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# Procuring Mobility as a Service: Exploring dialogues with potential bidders in West Sweden

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## Abstract
Following a political order in late 2014, the regional public transport organisation (PTO) in West Sweden has been on a quest to procure Mobility as a Service (MaaS). In spring 2016, they invited potential bidders to discuss the terms for such procurement through a 'request for information' process. 65 actors participated in a start-up meeting, and 30 explicated their thoughts in subsequent individual meetings with the PTO. Based on participatory observation of these meetings, this paper explores which aspects that frequented the discussions. It identifies seven aspects that potential bidders believe are important to consider when procuring MaaS: cross-sector collaboration, allocation of responsibilities, governance, business models, target groups, service design and technical integration. Moreover, the analysis suggests that MaaS (in this context) is premature for public procurement at this point in time. Instead more collaborative forms of public-private partnerships seem to be needed to drive the development.

## KEYWORDS:
Mobility as a Service, public procurement, public-private partnership

## Introduction

Multiple reports have in recent years detailed how global trends such as digitalisation (1) and servitisation (2) enable a forthcoming paradigm shift in the organisation of personal transport services (3). According to the forecasts, the lines between public and private transport will blur (4) and new types of services will extend the current mobility ecosystem (5). Predictively, transport services will also frequently be combined into overlaying mobility offerings that exploit the services' particular strengths, and avoid their weaknesses (6). The key motive is to provide citizens with the "travel flexibility and convenience of the private car, without its negative externalities, such as congestion, emissions and wasteful parking requirements" (7). Anticipated benefits of the development include improved effectiveness of the transport system, better value for public money and profitable markets for new types of transport services (8).

The flagship of the proposed transformation is Mobility as a Service (MaaS). Since Heikkilä first coined the term in 2014 (9), the hype has gone global. Still, the notion is novel and a commonly accepted definition is yet to emerge. Moreover, multiple concepts such as smart (10), shared (11) integrated (12), multimodal (13), combined (14), on demand (15) and new mobility (16) coexist and overlap, creating a linguistic jungle for scholars and practitioners. This paper takes off from a broad interpretation of MaaS as "services that facilitate using various modes of transport to get from one place to another" (17), but delimits the discussion to bundled multimodal offerings of public transport and other transport services.

To enable MaaS offerings, closer collaboration between public and private sectors may be needed. For instance, it is probable that terms under which MaaS providers can resell public transport (PT) tickets must be agreed upon (18). However, while such cross-sector schemes require high levels of commitment and coordination between stakeholders (19), a recent state-of-the-art survey among potential European stakeholders unveiled a perceived lack of collaboration (20). Existing procurement policies and practices have been identified as a potential cause, as they are considered to inhibit the dynamic, evolving nature of emerging mobility providers (21). Still, public procurement of technology has in the past proved to be "an extremely potent instrument for influencing the speed and direction of innovation" (22), thus, offering the public sector an opportunity to both boost and govern the development of MaaS.

In order to a) explore the feasibility of procurement as a tool for driving development of MaaS and b) extend the knowledge on what factors that will determine whether or not private actors will enter the emerging ecosystem, this paper explores initial discussions on procurement terms for MaaS in West Sweden. Hence, the paper addresses the following research question: *What aspects do potential bidders perceive as important to consider when procuring MaaS?*

## Background

### *Initial pilot*

The development of MaaS in West Sweden was initiated by the Gothenburg-based research project 'Go:Smart' (23). One of the aims of the project was to explore a potential path towards reduced need for private car ownership by piloting a new business and partnership model that integrated transport modes and made use of new opportunities brought by information technologies. Accordingly, an integrated mobility service that provided a seamless, multimodal journey experience was piloted. The service interlinked public transport with car- and bike-sharing, car rentals and taxis, and more than 190 individuals became paying end users for six months (November 2013–April 2014) (24). In short, the piloted service was appreciated by the end users and promoted changes in their transport patterns towards more sustainable habits (25). The participating transport providers, authorities and agencies cherished the promising outcome of the pilot and some of the involved actors formed a company, aiming to refine and commercialise the piloted service.

### *Pre-study*

Following the success of the pilot, the regional public transport authority (PTA) and its public transport organisation (PTO) felt a need to evaluate their legal possibilities, their potential roles in the emerging ecosystem and the possible consequences of their choices. Thus, the PTA commissioned the PTO to perform a pre-study. The pre-study identified five potential scenarios (26):

1. Await market development.
2. Make the public transport offer available for resale.
3. Stimulate the market through pre-commercial procurement.
4. Act as driving force through pre-commercial procurement.
5. Act as driving force through public procurement.

The pre-study recommended scenario four, reasoning that it was the option most in line with the mission that the PTO was given by the PTA: to identify a cost-effective solution that contributes to increased sustainable travel and to enhance the brand value of the PTO. Scenario four entailed that a pre-commercial procurement would be carried out by the PTO in order to identify one or a few private actors who could develop a MaaS that would be delivered to end users by one or more commercial entities closely associated with the PTO. The PTA accepted the pre-study's recommendation in December 2014 and gave the PTO funds to carry out the procurement process (27)[1].

