Regulation and Governance Supporting Systemic MaaS Innovations – Towards Innovation Platforms

TEEMU JUHANI SURAKKA* & TERO JUKKA HAAHTELA Aalto University, Finland // teemu.surakka@aalto.fi
FABIAN HÄRRI & TOBIAS MICHL Zurich University of Applied Sciences, Switzerland
ANNE KRISTIINA HORILA Growth Corridor Finland, Finland

Abstract

Mobility as a Service (MaaS) is an example of a systemic innovation, where sustainable mobility services addressing different customers’ transport needs are integrated with traveler information and ticketing/payment services. In our current research project, ENSCC Smart Commuting, we have examined how the differences in national regulation, stakeholder processes, and geographical characteristics have resulted in different approaches to regional governance when supporting different sustainable mobility solutions.

Public-Private-People-Partnership processes and clearly defined roles are essential when supporting systemic innovations. Growth Corridor Finland (GCF), a collaboration network comprising municipalities, ministries, chambers of commerce and private companies of the region, uses a common vision process and quick experiments to find out the optimal solutions for regional needs. There are several similar collaboration networks in the Basel metropolitan area such as Agglo Basel and the Trinational Eurodistrict Basel. These Swiss networks integrate the interests of more than 80 municipalities/cities and their thematic focuses include transportation and spatial planning.

In the field of transportation, these networks aim at promoting cross-regional mobility solutions and becoming innovation platforms for new smart and sustainable mobility solutions. The purpose of this paper is to describe the experiences of different stakeholders from this collaboration and how these formal collaboration networks could enhance stakeholder participation when progressing with their aims.

KEYWORDS Governance, Stakeholders, Transportation, Collaboration platforms, Case study

1. Introduction

We are currently experiencing a transition in how people conceive the need of owning a car or what is public transport. Especially the development of open data and mobile information platforms are changing the way consumers perceive public transport services (ITF, 2015). For example, the rising popularity of car-sharing (Shaheen & Cohen, 2016) in Europe has added real options for customers in supplementing mass transit services. These new services are enabled and powered by a variety of societal, economic, technological and consumer-related trends, such as urbanization, congestion in large cities, and environmental issues of traffic (e.g., Tinnilä & Kallio, 2015).

The role of regional authorities is also viewed differently in this transition. Some regions and countries in Europe emphasize the policy objectives of public transport authorities such as economic growth, space optimization, aesthetic impacts, congestion, social inclusion, and citizen well being (e.g., Polis, 2017). Others see private mobility service operators and Mobility as a Service (MaaS) offers as a vital part of accessibility and connectivity in the regions facing economic austerity (e.g., MaaS Alliance, 2017). Both of these viewpoints call for transparency and broad stakeholder participation in the development of the transportation
ecosystems. Formal collaboration networks can help with aligning these different objectives, make cross-regional mobility solutions possible, and promote smart and sustainable mobility innovations.

In our current research project, ENSCC Smart Commuting, we are looking into the mobility needs and mobility behavior of workers since mobile workers and commuters usually are the first customer segment to whom tailored mobility services and mobility as a service are offered. We have used sociotechnical analysis to describe the context of this technological and behavioral transition. The differences for example in national regulation, stakeholder processes, and geographical characteristics have also resulted in different approaches to regional governance of transportation systems. The aim of our recent survey and the purpose of this paper is to describe the various viewpoints of stakeholders and how collaboration networks could align these views. Our analysis of the sociotechnical regimes in Finland and Switzerland are discussed after this introductory chapter in Chapter 2 and our survey to stakeholders is presented in Chapters 3 and 4. Our paper ends with conclusions and recommendations for transparent stakeholder participation in the development of sustainable mobility solutions.

**Mobility as a Service (MaaS)**

From the viewpoint of single transport operator, new mobility services can be seen as competing offering, but many of the regional transport authorities are already considering the sustainability of the whole public transportation system. While the role of cities and regional transport authorities in this transition is under debate, the consensus is that these innovative services are needed to supplement traditional public transport services in this technological and behavioral transition. Mobility as a Service (MaaS) is one example of these emerging services. From a customer perspective, MaaS increases the transportation alternatives and modes available to them, as well as new digital services for effective and efficient planning and use of these various travel opportunities. In the long run, MaaS may also have impacts on city planning, land use, the role of public organizations and welfare of citizens. For this reason, this new concept has gained growing interest among all the stakeholders: consumers, politicians, academia, transport operators, software developers, etc.

Private MaaS companies are currently starting their operations in urban areas with larger customer bases, but demand-responsive transport is also seen as one of the key options to meet public transport challenges in rural areas (ITF, 2015; Hazan et al., 2016). Regions and countries with strong natural transportation monopolies see similar increase in mobility services, but usually, they are part of the service offering of these natural monopolies. Regardless of the organization of these new services, MaaS in this paper is used to describe the change from mobility as self-service and independent development of different transportation modes to a genuinely integrated mobility made possible by new digital services.

**Institutional change and socio-technical regimes**

Mobility as a Service is an institutional, and systemic change in mobility, transforming both customer experience and utilization of physical resources. By institutional we mean that it requires changes in institutions, which “are the rules of the game in society, or more formally, are the humanly devised constraints that shape human interaction” (North, 1990). Systemic refers to a paradigm shift, with an emphasis on the interrelationships and interdependencies among the parts of the system.

