms like Getaround, prospective owners might consider that using this personal asset to derive additional income may help offset the cost of purchase or allow the purchase of a more expensive car. More intense use may result in cars being re-sold after a shorter period of initial ownership, and hence may support continued new car sales and the used car trade. It is likely that more cars will be in circulation than in the absence of such systems. Getaround does not threaten the industry or automobility as defined by Urry (2004). In the Getaround model the idea of people driving cars for themselves is retained, as is continued reliance on the car as the core of the mobility system.

There are doubts about the longevity of the propensity to use shared vehicles (Mattia et al., 2019), especially following the demise of Autolib in Paris. The need for 'lock in' for Getaround, UBER and BlaBlaCar is evidenced in the desire of all three to expand their network size as rapidly as possible, and thereby 'occupy' the market. To achieve network scale, Getaround has if anything migrated to being closer to the mainstream automotive industry incumbents by sourcing cars from rental companies. The Getaround strategy, and that of BlaBlaCar, therefore seeks to resolve the problem identified by Wilhelms et al. (2017) of persuading owners of assets to share those assets on the market.

With the BlaBlaCar model there is a 'social', 'shared' and 'not for profit' content and philosophy rather like old-fashioned hitchhiking, but BlaBlaCar also represents intensification of use and possible purchase of more new cars. Individual owners have their costs covered, which logically will provide a greater incentive to make trips. Neither does BlaBlaCar threaten the industry or the primacy of the car. If anything, this model challenges the long-range bus and rail systems.

For UBER, research in the US suggests that ride hailing services extend automobility into neighbourhoods with low rates of car ownership and into rural areas, with significant social benefits (Brown, 2019). This is not a threat to the automotive industry, even if others doubt the reduction in social exclusion (Clark and Curl, 2016). Still, UBER might be a long-term threat with the well-documented interest in autonomous vehicles and the expansion into other urban transport modes. The provision of UBER via autonomous cars would effectively mean UBER ceases to be a platform business as defined in this paper as the many suppliers (drivers) would disappear from the two-sided market. Micro-mobility offers (McKenzie, 2019; Peters and MacKenzie, 2019) may act together with car exclusion policies in urban areas to reduce the utility of car ownership and / or use, thereby undermining the market for new cars. If UBER does become a successful 'mobility' brand, it may increasingly own the relationship with the customers and demote vehicle manufacturers to the status of (commodity) suppliers.

UBER has attracted the interest of vehicle manufacturers: Toyota invested US$500 million in 2018 (Bradshaw, 2018). In similar vein Gett, an Israeli start up founded in 2009, received a US$300 million investment from Volkswagen Group in 2016; and Lyft founded in 2012 had US$500 million investment from GM in 2016 as part of a bigger US2 billion fund-raising round. In 2018, with a focus on autonomous technologies. Another major agreement includes Volvo with UBER (Campbell and Hook, 2018). In addition, UBER and Daimler entered a similar agreement. UBER at least has the potential to privilege some vehicle manufacturers over others, and thereby contribute to the long-term structure of the industry. The Chairman, Dieter Zetsche, was quoted as saying:

"As the inventor of the automobile, Daimler aims to be a leader in autonomous driving—one of the most fascinating aspects of reinventing mobility. Mobility service providers offer an ideal platform for autonomous driving technology and UBER is a leading mobility platform company. The real revolution in future mobility lies in intelligently linking the four major trends we call CASE: connectivity, autonomous driving, sharing and electric mobility. And we will certainly be the driver of these changes." (Cited in Daimler, 2017).

These are significant investments but, as the three examples show, success even in narrowly business terms may be elusive.

These structural shifts and business model innovations are likely to be associated with wider developments around the quest for a circular economy (Ciulli et al., 2019), the separation of economic growth from ecological burdens, and the re-orientation of production and consumption to a service model rather than an ownership model (Pallaro et al., 2015). The automotive industry is deeply enmeshed in these wider developments as discussed above. Studies on the impact of network business models on incumbents assume disruption (Lasmar et al., 2019). Clearly the specific instance of AaaS may be contributory to the structural changes in the automotive industry, but is unlikely to be significant as a single source of change – hence a full understanding of these network platform business models needs to be underpinned by locating the analysis within wider changes underway in the provision of automobility. This constitutes a bigger research agenda.

Whether consumers are prepared to participate in AaaS, at least in scale to disrupt the industry, is not yet certain. These are deeply contested outcomes (Schwanen, 2016). Indeed, one key element of this contestation is the struggle for control over the entire value creation

and capture system for personal automobility (Weiller et al., 2015). In other words, there are potential synergies in the co-evolution of these themes into an AaaS industry (Viviani, 2016), but at present AaaS remains a marginal activity that has largely been marginal, captured or controlled by the incumbents.

