

Business model innovation for car sharing and sustainable urban mobility

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1. Introduction

The decarbonisation of the road transport system is a major challenge, particularly in urban areas. Despite opportunities to ride public transport, bicycles and to walk, privately-owned cars continue to dominate mobility regimes in many cities (Kemp et al., 2011). In suburban and rural areas, our reliance on the automobile is even more pronounced. The use of cars creates CO₂ emissions, air pollution and noise. The need to make cities attractive and liveable is conflated with problems such as congestion and lack of space, which are inherently linked to car usage. Yet the speed and scale of urbanisation makes it difficult for cities to develop efficient and sustainable transport systems (Ferrero et al., 2015). In suburban and rural areas, these types of problems are less salient, but other issues such as accessibility are the main reason why automobiles are the primary modal choice.

The resolution of transport system problems has largely been perceived as a technical (engineering) challenge (Graham and Marvin, 2001), and some argue that the resolution of transport sustainability problems is hampered by a ‘vehicle-based paradigm’ that has prevailed for over century (Jones, 2012). Accordingly, technological innovations (hybrid and electric vehicles, biofuels, hydrogen fuel cells etc.) are typically regarded as appropriate tools to deliver a more efficient and sustainable transport system. Until now, a singular focus on technology has failed to bring about the necessary transformations.

Mobility services such as car and ride sharing² are increasingly seen as a means to shift towards a more sustainable transport system, and are linked to better urban management; improvements in energy efficiency and urban air quality; greater use of renewable fuels; reduced congestion and improved accessibility (Greenblatt and Saxena, 2015; Greenblatt and Shaheen, 2015; Burrows and Bradburn 2014; Lerner et al. 2011; Rydén and Morin, 2005). Although spurred by new mobile technologies and applications, car sharing is primarily a *non-technological innovation* focusing on changes in

² Car sharing refers to short-term rentals of cars in different types of networks, whereas ride sharing refers to the shared use of a car for a given trip. In this paper, we focus on both car and ride sharing as they offer the possibility of making sustainability gains in the road transport system.

travel behaviour as a practice (see Shove and Walker, 2010), new markets and business model innovation (Cohen and Kietzmann, 2014). Business model innovation is critical to the commercialisation of new technologies (Bohnsack et al., 2014; Kley et al., 2011 Chesbrough and Rosenbloom, 2002), and several works have noted that new business models based on car sharing may unlock the economic potential of electric vehicle technology and assist in its adoption (e.g. Abdelkafi et al., 2013; Budde Christensen et al., 2012; Costain et al., 2012; Weiller et al., 2015). Business model innovation has also been linked to vehicles with hydrogen fuel cells and material recirculation, akin to the principles of a circular economy (Wells 2016).

At present, most commercial car sharing conglomerates such as Uber, Zipcar and Car2Go target densely populated urban areas due to the commercial opportunities available. Cities are the places in which workplaces and residential areas are most concentrated and have best accessibility to public transport. The possibility for integrating different transport modes is also largest here. Does this, however, imply that car sharing is not a viable alternative in suburban and rural areas? Or can business model innovation overcome barriers to the adoption of car sharing in less densely populated settings? And what is the link between car sharing business models and the uptake of environmentally-friendly vehicle technologies? In this study, we seek to address these issues by posing the following research question:

How can business model innovation in the field of car sharing contribute to a sustainable reorientation of the Nordic road transport system?

This paper consists of four sections. The next section draws on transition theory and the literature on business model innovation linking the latter to niche-level processes and transition pathways. Section two also provides some stylised facts regarding car sharing and outlines the method of our study. In section three, we present our findings. Section four concludes by outlining the ways in which car sharing can facilitate linkages to technological renewal and a more general sustainable reorientation of the road transport system by tracing three potential transition pathways.

2. Theoretical background

Transition research often utilises a multi-level perspective (MLP) to examine the dynamics of transformative and sustainable innovations (Geels 2002, Geels and Raven 2006, Geels and Shot 2007, Geels and Kemp 2012). The MLP argues that transitions come about through cumulative processes within and between three analytical levels – *niches*, sociotechnical *regimes* and an exogenous sociotechnical *landscape*. Structural changes often start as radical innovations or transition experiments in niches. Niches are the micro-level units where radically novelties emerge following innovative experiments (Geels and Kemp 2012). Niches can exist both within or outside regimes, such as car sharing services that are delivered by start-up companies, or by separate business units within car rental companies and car manufacturers.

In this paper, we reason that the potential for business model innovations in the field of car sharing to bring about a radical and sustainable transition in the transport system depends (at least in part) on a set of key niche-level processes. Smith and Raven (2012) discuss the understanding of niches as protected spaces and divide the concept of protection in a threefold manner – shielding, nurturing and empowerment. *Shielding*

involves processes and measures that remove some of the pressure for radical, path-breaking innovations to enter the market (incubators, exemptions from industrial standards, financial reliefs etc.). *Nurturing* involves processes that support the development of radical innovations. *Empowering* involves processes that make niche innovations competitive either without changing the regime (fit-and-conform) or processes that bring about changes in regimes (stretch-and-transform). These processes are intertwined such that shielding may prepare for more active support in the form of nurturing and in turn facilitate empowering, paving the way for more radical transformations. Similarly, Kemp et al (1998 see also Hogma et al 2002) pinpoint three processes that occur within niches. First, niches support *learning processes* across various dimensions: about the imperfections of a given technology and how they may be overcome, and issues related to organisation, market demand, user behaviour, infrastructure requirements, policy instruments and symbolic meanings. Second, niches support the articulation (and adjustment) of *expectations or visions*, which provide guidance and direction to innovative activities within the niche, and aim to attract attention and funding from external actors. Third, niches support the creation of *social networks* and the enrolment of actors, to expand the social and resource base of niche-level innovations.

In order to bring about sustainable transformations in the transport system, it is important that niches engage with technological *and* non-technological innovations. Moving from the current, unsustainable transport system towards a low-carbon mobility system requires deep structural changes in terms of vehicle technologies *and* ingrained mobility patterns (Geels, 2012). Innovations in the field of mobility services are reliant on business model innovation (BMI). One novel feature of mobility services is that the business model focuses on a new type of value proposition, where users purchase services (e.g. car sharing) rather than products (e.g. cars) (Williams, 2007). Given the importance of BMI for car sharing, in this paper we draw on two strands of the business model literature. The first describes business models as a credible unit of analysis, and the second describes business models as a mediating device that is essential to the commercialisation of new technology (Zott et al., 2011).

One way to apply the concept of a business model as a unit of analysis is to explore the way in which organisations create, capture and deliver value (Chesbrough, 2010; Johnson et al., 2008; Osterwalder and Pigneur, 2010; Teece, 2010; Zott et al., 2011; Zott and Amit, 2010). Here it is useful to treat business models as ‘activity systems’, which are defined as: “the content, structure, and governance of transactions designed so as to create value through the exploitation of business opportunities” (Zott and Amit, 2010). The ‘content’ of the business model refers to the set of activities performed by a firm or organisation; ‘structure’ refers to how these activities are performed; and ‘governance’ refers to who performs each activity. On the topic of governance, Andrew et al. (2007) notes that companies can adopt the role of integrator, orchestrator or licensor. An *integrator* takes full responsibility for the delivery of a value proposition and can be regarded as “the sole owner and executor of the innovation – and the primary, if not the only, participant in the rewards”. In contrast, an *orchestrator* reflects a more collaborative approach by leveraging the skills and capabilities of partners to capture and deliver value. A key skill is thus the ability to manage a network of collaborating partners. The role of orchestrator is similar to that of a broker, who

brings together different actors via a multi-sided business model ‘platform’ (Osterwalder and Pigneur, 2010). Uber is a good example of an orchestrator in that it provides a platform to match suppliers with users in the field of car sharing. Finally, a *licensor* allows other parties to commercialise the intellectual property inherent in a given innovation (Andrew et al., 2007).