To understand the underlying changing factors in institutional change, Kingston and Caballero (2009) compared a variety of theoretical approaches to conceptualizing institutional change. One of the identified
factors affecting change is the role of politics and collective action, which makes this work essential for our empirical paper. Kingston and Caballero (2009) also list the role exogenous (formal or informal) influences, endogenous processes, path dependence, the pace of change, and bounded rationality of the actors as influencing factors. In our analysis, we have used the socio-technical system (Geels, 2004) to illustrate the exogenous forces operating in the system, the path dependence of institutional change and the pace of change. This approach has allowed us to focus on the endogenous processes such as politics and collective action and the bounded rationality of actors due to communication challenges in our recent survey.

The role of innovation platforms

There is empirical evidence of the importance of stakeholder participation when implementing systemic innovations to different contexts. For instance, Schaffers and Turkama (2012) explore the transferability of systemic innovations in home care and independent living, energy efficiency, manufacturing networks and citizen participation. According to their findings, living labs approach can be used for cases that call for user-behavior transformation or business-model innovation. Living labs are by nature local, addressing the needs of specific demographics and developing suitable solutions to these requirements. And while different MaaS offerings have also so far been local, or at most connecting separated islands of urban mobility (cities) to the same offering, Kulmala and Tuominen (2015) points out that a highly efficient and productive transportation system is an essential part of regional competitiveness, overall economy and people’s quality of life. This aim enlarges both the context and stakeholder network (Figure 5) of sustainable mobility services beyond the scope of traditional living labs.

On the level of single modes, such as car sharing services, there are already established global enterprises from the car rental and car manufacturing industry that are looking for the bigger picture. With MaaS, we may witness the first nationwide offering to surface this year in Switzerland (PostBus, 2017). Interest groups, such as MaaS Alliance, aimed at developing standards, shared principles, and European wide approach to MaaS. The question remains what is the best way to align the different interests and ensure transparent stakeholder participation in the regional and national levels, which are natural extensions of the urban pilots of today?

Based on our earlier experience on innovation platforms (e.g., Malinen & Haahtela, 2010) we chose to do comparative analysis on the regional collaboration in Switzerland and Finland. The collaboration networks in these regions (Trinationaler Eurodistrict Basel and Growth Corridor Finland) share the principles of openness and inclusivity, meaning that they are open to all service providers and inclusive for all kind of users, but there are clear differences in the governance of transport systems (Chapter 2) and the role of regional transportation authorities in these two countries/regions. These networks have a history in spatial planning, transportation system development and ensuring the economic vitality of the region, but there are definite indications that supporting innovations in these thematic areas are becoming an essential task of these networks.

One of the reasons for the importance of this task is that accessibility and connectivity in regions is an environment that is fragmented and hostile to innovation. The governance styles and transportation subsidies in different independent municipalities do not allow market players to compete and establish business models that bring demand and supply into a natural balance. Thus, according to Arthur D. Little’s Future Lab (Van Audenhove et al., 2014) what is needed is a regional-level collaboration between all stakeholders of the mobility ecosystem to support innovative and integrated business models. As the lack of synergies between
isolated MaaS pilots leads to a sub-optimal outcome regarding mobility performance, there is a need for innovation platforms that integrate different mobility systems while ensuring that new solutions are adapted to local contexts.

With this latest task of regions and countries, tight regulation may not be the best starting point. The experimental economy needs speed, flexibility and positive attitude toward new initiatives, even if they might affect some traditional business areas negatively. To exploit the opportunities connected to servitization of mobility, public authorities should create an innovative environment (Finnish Transport Agency, 2015) regardless of the governance style in the region.

2. Socio-technical regimes

We use in-depth case comparison between different concrete contexts of action and interaction and interests of real actors involved. By context, we mean the socio-technical regimes in Switzerland and Finland. Specifically, we have examined how legislation, governance styles, and technology development influence different systemic innovations in these countries.

Finland

Finland has a two-level administration: national and municipality level, and the legislation is the same everywhere. As parliament and town councils change every four years after the elections, different topics in transportation become prominent and get funding. On the other hand, many issues and decisions in transportation become topical because of current EU directives and their preparation.

Several overlapping policies and legislation changes guide the changes in Finnish transport sector. These legislation reforms are such that are supposed to progress regardless of the government and dictate the development in transport sector during forthcoming years. Currently, the three most influential Finnish policies and legislation changes for MaaS are:

1. Climate strategy: Finland’s goal is to reduce greenhouse gas emissions 80–95% compared to 1990 levels by 2050. The role of the transport sector in reducing emissions is highlighted in the new the National Energy and Climate Strategy (Ministry of Economic Affairs and Employment, 2017) as road transport produces 90% of the greenhouse gas emissions of domestic transport and reducing emissions in other sectors are relatively complicated. According to the strategy, this reduction in emissions is achieved by the proliferation of electric cars, biofuels, and sustainable MaaS solutions.

2. New transport code (in act 1.8.2018) aims at responding better to the needs of transport users through enabling digitalization and new transport services. The objective of this reform is to promote the creation of new service models, ease market entrance, dismantle national regulation that limits competition and reduce the level of public guidance.

3. Legislation reform for Finnish Road Traffic Act aims for better alignment with EU legislation, increase road safety, and cover autonomous vehicles and new types of lightweight vehicles in the new act.

The major players in national level related to mobility are Ministry of Transports and Communications, Finnish Transport Agency and Finnish Transport and Safety Agency. The Ministry of Transport and Communications is in charge of implementing the intelligent transport strategy and is responsible for allocating sufficient resources to it within the transport administration sector. The Finnish Transport Agency is in charge of 1)
ensuring the availability of services in major urban areas and 2) continuity across administrative boundaries, as well as 3) responsible for the overall intelligent transport architecture.

