



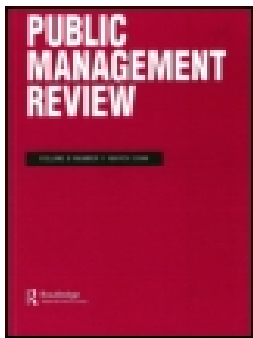
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Smith, G., Sochor, J., Karlsson, M. (2019). Public–private innovation: barriers in the case of mobility as a service in West Sweden. *Public Management Review*, 21(1): 116-137.
<http://dx.doi.org/10.1080/14719037.2018.1462399>

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To cite this article: Göran Smith, Jana Sochor & I.C. MariAnne Karlsson (2018): Public-private innovation: barriers in the case of mobility as a service in West Sweden, Public Management Review, DOI: [10.1080/14719037.2018.1462399](https://doi.org/10.1080/14719037.2018.1462399)

To link to this article: <https://doi.org/10.1080/14719037.2018.1462399>



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Published online: 04 May 2018.



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Public–private innovation: barriers in the case of mobility as a service in West Sweden

Göran Smith^{a,b,c}, Jana Sochor^a and I.C. MariAnne Karlsson^a

^aDivision of Design and Human Factors, Department of Industrial and Materials Science, Chalmers University of Technology, Gothenburg, Sweden; ^bDivision of Public Transport and Infrastructure, Department of Regional Development, Västra Götalandsregionen, Gothenburg, Sweden; ^cK2 – The Swedish Knowledge Centre for Public Transport, Lund, Sweden

ABSTRACT

Departing from open innovation (OI), this case study explores the development of Mobility as a Service (MaaS) in West Sweden. An analysis of 19 interviews reveals how representatives from involved actors perceive internal and external barriers as hampering the regional public transport authority's attempts to collaborate with private actors, and that the perception of barriers is incongruent across public and private actors. Transferability to other cases of public–private OI is discussed, and implications for public actors are proposed. The paper expands the knowledge of preconditions for MaaS' development and of the unique conditions for OI in public–private settings.

KEYWORDS Mobility as a service; public–private open innovation; innovation barriers

Introduction

Road transport is associated with a wide range of adverse effects on economic, environmental, and social sustainability, for example ecological degradation, noise, accidents, and congestion (Verhoef 1994). Car traffic has been identified as a major contributor to these negative externalities (e.g. Graham-Rowe et al. 2011). Accordingly, several types of measures aimed at reducing car use have been implemented worldwide (Gärling and Schuitema 2007). Following the 'carrot and stick' logic, these measures are not only aimed at penalizing car use but also at enhancing the attractiveness of travelling by other means. For instance, OECD advocated that 'the availability, frequency and safety of public transport should be strengthened to provide a viable alternative to private cars' (OECD 2008, 32). However, public transport (PT) might not be able to sufficiently solve the full spectrum of citizens' transport needs. As suggested by the international PT association, UITP (2016, 2), 'it is the offer of an integrated combination of sustainable urban mobility services that most effectively challenges the flexibility and convenience of the private car.' Hietanen (2014) coined this type of bundled solution 'Mobility as a Service' (MaaS), defining it as a 'mobility distribution model in which a customer's major transportation needs are met over one interface and are offered by a service provider' (3).

Propelled by global trends such as digitalization and servitization, the notion of MaaS has rapidly gone from nowhere to nearly everywhere in the personal transport sector

CONTACT Göran Smith  goran.smith@chalmers.se

since it was popularized by Heikkilä (2014). Several pilot demonstrations of MaaS and MaaS-related services have been performed, for example UbiGo in Sweden, SMILE in Austria, Switchh in Germany, and Whim in Finland (cf. Kamargianni, Li, and Matyas 2016). In general, there is very limited information on the impacts of these pilots (Karlsson et al. 2017); still, the UbiGo pilot illustrated the potential to shift modal share to the advantage of servitized transport modes, and at the expense of private car use (Sochor, Strömberg, and Karlsson 2015b; Sochor, Karlsson, and Strömberg 2016). This alleged potential has triggered PT authorities (PTAs) to investigate their roles in MaaS.

Integrated journey planning and payment systems, as well as multimodal service packages, have been proposed to be fundamental features of MaaS (Tinnilä 2016). As a consequence, the development of MaaS demands that the PTAs cooperate more intensively across their organizational borders. Further, MaaS introduces a need for two new roles in the value chain: ‘MaaS integrators’ that assemble the offerings of several transport service providers (e.g. PTAs, rental car companies, and citybike businesses), and ‘MaaS operators’ that package and deliver combined offerings to end users, as visualized in Figure 1.¹ Either public and/or private actors can adopt these roles. In any case, MaaS will require new types of inter-organizational partnerships, in which private actors play a larger role in the innovation of public services as well as in the delivery of public value. Thus, MaaS will likely disrupt how PT is planned, organized, and delivered to citizens (Smith, Sochor, and Karlsson 2017a).

We claim that the development of MaaS is a case of innovation, that is an ‘intentional, yet inherently contingent, process that involves the development and realization of new and creative ideas that challenge conventional wisdoms and break with established practices in a particular context’ (Torfing and Triantafyllou 2016, 218). Moreover, in order to realize MaaS, the PTAs must either accelerate internal innovation through purposive inflows of other transport service providers’ offerings (if the PTAs absorb the new roles) or facilitate external innovation through purposive outflows of their PT offerings to other actors (if external actors take the new roles). For this reason, we argue that the innovation process will be characterized by increased inter-organizational collaboration and propose that it, from the perspective of PTAs, can be conceptualized as a case of open innovation (OI) (cf. Chesbrough 2003).