### *Request for information*

In April 2016, the regional PTO invited potentially interested private actors to a request for information (RFI) process regarding MaaS (28). In the invitation, they detailed that they were planning to carry out procurement whereby a supplier would offer a comprehensive MaaS solution for end users, linking together transport and additional services. They moreover stated that the procurement was likely to result in a service concession arrangement whereby the supplier should combine the PTO's offering with other transport modes and additional services from other subcontractors - into an integrated solution.[2]

A start-up meeting for the RFI process was held in mid-May 2016. Roughly 120 representatives from 65 organisations attended. The key motive for the start-up meeting was to communicate the PTO's vision, to clarify common questions and to give the interested actors a chance to mingle and team up.

[1] The PTO later changed the type of procurement to a traditional public procurement.
[2] The description of the development of MaaS in West Sweden above does not purport to be all-inclusive.

*Individual meetings*

Following the start-up meeting, the PTO's project group held 28 individual 90-minute meetings with representatives from the 30 private actors that had requested a meet; hereafter referred to as 'the attendees'. During these meetings, the attendees commonly first held a presentation whereby the PTO asked questions, guided by a list of areas of special interest. These areas included the potential bidders' views on:

- An overall MaaS solution, including associated services and end user impact.
- A business model from the end users' perspective, including details of payment and invoicing.
- A business model between the PTO and the supplier, including key factors and undertakings.
- Assignment of responsibility between the PTO and the supplier.
- End user interaction responsibilities, including marketing and end user support.
- Plans and strategies for nationwide expansion.
- Technological considerations.
- Common pitfalls to avoid.

However, the meetings took different directions, and many ended up in more or less open discussions.

## Data collection and analysis

Information was collected in different ways. The main author observed 24 of the 28 individual meetings as an active participant (cf. 29). In the active participant role, the researcher becomes more involved with the insiders' central activities, compared to pure observation, but does not fully commit to values and goals (30). Thus, it implies that group members still consider the researcher as somewhat of an outsider. The main author recorded the topics of discussion by taking field notes, which were summarised after each individual meeting. These notes could then be compared with and complemented by the notes taken by an appointed secretary as well as by members of the PTO's project group.

An initial analysis was accomplished which followed three steps. Firstly, the main author read through the field notes and the individual summarises of the respective meetings and clustered recurrent themes inductively (cf. 31). Secondly, these themes were refined through a comparison with the secretary's and the project members' notes. Finally, the selection of themes was discussed with the project group and with the co-authors. These steps resulted in a set of 20 themes: *openness, packaging, content, business risk, scope, contract duration, control, division of responsibilities, brand, marketing, payment, development process, business model, system integration, collaboration, customer information, customer support, geographic focus, monitoring* and *marketing.*

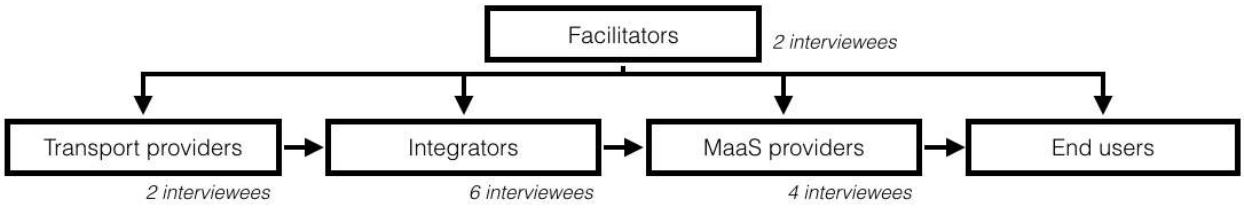


**Figure 1: The core roles in a basic MaaS value chain**

Shortly after the RFI, the main author performed 10 semi-structured interviews (cf. 32). The interviewees were purposively sampled (c.f. 33) from the attendees to represent all types of actors that participated in the individual meetings. A value chain model, developed from (2), visualizes the attendees' common understanding of potential key roles in the evolving ecosystem around MaaS, and what roles the interviewees foresaw that their organization would adopt[3], see Figure 1. In the model, 'transport providers' produce transport, both public and private. 'Integrators' integrate the transport providers' offerings technically and/or businesswise, which enables 'MaaS providers' to sell combined mobility offerings to end users. Finally, 'facilitators' facilitate the process, i.e. by providing technology or know-how.

[3] One organization can have multiple roles in the ecosystem.

The interviews covered four overarching topics: experiences in relation to MaaS, visions and goals for the development of MaaS, perceptions of the on-going development and implementation process and conditions for the emergence of sustainable and viable MaaS. As a last exercise in interviews, the interviewees were shown the 20 themes mentioned above. The interviewees were asked to point out the themes most significant to address when procuring MaaS, and to elaborate on the reasoning behind their selection. This information was used to reduce and validate the themes. Lastly, a second analysis grouped and sharpened the themes into seven aspects.