Cities and municipalities are responsible for organizing local public transport services in Finland. However, only certain school and social welfare transports are legally mandatory to organize everywhere. This means, in practice, that only the largest cities have excellent public transport services while the service level in rural areas is not that good, and a private car is by far the most common mode of transport in these areas. The larger cities are also drivers for most of the development in public transportation, as smaller municipalities do not have enough resources for the development.

With so many different public authorities tendering or organizing local public transportation, the transport operators and companies in Finland mainly have incompatible IT systems. However, Finnish Transport Agency is opening all the data it produces, and the new transport code includes measures for support open data and interoperability. These steps include making interoperability through API’s a criterion for public procurement. However, before these changes are in effect, organizing public transportation especially in rural areas remains to be a challenge with continuously diminishing population and passenger numbers, and difficulties in combining the legally mandatory transport services more sustainably.

GROWTH CORRIDOR FINLAND (GCF)

As a geographical area, Growth Corridor Finland stretches from Helsinki to Hämeenlinna, Tampere and Seinäjoki region as a string of cities. Economically, it forms the forefront basis of national competitiveness; more than 50% of Finland’s GDP is produced in this area. Growth Corridor Finland is also the biggest pool of workforce in Finland with more than 300 000 daily commuters. The distances between the urban areas are long and compared to urban areas in central Europe, the population density is low outside capital region of Finland (Figure 1).
As a collaboration network, the Growth Corridor Finland comprising of over 20 cities and municipalities of the region, three regional councils, four chambers of commerce, four ministries and the Federation of Finnish Enterprises. The development of new transport services and MaaS concepts are essential to GCF and Finland. For GCF these new mobility services are an important part of the accessibility, attractiveness, and vitality of the whole region. One of the objectives of the collaboration network in Growth Corridor Finland is to become the leading experimental platform on intelligent transport services and systems in Northern Europe. On a national level, the Ministry of Transport and Communications in Finland has pointed out in its press release (Ministry of Transport and Communications, 2017) that Finland’s greatest opportunities lie in the quick and comprehensive adoption of technological solutions being created globally.
Figure 2: The most recent mobility services implemented by private companies in Growth Corridor Finland. Picture copyright Growth Corridor Finland. Picture used and modified with permission.
Switzerland

Switzerland is a welfare country with high-quality infrastructure and public transport. Traditionally Switzerland has invested into a high-quality railroad service, and as a result, the number of kilometers traveled per inhabitant in a year on rails – around 2500 km – is highest in the World. The total length of the railway network is more than 5000 km, and the highway network is significant with more than 1800 km of highways. Given the population (8.5 million) and the area (41 000 km2) of the country, these transport infrastructure numbers are impressive.

Switzerland’s history and the system of government are entirely different compared to other western countries as it is a confederation, where cantons, districts, and municipalities have relatively more power in contrast to the Federal Government. Tasks, which do not expressly fall within the responsibilities of the Federal Government, are handled at the next level, i.e., by the Cantons. Therefore, different kinds of transport services can be legal or illegal in various parts of the country. Also, since Switzerland is not part of the EU, it also has more leeway in legislation.

One of the seven departments of Federal Government is Federal Department of Environment Transport, Energy, and Communications (DETEC). The Federal Government has set DETEC a primary task to “assure the sustainable provision of primary services in Switzerland … to meet present requirements for infrastructures and at the same time to secure for future generations the chances of an intact environment” (Federal Department of the Environment, Transport, Energy and Communications, 2017). While Cantons have most of the legal power in transportation, DETEC, by its decisions and support to natural monopolies in Switzerland (e.g., Swiss Federal Railways and PostBus) has had an influential role in the development of the Swiss public transport.

Of the Swiss population, around five million people live in the five most significant city regions: Zurich, Geneva, Basel, Bern, and Lausanne. All these city regions have high-quality public transport systems with undergrounds, trams, buses and local trains as well as several different last-mile mobility solutions including different car sharing service models, city bikes and excellent cycling possibilities with ride’n’park facilities. Outside these city regions, Swiss Federal Railways and PostBus take care of the long-distance transportation and accessibility of rural areas. These two transportation companies connect the whole country by a ‘clockface’ timetable approach. This approach means that every single public transport system and service is synchronized according to the railway schedules – and working like a Swiss clock.

From the perspective of new transportation services, this Swiss approach to organizing public transportation is a double-edged sword. It is possible to do different short-term demonstrations as most of the 26 cantons have resources and willingness to try various new services. The downside is that countrywide solutions require a lot of resources, especially for small startups, when all the different rules need to be analyzed and negotiated with each of the Cantons. Also, changes in legislation in one single canton can endanger the countrywide service promise.

However, the single most significant challenge for new transportation services to establish themselves in Switzerland is the subsidized and already existing high-quality public transport. Cooperation with different stakeholders is challenging, as the federal and local natural monopolies have the opportunity to restrict the use of their resources (infrastructure, timetables, booking systems, IT, etc.). As a result, a pragmatic way to establish a new transport service in Switzerland is to a) sell the concept to some of the large cities (for
city-related services) or b) to cooperate with either Swiss Federal Railways or PostBus, and hope that these companies incorporate the service as a part of their countrywide service portfolio.