Although the notion of OI was developed from partnerships between private actors (private–private OI), scholars have found that the public sector is increasingly interested in the idea (e.g. Fuglsang 2008; Ham et al. 2015; Lee, Hwang, and Choi 2012). Osborne and Brown (2013) related this growth to an overall transition in the role of governments, stating that emerging forms of new public governance are unleashing the innovative potential of collaborative innovation. In the light of this development, several case studies on OI in the public sector have been performed (e.g. Baka 2017; Mergel 2017; Zhang et al. 2017). Still, the understanding of such collaboration processes is limited (Mergel 2015). Hence, Chesbrough, Vanhaverbeke, and West (2014) strongly encouraged scholars to further explore the potential of OI in the public sector. Additionally, many studies on OI in the public sector stem from the e-government and interactive government research streams (cf. Kankanhalli, Zuiderwijk, and Tayi 2016). Therefore, they tend to study cases that either strive to crowdsource ideas and/or to engage citizens in policymaking (public–citizen OI). Public sector practices that aim to enhance collaboration with other professional actors in order to accelerate innovation seem to be less explored by OI scholars. For the sake of this paper, we label this type of OI practice ‘public–private OI.’

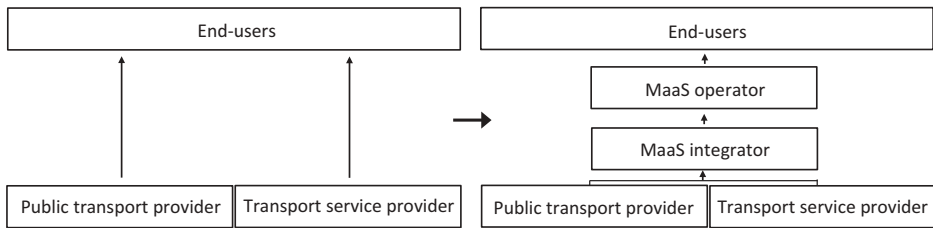


Figure 1. Principal illustration of a transition from the current system to an integrated MaaS system (adopted from Smith, Sochor, and Karlsson 2018). Reproduced by permission of Elsevier.

The aim of this paper is twofold: to increase the understanding of preconditions for the emergence of MaaS and to expand the knowledge of how the public sector can cater for public–private OI in general, especially the subset of these inter-sectorial partnerships that are driven by sustainability-related objectives (cf. Pinz, Roudyani, and Thaler 2018; Schmidhuber and Wiener 2018). In line with this mission, we utilize OI literature to explore the early stages of the development of MaaS in West Sweden. In particular, our intention is to shed light on the unique challenges that the PTA faces when striving to cooperate across its organizational boundaries to realize MaaS. We address the following research question: Which barriers does the regional PTA face in the development of MaaS in West Sweden, as perceived by involved public and private actors in the early stages of the development?

In the following, we first provide a background of OI and OI barriers. This is followed by brief descriptions of the development of MaaS in West Sweden, and of how we have studied it to answer the research question. Then, we describe what barriers are perceived to affect the PTA's innovation efforts. Subsequently, we discuss these findings and, drawing upon them, suggest implications for how public actors' adoption of public–private OI practices can be facilitated. Lastly, we conclude by examining the transferability of our findings and by drawing attention to study limitations.

Theoretical basis

OI

OI fundamentally means that innovation is generated by accessing, harnessing, and absorbing flows of knowledge across organizational boundaries (Chesbrough, Vanhaverbeke, and West 2014). Since Chesbrough (2003) coined the term 'OI,' the concept has progressed to include business model innovation and service innovation, in contexts that include multiple collaborations, communities, and entire ecosystems (Chesbrough, Vanhaverbeke, and West 2014). Empirical evidence suggests that it is a beneficial strategy; companies adopting OI practices are argued to outperform the ones who do not (Chesbrough 2017).

Three forms of OI are explored by Gassmann and Enkel (2004): inbound, outbound, and coupled. In the inbound form, the initiator of OI unlocks its organizational borders to make greater use of external ideas and technologies. In the outbound form, the initiator unlocks its own resources so that external actors can use them in order to for instance develop products and services without adhering to the organizational and/or individual goals of the initiator. In the coupled form of OI, inbound and outbound

practices are combined. As explained in Chesbrough, Vanhaverbeke, and West (2014), coupled OI can take many shapes, differing in the nature of the external partner, the coupling topology, the impetus for collaboration, and the locus of innovation. Thus, in essence, it can be interpreted as an umbrella term for enduring, bilateral innovation alliances.

Barriers to OI

Extant research addresses both internal and external barriers to adoption of OI. Analyses on national (e.g. Savitskaya, Salmi, and Torkkeli 2010), sectorial (e.g. Rohrbeck, Hölzle, and Gemünden 2009), and organizational levels (e.g. West and Gallagher 2006) have contributed to the general understanding of costs and risks associated with unlocking organizational borders. Categorizations of barrier types have also been proposed (e.g. Pontiskoski and Asakawa 2009; Oumlil and Juiz 2016), none of which has become the definitive version. Drawing on the levels of analysis initially proposed by West, Vanhaverbeke, and Chesbrough (2006), and increasingly embraced among OI scholars (e.g. Bogers et al. 2017; Mergel 2017), we adopt a classification of the main barrier types identified in extant literature as illustrated in Table 1.

Knowledge gap

Institutional context is important to the operation of innovation processes. This ‘implies that OI will work differently in different institutional environments, and may not work effectively in at least some of them’ (Chesbrough, Vanhaverbeke, and West 2014, 24). The public sector context offers distinctive characteristics such as the level of political influence, governance structures, and legal constraints. As a result, public actors face different sets of challenges for the diffusion of innovations, compared to private companies (Windrum and Koch 2008).

Munksgaard et al. (2012) concluded that innovative cooperation between public and private actors is contingent on at least two main barriers. One concerns the political basis that such partnerships rest upon, compared to commercial settings. The other concerns the embedded differences that exist between public and private partners, compared to the more homogeneous values and objectives shared between two collaborating private actors. However, Munksgaard et al. (2012) also pointed out that studies investigating OI in public sector are scarce.² Similarly, Oumlil and Juiz (2016) showed that most barriers to OI have been identified when small to medium enterprises (SMEs) adopt such practices. Additionally, Vanhaverbeke, Vermeersch, and De Zutter (2012) suggested that little knowledge regarding best practices for OI are transferable between SMEs and established larger companies, as they differ extensively in management and organization. As public actors are typically organized differently compared to SMEs, we hold that the same argument is applicable for the transferability between SMEs and public actors.