## Results and discussion

Overall, the PTO's initiative to invite private actors in early discussions was highly appreciated. In addition to trying to influence the scope of the procurement, the attendees also used the meetings to refine their ideas. Still, they found it difficult to answer the PTO's questions at the point of the meetings, as there were few clear standpoints to depart from. For example, the PTO did not clearly communicate exactly what they wanted to procure, the levels of freedom for contractors, or how the procurement would change their current practices. Thus, the attendees craved clarification in future procurement material.

> *My feeling with this combined traveling was that it was a very open scope, and I would never dare to send in a bid for such a job. There is too much [included] and there is too much uncertainty. No, I'd much rather preferred to work with, in this case, work with an effort to develop something together. – Interviewee 3 (translated)*

The main author's analysis identified seven intertwined aspects, outlined and discussed below, that frequented the discussions during the meetings, and that the potential bidders considered as important to address when procuring MaaS:

- Cross-sector collaboration
- Allocation of responsibilities
- Governance
- Business models
- Target groups
- Service design
- Technical integration

### *Cross-sector collaboration*

Close cross-sector collaboration between public and private actors was deemed as necessary in the future process. A suggested method for steering the development in a joint direction was to develop a roadmap for MaaS in Sweden. In order to create joint visions and goals, all types of actors in the ecosystem, including end-users, should preferably be involved in such work. It was moreover voiced to be important that MaaS providers should be able to put demands on for instance the transport providers' data quality, including the PTO's.

Creating a new ecosystem, negotiating with transport providers, developing the technological solution, acquiring end users and changing behaviours were all said to be time-consuming activities. Thus, the PTO's suggested time plan was perceived as too short. A quick process might lead to fewer integrated transport services and a lower service quality in general at the start, which could set MaaS off on the wrong foot with potential end users. Thus, in the case of procurement, lengthy initiation phases and long contract periods were found to be vital. Long-duration contracts were moreover said to be beneficial for end users who invest in new travel behaviours. However, long contract periods were also identified as infeasible in relation to the current rapid technological changes and the instability of the transport market.

> *I think the proposal said there should be something ready in June next year, so in six months implementation time. I think you will have a hard time to get the contracts with all the different companies within six months. And you haven't started implementing anything. So that's one of the big risks uh, problems I see um in addition to what I said before. – Interviewee 1*

One of the utmost recurrent messages during the meetings was to start small and scale up incrementally and iteratively. Many urged the development of a core from existing products and to start with ensuring its quality. Additional functionalities and services could be piloted and added subsequently. However, many argued that scalability should be demanded both for steering towards the vision of substantial societal impact and for making the business case economically interesting. Moreover, the attendees believed that both national and international actors should be involved from the start. Still, it was also voiced as important to include local actors with knowledge of the local context and market.

*Allocation of roles and responsibilities*

The allocation of roles and responsibilities across the actors in the emerging ecosystem was an uncertain but major topic during the meetings. For instance, some believed that it would be a huge challenge to get public and private actors to agree on new common terms of agreement and that dominant actors within the existing ecosystem might be resistant to change. Nevertheless, the attendees described a situation where the development of MaaS is facing a crossroad, where the PTO can either choose to create a 'point-to-point network' (i.e. no integrator in the ecosystem, meaning that MaaS providers and transport providers have direct contact); a 'controlled system' (i.e. one single MaaS provider is allowed to resell PT tickets); or an 'open marketplace' (i.e. everyone that fulfils mandatory requirements can resell PT Tickets).

> *I'm not sure what it means, but in terms of responsibility sharing, I think that's something that has to be clear from the very beginning, who is responsible for what. – Interviewee 2*

Many attendees advocated openness, stating that the PTO should allow anyone to resell PT tickets. Their main arguments were that the PT tickets should be available for as many end users as possible and that a diversity of services is needed in order to meet end user requirements and to cater for an unpredictable future. Such organisations might also create better incentives for private transport providers to join a MaaS as they would get both access to several new sales channels and an opportunity to improve their own services via PT integration. It was also expressed as vital to be open to all transport providers. In sum, many attendees believed that the public sector should have an enabling rather than a managing role.

Contradicting the notion of openness, some argued that collaboration with a small set of transport providers to develop a joint MaaS offering is a prerequisite for fruitful development. Moreover, it was mentioned that many international PTOs do not want a third party between themselves and the end users since such an arrangement would result in them losing direct contact with the users. The attendees also stated that the actor who owns the end user interface and/or the business model rightfully owns the end user contact. Thus, referring to both business intelligence reasons and sustainability reasons, some declared that the PTO should aim to keep their current position, as their current role gives them an opportunity to control the development of MaaS towards sustainability. It was also expressed as unfortunate if the offer of sustainable travel options becomes dependent on certain private actors, as they will come and go, compared to public actors who are likely to remain.

