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A critical reflection on challenges for urban transport and mobility governance

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CHAPTER 3

THE CASE OF MOBILITY AS A SERVICE: A CRITICAL REFLECTION ON CHALLENGES FOR URBAN TRANSPORT AND MOBILITY GOVERNANCE

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ABSTRACT

This chapter provides a reflective critique of Mobility as a Service (MaaS), an emerging development seeking a role within the Smart Mobility paradigm. We assess a range of its future implications for urban policymakers in terms of governance and sustainability (i.e., social and environmental impacts). We begin by describing the origins of the MaaS concept, along with the features of precursor technologies and current early examples. We then reflect on the marketing of MaaS and use it to consider how we might anticipate some potentially less desirable aspects

of the promoted business models. Finally, we discuss the implications for governance.

Keywords: Smart mobility; governance; sustainability; mobility as a service

INTRODUCTION

Urban governance is experiencing significant challenges, not least an accelerating shift from public to private provision, sometimes associated with austerity policies. At the same time, a scalar shift for transport governance is seen in the trend for devolution of responsibility to institutions at local and regional levels. We are also witnessing significant shifts in social practices and expectations, facilitated by advanced mobile information and communications technologies (ICT), an increased dependence on online service provision and a rise in demand for and supply of 'flexibility' in the provision of various types of service. Simultaneously, there is an ongoing and urgent need for the transport sector to address local and global problems that it plays a significant role in creating: urban congestion, noise, air pollution, public health, transport safety, unequal access to services and climate change emissions (Stead, 2016).

In this chapter we illustrate our account of this urban and mobility governance challenge by analysing one 'spearhead effort' that is generally referred to as Mobility as a Service (MaaS), a recent concept in the 'Smart Mobility' arena. MaaS represents a hybrid innovation, as a platform technology combined with a business model for delivering integrated access to transport services. This is sometimes termed a 'multi-sided platform'. As a tool for integration, it can, in principle, incorporate all currently available transport modes as well as emerging technologies such as self-driving vehicles, and as such can make it a tempting development for public authorities. Moreover, the MaaS concept could expand to include urban logistics and other services (e.g., gym, cinema or restaurant bookings), integrating these with the transport service needed to access them. However, underpinning the apps and the packages offered to users, there are business models. The choice of business model and the detailed design of the value offer is not trivial, raising important questions about inclusiveness and

sustainability, potentially threatening the common good. Given these questions, we highlight the risks to achieving a more sustainable transport system through the commodification of access to mobility by commercial intermediaries who provide ICT-based aggregation services to both end users and transport service providers. Furthermore, we unpack these issues to address the question of what MaaS might mean for the governance of mobility and urban development. Due to limited space we are unable to broaden the analysis to other critical issues such as the risk of mobility enclosure and its impact on the human right for freedom of movement, or the details of market regulation (for example in relation to acting as a 'reseller' for transport tickets) and consumer protection (in relation to both data and transport service levels), but we acknowledge that these issues are also of significant interest.

CONSTRUCTION OF MOBILITY AS A SERVICE

As a recent mobility concept, the definition of what is, or is not, MaaS is not fully solidified (see Chapter 4 for a review of why definitions matter). Jittrapirom et al. (2017) review 12 conceptualizations, classifying a set of core MaaS characteristics. These characteristics include the integration of transport modes, tariff options, a single platform, multiple actors, use of technologies, registration requirement and a user-centred orientation with personalization and customization. Overall, MaaS tends to consist of a platform that integrates access to information about and payment for multiple combinations of transport services.

With these characteristics in mind, we briefly describe the emergence and early development of MaaS concepts drawing from early experiences in Finland, the Netherlands and the United Kingdom, three countries where a more fully realized version of the concept is seeking to challenge the current landscape of urban transport provision. The MaaS discourse is driven by business and technology priorities. Hoadley (2017) describes how lobbying from the digital and intelligent transport systems industries, supported by innovators in the personal transport sector (e.g., car-sharing), is influencing policy thinking at higher scales. However, as the involvement of the public transport sector in MaaS has been limited, wider evidence at city/regional levels is missing.