**TRINATIONAL EURODISTRICT BASEL (TEB)**

One of the collaboration networks in Basel-travel-to-work area is TEB or the Trinational Eurodistrict Basel, which is a joint spatial and transportation system planning organization consisting many of the municipalities, cities and regional authorities in the region (Figure 3). The population density, the size of municipalities around Basel city and the network of railway lines differ quite much from the situation in Growth Corridor Finland. Although some people commute across country borders on their way to Basel, designing efficient transportation infrastructure in and around a dense metropolitan area is more straightforward task than in Growth Corridor Finland. However, since Switzerland is not part of the EU and it does not have the same rules regarding public procurement, the development and operation of public transportation in this region require shared vision and collaboration organizations such as TEB.

![Figure 3: Population density (municipalities not participating in TEB are white) and railway lines in Basel travel-to-work area. Thickened lines are the country (France - Germany - Switzerland) borders in the region. Picture copyright Aalto University.](image)

One of the tools used in the Basel metropolitan area is pendlerfonds, which promotes projects that help to reduce the parking pressure on the city center and facilitates public transport by constructing park-and-ride and bike-and-ride facilities in the neighborhood (Figure 4). The funds for these projects comes from the gross income from commuter and visitor parking tickets in the Basel city.
3. Survey

To deepen our understanding of the transformation potential of mobility innovations, the perceptions of different stakeholders were surveyed in both of our study areas. Before the survey, various stakeholder categories (Table 1) were identified by analyzing the stakeholder network of the Basel metropolitan area. This network was constructed by mapping the participants of 61 different stakeholder processes such as pilot projects, strategy development groups, academic projects, infrastructure projects, etc. in the theme of mobility and commuting. Altogether 268 stakeholders were identified this way (of which 210 could be contacted for the survey). In Basel area, also the connections between stakeholders during these processes were mapped to understand their overall embeddedness in the formal stakeholder network (Figure 5).
Figure 5: Stakeholder network of the Basel metropolitan area
Table 1: Stakeholder categories used in the survey analysis

<table>
<thead>
<tr>
<th>Category group</th>
<th>Category</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Administration</td>
<td>Public administration</td>
<td>Four different sub-levels were distinguished here: National Canton/Bundesland/Département/County Regional Municipal</td>
</tr>
<tr>
<td></td>
<td>Regional cooperation</td>
<td>Publicly funded platforms/organizations which focus on cooperation on a regional level (e.g. TEB)</td>
</tr>
<tr>
<td></td>
<td>platform</td>
<td></td>
</tr>
<tr>
<td>Associations &amp; NGO</td>
<td>Chamber of Commerce</td>
<td>Chambers of commerce as representatives of businesses</td>
</tr>
<tr>
<td></td>
<td>Citizen group</td>
<td>Interest groups representing citizens, often based in a certain city quarter</td>
</tr>
<tr>
<td></td>
<td>NGO and lobby</td>
<td>Non-governmental organizations and lobbying groups, often legal associations or foundations, who promote and support specific development directions</td>
</tr>
<tr>
<td>Industry</td>
<td>Company / industry</td>
<td>Industry representatives or companies which don’t offer mobility services (see “Transport company” below)</td>
</tr>
<tr>
<td>Planning &amp; Research</td>
<td>Consulting and planning</td>
<td>Private research, engineering, consulting and planning offices</td>
</tr>
<tr>
<td></td>
<td>Research institution</td>
<td>Public research institutes (e.g. universities)</td>
</tr>
<tr>
<td>Political party</td>
<td>Political party</td>
<td>Political parties</td>
</tr>
<tr>
<td>Transport company</td>
<td>Public transport company</td>
<td>Local providers of public transport</td>
</tr>
<tr>
<td></td>
<td>local</td>
<td></td>
</tr>
<tr>
<td></td>
<td>national</td>
<td>Provider of public transport on a national level, e.g. national railway company</td>
</tr>
<tr>
<td></td>
<td>regional</td>
<td>Provider of public transport on a regional level</td>
</tr>
<tr>
<td></td>
<td>Transport association</td>
<td>Consortium of different public transport operators providing homogenous services</td>
</tr>
<tr>
<td></td>
<td>Transport company</td>
<td>Providers of transportation services such as taxi, car sharing, bike sharing etc.</td>
</tr>
<tr>
<td></td>
<td>(other)</td>
<td></td>
</tr>
</tbody>
</table>

The Finnish sample was collected similarly with 130 stakeholder representatives identified from the participants of public stakeholder processes such as pilot projects, strategy development groups, and infrastructure projects done in the Growth Corridor Finland region during the past five years. These 130 representatives were supplemented with 70 stakeholders looking mobility and commuting on a national level to have survey responses from all the identified stakeholder categories from Finland as well.

With 99 completed questionnaires, the overall response rate was 24.1%. Whereas the samples do not claim to be representative for absolute quantitative evidence, the survey still points out differences in perceptions and attitudes according to stakeholder groups as well as to the two different sociotechnical contexts.
Based on previous expert workshops organized in our research project, we chose the following themes to be covered by the survey:

- Stakeholders’ experiences in cooperation processes,
- Stakeholders’ perception of the supporting factors and challenges/barriers in implementing mobility innovations,
- Stakeholders’ general attitudes towards certain mobility innovations, and
- Stakeholders’ potential active roles in the ongoing development and implementation of MaaS offerings.