> *Um, but we see, for instance, in Switzerland or in Dubai, uh, or in the US, that, uh, in most cases it is the interest of these transportation providers to actually retain, um, yeah, the closeness, the chemistry, whatever you want call it, with their travellers. – Interviewee 2*

Two particular types of responsibility that were frequently discussed during the meetings were support of and liability towards end users. The attendees agreed that end user support must be included in the service. Still, the views differed on whether or not a joint support function is vital and should be delivered by the MaaS provider. Transport providers might instead provide end user support related to their services. Similarly, views differed on who should be responsible when MaaS fails to deliver to end users, e.g. if a taxi ride is delayed so that the end user misses the bus. Some argued that MaaS providers want to be mobility providers and not mobility brokers. Hence, they should take responsibility for the entire trip. Yet, some pointed out that more expensive products, such as rental cars, could complicate such liability structures, again making it easier if each transport provider took care of their own part.

> *Should the poor customer centre in this mobility service handle these here? We are barely able to handle it here ourselves, with our stuff. And to have bicycles - And if you think this lot would also, would also take care of the rental bikes, trains that are delayed and should be rebooked, travel guarantees, public transport and taxis. No, it will never work, I think. You must have core competencies for each service. – Interviewee 7 (translated)*

### *Governance*

As mentioned above, many attendees asked for a roadmap for MaaS in Sweden, reasoning that it is key that actors share common visions and goals. Accordingly, although believing that the 'invisible hand of the market' would work in general, several attendees believed that a regulatory framework was needed, including incentives that navigate towards common goals. Identifying the right incentives for MaaS providers as well as developing feasible evaluation criteria were therefore described as important. For instance, the incentive model should see to that MaaS providers benefit from providing services that contribute to decreased car usage. However, many recommended steering towards sustainable habits through incentives, not through limiting service access. Thus, it was argued that the ecosystem should allow unsustainable choices, but penalize them by pricing each mode 'correctly'. The framework could furthermore regulate how end user data is used, who is eligible to resell PT tickets and make sure that services account for people with physical and cognitive disabilities. Moreover, when to promote PT and supplier neutrality were identified as two potential problem areas that the framework should deal with.

> *And I think that, also in the long run this type of system would need to be under control of the public, if political goals are first on the agenda. Um, because otherwise these business rules will change at some point of time to actually make the business more profitable, or profitable at all. – Interviewee 5*

Still, there might be a trade-off between control (of goals and direction) and diversity, level of service and ultimately attractiveness of joining the emerging ecosystem. Some attendees claimed that MaaS providers desire control over which transport providers to include and what ~~offerings~~ to offer. Thus, it was asserted that the PTO must release some control in order for MaaS to develop.

### *Business models*

To develop transparent and fair business models for MaaS might the 'impossible knot' of the development. In order to attain cross-side network effects (c.f. 34), the models must deliver value to PTOs and private transport providers as well as to MaaS providers. Additionally, other potential new types of actors such as integrators or facilitators must benefit. Still, since MaaS is a new and largely unproven phenomenon that is likely to disrupt the mobility ecosystem (35), none of the building blocks of the business model canvases (36) are certain. As a consequence, most attendees lacked related experiences and several struggled to present sharp business model proposals during the meetings. Still, the topic was frequently discussed and pointed out as important to address.

> *To get the business rolling and to make a good deal, you might need 50,000 households, or the equivalent, for instance business [travellers] that generate similar revenue, or what it may be. Uh, will that take one year or ten years? We have absolutely no idea. – Interviewee 6 (translated)*

The attendees disagreed on whether or not there was a viable business case for potential MaaS providers. Some did not believe so, drawing on small margins within the personal transport sector, large administration costs per sold ticket and that MaaS is not needed for planning and executing everyday trips and consequently is likely to miss the bulk of the mobility revenue. Moreover, they disputed that the end user demand is not proven. Others argued that the potential business in transforming private car users to shared mobility users is feasible, although acknowledging that large volumes are needed and that it is difficult to predict how fast a sufficient group of end users will be attained. To either request commissions from transport providers per sold ticket or to monetize on the additional value created through packaging were the two main trains of thought regarding revenue streams. However, autonomy to choose what transport services to include and access to new, flexible types of PT tickets were recognized as vital requirements in order to develop commercially competitive MaaS packages.

> *If you look at the travel industry, it is transactions you make money on, and a hell of a lot of transactions is needed in order to break even. – Interviewee 8 (translated)*

Quite a few of the attendees foresaw a role as technology provider (i.e. facilitator) or integrator. Many of them suggested that their business model in large would be based on a traditional procurement model, where the PTO simply financed the development and/or operation of the integration platform. It was also proposed that the platform could be reused and franchised, presenting an additional source of income for such actors. Moreover, they also envisioned chances to either take a share of the generated revenue or exploit the end user base, i.e. to sell access to the end user data.