Another way to apply the concept of a business model as a unit of analysis is the renowned Osterwalder canvas (Osterwalder and Pigneur, 2010). The canvas has many overlaps with the activity system approach in that also describes the content, structure and governance of business models. The canvas is comprised of nine ‘building blocks’ (see table 1): a value proposition (i.e. a product or service that is offered to customers); a customer interface; supply chain relationships; a financial model (i.e. a cost and revenue structure that distributes benefits across business model stakeholders); partners; distribution channels and other key resources and processes (Bocken et al., 2014; Johnson et al., 2008; Osterwalder, 2004; Zott et al., 2011). Further, the canvas comprises a useful means to create typologies of different business models linked to mobility services such as car sharing (Sarasini et al., 2016a).

Building block	Description	Examples
Customer segments	“the different groups of people or organizations an enterprise aims to reach and serve”	Mass or niche market segments
Value propositions	“the bundle of products and services that create value for a specific customer segment”	Novelty/new technology Increased product/service performance Customisation Sales of function or performance Brand/design Low-price Convenience/usability
Channels	“how a company communicates with and reaches its customer segments to deliver a value proposition”	Third-party retailers Web sales Own/partner stores Wholesalers
Customer relationships	“the types of relationships a company establishes with specific customer segments”	Personal assistance Automated services Communities Co-creation
Revenue streams	“the cash a company generates from each Customer Segment (costs must be subtracted from revenues to create earnings)”	Asset sale Usage/subscription fees Lending/renting/leasing Licensing Brokerage Advertising
Key resources	“the most important assets required to make a business model work”	Physical Intellectual Human Financial

Key activities	“the most important things a company must do to make its business model work”	Production Problem-solving Platform
Key partnerships	“the network of suppliers and partners that make the business model work”	Optimisation Risk reduction Acquisitions
Cost structure	“all costs incurred to operate a business model”	Cost-driven Value-driven Fixed/variable costs Economies of scale/scope

Table 1: The nine ‘building blocks’ within a business model (Osterwalder and Pigneur, 2009).

Business models are typically designed with two objectives in mind: profitability and scalability (Sosna et al. 2010; Teece 2010; Morris et al. 2005, 2006). The latter can be defined as the capacity or potential for a particular business model to expand effectively and efficiently by reaching larger numbers of customers and new markets (Jolly et al., 2012). A scalable business model is thus one that can diffuse at a relatively low cost to the host organisation. One other way to consider the scalability of business models is to examine geographical scope as an element within which a business model can function (Yip, 2004). Geographical scope is an important factor in the field of car sharing as the latter may not be economically viable in less populated geographical settings (e.g. suburbs, rural areas) where a critical mass of users is lacking.

In addition to profitability and scalability, BMI is increasingly recognised as a vital component of societal transitions towards sustainability (Bocken et al., 2014; Bocken and Short, 2016; Boons and Lüdeke-Freund, 2013; Schaltegger et al., 2016, 2012; Stubbs and Cocklin, 2008). For instance, several works have noted that BMI may unlock the economic potential of electric vehicle technology and assist in its adoption (e.g. Budde Christensen et al. 2012; Costain et al. 2012; Weiller et al. 2015). In the literature on business models, technologies and business models are linked, but are treated as distinctly separate concepts (Baden-Fuller and Mangematin 2013). In fact, the business model concept became popular during the internet boom as a means to examine how companies can capitalise on new technologies (Zott et al., 2011).

Some scholars have focused on the business model as a firm-level mediating device that harnesses the economic value inherent in a given technology and delivers it to customers in terms of a product or service (e.g. Chesbrough 2010; Chesbrough and Rosenbloom 2002). The main idea is that new technologies are useless without a functioning business model: “the inherent value of a technology is latent until it is commercialized” (Björkdahl, 2009). The often cited case to highlight this point is that of Xerox Corporation, whereby a new, technologically superior photocopier was developed but could not be commercialised without a radically new business model (Chesbrough and Rosenbloom, 2002). Following these insights, others have noted that BMI can spur the adoption of new technology (Bohnsack et al. 2014; Kley et al. 2011; Trimi and Berbegal-Mirabent 2012; Doganova and Eyquem-Renault 2009; Calia et al. 2007; Chesbrough 2007b, 2007a).

In this paper, we examine the role of car sharing business models in the deployment of new vehicle technologies such as electrified drivetrains and autonomous (self-driving) technology given their potential to bring about sustainability gains. We propose that focusing on the dynamics of BMI in the field of car sharing can provide insights regarding future developments in the transport system. That is, insights can be generated by understanding different types of BMI in this field; the types of experiments that are either planned and underway; the potential to deploy new vehicle technologies within car sharing systems; and the scalability of car sharing business models. To trace future developments we draw upon the literature on transition pathways. Several attempts have been to outline a set of pathway typologies:

1. *Reproduction* refers to situations where change is orchestrated within a regime, in the absence of changes and pressures at the landscape and niche level. In such situations, regime actors maintain the existing regime and their positions within it, and change is incremental, occurring along existing trajectories (Geels and Kemp, 2006). This is similar to *endogenous renewal* as described by Smith et al. (2005).
2. *Transformation* refers to situations where regime actors enact changes following pressures from outsiders at the landscape level, but with little influence from niches. In such situations, regime actors maintain their incumbency, but the regime is transformed due to a new set of institutional arrangements (Geels and Kemp, 2006). This is similar to the *reorientation of trajectories* as described by Smith et al. (2005) and *de-alignment and re-alignment path* as described by Geels and Kemp (2007).
3. *Transitions* occur in situations where strong interactions exist between the regime, landscape and niche levels. That is, regime actors are unable to solve problems and must rely on radical innovations developed within niches. Transitions are characterised by processes of creative destruction as some incumbents are replaced before “a new period of dynamic stability and reproduction sets in” (Geels and Kemp, 2006).
4. *Emergent transformation* occurs following R&D activities within small firms outside regimes that develop pervasive technologies, which influence several sectors and regimes (Geels and Kemp, 2006).
5. *Purposive transitions* are the result of intentional efforts by state or non-state actors to articulate visions, mobilise pressures for change, and apportion resources to effect change (Geels and Kemp, 2006).
6. *Technological substitution* refers to situations where acute landscape pressures (shocks, avalanche or disruptive changes) are coupled with maturity within niches. Acute landscape pressures provide a window of opportunity for niche innovations that may rapidly accumulate to replace the extant regime. This pathway has a ‘technology-push’ character, where incumbent firms compete with new entrants (Geels and Kemp, 2007).
7. *Reconfiguration pathway* refers to situations where radical, ‘symbiotic’ innovations are developed within niches to resolve local problems and appropriated as ‘add-ons’ to existing regimes. Such pathways allow regime actors to remain unperturbed, but creates tensions and conflicts among suppliers (Geels and

Kemp, 2007; see also Geels 2006a).

8. *Sequential pathways* refers to situations where disruptive landscape pressures develop and accumulate over time, leading to a combination of the pathways described above (e.g. transformation, then reconfiguration, then substitution) (Geels and Kemp, 2007).

Regarding transitions related to personal mobility, one can differentiate between two pathways. The first is based on existing and prolonged attempts to bring about sustainable transformations via technological substitution, and may be referred to as “the greening of cars” (Kemp et al., 2012). The argument here is that the current automobility regime is so deeply entrenched that the only option is to resolve sustainability problems via new technologies, leaving current practices and cultural elements intact. By contrast, Kemp et al. (2012; see also Parkhurst et al., 2012) argue that an “intermodal mobility” pathway is currently traceable, and comprises a reorientation of travel practices and behaviour towards an increased focus on combined forms of transport (e.g. bicycles, cars, trains, etc.). At present, it is unclear to which of the pathways described above a new, intermodal regimes corresponds.