The central assumption of MaaS as promoted by MaaS Global (often credited with inventing the concept) is that transport services can be converted into service packages, as with the telecommunications sector. Registered users can select a package that bundles access to several transport modes, ranging from conventional public transport to taxis (shared or solo) and vehicle-sharing such as cars, scooters and bicycles (electric or otherwise). The monthly number of trips by each mode is determined by packages purchased on the basis of the user's expectation regarding the number of trips s/he needs. The expected result is provision of door-to-door mobility services, with the promise of greater 'efficiency' and the opportunity to break car-dependency. The benefits of bundling various transport services together through one digital interface are presented as good for both the customer and the operator. Wherever elements of MaaS are being rolled out under the Smart Mobility banner, we are offered variants of the same dream: 'seamless and effortless' (MaasAllianceEU), 'Smarter, Faster, Greener', 'on-demand tailor-made transport' and 'instant Access' (MaaS Scotland).

The vision, as is overwhelmingly clear in the promotional rhetoric, dominantly focuses on envisioning 'positive' effects. From the perspective of a multi-level model of innovation, this rhetoric is an inevitable process of niche actors challenging the incumbent actors of the regime they are targeting (Shove & Walker, 2007). This is resulting in promotional alliances, such as the European MaaS Alliance (http://maas-alliance.eu) and Scotland's MaaS Scotland (https://maas-scotland.com/), bringing together public and private actors who have been engaged in concept formation with a number of prototypes, building and converging towards the first emergence of the term itself in Finland (Heikkilä, 2014). The prototypes exist on a continuum starting from what might be termed 'pre' or 'partial MaaS' such as Smartcard-based integrated ticketing systems to full-integrated apps. In addition, the European Union has funded several pilot projects that focus on different services or technologies that collectively have informed the development of the higher level of integration conceptualized for MaaS. For example, as part of Superhub, a MaaS-type approach was used to try and incentivize people to use sustainable transport.[1]

Developments from the sharing economy have informed the development of MaaS. Many peer-to-peer products to share vehicles, traffic information or offer rides have been developed, such as Flinc, Waze, Car2Go,

BlaBlaCar, ReachNow, Zipcar, CoWheels and Faxi, many of which can in principle be accessed through a MaaS platform (Flinc was part of the Berlin field test of MyWay). However, MaaS is not a necessary development for most of the new transport technologies, such as electric or self-driving vehicles. Ultimately, in order to appeal to users AND to deliver on the objectives of local authorities, the full MaaS vision needs a unique selling point. This is the implicit promise of making more efficient use of diverse transport services by simplifying access to them in more flexible combinations, while emphasizing the sharing of mobility resources, thus speaking both to the policy objectives of mobility governance and of a better and cheaper mobility offer for users. This is a key claim of the field leader, MaaS Global, for its product, Whim.

The imminent introduction of Whim in different national contexts (Finland, the United Kingdom, the Netherlands and Singapore) suggests that concept transfer of 'full MaaS' is already occurring through concerted effort on the part of MaaS Global. These efforts can engage with actors at city, regional, national and supra-national scales, to offer more 'efficient' door-to-door mobility and promote 'sustainable urban transport'. However, there are various unresolved societal issues in deploying commercial MaaS in real life, some of which are discussed below.

Complexities and Contradictions in MaaS for Real

Transport professionals are well aware of the history of unanticipated consequences around many twentieth-century mobility innovations such as biofuels (Morton et al., 2017). Therefore, in this section we now consider two interdependent issues with MaaS that are under-examined. Based on existing deployments of MaaS, we consider that these could be predicted as having undesirable consequences. First is the choice of the business model, its formulation and possible impact on aspects of mobility resilience. Second is the promise of freedom, a central component of the MaaS rhetoric.

Business Models and Resilience

The Multi-Sided Platform nature of MaaS is critical to its value proposition: the benefits to users on different sides accrue as users *on every side* increase in number, increasing the opportunities for interactions and

subsequent revenue generation (Jittrapirom et al., 2017). Gaining a critical mass of MaaS users to both demand and supply services is crucial to success, as highlighted by Finger, Bert and Kupfer (2015) and Sochor, Strömberg and Karlsson (2015). The business objectives are also an essential element in whether a MaaS has potential to achieve social or environmental benefits (e.g., through stimulating beneficial behaviour change). Some of the business models of early Smart Mobility entrants are aggressive (e.g., Uber), and many disrupt existing provision (e.g., Uber disrupts the traditional taxi and private hire markets, and Obike (and other) dockless bikes have challenged both city authorities' control of their jurisdiction and existing dock-based bike-share systems). It is not clear that all the providers are looking to be part of an aggregation model, in much the same way that, where competition is allowed for bus routes, the outcome is not integration.