> *Our idea is really that if we have this new platform, we can also use it in completely different fields of application. Um. We already have two, three new business ideas that we can build on this solution. At the same technical solution, and then it's Mobility as a Service, but then it's different target groups with different payment models. – Interviewee 9 (translated)*

Even though some argued that public funding was not needed, many stated that public investment is needed in order to decrease the business risk for MaaS providers. According to these attendees, some public entity, tentatively the PTO, should pay for and own the integration platform. If public money is not included, only inexperienced companies would be interested and their interest would be based on that they underestimate the complexity. Moreover, it was suggested that the PTOs are important marketing partners, that they need to subsidise any unprofitable services that they want to include in MaaS and that they possibly also should stimulate the emergence of new transport modes. The PTOs could ask MaaS providers to pay a commission for reselling PT tickets, but the leading belief was that their return of investment (ROI) should mainly stem from increased PT sales, not from MaaS per se.

According to most attendees, the main value for private transport providers in joining MaaS schemes is similar to what the PTOs are looking for, i.e. expanding their markets and selling more tickets. In search of that, some thought that private transport providers would probably be ready to trim or slightly change their business models if they felt confident that they would not be scammed. However, not all agreed:

> *If we knew that we [just had to] give away some margin to be included in one of these, we want to join for sure. …We cannot sit here with our arms folded; we don't want to join because we have zero percent margin. Just that we [would like to] know that it would remain that way, so that there will not become any big, yeah, colossus, like it has become with the rental cars, where large brokers just lay there, and watch [the market] with monetary eyes. – Interviewee 7 (translated)*

Regarding business risks, the main message during the meetings was that it must be shared across partners. Since the potential market is limited, the market penetration is uncertain and the time to ROI potentially long, the attendees were hesitant to say that their companies could take the whole investment. Furthermore, it was considered to be difficult for bigger companies to share the risk with start-ups as such companies might go bankrupt and disappear.

### *Target groups*

The attendees pointed out mixed mode users, who are not dependent on private car usage as the first and main target group for MaaS, i.e. current private car users that could manage the bulk of their travels with PT. However, an identified success factor for MaaS was to be viable for those who only use PT or currently use PT and want to extend their access to other transport services. Hence, the attendees believed that some end users will use cars more and others less, but that the net effect would be positive for society. Another identified success factor was to focus on future users, as they will have completely different demands for transport. Lastly, another viable target group was business travellers, where the main benefit was thought to be decreased administration costs.

> *First of all, when you lower the barriers to use public transport or to use mobility, it will help to reduce the ownership of cars, right? So they will, they will be less dependent from their car and they will be encouraged more to use the public transports. – Interviewee 5*

On one hand, some attendees argued that the price was not the detrimental factor for the main target group. Instead simplicity was seen as the attribute that will attract end users. On the other hand, other attendees claimed that saving time and money would be the two main drivers for adopting MaaS. Either way, it was commonly emphasized that everyday travel is not a hobby; nobody wakes up, wanting to be multimodal. Thus, MaaS must offer equal or better mobility 'insurance' compared to private cars.

> *I think it, the thing is that you can ensure, well, the guy, uh, when you use these applications of this MaaS service, uh, we can ensure that you're going to be able to fulfil all your mobility needs you have right now, but in the end, to a lower price. – Interviewee 4*

The foreseen target groups were believed to typically live in the outskirts of bigger cities. An initial focus on urban areas was also seen as needed in order to create a viable business model. Thus, an identified risk was that countryside dwellers might not benefit from MaaS, as discussed during the meetings.

> *One group of people who are living in the cities, and they are faced with daily problems of, the space is for example missing. It's nearly impossible to leave your car somewhere; it's very expensive and so forth …Which on the same way have the insight that it doesn't make sense to block the road with their own car, standing there for 23 and a half hours today, and just blocking space, um, I think is one main target group. – Interviewee 1*

### *Service design*

PT was described as the core component of MaaS. Thus, a recommended initial offering was to combine traditional PT, PT on demand, taxi and bike and car rental. National rail services, car-sharing, ferry, parking, home delivery, luggage pickup, commercial traffic and peer-to-peer mobility were some of the transport services that were suggested to be included in future offerings. Nevertheless, exclusive offers were believed to be the key for the attractiveness of MaaS, as merely including basic services could be a faulty tactic, even at an early stage.

Many attendees argued that the biggest value of MaaS would be increased access to and overview of the transport services. Some even implied that creating mobility packages was not that important and identified a risk that packages could become too specific, only appropriate for a selected few. Nonetheless, most believed that 'one-stop shops' and mobility packages could and should coexist. A recurrent recommendation was to first establish one-stop shop services, in order to learn what the end users desire prior to packaging offerings.

> *So far, it's very complicated to use all these different services, you need to have your own user account, you need to trust these different services, you need to put the payment options, you, you don't have an overview of your mobility cost if you divide that to ten different um, companies, maybe you get something by PayPal, something on your credit card invoice, also this type of control is, is gone. – Interviewee 1*

The attendees thought that extensive decision support was needed for the end users. Thus, a travel planner and visualization of real time data, including traffic disruption and division management were described as central modules. Moreover, MaaS could include support for social media sharing, direct contact with end users and facilitate comparison with private car costs. Cross-loyalty programs were also suggested, and it was pinpointed that the rewards should be transport related.