In this paper we use the canvas to categorise different types of car sharing business models and to explore innovative, niche-level experiments within these business models. We also examine the scalability of car sharing business models as a means to trace potential pathways towards a sustainable reorientation of the transport system.

Generally, mobility services such as car sharing are currently seen as a significant innovation opportunity. This is partly due to digitalisation, and the application of ICT technology in the transport sector (Burrows and Bradburn, 2014; Motta et al., 2015). It is also due to the development of new business models that capture the value inherent in collaborative consumption; multi- and intermodal travel; and big data analytics. Also, new business models in the field of mobility services can contribute to a more sustainable mobility system (Sarasini et al., 2016a, 2016b; Spickermann et al., 2014). Hence several actors from the private and public sectors, including automakers, are now experimenting with different types of mobility services in an attempt to capitalise on these opportunities and to diversify their business models (Firnborn and Müller, 2012).

Little has been done to examine the types of business models that facilitate car sharing (exceptions include Cohen and Kietzmann, 2014). Car sharing business models can be divided in terms of three general characteristics. Business-to-consumer (B2C) and business-to-business (B2B) car sharing refer to service provision to client organisations and client individuals, respectively. In B2C car sharing a company owns a fleet of cars and facilitates sharing among members. In B2B car sharing, employees are given access to a car sharing organisation’s fleet through their employer. This is also referred to as corporate car sharing or employer-based car sharing (Clark et al., 2016). Peer-to-peer (P2P) car sharing refers to existing car owners who make their vehicles available for others for hire or rental. Car sharing can be further separated into different models such as station-based (roundtrip) and free-floating (point-to-point) car sharing (Martin and Shaheen 2016). In *station-based* car sharing, users collect and return cars to fixed stations. Zipcar is known as the largest provider of station-based car sharing services

worldwide (Le Vine et al., 2014). *Free-floating* car sharing enables users to begin and end a trip at different locations within a specified geographical zone. The largest operator of free-floating car sharing services worldwide is Car2Go (Le Vine et al., 2014).

A fourth, emergent mode of car sharing is linked to the combination or integration of different transport modes (e.g. public transport, taxis, car pools, bicycle pools) in a single, intermodal mobility offering, commonly referred to as Mobility as a Service (MaaS). MaaS is currently emerging in several initiatives across Europe, in some parts of the USA and Australia, and aims to provide a valid alternative to private car ownership by offering users the opportunity to purchase monthly mobility subscriptions via smartphone applications (Sarasini et al., 2016a; Sochor et al., 2015a, 2015b, 2014a, 2014b).

Car sharing can be distinguished from traditional forms of car rental and taxi services in that it typically involves short-term rentals at hourly rates. Car sharing is particularly attractive to people who use vehicles on an occasional basis and provides access to mobility services in place of car ownership. Car sharing also enables an improved utilisation of resources through the redistribution, sharing and reuse of excess capacity. There are various types of organisations that deliver car-sharing services. Some operators are for-profit while others are non-profit. Commercial operators may have car sharing as their core business or be part of a larger organisation, such as car rental companies (AVIS, Hertz, Sixt) or car manufacturers (Volvo, BMW, Daimler).

Car sharing is still a marginal phenomenon in most countries, but several factors are driving the growth of shared mobility (Roland Berger, 2014). *Environmental problems* related to climate change and local pollution are perhaps the most important factors driving change in the transport system (Kingsley & Urry 2009). Emissions from transport, and particularly cars, are responsible for a major share of greenhouse gases in the world and urban areas are particularly exposed to problems with congestion, noise and pollution. *Scarce resources* also point in the direction of more shared mobility and car sharing. Scarce raw materials are increasing the demand for more efficient and low-cost mobility. Further, in urban areas, land scarcity is an increasing problem for expanding the transport infrastructure. For many private households, car sharing may be the only feasible way to gain access to a car. Shared mobility and car sharing may also be a result of the development of a *new consumption culture*, particularly among young urban people, often referred to as millennials. The status attached to car ownership has gradually eroded among these groups, and access to mobility services is more important (David and Dutzik, 2012). Car sharing implies that such groups can gain the benefits of private cars whilst avoiding the costs and responsibilities of ownership. *Digitalisation* has also boosted car sharing. New information communication technologies and the pervasiveness of smartphones are key to connecting providers and users of car sharing. Finally, *demographic trends* and *urbanisation* have promoted the need for efficient, low-carbon mobility solutions. Larger shares of the population live in cities or urban areas where there is a growing number of single-person households and longer life expectancies. All these factors increase the demand for more individual mobility services such as car sharing and there are many reasons to believe that car sharing is primarily an urban phenomenon. An urban focus is especially pertinent given the fact that cities and urban regions struggle with increasing population density and must provide improved accessibility to citizens whilst attempting to reduce

congestion and pollution problems. Urban areas and cities are also places where socio-technical transitions in mobility most likely can take place (Bulkeley et al., 2013). In this paper we challenge the notion that car sharing is limited to urban areas by examining the types of business models that can facilitate car sharing in different geographical contexts (i.e. urban, suburban, rural and intercity travel); and by exploring transition pathways based on the ways in which car sharing organisations are currently experimenting with business model innovations.

2.1. Method

The study is based on a set of semi-structured interviews with 15 car sharing organisations and initiatives in four Nordic countries (Denmark, Finland, Norway and Sweden). A Nordic focus was adopted primarily due to the fact that the study is part of a larger project financed by Nordic Energy Research, which aims to generate insights regarding the governance of a transition to a decarbonised transport system. The Nordic focus also allows for the analysis of car sharing in a region with a somewhat coherent sociopolitical environment, culture and circumstances. Each of the Nordic countries has, for instance, a comprehensive public transport system that may be critical in a future, intermodal mobility system, and the region may be regarded as a pioneer of MaaS. When selecting respondents, we targeted a mix of car sharing organisations and initiatives, ranging between commercial operators and civil society organisations. We also targeted organisations at different stages of development, ranging from start-ups to companies that have existed for over a decade. The aim was to understand the dynamics of BMI at different stages in the development cycle.

3. Business models for sustainable forms of car sharing in the Nordic region

Collectively, car-sharing organisations use terms such as flexibility, convenience, accessibility and affordability as their unique selling points. *Flexibility* refers to the ability for users to select between different vehicles for different types of trip. *Convenience* and *accessibility* are related concepts that refer to the access which car sharing provides, i.e. the opportunity to utilise vehicles for different activities (e.g. commuting, leisure trips, hobbies, grocery shopping) whilst avoiding the headaches associated with vehicle ownership. *Affordability* refers to the opportunity to access vehicles yet avoid the total costs of ownership, as there are outsourced to private organisations or other private individuals. The principal advantage of this arrangement is that users can avoid costs related to parking, maintenance, insurance and so on that are fixed regardless of the extent to which vehicles are utilised.

We identified three primary business models among Nordic car-sharing organisations. We refer to these according to the role taken by each car-sharing organisation – as an integrator, orchestrator or licensor (Andrew et al. 2007). B2B and B2C business models are inherently similar and are operated by companies that act as *integrators*, that is, companies which take full responsibility for the delivery of the value proposition to the end user. In such business models, car-sharing organisations own and operate a fleet of shared vehicles that are offered to users. By contrast, P2P car sharing relies on organisations or individuals that act as *orchestrators*, who establish platforms which allow individuals to share their own assets (vehicles). Orchestrators do not own the vehicles made available to users, and typically facilitate car and ride sharing via multi-sided platforms. Some car sharing organisations also act as *licensors*, providing access to key

resources that in turn allow third parties to establish their own car sharing systems. This is particularly the case in B2B segments, where some companies act as both integrators (where they themselves own vehicle assets) and as licensors. However, the licensing business model is less prominent in the Nordic region, and is limited to a few cases. Hence we focus on integrators and orchestrators, whose business models are summarised in table 2. In what follows, we describe the main elements of these two business model archetypes and examine the dynamics of business model innovation in the field of car sharing.