Operators of shared services are increasingly being relied upon as a substitute for public transport in some jurisdictions (notably the United States). For example, in Florida, some administrations subsidize residents' Uber trips instead of extending bus routes. In Altamonte Springs public transport has been drastically reduced, and all Uber trips are subsidized by at least 20%. In turn, this could affect mobility resilience, given that Uber has released audited accounts that show that it is making large losses despite high turnover (*Financial Times*, 2017). Given the use of aggressive customer subsidies to build the business, there are two important concerns. One must be the risk of business failure which would leave car-less residents without mobility due to the reduction in support for socially necessary services. This is a risk even if a ride-hailing service is integrated into a MaaS. If the aggregator has no alternative provider for the journeys that the ride-hailing service supplied, then those customers who were reliant on it have no mobility. Whether this is the case may depend on whether or not certain operators demand (or are offered) exclusivity within the MaaS product. The second concern is what happens when most Uber users must pay the full, rather than subsidized, cost of their journeys and there is no longer a public transport alternative (Lee, 2016) as ride-sharing has been shown to reduce use of public transport (Clewlow & Mishra, 2017).

Another question is MaaS's reliance on registration and digitalization, which create additional barriers for those who are already experiencing exclusion, adding a loss of mobility to problems caused by, for example,

the digital gap or through lack of access to banking. This is an important question, transport operators increasingly offer 'discounts' to smartcard and app users, leaving those using traditional payment methods using cash at the point of use, paying more for the service. AU:2

Finally, there has been little discussion on the vulnerability in relation to MaaS's dependence on ICT. There is the potential for an entire city to come to a standstill, should the MaaS system be compromised, for example through power failure, ICT failure or a Deliberate Denial of Service cyberattack. The transport sector is a critical infrastructure, having been the focus (or means) of criminal and terrorist attacks (Theoharidou, Kandias & Gritzalis, 2012). While the dangers of a compromised MaaS system may not be as serious as say a cyberattack on a fleet of self-driving vehicles, its disruption potential on urban mobility is still substantial, suggesting that if access to transport is mediated via MaaS platforms, these clearly need to be included in Critical Infrastructure Protection strategies.

The False Promise of Freedom

Selling of the notion of 'freedom' in the context of a finite transport network and environmental limits raises the need to have a debate about individual and collective rights/responsibilities. MaaS Global advertises itself as 'mobility on a whim', promoting an ideal of individual unfettered freedom. This promise is at odds with the challenge of satisfying simultaneous demand in a finite transport network. By drawing parallels for MaaS packages with those used in telecoms or media streaming, the impression is given that any desired trip can be made at any time (any origin to any destination). However, telecommunications and transport networks have different network capacity properties. ICT network capacity is more easily scaled-up as network demand is managed through data package routing protocols, as data ascribes no emotional or economic value to its path from origin to destination. Telecommunications network congestion can be managed in ways that are impossible in a transport network. Data can be prioritized, held in a buffer, or rerouted through different nodes, not necessarily the shortest path. This is not the case for humans moving through urban transport systems, who will know if they are deliberatively delayed or diverted, and will complain, or even rebel. Thus, it is hard to see how MaaS can deliver its promise of freedom through its packages of

different levels of pre-purchased or 'Pay-As-You-Go', if the network is at capacity at the point at which a customer requests service.

The promise of freedom also fails to acknowledge that current problems of traffic congestion, urban air pollution and greenhouse gas emissions arise from the aggregate impact of our individual activities. In the drive to develop a customer base, MaaS could feed unsustainable individual practices rather than restraining and redirecting people to more sustainable transport modes. Hoadley (2017) highlights this risk, citing the 'poor visibility given to public transport in current MaaS discussions and developments' (p. 7). The same is potentially true for non-motorized transport modes (walking and cycling) which may be sidelined as mobility options because they do not generate substantial income for MaaS (see also Chapter 2 for further discussion on unaligned commercial behaviours).

Furthermore, the potential for a rebound effect, where energy (time or travel) savings in one area are 'cashed-in' by increasing use in another area, is largely ignored (see also Herring & Sorrell, 2008). This is glossed over in promotional scenarios:

> *After a month of using MaaS, Melinda's family life has completely changed. They have sold Melinda's car and offer the other car for short term rental using the MaaS operator's website (community car club). In exchange Melinda's family gets credit in their MaaS account, which they use to buy mobility services. (TSC, 2016)*