Summing up, it is reasonable to expect that unique barriers challenge public actors when they adopt OI practices (Kankanhalli, Zuiderwijk, and Tayi 2016). Still, few scholars have studied barriers to OI in the public sector in general,³ and public-private OI in particular, that is public practices that aim to enhance collaboration with professional private actors in order to accelerate innovation. Accordingly, we utilize OI to explore what barriers the PTA in West Sweden faces when they strive to collaborate with private actors in order to develop MaaS.

The development of MaaS in West Sweden

In 2014, the attentiveness to MaaS was sparked in West Sweden by the well-documented pilot in the Go:Smart project (e.g. Sochor, Strömberg, and Karlsson 2014a; Sochor, Strömberg, and Karlsson 2014b; Sochor, Strömberg, and Karlsson 2015a; Sochor, Strömberg, and Karlsson 2015b; Sochor, Karlsson, and Strömberg 2016). The pilot demonstrated a MaaS (named UbiGo) that gave end-users access to PT, rental car, car sharing, taxi, and citybikes through a common app and via customized household subscriptions. The evaluation showed a shift from private car use to use of other means of transport, including an increase in the use of PT (Strömberg et al. 2016).

The rationale behind the PTA's interest in MaaS is the overall goal of the public sector in West Sweden to increase the share of 'sustainable travel.' According to the plan, the modal share of PT should be doubled by 2025, compared to 2006 levels. So far, the growth is on track. However, in the past decade, costs for running PT have increased faster than both the travelling and the revenues from taxes and tickets.⁴ Hence, in order to reach the modal share goal, cooperation to develop smarter combinations of transport modes has been pinpointed as a prioritized development area.

Following the overall positive results of the UbiGo pilot, the PTA initiated a process of evaluating their role in the realization of MaaS. Having considered the legal possibilities and consequences of different scenarios, they eventually decided to act as driving force in the development, and commissioned funds for completing a pre-commercial procurement of a MaaS. In the spring of 2016, the PTA invited potential bidders to a request for information process. In this process, 30 potential bidders shared their views on appropriate

Table 1. Categorization of barriers to open innovation.

Barrier category	Description	Examples of barriers
External	Barriers that originate from broader institutions such as the industry sector, society or innovation system	Frequent themes include legislation and policy, e.g. overcoming IP rights (Savitskaya, Salmi, and Torkkeli 2010) and adhering to government policies and funding mechanisms (Lam, Hills, and Ng 2013)
Inter-organizational	Barriers that originate from the inter-organizational collaboration process	Frequent themes include partner relations and division of work, e.g. establishing trust (Westergren and Holmström 2012), finding partners (Kutvonen 2011), dividing tasks (Van de Vrande et al. 2009), and managing coordination costs (Laursen and Salter 2006)
Organizational	Barriers that originate from the focal firm's organization as a whole	Frequent themes include culture and organization, e.g. adopting external ideas (Laursen and Salter 2006), overcoming organizational inertia (Lüttgens et al. 2012), loosening protection of IP (Alexy, Criscuolo, and Salter 2009), and risking increased complexity and loss of control (Enkel, Gassmann, and Chesbrough 2009)
Intra-organizational	Barriers that originate from sublevels of the organization, such as departments, teams, projects, or individuals	Frequent themes include management and resources, e.g. internal management (Gassmann, Enkel, and Chesbrough 2010), sustaining commitment (Chesbrough and Crowther 2006) not using OI as a proxy to improve other measures (Golightly et al. 2012) and finding suitable manpower (Lee et al. 2010)

IP: Intellectual property.

procurement conditions in individual meetings with the PTA. However, few potential bidders saw a viable business case in the PTA’s description of how they envisioned a potential procurement. Accordingly, the PTA recognized that their initial proposal might not cater for a MaaS that would be commercially viable while contributing to societal good. Therefore, the PTA concluded that they needed to take on a greater share of the business risk in order to facilitate the development. Thus, they decided to team up with other Swedish PTAs to develop a joint nationwide technical and regulatory platform for releasing PT tickets to actors that want to develop and deliver MaaS offerings.

Method

The development of MaaS in West Sweden is one of the first attempts to realize MaaS, which is currently a top strategic priority for public and private actors across the global transport industry. Hence, we judged that the studied case could be informative for many MaaS practitioners. Further, the development of MaaS in West Sweden can arguably be interpreted as an ‘extreme’ case of public–private OI (cf. Patton 2002) because of the disruptive and emerging nature of MaaS. Due to their information richness, ‘extreme’ cases have been described as useful for open-ended probes (Seawright and Gerring 2008). For this reason, the studied case appropriately matches the explorative objective of our analysis.

The study described in the paper took place shortly after the request for information process, but before the PTA’s decision to join forces with other Swedish PTAs. The study was organized as an explorative and qualitative case study. The empirical basis was 19 semi-structured interviews conducted just after the individual meetings between the PTA and the potential bidders. The interviews, which lasted between 45 and 80 min, followed an adaptable and flexible interview guide, covering four overarching topics: experiences in relation to MaaS, visions and goals for the development of MaaS, perceptions of the ongoing development, and conditions for the emergence of sustainable and viable MaaS.

We sought to acquire a holistic understanding. Therefore, representatives of both public and private actors involved in the development were interviewed. Representatives from private actors were purposefully sampled from the 30 potential bidders. As we wanted to embrace the perspectives of all types of actors in the emergent ecosystem, the selection of interviewees was based on what role the actors stated to be aiming for in a future MaaS value chain.⁵ In a similar process, public representatives were selected from different internal organizational units⁶ (see Table 2).