	Integrator	Orchestrator
Value propositions	Station-based Free floating	Rental from peers' homes
Customer segments	B2C B2B	P2P
Channels	Smartphone apps Website	Smartphone apps Website Social media SMS
Customer relationships	Looser ties based on digital surveys and feedback	Close ties based on continuous interaction
Costs	Vehicle fleet maintenance and operation Parking fees Congestion charges Employees	Employees
Revenues	Monthly subscription payments Hourly fees Kilometre fees	Provisional fees
Key activities	Customer support and marketing	Customer research and co-creation
Geographical areas served	Urban, some suburbs	Intercity travel Urban, suburban and rural
Vehicle technology	Mix of ICE and electric vehicle technologies	Existing vehicle stock

Table 2: Two business model archetypes in the Nordic region.

3.1. Integrators

Integrators are typically private sector car sharing companies that offer car sharing on a station-based or free-floating basis. They are owned by entrepreneurs or by parent companies, some of which are spun-off from the automotive sector and/or the traditional car hire industry. In the Nordics, station-based car sharing is fairly well established having been adopted by a greater number of users than free-floating car sharing, which is a relatively new concept. Following the decision by Car2Go to desist

operations in Stockholm during 2016, there is currently one company that provides free-floating car sharing in the Nordics. Hence one of the major challenges associated with free-floating services is informing potential users of the basic concept of free-floating car sharing in order to convince them to trial and adopt the service. To minimise the costs of running a free-floating service, this operator has devised an innovative pricing model that provides a discount to users that are willing to relocate vehicles. This saves the company money as they would otherwise have to pay staff to redistribute vehicles after use.

With regard to pricing models, some integrators charge monthly subscription fees, offering different packages according to the level of use required by users. One integrator in Finland offers allows up to five users per subscription, in the name of flexibility and affordability. A common feature of the pricing model among most integrators is a fee charged per kilometre and per hour of use. In addition, monthly subscription fees typically range between around €15 to around €100, depending on the company and the type of coverage offered within different packages. Some integrators offer reduced usage fees as part of a more expensive monthly subscription, and some integrators charge no monthly fee, allowing members to register gratis and with no fixed subscription periods. This allows users to purchase services on a pay-as-you-go basis as a means to provide easy and flexible access to individuals that wish to trial their services prior to adoption. Also, in some instances integrators offer electric vehicles at a lower cost than ICE counterparts, but this is mainly due to partnerships with municipalities that are willing to provide some level of funding to promote environmental travel.

With regard to BMI, Integrators typically experiment with improving the value delivered through their offering by developing new pricing packages with differing levels of coverage. They also expand their offers to include a wider selection of vehicles and vehicle types. One integrator, for instance, recently launched a light van pool in central Gothenburg, whereas another is experimenting with electric bicycles. Other experiments include the opportunity to exchange one's own car for an equivalent during longer trips such as holidays. In such 'extended share' arrangements, users can temporarily trade in their own vehicles for utilisation in the sharing fleet in exchange for an equivalent vehicle at their holiday destination. This type of innovation is however hampered by incompatible insurance rules in different countries.

Integrators are also experimenting with new applications of digital technology. One critical area is that of 'digital keys', which is the name given to smartphone applications that allow users to unlock vehicles via Bluetooth technology. In the future, digital keys will likely replace existing key card systems, and will also allow for private owners to plug their vehicles into integrators' business models, facilitating new forms of peer-to-business-to-consumer/business car sharing. This is something of a natural evolution of previous and ongoing developments where several integrators have scaled or are currently scaling their business models by entering into partnerships with municipalities, business parks and residential building owners that wish to provide car sharing for employees and residents.

Respondents noted that digital keys will also be of utility in extended share agreements, (described above), and in new types of open or closed social circles such as families or

groups of friends that wish to share a single vehicle. In such arrangements, integrators would either provide the vehicle and the booking system, or they may act as orchestrators by providing the ICT platform that is required to share privately-owned assets. Further, one integrator is experimenting with an offer that would allow Mercedes Benz owners to access Mercedes Benz taxis via their ICT platform. The same company is experimenting with the P2B2C/B sharing model described above. In other words, integrators are not rigidly attached to their role and see opportunities in becoming orchestrators. Digital technology is a key enabler for this shift.

A further focal point for integrators' experiments is to blur the lines between different customer segments. Whilst some integrators focus more rigidly on B2B or B2C segments, others have experimented or are currently experimenting with new types of offers that allow commuters to access a shared vehicle for private use in the evenings and on weekends. The same vehicle is then stationed at their workplace during working hours, and can be utilised by others for business trips. In connection with this, one integrator offers differentiated pricing for different types of users at different times:

"With our system, we can create one pricelist for 8am to 4pm, and another for 4pm to 8am. So we make special prices for companies during the day... and we can dedicate one car to one company between 8am and 4pm, and no normal customer can actually see the car during this time. But from 4pm we can open up to private users".

These types of business model innovations are designed to promote a greater utilisation of vehicles, and can link workplaces to commuters homes, which in many instances refer to towns, cities and their suburbs. However, one barrier to this type of development (particularly in Finland) is the tax system, which cannot delineate between different types of vehicle usage in the same contract:

"The problem is taxes. If a company buys a product from us, a different company, they don't have to pay taxes for the ... But if a person uses the car, for example in the evening or weekend, then they have to pay the taxes".

Notwithstanding, this type of business model innovation can play a role in reducing transport emissions by encouraging sharing among commuters. One integrator claimed that their business model, despite focusing currently on city centres, can actually assist in reducing emissions via behavioural changes in commuting from suburban areas:

"...if we can get commuters that today drive their cars into the city, to instead leave the car one day per week, it's a huge effect. It's a 20% improvement. Do it once a month, and it's 5% improvement right away. For no effort. We can all find one day where we are better off to leave the car at home. So that's a kind of two-step approach for CO2 emissions to go down. Because it's not a technical solution, but it's actually the business model as a whole..."

Generally, integrators tend to initiate their businesses in urban centres where there is more likely a higher demand for vehicles and thus a high utilisation (i.e. sales). However, integrators typically see urban centres as a starting point and plan to expand to surrounding suburbs, particularly in the B2C segment:

"...with a big smile I can say "this is a solution for everyone". But that's not the way we work. The lowest hanging fruit is private individuals...that is the first step. Mainly within the city, and then

slowly evolve outside of the city, focusing on commuters. And then the next step is the rest of the country, that travels into the capital frequently”

Other integrators have already extended their coverage to suburbs and smaller towns (having existed for longer, and thus having a larger customer base), suggesting that the strategy outlined in the statement above is a viable one. That is, integrators within the B2B and B2C segments generally operate their fleets in major Nordic cities, towns and some suburbs around larger cities. However, none of the integrators that participated in this study stated that they are currently focused on rural areas, and none revealed any plans to expand to these areas. This is due to the fact that integrators face challenges in developing lucrative business models in areas with lower population densities.

Generally, integrators market themselves as offering modern fleets, where users gain access to the latest vehicle models. Vehicles are typically replaced between 18-24 months of use, but in some cases the leasing periods are as short as six months. This high level of throughput is generally translated into an impetus for the introduction of more environment-friendly vehicles, and the majority of our respondents argued that they will increasingly introduce hybrid and electric vehicles into their fleets over the next few years. Some integrators already operate hybrid and electric vehicles, and some offer electric vehicles only. In addition to the unique selling points described previously, these integrators actively market themselves in terms of their sustainability credentials. One integrator that operates electric vehicles, primarily in the B2B segment, stated that:

“...what is really unique to us, I think, is that we always start from the point that we want to provide completely sustainable mobility for an organisation. It should be sustainable in the long run. It should be a factor 10 better than today’s solution...So we want to be true, truly sustainable mobility. And we are totally alone there today.”