> *The range of services must be so interesting that, uh, that you actually want to use the app very, very often. And since this is an app we can communicate with our users much more direct nowadays. So we can give feedback on how much money you have saved already by carpooling or by leaving the car at home to ride the bus. – Interviewee 9 (translated)*

The payment solution was described as central to MaaS; it should be seamless and transparent. Drawing on simplicity, some attendees said that an aggregated invoice is preferable, while others argued against this since extra layers are costly and impede end user integrity. Aggregated invoices might also make the division of responsibilities more difficult, i.e. when the end user cannot pay.

Finally, the attendees had somewhat conflicting opinions regarding how MaaS should be branded. Existing PTO brands were perceived as trustworthy. The comfort of a known public actor was thought to be needed in the new complex MaaS world as it would guarantee that the services do not scam the end users. Moreover, a novel brand would require a lot of time and money in order to gain awareness. Still, many argued that a combination of introducing a new brand and keeping the transport providers' brands visible would be the most transparent and appropriate choice for the end users. In the end, the attendees thought that the brand question should be decided upon based on what is best for the end users.

*Technical integration*

A common view was that transport providers normally have poor technical back-ends, meaning that it is not easy to connect to their interfaces and retrieve desired information, e.g. ticket prices and real time information regarding service status. Although the interfaces are usually similar across similar types of businesses (e.g. car rental companies), the number of different standards was thought to hamper the forthcoming integration work; thus, the integration will probably take a lot of time. While some argued that harmonization would be needed in the long run and that this should be done using existing or evolving sector standards, others suggested that it would be quicker to adapt to transport providers' current practices. Nevertheless, the common interpretation was that the technological solution should be modular and scalable but not too specified in procurement. The large anticipated volume of requests was assumed to imply that platforms need to store knowledge locally in order to avoid long response times or even breakdowns. An offline solution is likewise needed to avoid excluding non-smart phone users and to cater for poor Internet reception.

> *I think in order to get this off the ground, it doesn't really matter what you write about technology. It will still become what it becomes. You may as well write whatever the heck you want, the technology will become the one that is the, uh, best [fit]. If one limits the technology in any way though, then there's a risk that it'll die, because you cannot use the best technology. So one should write quite little about technical limitations. – Interviewee 10 (translated)*

It was pointed out that some types of offerings such as rental services will be more difficult to integrate, as they are time dependent compared to when the price solely relies upon location. Nevertheless, some attendees argued that full integration of transport providers' services was not needed, at least not initially, as deep linking to other apps for payment was perceived to be an acceptable start.

The data was said to be the new oil, although frequently overrated. Thus, ownership of the end user data in MaaS was perceived as important. A lot of data will probably be generated from MaaS usage and it was considered important that the PTO get access to (and use) the data that concern the PT services. However, it was emphasized that the end user data also must be protected and that the true owners are the end users themselves. The Swedish implementation of the data protection directive (37) might furthermore be a hindrance to freely share end user data. Still, end users were generally perceived to be willing to share their data, if they understand what they gain from it.

## Concluding remarks and implications

In summary, creating the new MaaS ecosystem might not only take time and effort, extensive *cross-sector collaboration* will also be needed according to the attendees. To get MaaS development going, a roadmap with incremental steps and clear common goals is essential. The procurer should *govern* the development so it follows the depicted path but not rule with a rod of iron. Although not agreeing on how open the emerging ecosystem should be, the common message was that procurements have to ensure that *responsibilities* are fairly shared across involved actors. Furthermore, procurements must enable *business models* that are transparent and viable for all involved actors. Public funding might be needed to make that happen, and the increase in PT usage would be the main reward for such a public investment. The initial *target group* for MaaS probably live in the vicinity of bigger cities and use PT for the bulk of their travels, but little is known of their needs and demands for MaaS. Thus, procurements should also cater for a wide range of *service designs*, as a flora of services might be needed to cater for uncertainties. Lastly, procured *technical integrations* should build on existing products and be flexible and scalable.

When evaluating the knowledge attained during the RFI process, the PTO realized the conditions for the procurement were too vaguely described to receive clear answers to the questions they had posed. Therefore, they then authored a scenario document, which described their objectives of pursuing MaaS as well as a possible structure on which a future agreement might be based. This document was sent to the organizations that had participated in the individual meetings, with the following overarching question attached: Based on these conditions, do you see a viable business case? After reviewing the responses, the PTO decided that procurement through service concession with the aim of delivering a MaaS solution was not feasible at that point of time, due to high economic risks for bidders and high probabilities of unsound business models. Instead, the PTO started working on how to modify their offer and their role, in order to increase the attractiveness for private actors to enter the MaaS ecosystem.