In this example, Melinda's family have become totally dependent on the MaaS service for all their mobility, and have been able to make time and cost 'savings'. However, the money they accrue by renting out their remaining vehicle is limited to use for other mobility services. Thus, MaaS is able to frame their mobility practices, by making the offer of credit that can only be spent within the MaaS system. Should a package allow six taxi trips per month, for example, the theory of loss aversion (human cognition is more attuned to avoiding a loss than achieving a gain) (Tversky & Kahneman, 1991) would suggest that users will experience regret if they do not 'use up' their trip allowance, potentially resulting in induced trips adding further pressure to the system. This means that the design of packages and pricing is crucial – users should be allowed to 'roll-over' unused credits to prevent the risk of induced travel. There is some parallel to the mobile

telecommunications market, where Gerpott and Thomas (2014) have shown tariff-type impacts on consumers' data usage intensity. Industry research also suggests that mobile customers buy more expensive packages than they need to avoid the risk of paying high charges for going over their data allowances. Since early 2016 in the UK 'Data Rollover' packages have started to be introduced as a result (uSwitch, 2017).

IMPLICATIONS FOR GOVERNANCE

In this section, we consider the governance implications of the issues highlighted in the preceding sections and raise some key questions, in order to highlight where stakeholders might be advised to take particular care before making MaaS a central pillar around which urban transport is organized. In several respects, MaaS repackages existing Intelligent Transport System ideas of integration, and sounds intuitive, understandable and attractive, in part because achieving 'seamlessness' between modes has been a goal of transport authorities for many years. As MaaS is promoted in this way, it is hard for stakeholders not to embrace it. This positive framing is a clear attempt to win a significant place in the market by MaaS providers, who are primarily private companies. However, the enthusiasm with which organizations are embracing the concept masks some significant uncertainties around governance in relation to control and setting strategic goals. Whilst MaaS has developed with little direct public steering, in Finland, the Ministry of Transport has been quite engaged in providing support to help MaaS into the marketplace, with various incentives and a hope for 'another Nokia' (i.e., supporting innovation with money but little regulation, in keeping with a free-market ideology). However, it is starting to be recognized that this will need to change, as the steering efforts so far have not taken into account the full extent of complexity and unanticipated consequences from MaaS. Clearly, there are different roles that public authorities can take (e.g., enablement, leadership, laissez-faire). Four key choices are set out below.

First, decision-makers need to be able to assess and compare transport systems/infrastructure investments/policies, but this poses a number of challenges. The greatest issue is the inevitable uncertainty about the direction of technological development and its impacts. One way of addressing

this uncertainty is to create a controlled but open structure for research and testing.

Second, there needs to be a process for negotiating and ascribing liabilities across a complex web of stakeholders, addressing consumer protection, developing market rules and defining the role of the public sector. For example, there is a need to set minimum service standards to protect socially necessary services, or ensuring that the cheapest public transport fares are available to MaaS users, however small their service use.

Third, it is important to highlight that the MaaS concept includes a need for a set of organizations, legislation and other aspects that collectively serve to lock a technology into society. MaaS is a technological assemblage and not solely an App, the value concept of service packages or the revenue streams that define the business model. MaaS's uniqueness is the potential to involve so many different individual technologies, both ICT and transport, and the ability to position the concept as an optimizer. For it to work, it requires the MaaS operators to occupy a very powerful place in the network both in a co-ordinating space and a price-setting space. This is something that has proved almost impossible for city-led transport systems in the past. It is difficult to imagine such a powerful position in the governance network being easily obtained, but if it is, then it would certainly need regulating.

Finally, there are risks of inaction by the state because doing nothing is not the same as no change, as this is already occurring. As models like Uber or Lyft have made taking a taxi exceptionally convenient, there is evidence that this reduces public transport use: a taxi can provide door-to-door service, and where more than one ride-hailing service is present, price competition results in pulling custom away from transit services (Clewlow & Mishra, 2017; Sadowsky & Nelson, 2017). MaaS also introduces a commercial intermediary between citizens and public transport providers, diluting brand image (Hoadley, 2017), suggesting a reason why it has taken longer for MaaS platforms to engage with long-established public transport operators. For example, in the West Midlands, Whim has successfully negotiated Gett taxis, National Express buses and Midland Metro trams, the regional city bike and rental car providers, but has not yet persuaded other large public transport providers such as FirstBus or Arriva. Thus, relying on MaaS to relieve cities from car dependency and related congestion is an outcome that could be further undermined if the door-to-door

convenience of ride-hailing (and eventually self-driving vehicles) becomes a reality without strong steering by the state and forward-thinking strategies in place to address these conflicting forces.