This particular organisation focuses on combining its own services with public transport rather than volume sales, asserting that public transport is a more sustainable alternative than car travel, such that the latter should be seen as a first/last mile solution, particularly in the B2B segment.

All of the respondents welcomed a shift to increasingly autonomous vehicles in the future, and noted the potential to reduce emissions via deployment in car sharing initiatives. One respondent argued that car sharing business models can easily accommodate autonomous vehicles, and that the latter will relinquish the need to own a car at all. Another integrator, which is involved in testing autonomous vehicles, noted their potential utility as follows:

“...this could be very interesting, looking from a B2B perspective. Because then I can have an area with a lot of businesses and just tell my cars “go down there around three o’ clock in the afternoon, pick up these people and take them home”. So that could be interesting. I think that could be the way to move, but not directly free floating”.

The opportunity associated with this is that integrators can easily target areas of high demand during different periods. Respondents also noted that autonomous vehicles would reduce the need for parking spaces, which are presently a major headache (and cost) for integrators. That is, the ability to avoid parking costs would directly increase

integrators' profitability. Further, integrators would avoid having to negotiate for new parking spaces every time they introduce a new vehicle in their fleet, which in many cases is retarding the speed at which their services can be scaled. In some cities (e.g. Copenhagen), the demand for parking outstrips supply, which means that spaces reserved for shared vehicles are often taken by frustrated drivers who are willing to pay the resultant fines. One integrator that operates an EV fleet argued that autonomous vehicles will enable decentralised vehicle charging by travelling out of the city for overnight recharging, in a manner that helps to alleviate inner cities of land scarcity pressures.

In sum, the availability (and cost) of parking is a major obstacle to the scaling of integrators' business models. One exception is Helsinki, which has 2000 parking spaces for shared vehicles. However, none of these spaces are electrified. Ironically, the high cost of parking creates incentives to increase the utilisation of free-floating vehicles:

“And then you directly understand the balance or the importance of the cars being driven. If it's driven, I earn money and have no parking cost. If it's standing still, I have no revenue and I have parking costs”.

In other words, assuming that free-floating car sharing results in sustainability gains, the high cost of parking actually creates the right incentives for change. However this type of incentive is limited to the free-floating segment, as station-based car sharing is subject to fixed costs for parking, regardless of the degree to which utilised. The severity of the parking problem was noted by several integrators, who requested that policymakers prioritise solutions to allow their business models to scale in a less costly manner.

Furthermore, integrators also argued that the process of establishing recharging points for EVs be prioritised by policymakers. Similar to parking, integrators must establish charging stations on a case-to-case basis and several integrators have consequently partnered with specialised suppliers that act as mediators between landowners, utility companies and car sharing integrators to provide EV charging services. Notwithstanding, establishing on-street vehicle recharging is a near impossibility in many Nordic towns and cities, such that the possibility of creating charging stations is instead restricted to parking spaces on privately-owned land. According to respondents, too costly due to the different parties involved, and too bureaucratic. One Swedish respondent commented that these difficulties mean that integrators will face significant challenges in fulfilling their obligations towards transport policy goals:

“The major thing we are working on right now is how to electrify of our fleet. We have ambitions to become green, and if we aren't fossil-free by 2030...in terms of vehicles...that would be totally unacceptable...This actually means that we must start being able to locate one or two new spaces for charging stations a week. Every week until we've reached 2030. Last week there were none, and the week before that we didn't find one. This week we won't be able to find one either”.

Given the current limited range of EVs, setting up a more comprehensive charging infrastructure would allow for a higher utilisation of shared electric vehicles.

Regarding other policy-related issues, integrators also took issue with the fact that VAT is charged at a higher rate for car sharing than for taxi trips, and some took issue with the fact that P2P sharing is subject to a different set of tax rules than B2C and B2B car

sharing, in that peers do not pay taxes until a certain income threshold has been reached. Integrators claimed that this results in an unlevel playing field between themselves and orchestrators. Integrators also argued for a relaxation of congestion charges for shared vehicles in those Nordic cities that have implemented them.

When asked what other types of actions policymakers should take to promote car sharing, integrators also argued for the creation of pilots and experiments with new business model innovations. Whilst acknowledging that public funds are available for these purposes, integrators argued that policymakers should be more proactive and create a climate of openness, whereby new ideas and concepts are trialled more swiftly than at present:

“Foster openness to dare to do tests as policymakers, they need to dare to test...Dare to do pilots or tests, where you at the end can change. I would prefer to do real live testing. Do it for free floating, test it for peer to peer. Do it with the bicycle share. Do testing. Try it for six months or a year, and if that doesn't work out, change again”.

The focus on creating an open culture for business model innovation was highlighted by another respondent as follows:

“Everyone wants to be the best, and everyone is trying to attract the same customer. I'm not totally convinced that this is a suitable model for a modern city; everyone developing their own, separate mobility clusters. It would be for the best if you could find...If all players could connect to a single ecosystem according to their own needs...Everyone living in Gothenburg could somehow plug into the same ecosystem, compatible with a lot of individual solutions. If I was a politician, then I'd invite all the different players, try to get the conversation going. And everyone could be open about having business interests of their own. It's nothing to be ashamed of...But is there a possibility...Could we start taking the first steps towards having such an conversation?”

Some integrators further argued that collaboration is a necessity given the strength of existing lobbyists from parts of the traditional transport sector (e.g. the automotive industry), and argued that car sharing organisations do not have the same political clout:

“...the thing is, there are not so many car sharing companies yet. They are usually small businesses. And they don't actually have a voice when people make big decisions...”

Aside from political actions, integrators pointed out that behavioural changes are required in order to scale up car sharing. One of the key issues related to behavioural change, according to integrators, is that people are not aware of their actual transport costs and thus lack the motivation to shift towards a more economical alternative such as car sharing:

“The big challenge is that people don't even want to know how much they pay for their own car. An average Swede works around three months a year to pay their private car, but they don't know it, and they don't want to know it. They clean it, they service it, and they spend a lot of time with it. Car sharing is to me quite obvious, you can pay maybe one third of your private car costs; we clean the car for them, we service it for them, we do everything, change winter tires and everything. So for me it's quite obvious...We have problems to reach out...I think 99% because of habits, and you need to really be an early adopter to change your behaviour. It's totally a psychological problem I think”.

3.2. Orchestrators

Orchestrators vary between for- and non-profit private-sector companies to civil society organisations. The common theme is that orchestrators facilitate car and ride sharing without owning the vehicles that are shared among users. We identified two types of orchestrator that facilitate car sharing. The first facilitates more traditional forms of P2P car sharing by providing a multi-sided platform to connect private vehicle owners to users. The platform, which in practice takes the form of an online booking system, or a less formal social media network, can be used to facilitate both car and ride sharing. The second type of orchestrator is linked to the concept of Mobility as a Service (MaaS). MaaS is at an emergent stage, with several operators conducting experimental pilots and field tests throughout the Nordics. Finland and Sweden are particularly active in the MaaS field, and are among the global pioneers of the concept. Given its novelty, MaaS lacks a robust definition, but commonly refers to the combination of different transport services (public transport, taxis, car rental, car clubs and bicycle pools) in a single offering that is made available to users via a single smartphone application. MaaS aims to provide an alternative to private vehicle ownership and use by offering a ‘seamless’ intermodal service, which can transport passengers from door-to-door in a more effective way than existing public transport systems. MaaS operators act as orchestrators by signing agreements with different transport providers that are willing to act as ‘suppliers’ in a wider ecosystem, and by marketing the service to users.