4. Results

Stakeholders’ attitude towards MaaS

In the first section of the survey, participants were surveyed regarding their general attitude towards MaaS. What became apparent is that all stakeholders without any exceptions see MaaS concepts either neutral or positive development in transportation. In Finland, more than half of all stakeholders state that they actively support MaaS (Figure 6), around 30% approve it and about 10% are neutral towards this new concept in mobility. In Switzerland, the attitude towards MaaS is also favorable, yet less enthusiastic than in Finland: around 30% of Swiss Stakeholders are actively in favor of MaaS, about 40% approve it, and approximately 30% are neutral.

When looking at the responses between stakeholder category groups, the results differentiate a bit more. Especially “Industry” representatives show a significant acceptance for MaaS. This may be because innovations can create new markets and make room for new business models from which these industry-actors would benefit even though they do not offer transportation services themselves. In contrast, stakeholders in the category “Administration” and “Associations and NGOs” show below-average enthusiasm compared to other stakeholders.

The stakeholders were also surveyed regarding two specific aspects regarding their opinion towards MaaS. First, whether they see MaaS as important for their own (business) activities, and second, if they see MaaS as relevant for the future commuting and mobility in general. It became apparent that the overall positive attitude
and openness towards MaaS persists in these situations, especially regarding stakeholders’ opinion that MaaS will be relevant for future commuting schemes (Figure 7). The results are very similar in Switzerland and Finland, and in both countries over 35% of stakeholder consider MaaS a mobility offer, which will become very relevant for future commuting schemes.

In contrast, the estimations regarding relevance for stakeholders’ activities differ between the two countries. In Switzerland, a higher share of stakeholders (around 33%, see Figure 7) consider MaaS to be very relevant for their own (business) activities. In Finland, this share is lower (14.5%). However, over 40% of the Finnish stakeholders state that MaaS is “rather relevant” for them. Only 18.2% chose this category in Switzerland.

![Figure 7: Relevance of MaaS for future commuting schemes in general (left) and for stakeholders’ own activities (right).](image)

When presenting these two factors in one diagram (Figure 8), it becomes apparent that Finnish stakeholders rate MaaS more relevant for future commuting schemes than for their activities in commuting. In Switzerland, the results are more evenly distributed: those stakeholders considering MaaS important for commuting see it also more important for their activities and vice-versa. This could indicate that Finnish stakeholders act and think more based on promoting systemic innovations than on their immediate interests.
Figure 8: Perceived relevance of MaaS for future commuting and for stakeholder’s own activities in commuting.

Supporting factors and barriers

To create successful innovation platforms, it is necessary to have a profound knowledge of which frame conditions are considered supporting a technological implementation or whether they are currently considered as challenges. Therefore, the survey respondents were asked to what extent they think certain frame conditions to be supportive factors, assuming that these conditions are satisfied. At the same time, they had to evaluate, if these conditions are still challenges or not. These results are evaluated together in one diagram (Figure 9).

The consolidated analysis revealed that especially the factor “state of technology development” is considered being an essential part of implementing new technologies. If the technology is not developed enough, the innovation cannot be fully exploited. Correspondingly, a working proof of concept is seen as an influential supporting factor.
Interestingly, the factor that is considered being the least supportive is “economic viability”. This may be an indication that stakeholders could envision making investments in new technologies, even if their return on investment is not yet known.

Currently, the respondents are considering all queried factors still as challenges, however, generally on a low level. The factor “policy and legislation” is rated as the factor representing the most significant obstruction for implementing new technologies. The stakeholders also state that the collaboration and communication with other stakeholders do not present a considerable challenge. This may be because stakeholders could imagine implementing innovations on their own, or that collaboration between stakeholders is expected to be easy. To dig in more in-depth on this issue, we asked respondents to tell us positive and negative experiences from this collaboration using open text fields.
Positive and negative experiences from collaboration

The most significant finding in the Finnish survey data is the enthusiasm showed towards new mobility solutions and cooperation. This enthusiasm was the most common description that respondents gave as an answer to the open question about their positive experiences during collaboration process. The respondents also stated that Finland is a relatively small country where different stakeholders know each other. Common to Finnish stakeholders is also their willingness to cooperate, and they perceive that essential themes and development activities have been recognized during these collaborations. This shared vision is considered to create a good background for the forthcoming change. The cooperation experiences between different stakeholders are mostly positive.

On the downside, Finnish respondents are of the opinion that some changes happen quite slowly. There are also some stakeholders who are more conservative than others; the difference between forerunners and laggards is perceived to be significant. For example, some of the stakeholders state that cooperation with Finnish natural monopolies in transport is not fluent enough. Overall, according to the survey answers, there are various opinions and ideological differences about what should be the role of the public sector in this paradigm change. Furthermore, the interests and needs of the large cities and smaller municipalities are not fully aligned.

According to stakeholders in Basel region, the interest towards new mobility solutions and cooperation has increased significantly. Most stakeholders understand the need for change and the attitudes are in favor for more environmentally friendly alternatives. As a positive result of collaboration, quality of life was mentioned, and the respondents appreciated the promotion of active modes of transport (riding a bike, walking, etc.). One of the positive experiences also mentioned was the fact that stakeholders and companies from different modes of transport want to cooperate, share knowledge and learn together from each other. In Switzerland, even the most significant natural monopoly companies, such as Swiss Federal Railways, have also shown their commitment to knowledge sharing and cooperation.

There are still particular challenges and negative experiences in Basel region also. For example, some influential lobbyist (e.g., automotive associations) are very much focused on sustaining their power and are very conservative regarding new mobility innovations. Also, and maybe typical for Basel region only, there are considerable differences between the development cultures in different countries. Some stakeholders in Basel region are more cautious and slower in adapting and implementing new ideas. For example, attitude towards (organizational) mobility management is not so positive in some of the countries in the region.