The interviews were recorded and transcribed verbatim to enable further analysis in Atlas.TI. Following the recommended process by Charmaz (2006), the interviews were first coded inductively. Altogether 1438 quotations and more than 1000 unique codes were accumulated in this process. Then, memos were developed to summarize the core of the 24 largest clusters of codes.⁷

Table 2. Interviewees.

Public actor representatives	Private actor representatives
Five project group members (operational company)	Two potential transport service providers
One steering group member (operational company)	Three potential MaaS integrators
One executive group member (operational company)	Three potential MaaS operators
Two department for PT and infrastructure members	Two potential facilitators

A review of the memos showed that a large portion of them addressed notions of innovation barriers affecting the development of MaaS. Thus, in order to address the research question of this paper, a second and more thorough analysis of the quotations, focusing on perceptions of barriers, was performed. This resulted in 39 refined codes, describing perceptions of distinctive barriers (including whether public, private, or public and private sector interviewees had mentioned them). As a last exercise, the identified barriers were categorized according to the barrier category from which they originated (cf. Table 1).

Results and analysis

External barriers

Perceived external barriers primarily regarded legislation. Based on the EU's regulation on public passenger transport services (European Parliament and Council of the European Union 2007), the Swedish PT act (Ministry of Enterprise and Innovation 2010) defines the PTAs' responsibilities and rights, that is what they should and can do. For instance, it states that the PTA should plan and govern regional PT services, which are defined as 'passenger transport services of general economic interest provided to the public on a non-discriminatory and continuous basis' (European Parliament and Council of the European Union 2007, 6). Many interviewees believed that this law limits the PTA's action space in relation to MaaS. The interviewees moreover pinpointed three other Swedish laws that they also believed hamper what the PTA can do: the local government act (Ministry of Finance 2017), the law on the application of EU state aid rules (Ministry of Enterprise and Innovation 2013), and the competition act (Ministry of Enterprise and Innovation 2008). The general interpretation of the total effect of these laws was that the PTA under current legal circumstances cannot take any other role in the emerging ecosystem than the role as provider of traditional PT (cf. Smith, Sochor, and Karlsson 2017a). Other roles would imply that they were moving outside the domain in which they are allowed to work. The aforementioned laws were also perceived to impact how the PTA can cooperate with private firms, as public actors are not allowed to restrict or distort market competition. As a consequence, it was believed to be difficult for the PTA to form long-lasting partnerships.⁸

Another legislative problem that the interviewees mentioned was that both the PTA and other involved actors (e.g. potential MaaS operators) commonly treat the current law as unchangeable. As an effect, decisions on how to organize MaaS are based on current possibilities, when one might argue that such decisions should rather be based on preferred outcome, that is through backcasting (cf. Holmberg and Robèrt 2000).

Inter-organizational barriers

The development of MaaS would require a new actor ecosystem to emerge, with modified roles and increased inter-organizational collaboration. As a consequence, new inter-organizational barriers would arise. First of all, the interviewees mentioned that new responsibilities and roles are to be distributed across the actors in the emerging ecosystem, in both the development and operational stages. This was seen as challenging, mainly due to the large number and high levels of uncertainties, which relates to the overall lack of experience (cf. Smith, Sochor, and Karlsson 2017b). For instance, the interviewees mentioned that it

was unclear which type of actor would be the face of MaaS for the end users (customers) and own the end-user relationship, who would take responsibility for end-user support, and who should refund the end users when the system falters. Hence, the interviewees identified the sharing of responsibilities and roles as one of the major challenges for the MaaS development.

At the point of the interviews (autumn 2016), there were two major, and conflicting, views on public and private responsibilities in the realization of MaaS (cf. Smith, Sochor, and Karlsson 2017a). Basically, one stream believed that the public sector should take the front seat role and enlarge the PT offering to include MaaS (cf. inbound OI), while the other stream believed that the PTA should stick to PT and let the private sector lead the development (cf. outbound OI). The conflicting trains of thought contributed to the PTA's struggles of defining what role they should take in the emerging MaaS ecosystem.

It is a very ideological or political question, and you can probably have very different opinions regarding that. Regarding whether you think that it's the market that should steer something like this, or if you think it's the public [sector] that should govern. – IP3 (translated)

The procurement process was another impediment that the interviewees said contributed to the difficulty of transitioning from the demonstration of UbiGo in 2014 to the actual implementation of MaaS. In general, a large majority of the interviewees believed that public procurement is an ill-fitting method for driving collaborative innovation (cf. Smith, Sochor, and Karlsson 2017b). Procurement is a method for operating systems, not for innovating, they said. They perceived procurement as a slow process that invites the same old actors and that fosters neither cooperation nor innovation. Moreover, the group of interviewees that mentioned this issue thought that procurement is a monopolistic method that more often than not creates dominance and dependence.

If you want to take part in procurement, and see these 'must' and 'should' demands, and these things, and you realize; yes, this will become so static, there is no flexibility at all. – IP17 (translated)

The interviewees also brought up the hurdle of negotiating contracts. Contractual agreements are always difficult, they said, but that the case of MaaS brings additional difficulties. The contracts would involve a new product with uncertain impact. Moreover, the contracts would be set up between actors that have not previously collaborated, are of entirely dissimilar natures, and originate from different traditions, for example global enterprises, PTAs, and local start-ups.

And that is one of the major challenges in all the projects we have seen so far, especially with the [undisclosed project name] project where it took more time to negotiate these things than actually implementing it. Uh, not only more time, it took ten times more [time] than simply implementing things. – IP5

Organizational barriers

Interviewees from both the private and public sectors stated that the culture and organization at the PTA's operational company negatively influences the development of MaaS. Several of the interviewees said that the work culture within the operational company does

not foster a positive innovation climate and that their internal organization makes them incapable of both experimenting and driving collaborative innovation. For instance, the operational company's organization structure and their goals are largely designed for their traditional task (to manage the regional PT system), while the mission to improve the PT system through innovation only appeared on their agenda quite recently. Thus, the interviewees thought that the operational company lacks a systematized approach to handling inter-organizational innovation projects. Some of the interviewees also mentioned an inherent resistance to change within the operational company. Two particular facets contributing to the inertia in this case were said to be fear of MaaS cannibalizing off the PT market share and the difficulty of adopting external ideas.