P2P orchestrators facilitate car sharing by providing the means to connect providers (normally private vehicle owners) with users, typically via digital channels such as smartphone applications and dedicated online booking systems, but also via social media and, in some cases, SMS text-messaging services. The latter is useful for some demographic groups are not familiar with smartphone technology. The main value proposition is similar to that of an integrator – orchestrators aim to provide flexible, convenient and affordable car sharing services provide access to vehicles without necessarily needing to own them:

“We are offering the shared car service. It’s our main focus, simply. It’s the most important thing for us. Indeed, for us the most important thing isn’t the car. We couldn’t do without it, certainly. But our real gift to the consumer is making cars available for them. That’s what it’s really about, on top of the flexibility this allows for”.

One of the main selling points in the P2P segment is the opportunity to either avoid or reduce the costs of vehicle ownership by transforming vehicles into money-generating assets. In addition, orchestrators seek to differentiate themselves from integrators by focusing on the increased level of flexibility that P2P sharing offers:

“...about what kind of additional value you get from our service compared to traditional car rental companies...We are able to offer cars in all price ranges, and it’s left to the consumer to make the decisions about what kind of car he or she is looking for. And a lot of people have evidently considered your car totally sufficient”.

One other difference between orchestrators and integrators is that the level and quality of the service in P2P segments relies heavily on the engagement of vehicle owners and users. For example, whilst integrators can provide immediate accessibility to their fleet via the booking system (depending on availability at any given moment), orchestrators are in some instances hampered by the response times of vehicle owners. One way to

manage this limitation is for orchestrators to allow for user profiles which, among other things, state average response times from vehicle owners. User profiles are an instantiation of another major difference between integrators and P2P orchestrators. The former maintain rather loose ties with their customers by, for example, garnering feedback through electronic surveys. By contrast, orchestrators in the P2P segment have much closer ties with their users via frequent face-to-face meetings, telephone conversations and focus groups. The main reason for this is again that orchestrators are more reliant on private individuals to ensure that their services function, and because trust and social capital among vehicle owners and users is also critical. Without this, owners would be more reluctant to rent out their vehicles and both owners and users would be more reluctant to share rides. Hence several orchestrators request that owners and users publish profiles of themselves, complete with a picture and a personal description in a transparent fashion that allows others to make their own judgements regarding their willingness to share:

“...there are people who are not open about who they are. People who either have a mysterious picture of themselves, write very little, write poorly, or just show very few signs of general IQ and social ability. That would never be good. If there’s something strange in your text or the picture or the information that you send, you will always be declined. Yet if people are open they will always get what they ask for”.

Moreover, orchestrators do not just rely on trust and social capital; they actively promote and support it. This is particularly the case in the P2P ridesharing segment, as people often choose to share rides for reasons other than cost saving, such as the experience of travelling with a like-minded person during an intercity trip:

“...if you’re two single people and you end up in a car and you have a nice experience, it’s a great arena for casual discussion, because the discussion is just part of ... it’s not the activity, it’s just there if you want it. We know that quite a few have romantic relationships through our service, and friends, people getting jobs, all these things. So yeah, there’s a lot of stories there, a lot of interaction...”.

One orchestrator has uniquely focused on the creation of trust and social capital by adopting an entirely different approach to commercial orchestrators, in that it describes itself as an ‘idea’ and a ‘movement’. In this arrangement, the orchestrator facilitates P2P ride sharing among groups of friends via social media outlets, taking no provisional fee for these activities. The main idea behind this movement, which is also environmentally motivated, is that friends can share the costs of trips evenly whilst contributing to a healthy civil society that is based on deep trust among peers.

Similar to integrators, orchestrators are actively experimenting with different elements of their business models. In some instances this includes the introduction of new value propositions that expand on their initial offering (e.g. P2P car sharing orchestrators diversifying into P2P ride sharing and vice versa, or by offering vehicle leasing services as part of an overall sharing package) and in other instances orchestrators focus on scaling their business models by entering into new partnerships with municipalities, businesses, property owners and housing companies that aim to reduce their own transport costs and environmental impacts by better utilising their own (or others’) vehicles. In one case, an orchestrator has partnered with a traditional car rental company to return vehicles deposited in different cities to their home stations, allowing for zero-cost P2P ride sharing. Some orchestrators are also involved in trials of digital

keys. Here the rationale is the same as that of integrators, where digitalisation is seen as a key enabler of improved accessibility and flexibility. However, BMI in the P2P segment is hampered by a lack of clarity regarding taxable incomes. The Finnish transportation code, for instance, requires adjustments to clarify the levels of taxable income from P2P car sharing. At present a €10,000 per year threshold is being discussed, but discussions are complicated by the perceived risk of Uber-like services to the traditional taxi industry.

A further focal point for BMI, which applies also to both integrators and orchestrators, is to establish partnerships with MaaS operators. The latter also function as orchestrators given that MaaS is dependent on an ecosystem of transport service providers. Partnerships are thus fundamental to its success. Several integrators and orchestrators have entered into partnerships with MaaS operators and are thus active in their experimental pilots and field tests, and one Finnish integrator is a partner in Finland's most prominent MaaS scheme. In the Nordic region, MaaS is dependent on public transport as "the backbone of the service", and thus requires collaboration from public transport operators (PTOs). Without a well-functioning and comprehensive public transport system, it would be difficult to develop business models that offer an affordable alternative to private car ownership. However, one key sticking point is that PTOs have historically been reluctant to allow third-party resales of tickets by MaaS operators. Partial resolutions to the problem have been implemented or are underway in both Finland and Sweden.

At present, the business model for MaaS is not complete. The overall value proposition is at a conceptual stage, in that it focuses on the combination of different transport services as described previously. In practice, however, the number of transport service providers will likely increase in the future as MaaS attracts increasing numbers of users, and operators are experimenting with the inclusion of a broader range of taxi operators, car rental services, car sharing organisations and so on. The overall utility of the MaaS concept is outlined as follows:

"It's not something where we want price to be our competitive advantage... It's actually the ease of use...that it's more convenient...and you can get all the tickets. You can get the public transportation, the taxi and the rental car, all in the same app, so you don't have to go to many different sites or different apps. You can get it in the same place, together with routes based on where you are, and it makes the trip as convenient as possible. The freedom to choose and the ease of use is, those are the competitive advantages we have...We don't want to be someone who sells, or a ticket aggregator, that's not our business".

The main reason for providing ease of use is to grant users with the accessibility required to perceive MaaS as a genuine alternative to private car ownership:

"To us, the most important thing is that if we are trying to promise users freedom, and if they are most of all trying to achieve a situation where we could be a good option instead of a private car, then of course it has to be as accessible and as easy to own a private car".

MaaS can be viewed as a further facilitator of car sharing, in that providing access to integrators' business models is key to convincing private car owners to adopt the service. In addition to the field tests and pilots described above, MaaS operators are experimenting with the inclusion of features within smartphone applications that allow

users to compare their existing transportation costs with those of adopting a MaaS service. The feature allows users to enter their car registration number and calculates their transport costs based on the vehicle model and other data (e.g. kilometres driven per month).

Geographically, orchestrators as a whole focus at least initially on urban areas, for similar reasons as integrators. Further, some orchestrators argued that urbanites are more likely to adopt their services:

“Urban people are the ones who are most likely to be into our kind of solution. Like an app-based mobility solution, they are urban phenomena... Yeah, reading the right sort of media. Following the correct influencers. We have a lot of users who are very good at attracting new users, because they tell stories about us in social media, they tell stories on the lunch table in the office, and the stories are generally “I’m doing something green, I’m doing something social”, or “I’m doing this smart, new app-based thing”. All of which are sort of arguably urban characteristics”.