There is a need for strategic thinking about urban technology, as the integration of the built environment, hard infrastructures and digital services. However, no cities have yet incorporated MaaS into transport, environment and energy policies (Li, 2017), even though quite large elements of MaaS are operating in several places, as described above. This is a strategic omission that reduces the opportunity for MaaS to be designed to contribute to sustainable urban mobility. According to Li (2017), this is because everyone believes in the idea that MaaS will *automatically* contribute to sustainable urban mobility through 'efficiency'. However, citizens and governance actors need to be able to decide which modes should be prioritized according to the social and environmental needs of their jurisdiction, and specify MaaS packages accordingly. However, it is striking that both Li (2017) and Hoadley (2017) note the lack of engagement from city and regional authorities at this stage. For example, the UK Transport Systems Catapult did not identify a role for transport authorities in the MaaS ecosystem beyond being a 'customer' for data (TSC, 2016). This dominance of producer-led visions is also a feature of autonomous vehicle innovations as discussed in Chapter 5.

The current focus on outsourcing innovation to the private sector combined with the competitive national rhetoric predicated on economic growth through mobility innovations suggests that government may be tempted to cede control of outcomes to market forces. This path carries profound implications for decision-making in transport and urban governance, as there is a critical governance gap in relation to managing the Smart Mobility transition if regulation is removed in a bid to placate private sector demands. MaaS innovators are primarily private sector firms who are attempting to steer the development of the mobility system in ways that serve their vested interests (Vergregt & Brown, 2007), and regulatory capture through manipulating transport governance mechanisms does have a precedent (Morton et al., 2017). The further commodification of urban mobility, whilst offering opportunities to some consumers, is not synonymous with being able to steer mobility systems to more desirable outcomes. However, there are models where the public sector remains at the heart of the system if not the technologies.

In summary, some governance levers could be lost through ideological pressure to create revenue streams out of previously public goods, endangering the achievement of social and environmental goals that are intertwined with mobility provision. Whilst recognizing the positive potential of MaaS, it should not be presumed to deliver a uniquely positive set of outcomes for all. Strategic management is needed to set objectives, monitor mode share changes and to understand social, distributional and environmental impacts, as well as to provide an environment where innovation (by both the public and private sectors) can flourish. Risks also need to be addressed, in order to understand whether the transport efficiency gains that might be realized through the wholesale adoption of MaaS are jeopardized by a resilience gap.

CONCLUSIONS

In this chapter, we have highlighted that MaaS represents a conceptual approach to delivering service to users that is not a fixed product. Conceptual elements exist through individualized services, but MaaS is increasingly promoted as an integrated product capable of shaping how transport is organized and managed in cities. We have illustrated this point through a short description of the construction of the MaaS concept and given an account of its emergence in early sites of innovation for integrated MaaS platforms.

We have highlighted the risks posed by the business models to meeting key policy aims such as congestion reduction and climate change mitigation, as well as touching on the social inclusion aspects. We have also highlighted the potential threat to transport and social resilience through over reliance on single operators of innovative services, and the potential effects of innovative services on existing services. The result could be a deepening of exclusion by over digitalizing and enclosing access to transport services and through cyberattack vulnerability.

The dominant rhetoric surrounding MaaS is technologically deterministic and highly optimistic. However, we contend that advertising MaaS as 'mobility on a whim' promotes a false promise of individual unfettered freedom that fails to acknowledge that current problems of traffic congestion, air and noise pollution, and greenhouse gas emissions are large-scale

problems arising from the aggregate impact of our individual activities, with a wide distribution of mobility habits.

Whilst MaaS could be designed to influence behaviours to be more sustainable, the commodification of mobility through the service package approach requires customers who buy services. Profitability of private businesses inevitably requires the use of these services. Thus, MaaS has a strong potential to result in *increased* mobility amongst those who can pay for it (and have paid in advance). Steering MaaS developments towards more desirable and inclusive societal outcomes requires engagement by the state in the design goals, pricing structures (and subsidies), coverage and consumer protection. In so doing, it may offer opportunities to overcome longstanding challenges to truly integrated transport services. The alternative path where MaaS is seen as the solution through outsourcing the challenge of mobility co-ordination and where the state shrinks in its capacity to co-ordinate and steer seems fraught with risks that would be difficult to reverse. However, the situation is not one of a dichotomy between the opposing paths of laissez-faire and state-led regulation, though there is a need to avoid possibly damaging technology lock-ins. While the technology is in its foundational development stage, there is an opportunity to address the consumer issues in a proactive or even participatory way by stimulating debate about the proper role of the state in addressing citizens' fundamental mobility needs.

NOTE

1. Many such initiatives are documented by Jittrapirom et al. (2017) and Kamargianni, Li, Matyas, House, and Count (2016), including UbiGo, Smile, Tuup, Moovel and Whim.

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