We do not think that the public sector is best at meeting customers' real or expected needs. Eh. Or, we, I'm completely sure that we're too bad at it. We are still production oriented. We start from what we have and say: go ahead customer, be satisfied with this. – IP4 (translated)

The interviewees moreover believed that the PTA's freedom to act was restricted by the mandate and decision-making scheme attributed to the operational company. For instance, the operational company must anchor most key decisions with the PT committee. Moreover, the interviewees mentioned that, as a public actor, the PTA has to adhere to for example, the principle of public access (cf. Bohlin 2015), adding to the administrative burden. Thereupon, the PTA was described as slower and less flexible than private enterprises in general, making it difficult to cooperate with them, according to the interviewees.

Intra-organizational barriers

The operational company had neither a publicly available strategy nor a vision regarding MaaS at the point of the interviews. Thus, the operational company's internal project group found it difficult to interpret and communicate what role the operational company aimed for and how others could relate to this, both internally and externally. Among other things, this contributed to the potential bidders' difficulty in understanding the boundary conditions and aim of the request for information process. Additionally, although launching a rather large, external marketing campaign regarding MaaS, not everyone thought that the operational company was internally prioritizing the issue of MaaS, resulting in both an overall lack of resources and a lack of competence within the project group. Moreover, it made the process of establishing a common internal understanding of MaaS and its potential impact across the organization cumbersome.

I'm not a businessman. I have a completely different background. I don't know anything about business and finance and such. And I have missed that, to have a really good business analyst on the team. – IP3 (translated)

Concept-related barriers

In addition to the four, abovementioned barrier categories that mainly relate to the OI practice that the concept of MaaS entails (see Table 1), the interviewees also mentioned several barriers that primarily relate to the concept and business case of MaaS per se, which we classify as 'concept-related barriers.'

The concept of MaaS builds on the integration of multiple transport services, and together these should cover the lion's share of end users' travel needs and offer a wide

range of mode options. Therefore, MaaS can only work if the majority of the dominant transport service providers are convinced to join. A consequence of this is that the concept of MaaS is vulnerable to the support of specific actors, or lack thereof, something that was stressed by several interviewees.

If you have a perfect car sharing company in your city and they don't agree [to] being part of such a system where they don't completely own the customer, um, then this whole platform does not make sense. ...And then this whole integrated solution thinking and reducing barriers is gone. – IP5

According to the interviewees, a distinctive aspect of the emerging MaaS ecosystem making the transport service providers reluctant to jump on the bandwagon is the fear of losing control and being dominated by other actors. The interviewees that discussed this problem especially stressed worries about MaaS operators and/or MaaS integrators acquiring dominant positions, which could diminish the transport service providers' ability to act independently, and might even eventually suffocate their business models. Among other things, parallels were drawn to the emergence of brokers for rental cars and flight tickets, developments that were said to be negative for the involved transport service providers, as the brokers press their financial margins. To mitigate such risks, more or less all interviewees agreed that new MaaS business models need to be developed that fit all involved actors. However, this was perceived to be a cumbersome task, as actors in several types of roles must be satisfied in MaaS ecosystems (cf. [Figure 1](#)). Moreover, the partners would also have to share the business risk of the development – which the interviewees found tricky, as the ecosystem would include both public and private actors.

The interviewees also stated that it is costly to attract end users, especially if you have an unknown brand with an unknown product. Thus, the process of creating public awareness of MaaS, and convincing potential customers of what MaaS can offer them, was anticipated to be a long and challenging process. Some interviewees argued that it is not even an established fact that there is any need for MaaS among potential end users. Furthermore, it was said that large volumes are required to create a viable business case, due to small margins and cheap products within the personal transport sector. For these reasons, MaaS is associated with high economic risks, huge marketing costs, and a long time to return on investment. As a consequence, not all interviewees saw any business potential in MaaS. This was also manifested in the potential offering that the operational company distributed as a part of the request for information process, since potential bidders saw little business opportunity in it, as it was formulated (Smith, Sochor, and Karlsson 2017b).

According to several of the private sector interviewees, the main reason to why non-pilot-based MaaS is still to appear in West Sweden is the fact that external actors have not been allowed to resell PT tickets. Bundled MaaS requires that PTAs make a range of PT tickets available, at least single and monthly tickets, and give reasonable margins, interviewees said. Moreover, the current range of tickets might not be enough. One private sector interviewee emphasized that the regional PTA has to develop new types of tickets in order to enable MaaS packages that would be attractive for end users. As said by him, the current range of PT tickets is far too inflexible to enable external actors to develop attractive MaaS offerings. In particular, he wanted the PTA to develop daily PT tickets, in addition to single and monthly tickets.

Who is allowed [to] sell which tickets and under which conditions, I think that's [the] most important thing. – IP9

Further, technical and contractual harmonization was said to be needed to enable technical integration and the development of attractive MaaS offerings. Sweden is a rather small market, where PTAs in general have appeared to be interested in MaaS (cf. Samtrafiken 2017). Therefore, it would be reasonable to standardize or harmonize for example how tickets can be distributed and resold, according to the interviewees. The rationale was to avoid extra work and development of solutions that cannot be integrated.

The interviewees also pinpointed several additional conceptual weaknesses of MaaS. First, the uncertainties of individual transport services would add up in combined services. For instance, if PT and taxis both have a reliability of 80 per cent, a MaaS that combines the two modes into intermodal trips would probably have an even lower reliability. Assuming that potentially problematic reliability rates cannot be improved, and intermodal trips better coordinated, this may make it difficult to develop quality services. Second, if MaaS is dependent on transport services that can be integrated, then the potential MaaS market is likely constrained to the markets in which such services operate, that is typically in urban settings. Third, PT is organized differently in each region in terms of for instance, responsibilities, price structures, and technologies. Hence, it might be difficult for MaaS integrators and MaaS operators to reuse solutions across cases, thus impeding business models based on global approaches.