However, several orchestrators in the P2P segment facilitate intercity ride sharing, whereby peers share longer trips for economical, environmental and/or social reasons (i.e. they prefer the company of a peer). Until now, ride sharing has proved to be more suited to longer trips rather than urban travel, although one Danish respondent commented that digitalisation can play a significant role in encouraging ride sharing for shorter trips, in that it can become more “real time”. Others are increasingly focused on commuting via partnerships with municipalities, and are thus active in linking cities and towns to their suburbs. Further, one P2P orchestrator is currently engaged in a pilot in Lapland, which aims to disprove the myth that sharing is an urban phenomenon by experimenting with the concept in rural areas: “If it works in Lapland, it works anywhere”. In Sweden, one P2P orchestrator with around 70,000 members has already been successful in facilitating ride-sharing in several rural areas. MaaS operators have a similar initial focus on urban areas, but focus instead on city regions to include suburban travel and commuting. This is partly due to the regional coverage of PTOs, which easily allows MaaS operators to have a similar focus. It is also partly a result of pressures from municipalities and local PTOs, who wish to improve regional (and not just inner city) accessibility via MaaS. Notwithstanding, in Finland a pilot is currently underway to test MaaS in a ski-resort (*Ylläs*), again giving credence to the notion that rural car sharing may be feasible. In Finland, the focus on new mobility services in less populated areas is in part driven by municipalities, who must find more cost-efficient ways of providing transport given the low utilisation of public transport on certain routes. Car and ride sharing, as part of intermodal schemes, are being tested as lower-cost alternatives.

Both commercial P2P orchestrators and MaaS operators have pricing models that operate on similar principles. In the P2P segment, orchestrators charge a provisional fee for every car and ride sharing transaction. Some P2P orchestrators, particularly those driven by ideological reasons (i.e. the opportunity to facilitate a sustainable civil society movement based on trust and sharing) charge no fee. MaaS operators offer different packages to users, with different levels of coverage at fixed monthly fees (although variable rates apply to pay-as-you-go subscription models). This pricing model, whereby transport costs are assimilated into a single monthly fee, have led one MaaS operator has marketed itself as “the Netflix of transportation”. Similar to

commercial P2P orchestrators, MaaS operators generate revenues by charging provisional fees within each subscription.

Generally, orchestrators have little or no control over the vehicles offered in the fleet, as these assets are owned by private individuals. In some cases this can be problematic from a sustainability perspective, as older vehicles are generally less fuel-efficient than newer counterparts. In Finland, for example, the vehicle fleet has an average age of 13 years and Norway has a similarly aged fleet. Orchestrators' lack of discretion in renewing the vehicles in their fleets means that they cannot influence the deployment of new vehicle technologies such as EVs and autonomous vehicles in the same way that integrators can. Rather, orchestrators argue that technological renewal is the responsibility of private vehicle owners, which respond to market prices and the incentives created via public policy:

“In my mind, that’s the consumer responsibility, and that’s wherever the tastes of the consumers go. Both the people who ultimately buy or lease a car that they choose to rent out, but also which cars are favourable to rent on our platform. Norway is a really good example, because there you have clear incentives for acquiring an electrical vehicle, and definitely for driving around in one. So if you’re renting a car in Oslo, because you want to go to IKEA, and you want to go to the ski jump, and you want to take a trip to the beach, you want to be in an electrical vehicle, because you don’t have to pay any toll fees, and you can just park...everywhere. We have very little that we could do to shape those drivers...we cannot be a driver of those decisions. So we, as well as the private consumer, are shaped by the political environment and incentives. We take a very limited role in that sense. We have to play by the local market conditions; we are dependent on there being clear political direction in terms of climate cars or sharing cars, and making that, in itself, lucrative for people. Because they ultimately are the...we were just a provider of the meeting place”

As regards to political actions that can help orchestrators scale their business models, some orchestrators argued in a similar fashion to integrators that rules regarding taxation and VAT must be clarified and equalised between different types of car sharing services. However, it was mainly MaaS operators, not P2P orchestrators, that argued for this due to the fact that they play an orchestrating role in bringing different transport service providers together in order to deliver their service. Hence their job is made easier if suppliers play by the same rules regarding VAT. In terms of taxation, MaaS operators argued that there is a need to introduce new taxation laws regarding work bonuses for business users. At present, there are taxation laws for company cars, but, given its novelty, there is no legislation for MaaS. Work is underway in Finland to rectify this problem.

Further, and similar to integrators, P2P orchestrators (particularly those involved in ride sharing) argued that governments should implement exemptions from congestion charges and parking fees given the sustainable aspects of using their services. One orchestrator argued that policymakers should focus on the creation of ride-share lanes alongside park and ride schemes that link commuting to P2P sharing. This would allow cars that are parked during working hours become available to others for short-term rentals. Another orchestrator argued that car sharing should be recognised for its potential to reduce CO₂ emissions, and thus be treated in a similar fashion to other mitigative measures in climate policies. Finally, orchestrators argued that governments

and municipalities should assist in raising awareness for car sharing via information campaigns.

4. Discussion and implications for governance

Our findings suggest that different types of car sharing business models have different types of utilities in reducing CO₂ emissions from transport. Integrators, which primarily serve the B2C and B2B segments, operate business models that appear to be viable in urban centres and surrounding suburbs, where population densities allow for profitability. The main reason for this is that integrators own the vehicles in their fleets (as shown by the vertical axis in figure 1), and thus require a higher utilisation of individual vehicles. In contrast, orchestrators charge provisional fees to rentals of privately-owned assets and are thus less concerned with the level of vehicle utilisation. Rather, profitability depends on a large customer base where private vehicle owners match the needs of users. These differences have implications for the technological renewal of the vehicle fleet. Integrators typically strive for a modern fleet based on rapid renewal, whereas orchestrators have no discretion over the types of vehicles that are shared between peers. However, orchestrators are better placed to access areas with lower population densities, and several organisations have succeeded in (or are currently experimenting with) facilitating rural and intercity travel. The implications are that the geographical scaling of shared car travel relies on both integrators' *and* orchestrators' success in convincing users in the B2C, B2B and P2P segments to adopt replace private vehicle ownership with shared mobility. These applications of car sharing business models are summarised in figure 1.

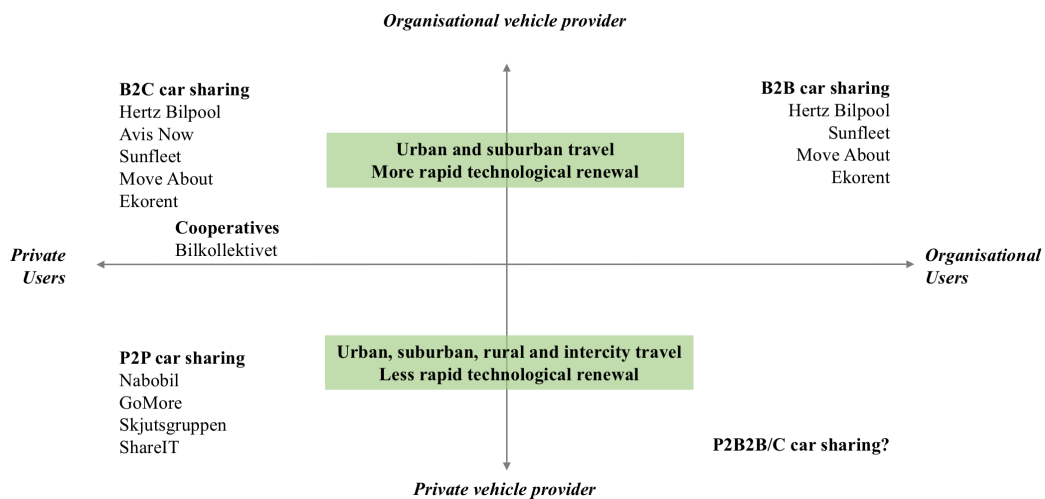


Figure 1: Applications of integrators' vs. orchestrators' car sharing business models.