Means for motivating stakeholders to participate in MaaS

In the third section of the survey, participants were asked what motivating factors could encourage them to participate in the development and implementation of MaaS offerings. Generally speaking, Finnish stakeholders see more possible factors as motivating than the Swiss stakeholders (Figure 10). This result raises the question if in Finland stakeholder are more motivated and open to being actively involved in MaaS. The only aspects that are considered to be more motivating by Swiss stakeholders are “environmental benefits” (highest share of all items over both countries) and “market-readiness”.
This result supports the earlier argument that Swiss stakeholders are more conservative than the Finnish stakeholders and/or that MaaS is not seen as a separate offering from the well developed public transportation in Switzerland. Generally speaking, essential motivations for stakeholders are compatibility with their strategies, as well as with the existing mobility offers. Besides, economic considerations seem to be important, especially the possibility to gain new customers and being a first mover; however only when the commercial viability is given. This is rather interesting, as the aspect of economic feasibility was not given much consideration in the previous section of the survey. Therefore, it can be concluded that stakeholder viewpoints are not without contradiction and some aspects become relevant only when own interests are on the line.

Another goal of the stakeholder survey was to find out what active roles could the stakeholders imagine for themselves in contributing a MaaS implementation. In our country comparison, the same is valid as for the motivating factors: the share of stakeholders who can imagine a role for themselves in the implementation of a MaaS offering is considerably higher for the Finnish ones. Also, the percentage of “None” is double the size in Switzerland than in Finland (Figure 11).
However, even in Switzerland, more than 80% of all stakeholders could imagine an active contribution. This result reveals the potential regarding the resources that stakeholders are theoretically willing to provide to the implementation of MaaS - under certain conditions.

The only active role that more Swiss stakeholders could imagine for themselves compared to Finnish counterparts is lobbying. This supports the thesis that Swiss stakeholders are conservative and only prepare for disruptive innovations, yet they do not support it through becoming genuinely active themselves. However, the share of those who can imagine themselves as service providers within a MaaS ecosystem is equal between Switzerland and Finland. A further analysis between stakeholder categories revealed that especially public transport companies could imagine that role in both countries.

**Conclusions**

The results of our survey reveal that one of the pre-conditions for a successful MaaS implementation seems to be fulfilled already: the general acceptance towards this systemic innovation is very favorable among decision makers and market actors. Also, the questioned stakeholders assume, that MaaS will play a rather important role for future mobility systems. However, there are considerable differences in the stakeholder processes stemming from the cultural and legislative contexts of the regions and the historical development of the collaboration platforms in these two countries.

As an example, PostBus as a subsidiary of the Swiss Post operates in the regional and rural areas of Switzerland and has 869 different routes and 2193 buses making it one of the natural monopolies in Switzerland. Currently, the company is actively developing or acquiring new types of services into its portfolio. In July, the company launched a new smartphone app that combines practically every public transport operator in Switzerland to the same service. Within the application, a customer can use the timetable display to purchase electronic tickets for almost all fare networks, including also mountain railways and cable cars. Later this year, the application will get more features. It will become a country-wide full-featured multi-modal route
planner. In addition to public transport, these will also include taxi services, bicycle and walking routes, private transport and sharing services. Thus, despite very independent cantons in Switzerland, we see public transportation mainly developed under a strong national planning paradigm, with national transportation monopolies setting the pace and more dynamic last-mile solutions serving the regional and local needs. Opinions have been raised that transportation provision could be offered more efficiently in Switzerland and this is mainly because these natural monopolies are not that transparent with the use of their resources.

There is also considerable path-dependency in the development of Swiss public transportation, and social innovations have been mainly witnessed inside single Cantons, such as Basel-Stadt.

On the other hand, Finland has chosen to deregulate the industry and rely on new businesses and business models to make transport provision more efficient with increased flexibility and competition. Finnish ministries and regional authorities are making valiant efforts in providing equal opportunities for all the actors and ensuring compatibility of the mobility offers. However, the fast-paced development in Finland has resulted in very fragmented situation (Figure 2) with many of the companies doing overlapping work when trying to serve the mobility needs of the few genuinely urban areas in Finland. The regional actors, such as the Growth Corridor Finland network, are aiming to enhance the vitality of the whole region – not just the urban areas. Currently Growth Corridor Finland is supporting the electrification of the transportation, emphasizing the tools of spatial planning in connecting the rural areas to efficient (and sustainable) transport corridors and creating possibilities for innovative mobility solutions in providing cost-efficient mobility solutions in rural areas also. The effects of this Finnish approach remains to be seen outside these urban islands and on the national level, but interestingly there are already first signs of global scaling of the MaaS business models developed in Finland.

The regional exogenous influences, endogenous political processes, path dependence, the pace of change, and the bounded rationality of the actors are visible in our research. Influential stakeholders tend to be conservative when their interests are challenged or when their interests in the transition are not clear yet. This is the case with automotive associations in Switzerland and national railway company in Finland facing deregulation and the opening of both freight and person transportation on the railway to competition. In contrast, the Federal Railway Company in Switzerland is embracing the change as a part of countrywide service provision, and in other parts of Europe, automotive companies and associations are driving the transition to new mobility services. In our survey, when comparing the results from our two case study areas, stakeholders considered “economic viability” not to be very relevant in terms of innovation support for implementation processes. When asked, however, which factors would motivate themselves to contribute to a MaaS implementation, the respondents stated that economic viability is despite everything a quite important factor for their commitment. This shows that stakeholders’ attitudes are not free from contradictions and this need to be kept in mind when guiding and creating innovation platforms.