Differences in perceptions of barriers

Distinctive differences appeared during the interviews in how the outlined barriers were perceived across public and private actors. On the external level, the public sector interviewees stressed the importance and impact of legislation, such as the competition act and procurement laws, far more than the interviewees from the private sector. In contrast, the private sector interviewees brought up another legislative aspect that the public sector interviewees oversaw, namely that the current legislation hinders the development and diffusion of new types of shared transport services, which in the end could lead to a narrower and less interesting range of services that can be combined in MaaS. The private actor interviewees moreover tended to focus more on barriers related to the business case, such as the high diversity in needs among the potential end-user group, the high cost of establishing a new brand, and the anticipated long time to return on investment.

On the inter-organizational level, the public sector interviewees spoke much more frequently on the importance of governance. They typically underlined the need for public sector funding in order to mitigate the divide between societal aims and business goals, that is to steer private developments towards what would be best for society. Likewise, the public sector interviewees also mentioned a potential key trade-off between public control and both the attractiveness for private parties to join and their abilities to develop thriving services. Further, the public and private sector interviewees disagreed on the general interest in joining MaaS ecosystems. The public sector interviewees believed that there so far seems to be a lack of actors that want to participate in MaaS schemes. Using the group of actors involved in the request for information process as a basis for their argument, the public sector interviewees mentioned two particular roles as vacant:

private transport service providers and MaaS operators. In contrast, the private actor interviewees, at large, argued that the private sector has shown sufficient interest in these roles. Finally, the bulk of the public sector interviewees believed that the private actors' expectations about how fast MaaS can be developed from pilot stage to implementation are unrealistic. In general, the public actor interviewees regarded MaaS as a premature concept that should be tested further, while private actor interviewees to a greater extent painted a picture of a verified approach, ready for full-scale implementation.

In summary, the perspectives of the interviewees seemed to influence their interpretations. The discrepancy between the public and private sector interviewees' perceptions suggests that both groups were primarily aware of, and regarded, the type of barriers that directly affected their own line of work.

Discussion

This study set out to explore which barriers the regional PTA in West Sweden faced in the early stages of the development of MaaS. The analysis reveals that barriers on multiple levels are perceived to impede their innovation efforts in this regard. Some of these barriers may be unique to disruptive innovations that require organizational changes. For instance, not all types of public–private OI necessitate as vast modifications to current business models and business relations as large-scale deployments of MaaS do. Other barriers might be exclusive to the context of the case study; for example, the ones that arise from distinct institutional arrangements such as the organization of regions' and municipalities' tasks (unique to Sweden) and the hidden subsidies of private car use (domain specific). Still, we propose that the analysis illustrates several barriers that may be hindering other cases of public–private OI as well.

On the external level, the analysis reveals that laws and regulations make it difficult for the studied PTA to establish long-lasting partnerships with private actors in relation to MaaS, and to expand beyond their pre-assigned mission of providing regional PT. Apart from the PT act (Ministry of Enterprise and Innovation 2010), all of the laws referred to in the interviews are domain independent. Hence, they would impede all similar Swedish public actors from adopting public–private OI practices. Moreover, the legislative barriers might be partially pertinent across Europe, as many of the Swedish laws that the interviewees mentioned are based on European legislation, such as the law on the application of EU state aid rules (Ministry of Enterprise and Innovation 2013). Previous OI studies have touched upon hampering legal aspects, for instance complexities with memoranda of understanding (Mergel 2017) and IP rights (Lüttgens et al. 2012; Savitskaya, Salmi, and Torkkeli 2010). However, we found no traces of legal barriers hampering the perceived action space of focal actors in OI in the extant literature (cf. Mukhtar-Landgren and Smith 2018). Thus, our study indicates that legal barriers may be particularly inhibitory in the public–private form of OI.

On the inter-organizational level, the analysis shows that the lack of MaaS experience and the public–private divide make it challenging for the studied PTA to establish inter-organizational trust and understanding in relation to MaaS. These factors moreover make it difficult for the PTA to agree on business models and to divide the responsibilities across the other actors in the emerging MaaS ecosystem. Extant literature on barriers to OI has highlighted similar relationship issues (e.g. Enkel, Gassmann, and Chesbrough 2009; Van de Vrande et al. 2009; Westergren and Holmström 2012). Still, Munksgaard et al. (2012) suggest that five underpinning incompatibilities pose additional tensions on OI in

public–private partnerships: objectives and interests, time horizons, risk behaviours, incentives for participation and expected rewards, and innovation understandings. Our study adds an information rich case, which enforces the notion of the public–private divide as a major barrier for public–private OI.

The PTA initially utilized a public procurement procedure to drive the development of MaaS. The analysis shows that both public and private actors perceived that this hindered experimentation, encumbering the transition from pilot to implementation and obstructing inter-organizational collaboration. Highly regulated and formalized processes are customary for most public actors, and public procurement has often been criticized for driving up costs (e.g. Flyvbjerg, Bruzelius, and Rothengatter 2003) and for hampering innovation (cf. Uyarra and Flanagan 2010). The lack of appropriate cross-border procurement methods have also been recognized as one of the central reasons for the current lack of innovation-driven market development in Europe in general (Debackere et al. 2014). Hence, our findings support and extend earlier claims regarding public procurement and OI, suggesting that too rigid procurement procedures may be a generic barrier for public–private OI.

On the organizational level, the analysis illustrates that the PTA is not perceived to be organized for driving collaborative innovation and also that the PTA's organizational culture is believed to foster inertia and prevent experimentation. Moreover, the added bureaucracy and the political control were professed to make the PTA less agile, compared to similar private actors. Organizational inertia, the 'not invented here' syndrome, and risk aversion have previously been identified as barriers to OI (e.g. Huang et al. 2013; Lüttgens et al. 2012; West and Bogers 2014). Sorensen and Torfing (2012) furthermore argue that the thick layer of formal rules, the multi-layered hierarchies, the organizational silos, the lack of economic incentives, and the divided political leadership at the top of public actors undeniably tend to stifle public innovation in particular. Our study widens the understanding that public actors face vast organizational barriers in relation to innovation, by showing that the barriers also are present and impeding in a distinct case of public–private OI.