In hindsight, the chosen procurement process was likely inappropriate for managing a situation where uncertainties were as high as in the described case, and where a majority of the actors involved (both procurer and bidders) did not have any substantial, previous experience in MaaS. For example, the bidders were supposed to combine the services from public and private organisations from both the transport sector and from other sectors such as IT. This would require the evolution of a new mobility ecosystem, which would disrupt current roles, relations and responsibilities. Moreover, requisite technologies were yet to be developed and neither organizational structures nor business models were undefined. Additionally, the end user needs and demands in relation to MaaS remain largely unexplored outside the Go:Smart pilot (24, 25). Hence, it was tremendously difficult for the PTO, in the role of procurer, to specify what a MaaS in West Sweden should be like, and what it would be worth, e.g. what societal value it would generate. Similarly, the potential bidders faced an incredibly difficult task when trying to anticipate how costly and difficult it would be to deliver MaaS, as envisioned by the PTO.

When uncertainty is high among both procurers and bidders, extant procurement literature recommends an adhocracy procurement structure, characterised by collaboration throughout the process, high levels of flexibility, low levels of formal rules and informal interpersonal relations, see Figure 2.

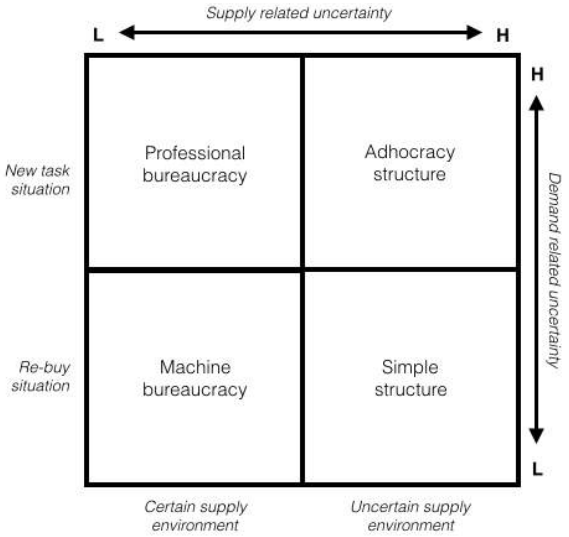


**Figure 2: Contingency factors for procurement, adopted from (38)**

This form of procurement, sometimes referred to as virtual networks, holds potential to offer local control and flexibility to reduce uncertainty in dynamic and heterogeneous environments, or when dealing with complex buying needs (39). Thus, based on the notion that the level of uncertainty seems to currently be high in MaaS in general, more collaborative public-private partnerships (PPPs) that facilitate experimenting, experience building and cross-sector communication and knowledge sharing seem to be needed to drive the development of viable and sustainable MaaS at this point in time.