The engagement of citizens and stakeholders is one of the critical elements in any regional strategy work. This fundamental duty of local authorities should be enhanced by identifying all the relevant stakeholders and start appropriate, target-group specific, processes to engage them. The importance of this process and the introduction of border-spanning (between regions, authorities, cultures, countries, etc.) innovation platforms is emphasized when dealing with institutional and systemic innovations such as cross-regional MaaS. With our case comparison we hope to inform the existing structures how they can be enhanced in supporting systemic and cross-border innovations – to become real innovation platforms.
References


Mobility-as-a-Service: Development of a Tentative Impact Assessment Framework

MARIANNE KARLSSON & JANA SOCHOR Chalmers University of Technology, Sweden
AKI AAPAOJA & JENNI ECKHARDT VTT Technical Research Centre of Finland Ltd
DAVID KÖNIG Austrian Institute of Technology

KEYWORDS Mobility-as-a-Service (MaaS); framework; impact; assessment

Introduction

With the continued global trend of urbanization and increased demand for transportation with related issues of emissions, noise, congestion, etc., urban mobility is a major challenge for the future. Many attempts have been made to bring about sustainable changes in individuals' mode choices and travel behaviours including information and education campaigns to raise commuters’ awareness and change attitudes, competitions and handing out free public transport passes and increasing the attractiveness of public transport via new vehicle designs and improved traveller information. Nevertheless, further efforts are needed in order to solve the problems.

Mobility-as-a-Service (or MaaS) has been argued as a solution to reduce the use of private cars and instead increase the use of public transport and ride sharing services. Few pilots or trials have however been completed (as yet) and even fewer have been evaluated in a systematic and structured way. An assessment framework is essential on order to allow for a more systematic evaluation of impact and comparison between, for instance, different types and levels of integration and/or different business models, a common assessment framework is beneficial.

One of the aims of the project Mobility as a Service for Linking Europe (MAASiFiE) was to develop such a framework and to use the framework for a structured assessment of the possible impacts of (different types of) MaaS. The purpose of this paper is to present the development of the framework as well as the results of the impact assessment in which the framework was applied (see also Karlsson et al., 2017).

Developing the framework

The framework was developed in three main steps: a literature review, a web survey and consensus workshops, before a feasibility evaluation was accomplished.

A number of more or less well-defined impact factors and/or indicators, used in relation to different types of interventions (projects, policies, etc.), were extracted from the literature review. Examples include emissions (e.g., Cascajo, 2005), travel time (e.g. Weisbrod & Weisbrod, 1997b), journey quality (e.g., Kamargianni et al., 2015), modal share (e.g. Burrows et al., 2015) and social inclusion/exclusion (e.g., Burrows et al. 2015). Several of the identified impacts and indicators were considered to be of relevance to more than one main impact area, for instance to environmental as well as social impacts.

The impact and indicators identified in the literature review formed the basis for the design of a web-survey. However, an impact assessment of MaaS was judged to require further focus on the actions of the users
of the services, as well as the businesses/organisations that provide the services. Additional impact topics were therefore added while less specific ones were excluded (e.g. quality of life). The remaining items were organised according to an individual, organisational/business and societal level respectively. All in all, the survey received 136 respondents from primarily Finland, Sweden, and the U.S. Altogether 57 different types of impact were rated as to their relevance for an assessment of MaaS. Most of the proposed impacts were considered highly relevant by a substantial portion of the web-survey respondents, why the number of impacts needed to be reduced to a feasible number.

The aim of the next step in the development process was to cluster and reduce the number of items. Based on these discussions, and taking the MaaS ecosystem into consideration, the list was reduced to 17 topics or KPIs; six on an individual level, six on a business level, and five on a societal level. They are to different degrees related to the generic impact areas: environmental, economic and social impacts respectively.

Table 1. Overview of items on three levels and their connection to environmental, economic and social impacts respectively.

<table>
<thead>
<tr>
<th>Level</th>
<th>KPIs</th>
<th>Environmental impact</th>
<th>Economic impact</th>
<th>Social impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>Societal level</td>
<td>Emissions</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Resource efficiency (roads, vehicles, land use, ...)</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Citizens accessibility to transport services</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td></td>
<td>Modification of vehicle fleet (electrification, automation)</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Legal and policy modifications</td>
<td>√</td>
<td></td>
<td>√</td>
</tr>
<tr>
<td>Organisational/biz.</td>
<td>Number of customers</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Customer segments (men/women, young/old, ...)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Collaboration/partnerships in value chain</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Revenues/turnover</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Data sharing</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Organisational changes, changes in responsibilities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Customer/user level</td>
<td>Total number of trips made</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Modal shift (from car to PT, to sharing, to ...)</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Number of multimodal trips</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Attitudes towards PT, sharing, etc.</td>
<td>√</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Perceived accessibility to transport</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Total travel cost per individual/household</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Using the framework

As a final step in the process, the tentative framework was tried out. The main aim was to evaluate the feasibility of the framework for assessing the outcome of MaaS. The main cases providing an input included UbiGo in Gothenburg, Sweden (e.g., Sochor et al., 2014; 2015a; 2015b; 2016), and SMILE, in Vienna, Austria (e.g., http://smile-einfachmobil.at/pilotbetrieb_en.html). However, a broader basis was desired why an additional sample of primarily MaaS-related services were analysed including carsharing services (e.g., ZipCar, Car2go) and multimodal services (e.g. Kutsuplus, Tuup, and Hannovermobil) (for more detailed
information see Karlsson et al. 2017). The information used originated from different information sources including project reports and other project documentation, as well as interviews with stakeholders, etc.