On the intra-organizational level, the analysis reveals that the PTA's innovation efforts are hampered by a lack of human capital and by the low prioritization of the development of MaaS. This is in line with extant findings on barriers to OI that pinpoint managers' struggles with finding suitable manpower, sustaining commitment, and conveying firm leadership in embracing OI as a core strategy (e.g. Chesbrough and Crowther 2006; Gassmann, Enkel, and Chesbrough 2010; S. Lee et al. 2010). Consequently, our study elucidates that public–private OI is affected by similar intra-organizational issues as is traditional private–private OI.

Practical implications

Based on our analysis of innovation barriers, we suggest implications aimed at facilitating public actors' adoption of public–private OI. In general, Feller, Finnegan, and Nilsson (2011) argued that OI practices represent a more radical manifestation of transformational government, signalling not only fundamental change in the nature of value creation and service delivery by public actors, but potentially in the nature of their organization. Our study supports this claim by illustrating the need to transform the role of public actors in public–private innovation from innovation purchasers to innovation partners. Hence, we

outline a set of actions, for lawmakers and for public directors and managers, which we believe could assist and accelerate such a transformation.

The mission of the PTAs, as stated in the Swedish PT act, is currently to provide regional PT. In the studied case, this was perceived to hamper the PTA's action space in relation to MaaS. For instance, the PTA judged that they could not take on the role of MaaS operator (cf. Smith, Sochor, and Karlsson 2017a). Similarly, the actions of other public actors in Sweden are limited to what is stated in applicable laws, appropriation directions, and other governing documents. Inspired by performance-oriented regulatory regimes (cf. Wagner and Fain 2017) and by technology neutral regulation (cf. Koops 2016), we argue that public actors in general could benefit from missions that focus more on the objectives, and less on their actions. Accordingly, we urge lawmakers to explore *more outcome-oriented missions* for public actors, that is missions that give more flexibility in what means public actors are allowed to pursue to achieve policy goals. In this particular case, the regional PTAs' mission should arguably be to support sustainable travel throughout the regions rather than to offer regional PT, if the overarching policy goal is to reduce the negative externalities of personal transport without compromising accessibility. A first step in this direction would be to enlarge the definition of PT to encompass more means of shared travelling.

The studied case illustrates how difficult the conversion of successful pilots to actual implementations can be in public-private settings. Among other things, the analysis suggests that public-private OI might require a process distinctively different from the traditional procurement process. Better opportunities for long-term, joint value creation across sectors are needed, especially when the level of uncertainty is high (Smith, Sochor, and Karlsson 2017b). Hence, we advise both lawmakers and public actor managers to *explore collaborative procurement processes*. One such approach is the pre-commercial procurement process, which is meant to target more emerging products and services (Edler and Georghiou 2007). Another approach is 'virtual network,' which is a procurement process model suggested to foster more collaboration. Virtual networks are characterized by non-hierarchical collaboration, high levels of flexibility, low levels of formal rules, and informal interpersonal relations (cf. Bakker, Walker, and Harland 2006). Moreover, we propose that lawmakers should investigate new contract forms that could allow for intermediate steps that bridge the current gap between 'no standard rules apply' pilots and traditional contracts.

Few interviewees in this case study had first-hand experience with MaaS, as a result the common pool of knowledge was limited. Crosby, Hart, and Torfing (2017) argued that collaborative innovation should be inspired by the logic of prototyping, that is towards experimenting through trial and error. In line with these insights, we argue that more MaaS pilots are needed, including thorough and comparable evaluations (cf. Karlsson et al. 2017). Beyond the acquisition of knowledge and experience, pilots could also contribute to MaaS development through technical development, market creation, and network formation (Karlström and Sandén 2004). Accordingly, we request public actors to *invest in joint knowledge building* through collaborative experimentation and piloting. It is also important that the public sector secures the active involvement of potential end users in the innovation process since their adoption and use will ultimately decide the success of the innovation (cf. Von Hippel 2005), and the sharing of the acquired knowledge across the innovation

ecosystem. This, public actors can accomplish by demanding end-user involvement, evaluation, and disclosure of raw data when funding pilot demonstrations.

Underpinning motivations for participation in OI activities seem to be incongruent across the public and private actors. The PTA and the potential bidders have different organizational goals to adhere to, and, thus, they strive to accomplish different things. Still, in contrast to Munksgaard et al. (2012), we argue that their motivations can be compatible. For instance, all involved actors in the studied case share the interest of reducing the need of owning a private car. Additionally, to align interests, public actors can regulate or penalize private actors' OI activities that are outside the public's sphere of interest (e.g. in this case MaaS that replace PT trips with rental car trips) and incentivize activities that are (currently) outside the private actors' sphere of interest (e.g. in this case MaaS in non-profitable geographical areas). However, Bommert (2010) reasoned that the opening of the innovation cycle requires the public actor's capacity to make a trade-off between authority and innovation assets and to give up or share its authority to define the public value of innovations. Hence, in addition to *regulate and incentivize private actors' activities*, public actors might also have to adapt to the private sector's interests when adopting public-private OI practices.

A shared conceptual space is key for collaborative problem-solving (Roschelle and Teasley 1995), and our analysis suggests that this is currently lacking in the development of MaaS in West Sweden. Thus, we draw on Nambisan (2008) by arguing that an important public role in public-private OI is to *establish and support collaborative environments* where public and actors can come together to devise a shared understanding of the emergent problem as well as of inter-organizational differences (e.g. regarding motivations and organizational cultures). For instance, interactive governance literature shows how governance networks provide crucial arenas for multi-actor collaboration (Osborne and Brown 2013), and it has been proposed that innovation labs and innovation contests can function as OI intermediaries, providing opportunities for public and private actors to interact (Smith, Hjalmarsson, and Burden 2016; Smith and Akram 2017; Gascó 2017; Gascó-Hernandez, Sandoval-Almazan, and Gil-Garcia 2017).