Our study shows that both integrators and orchestrators are actively experimenting with different elements of their business models as a means to attract larger numbers of users. In practice this means focusing on incremental BMIs that serve to improve the flexibility, convenience, accessibility and affordability of car sharing such that business models scale (i.e. diffuse to new geographical areas following adoption by increasing numbers of users). One key focal point for BMI is the further deployment of digital technologies (digital keys) to enable better accessibility in each of the B2C, B2B and P2P segments. Digital keys may potentially give rise to new forms of car

sharing whereby peers pool their own vehicles within integrators' fleets for use by business and private users (referring to the lower right quadrant in figure 1). The advent of digital keys means that some integrators will likely adopt the orchestrator role. Moreover, car sharing organisations, especially integrators, show a definitive interest in electrifying their fleets, and both integrators and orchestrators argue that they are well placed to appropriate the benefits of autonomous vehicles. Tests and pilots are currently underway in both of these technological fields, and several organisations have already made headway in the deployment of EVs.

Given the range of innovative experiments in this field, one may argue that of the three processes that occur within niches, car sharing organisations are successful in terms of experimentation and learning. Learning in this case refers to the ability of car sharing organisations to develop new ways to match user needs and expectations via new value propositions, but it also refers to the propensity among users to modify their transport behaviour and travel patterns. Car sharing is not the same as car ownership, especially since the dominant station-based model implies that users must travel to gain access to cars. Whilst car sharing is a growing phenomenon, it remains to be seen whether the necessary changes in attitudes and behaviour will occur. To this end, pilots and tests of new concepts are useful, and it is essential that they are designed on a low-cost and low-risk basis (Sochor et al., 2016). Car sharing organisations can assist in creating such conditions by, for instance, waiving subscription fees, but it remains to be seen whether this is sufficient to persuade car owners given the sunk costs of vehicle ownership.

Our findings demonstrate that the other niche-level processes (the articulation and adjustment of expectations or visions; and the creation of social networks and the enrolment of actors) are not as strongly supported in the field of car sharing. The main reason for this appears to be a persistent fragmentation that has been observed in other parts of the transport system (Banister, 2008; Jones, 2012; Miciukiewicz and Vigar, 2012; Schwanen et al., 2011). That is, both integrators and orchestrators compete more than they collaborate, and there is a lack of a clear and robust vision for car sharing in the Nordics, despite its linkages to technological renewal in particular and transport system sustainability more generally. In short, car sharing organisations appear to have not yet successfully created the social networks that are necessary to bring about radical change. One exception is MaaS, which is a radically new concept that necessitates that creation of new networks and partnerships with public and private sector actors, both nationally and internationally (Sarasini et al., 2016b). Our study also demonstrates that both integrators and orchestrators are increasingly interested in the MaaS concept, and several car sharing organisations have already entered into MaaS partnerships – especially in Finland.

Based on these observations, it is possible to trace three potential pathways regarding the future of the road transport system (figure 2). The first is the traditional, tried, tested (and failed?) technological substitution pathway, where a focus on the greening of cars obscures the need to modify transport practices and behaviour (Kemp et al., 2012). The second (shared mobility) is an extension of the current trend towards car and ride sharing, with the caveat that initiatives and schemes remain fragmented, such that integrators continue to compete rather than collaborate, failing to create the right conditions to transform the existing regime. The third pathway, entitled 'integrated

mobility’, is traceable from the current focus on intermodal mobility services (Parkhurst et al., 2012), assuming that the current attention given to MaaS is not part of a hype-disappointment cycle (Verbong et al., 2008).

It is important to note that these pathways are not separate, in that the servitisation of transport in the shared and integrated mobility pathways can create incentives for more rapid technological renewal of vehicle fleets. In addition, product-servitisation creates incentives for material recirculation, akin to the principles of the circular economy (Tukker, 2015), and intermodal mobility services have been shown to encourage shifts among users towards more sustainable transport modes such as cycling and walking (Sochor et al., 2016; Strömberg et al., 2016). Further, the integration of telecommunications, energy services and transport via intermodal mobility services in the mid to long term is seen by some as a significant innovation opportunity (Sarasini et al., 2016a, 2016b; Spickermann et al., 2014).

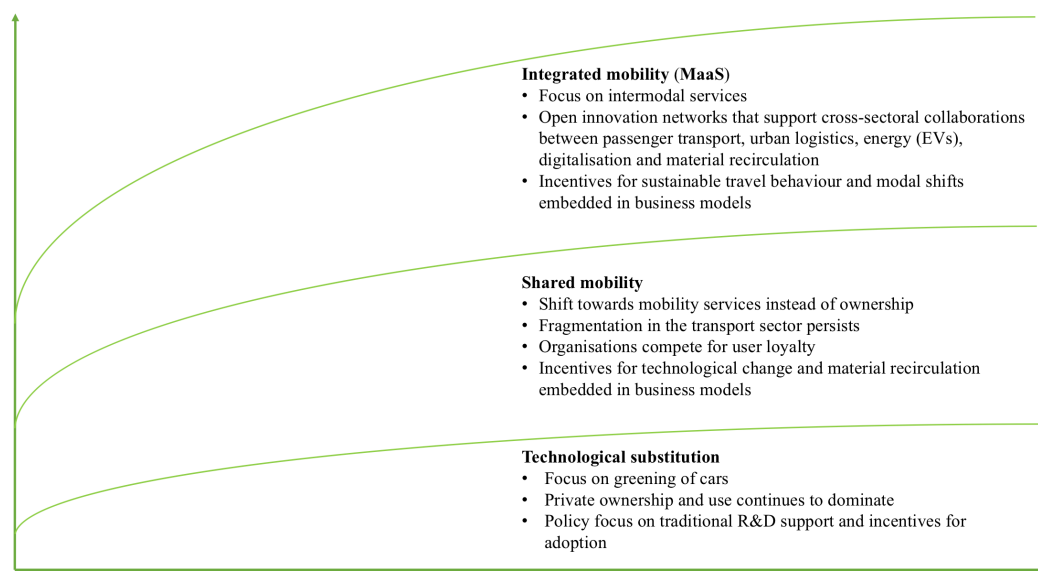


Figure 2: Three pathways towards a sustainable Nordic road transport system.

The governance of such a transition is not easy to understand. Our study shows that at present, several actors from within and outside the transport regime are experimenting with different models of sharing in response to a multitude of landscape-level drivers and pressures (digitalisation, urbanisation, the persistence of sustainability problems, accessibility, etc.). Based on this, it is not entirely clear how the shared and integrated mobility pathways outlined above should be categorised. On the one hand, they may be seen as *purposive transitions* in that both state and non-state actors are actively supporting niche and regime-level activities that may bring about a transformation (Geels and Kemp, 2006). However, the integrated pathway may be better described using the idiom *reconfiguration*, since a transition to intermodal mobility systems focuses on the (re)alignment of regime actors’ business models and positions in the value chain, where a new entrant serves to orchestrate the MaaS system (Geels and Kemp, 2007; see also Geels 2006a). Regardless, we propose that in addition to resolving the obstacles to business model innovation outlined in section three, practitioners and policymakers should focus on articulating visions and expectations

that serve to maximise the potentials outlined above. In the Nordic region, such discussions are already underway, but have not yet yielded a truly overarching vision of a sustainable transition in road transport. It is with these potentials in mind that we present the three pathways, which are intended as a contribution to ongoing discussions.

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