Network platform business models are readily applied to automobility services and, as this paper shows, in a variety of formats. While BlaBlaCar is closest to the 'sharing economy' ideal, it is Getaround and UBER that have scale, and therefore influence. Even then, the scale of operations is vanishingly small compared with the annual global new car market (see Table 2 below). The AaaS concept highlights the incremental and non-disruptive character of the activities of these network platform businesses, however UBER at least has the potential to privilege some vehicle manufacturers over others, and thereby contribute to the long-term structure of the industry.

There are multiple pathways or routes to market in between the vehicle leaving the factory and being in use in the market. These different routes vary widely depending upon multiple factors including the position and strategy of the vehicle manufacturer, the size and character of the various sub-markets to be accessed, the demand-supply position for individual models and variants of models, and the relative capacity of the 'remarketing' structures for each manufacturer. These all vary with time, and with each market under consideration. AaaS fleets may be considered as a new pathway or route to market with some distinct features depending upon the business model in question. It is therefore pertinent to give some consideration to these routes to market, to understand the potential impact of car sharing on the market overall.

Table 2 summarises the different routes to market. In so doing, the Table provides estimates of some of the important parameters associated with each route to market. These parameters have been discussed with industry experts and participants, but equally it must be understood that the parameters are guideline estimates only in what is a complex and dynamic situation. Indeed, the marketing and remarketing of cars is a constant process of adjustment in a bid to reconcile the relentless flow of the manufacturing system against the intermittent demands of the market.

Potentially there are many routes to market, with varying rates of discount on official list price, varying holding periods, and different return routes. At present AaaS schemes are a residual fraction of the overall market, and probably in total less important than, say, the number of demonstrator vehicles registered per dealer across most markets. The integration of AaaS with other technology developments, in for example electric powertrain or autonomous driving, further reduces the potential of new entrants to disrupt the incumbent industry because it requires mastery of a growing range of competences.

AaaS offered via independent platform business models therefore represent a very small intermediation in the market structures of the automotive industry. Equally, the notion that the sharing economy via platform business models will contribute to sustainability is by no means self-evident (Laukkanen, M. and Tura, N. (2020), as our examples suggest. None of the examples challenge consumption practices around automobility (Lai and Ho, 2020) More research is needed into the negative externalities of platform business models.

7. Conclusion

All the mobility (value-network) platform business models discussed in this paper arise out of dissatisfaction with private car ownership and use but they remain mechanisms by which the automobility system is perpetuated. The fluidity in the business models is potentially important for the ultimate relationship these AaaS providers have with the automotive industry. In particular, we observe a growing closeness to the incumbent industry and market structures that will reduce the disruptiveness of the cases. The provision of AaaS is therefore not necessarily a contribution to MaaS but fits seamlessly into existing automotive industry practice. It is concluded that AaaS delivered by network platform business models is not disruptive to the automotive industry, nor to the primacy of the car in contemporary transport systems. AaaS is important for precisely this reason: It may allow the perpetuation of the automotive industry and of mass automobility, and thereby assist the industry in resisting transformative change. Alternatively, it may be that as a powerful and resourced incumbent industry, the automotive sector is best placed to initiate, integrate and manage multi-faceted system change within which AaaS is but one component element. Such integration constitutes another form of the 'bridging' activities identified by Berggren et al. (2015). There is a renewed interest in the activities of incumbents beyond characterising them as unhelpfully obstructive, to understand how cross-sector transitions might be facilitated (Andersen et al., 2019; Rosenbloom, 2019).

More profoundly, the paper suggests that the attention given to the innovative and the disruptive may obscure the resilience of incumbent organisations and practices as constituted within highly complex and inter-dependent socio-technical systems (Bergek et al., 2013). Further research is needed to elaborate the network business model typology outlined here, and to locate the historical and spatial specificity of AaaS models in order to explain how and why such models are successful in some locations and times, but not in others. The greater research challenge is to situate business model innovation in over-arching, long-run, and system-wide processes of socio-technical change. A first step is to understand the implications for new car sales from the vehicle manufacturers. Initial research by Ward et al. (2019) suggests a modest reduction in registrations (in the US) of 3% in the period 2005 to 2015.

This last area is the most problematic in terms of tracing cause and effect, either for the automotive industry as a whole or for individual vehicle manufacturers. Other incumbents in contemporary automobility may also suffer disruption: car rental companies or taxi companies for example. Alternatively, public transport services or other modes may face substitution effects. AaaS may act simply to expand the market via more precise segmentation of automobility offerings, and in this way the sharing economy results in more mobility, not less. There are therefore many research questions to follow on once AaaS is defined as a phenomenon.

Author Agreement

All of the authors have seen the final version of this paper prior to submission to Technology Forecasting and Social Change. The research has not been submitted elsewhere, and is all our own work.

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