However, if aforementioned processes and arenas are to grow and mature, the focal actor must first *develop internal OI organizations and processes*. For example, Chesbrough and Crowther (2006) identified that moving from a set of ad hoc processes to clearly defined OI practices, systems, roles, and responsibilities can help to ensure successful adoption across the organization. A particular aspect that seems important to address in this regard is to offset risk aversion (Brown and Osborne 2013; Smith, Sochor, and Sarasini 2017c). Additionally, the studied case supports earlier claims of the importance of adequate staffing of OI initiatives (e.g. Sørensen and Torfing 2012). It is indeed vital that the involved personnel have the competence and a mandate to manage the OI process both internally and externally.

Lastly, drawing on extant literature on long-term management of sustainable transitions (e.g. Kemp, Loorbach, and Rotmans 2007; Loorbach 2010; Rotmans, Kemp, and Van Asselt 2001), we urge public actor directors to *focus on the long-term effects* of disruptive innovations. This implies allowing more slack with short-term goal fulfilment. Further, public actors should for this type of innovations collaborate with private actors, not only in concrete development projects but also when developing visions and roadmaps, in order to facilitate alignment of all actors' operational and tactical activities with the overarching mission (cf. Smith, Sochor, and Sarasini 2017).

Concluding remarks

In summary, this case study adds to extant literature on barriers to OI by illustrating that the public–private dimension of public–private OI adds extra intricacy to the OI task: laws regulate the mission, action space, and innovation processes of public actors, making it difficult for them to collaborate with private actors; the added bureaucracy and political control that public actors face, compared to private actors, impede public actors' agility and speed; and inter-organizational collaboration between public and private actors is hampered by the embedded differences between them. The study also complements existent literature by illustrating a distinctive difference in how the barriers were perceived across public and private actors, suggesting that each type of actor was more concerned with the barriers directly affecting their own work.

The study was designed as a single, qualitative case study. This is an appropriate approach for exploring new phenomena in depth and for creating high-quality explanatory theories (Baxter and Jack 2008; Dyer and Wilkins 1991; Eisenhardt 1989). Still, this type of study design has often been criticized for lack of generalizability and repeatability (e.g. Miles 1979). We side with Donmoyer's (2009) emphasis on the value of learning from individual cases, as well as from reviews of aggregates, to create a holistic understanding, and that the traditional conceptualization of generalizability should be updated in the light of this, focusing more on the meaning and perspective of knowledge. In this specific case, we propose a naturalistic approach to generalizability, that is that our findings should be interpreted as transferable to other similar cases of public–private OI rather than to the entire population of public–private OI (Myers 2000).

The studied case is arguably an 'extreme' case of public–private OI due to the novelty of MaaS and its potentially large-scale, disruptive nature (cf. Flyvbjerg 2006). This case was one of the first developments of MaaS in general, and the first attempt to procure MaaS in particular. Concurrently, the development and diffusion of MaaS promises a vast reform to how personal mobility is planned, operated, and executed. As a consequence, the studied case activated a large range of actors and many of the innovation ecosystem's basic mechanisms, while the involved actors' actions were not influenced by previous MaaS experiences. Comparative studies of more typical cases of public–private OI should be studied in order to establish the generalizability of the findings to public–private OI as a whole (Schofield 2002). The studied case is moreover confined to a specific geography (West Sweden) and to a particular domain (PT) and focuses solely on the early phases of the development of MaaS. Hence, additional studies of both the same case in later stages of the development of MaaS, and of heterogeneous sets of other cases of public–private OI in other institutional settings, are needed in order to better understand the development of MaaS and for broadening the understanding of barriers to public–private OI.

Notes

1. Moreover, different types of facilitators, e.g. technology providers, might be needed.
2. Still, findings from tangent research streams such as new public governance (cf. Osborne 2006), networked governance (cf. Stoker 2006), co-creation (cf. Voorberg, Bekkers, and Tummers 2015), and collaborative innovation (cf. Sørensen and Torfing 2011) seem partly transferable.
3. With notable exceptions, such as Mergel (2017).
4. Citizens' rising expectations of services and limited or shrinking budgets are observed all over the public sector (Osborne and Brown 2013).

5. Some actors aimed to acquire several roles, e.g. both MaaS integrator and MaaS operator.
6. The regional council in West Sweden has organized the responsibility for regional PT by setting up a political PT committee and an operational company, supported by civil servants in the department of PT and infrastructure. For the sake of this paper, the operational company, the PT committee, and the department of PT and infrastructure are, together, viewed as one actor constituting the regional PTA.
7. Memo-writing is described in Charmaz (2006, 72) as ‘the pivotal intermediate step between data collection and writing papers.’
8. Moreover, the EU directive on public procurement (European Parliament and Council of the European Union 2014) sets conditions for the PTA’s collaboration processes.

Funding

This work was supported by the K2 – The Swedish Knowledge Centre for Public Transport (funding of salary); Västra Götalandsregionen (funding of salary).

Notes on contributors

Göran Smith is an industrial doctorate within public innovation and sustainable transitions. In his doctoral project, he studies the development and diffusion of Mobility as a Service (MaaS) in order to contribute to a better understanding of collaborative innovation processes in public–private settings, and of how public actors can manage them.

Jana Sochor is a senior researcher. Her research interests include understanding end users’ perceptions, motives, and behaviours as related to MaaS so as to improve system/service design and development, adoption, and effect, and in turn positively impact users’ mobility choices in a more sustainable manner.

I.C. MariAnne Karlsson is a professor (chair) in human-technology systems at Chalmers University of Technology. Her research aims to develop knowledge on the multidimensional relationship between people and technology. She has more than 20 years experience in the sustainable mobility domain and has studied MaaS since the birth of the concept.

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