**References**


1. Rode, P., Hoffmann, C., Kandt, J., Graff, A., & Smith, D. (2015). *Towards new urban mobility: the case of London and Berlin*. London: LSE Cities - The London School of Economics and Political Science.
2. Datson, J. (2016). *Mobility as a Service - Exploring the opportunity for mobility as a service in the uk*. Milton Keynes: Catapult Transport Systems.
3. Murphy, C. (2016). *Shared Mobility and the Transformation of Public Transit*. Prepared by the Shared-Use Mobility Center for the American Public Transport Association.
4. Burrows, A. (2016). *Journeys of the Future - Introducing Mobility as a Service*. Atkins.
5. Van Audenhove, F.-J., Korniichuk, O., Dauby, L., & Pourbaix, J. (2014). *The Future of Urban Mobility 2.0: Imperatives to Shape Extended Mobility Ecosystems of Tomorrow*. Arthur D. Little.
6. Van Nes, R. (2002). Design of multimodal transport networks. *Civil Engineering. Delft Technical University, Delft*, *304*.
7. UITP. (2016). *Public transport at the heart of the integrated urban mobility solution* (Policy brief). Brussels.
8. Hietanen, S. (2014). “Mobility as a Service” – the new transport model? *ITS & Transport Management Supplement. Eurotransport*, *12*(2), 2–4.
9. Heikkilä, S. (2014). *Mobility as a Service-A Proposal for Action for the Public Administration, Case Helsinki* (Master Thesis). Aalto: Aalto University.
10. Casey, T., & Valovirta, V. (n.d.). *Towards an open ecosystem model for smart mobility services* (VTT Technology No. 255). Helsinki: VTT.
11. Cohen, B., & Kietzmann, J. (2014). Ride on! Mobility business models for the sharing economy. *Organization & Environment*, *27*(3), 279–296.
12. Melzer, S. (2016). Integrated Affordable Mobility Solutions in a Smart Neighborhood. In *Integration of Nature and Technology for Smart Cities* (pp. 367–376). Springer.
13. Spickermann, A., Grienitz, V., & Heiko, A. (2014). Heading towards a multimodal city of the future?: Multi-stakeholder scenarios for urban mobility. *Technological Forecasting and Social Change*, *89*, 201–221.
14. Cerfontaine, C. (2011). Combined Mobility or offering citizens the possibility to live in their city without owning a car. *Public Transport International*, (2).
15. Spieser, K., Treleaven, K., Zhang, R., Frazzoli, E., Morton, D., & Pavone, M. (2014). Toward a systematic approach to the design and evaluation of automated mobility-on-demand systems: A case study in Singapore. In *Road Vehicle Automation* (pp. 229–245). Springer.
16. Kamargianni, M., Li, W., Matyas, M., & Schäfer, A. (2016). A critical review of new mobility services for urban transport. *Transportation Research Procedia*, *14*, 3294–3303.
17. Laurell, A. (2017). *Förarbete . Swedish Mobility Program (SMP)*. Samtrafiken.
18. Holmberg, P.-E., Collado, M., Sarasini, S., & Williander, M. (2016). Mobility as a Service-MaaS: Describing the framework. In *Tuesday, February 16, 2016*.
19. Batty, P., Palacin, R., & González-Gil, A. (2015). Challenges and opportunities in developing urban modal shift. *Travel Behaviour and Society*, *2*(2), 109–123.
20. König, D., Sochor, J. L., & Eckhardt, J. (2016). State-of-the-art survey on stakeholders’ expectations for Mobility-as-a-Service (MaaS)–highlights from Europe. In *11th European Congress on Intelligent Transportation Systems, Glasgow, June 6-9, 2016*.
21. Tsay, S., & Accuardi, Z. (2016). *Private Mobility, Public Interest - How public agencies can work with emerging mobility providers*. New York: Transitcenter.
22. Edquist, C., Hommen, L., & Tsipouri, L. (2000). Introduction. In *Public Technology Procurement and Innovation* (pp. 1–4). Springer.
23. Karlsson, M., Arby, H., Billger, M., Holmberg, P.-E., Kuschel, M., Strömdahl, A., & Vennersten, S. (2013). GO Smart: An innovative solution to the seamless journey. In *Nationella konferensen i transportforskning, 22-23 oktober, 2013, Göteborg*.
24. Sochor, J., Strömberg, H., & Karlsson, I. M. (2015). Implementing mobility as a service: challenges in integrating user, commercial, and societal perspectives. *Transportation Research Record: Journal of the Transportation Research Board*, (2536), 1–9.

25. Sochor, J., Karlsson, I. M., & Strömberg, H. (2016). Trying Out Mobility as a Service: Experiences from a Field Trial and Implications for Understanding Demand. *Transportation Research Record: Journal of the Transportation Research Board*, (2542), 57–64.
26. Bokeberg, U. (2014). *Leveransmodell för kombinerad mobilitetstjänst: Tjänsteutlåtande till kollektivtrafiknämnden*. Västra Götalandsregionen - Kollektivtrafiksekreteriatet.
27. Frey, S. (2014). *Protokoll från Kollektivtrafiknämnden, 2014-12-04*. Västra Götalandsregionen - Kollektivtrafiknämnden.
28. Karlberg, L. (2016). *Invitation to a Request for Information (RFI) in relation to combined mobility*. Västtrafik.
29. Spradley, J.P. (1980) *Participant Observation*. Fort Worth: Holt, Rinehart and Winston, Inc, 1980, in Baker, L. (2006)
30. Baker, L. (2006). Observation: A complex research method. *Library trends*, *55*(1), 171–189.
31. Charmaz, K. (2006). *Constructing grounded theory: A practical guide through qualitative analysis (Introducing Qualitative Methods Series)*.
32. Longhurst, R. (2003). Semi-structured interviews and focus groups. *Key methods in geography*, 117–132.
33. Tongco, M. D. C. (2007). Purposive sampling as a tool for informant selection. *Ethnobotany Research & Applications*, (5), 147–158.
34. Eisenmann, T., Parker, G., & Van Alstyne, M. W. (2006). Strategies for two-sided markets. *Harvard business review*, *84*(10), 92.
35. Freese, C., Schönberg, A. T., & Horstkötter, D. (2014). SHARED MOBILITY How new businesses are rewriting the rules of the private transportation game. *Roland Berger Strategy Consultants, München*.
36. Osterwalder, A., & Pigneur, Y. (2010). *Business model generation: a handbook for visionaries, game changers, and challengers*. John Wiley & Sons.
37. Personuppgiftslagen, D. (n.d.). *Public Law. No. SFS 1998: 204 (1998)*.
38. Bakker, E., Walker, H., & Harland, C. (2006). Organizing for collaborative procurement: An initial conceptual framework. *Advancing Public Procurement: Practices, Innovation and Knowledge-Sharing. Academic Press, Boca Raton, FL*, 14–44.
39. Bakker, E., Walker, H., Schotanus, F., & Harland, C. (2008). Choosing an organisational form: the case of collaborative procurement initiatives. *International journal of procurement management*, *1*(3), 297–317.