As available data did not support a quantitative assessment, a qualitative assessment was made taking into consideration the results of the assessments reflected against additional literature.

Overall, the assessments suggest that a broader introduction of MaaS could result in overall positive impacts, in terms a modal shift, a change in attitudes and an increase in perceived accessibility to the transport system (Table 2). However, some conflicts between impacts on different levels were identified where, for instance increased accessibility to the transport system – a desired impact on an individual and societal level – may result in an increase in the number of trips made – possibly a desired impact on an individual level but an undesired impact on a societal level with negative implications for emissions as well as congestion. When planning for a further introduction of MaaS from a societal perspective, such conflicts must be addressed in order to best determine how to potentially integrate overall societal goals into the MaaS offer and business model.

Table 2. Overview of anticipated impacts

<table>
<thead>
<tr>
<th>Level</th>
<th>KPIs</th>
<th>Impact areas</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Environmental</td>
</tr>
<tr>
<td>Individual/user level</td>
<td>Total number of trips made</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Modal shift (from car to PT, to sharing, to ...)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Number of multimodal trips (combining different modes of transport)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Attitudes towards PT, sharing, etc.</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Perceived accessibility to transport</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Total travel cost per individual/household</td>
<td>✓</td>
</tr>
<tr>
<td>Business/organisational level</td>
<td>Number of customers</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Customer segments (men/women, young/old, ...)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Level of collaboration/partnerships in value chain</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Revenues/turnover</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Level of data sharing</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Organisational changes</td>
<td>✓</td>
</tr>
<tr>
<td>Societal level</td>
<td>Emissions</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Resource efficiency (roads, vehicles, land use, ...)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Citizens accessibility to transport services</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Modification of vehicle fleet (electrification, automation)</td>
<td>✓</td>
</tr>
<tr>
<td></td>
<td>Legal and policy modifications</td>
<td>✓</td>
</tr>
<tr>
<td>Overall positive increase/decrease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Both positive and negative increase/decrease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Overall negative increase/decrease</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not possible to assess</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Reflections

As MaaS is still a new concept, there is a general lack of generally available information on actual impacts of MaaS and the same is true of MaaS-related services. Services which appear to have undergone more thorough evaluations include well-established mobility services, such as carsharing and bicycling schemes, whereas other services, most of which are pilot projects and/or recently introduced services, have not been exposed to the same process (as yet). Furthermore, when evaluations have been undertaken they appear to have focused on those impacts that relate to users’ behaviour in terms of, for example modal shifts and possible consequences on emissions, i.e. on a societal level, whereas impacts on a business level have not been addressed or the information is not generally available. Thus, there appears to be a gap between information needed and topics covered in evaluations (if any), as there is an active search for knowledge in the transportation/MaaS community regarding business and collaboration models, roles and responsibilities of various stakeholders, etc., so as to better understand how to sustainably operationalize the concept of MaaS.

From the limited experience that has been documented, MaaS will result in (or necessitate) impacts on the business level including increased collaboration and partnerships in the value chain, increased data sharing, as well as changes in organisations and their roles. MaaS also has the potential to attract new customer segments, although the impacts on revenues and numbers of customers are unclear due to their intimate link with the specific MaaS offer (number of modes, subscription levels, relative prices, etc.).

A fundamental issue for feasibility studies in general and the assessment of possible impacts which have been part of the present project, is the lack of empirical evidence. The argued impacts of MaaS, positive and/or negative, are to a large extent based on informed assumptions and experts’ opinions. Hence, it is important that different pilots and trials are initiated, with the intention to be developed into a fully functioning service, in order to provide further evidence of the possible impacts of an implementation of MaaS. Resources must then be allocated to address and evaluate different types of impacts (economic, environmental, and social) on different levels (individual, business and societal). However, in order to allow for a comparison between, for instance, different levels of integration and/or different business models, a common assessment framework would be beneficial. The framework introduced in the report provides a first attempt.

Acknowledgements

The work presented here was part of the MAASiFiE project funded by CEDR- Conference of European Directors of Roads. Their support is gratefully acknowledged.
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MaaS Alliance White Paper

PIIA KARJALAINEN MaaS Alliance, Belgium

The Mobility as a Service (MaaS) sector is expected to grow to a business worth over one trillion euro by 2030. All over Europe, MaaS initiatives are planned or starting up and the MaaS Alliance helps these to cooperate through a shared work programme engaging service providers, transport operators, public authorities and users in order to create a vital and interoperable MaaS ecosystem to fulfil high expectations.

To support the development of MaaS, the MaaS Alliance published its guidelines and recommendations to create the foundations for a thriving MaaS ecosystem as its White Paper on 4th of September. The White Paper provides definitions for the main elements of MaaS and identifies some of the main preconditions and the main principles of the ecosystem. The key findings of the White Paper are summarized below.

What is MaaS?

Mobility as a Service (MaaS) is the integration of various forms of transport services into a single mobility service accessible on demand. So MaaS is a service promise, or even more precisely, it is an access promise. For the user, MaaS offers added value through the use of a single application to provide access to mobility, with a single payment channel instead of multiple ticketing and payment operations. To meet a customer’s request, a MaaS operator facilitates a diverse menu of transport options, be they public transport, ride-, car- or bike-sharing, taxi, car rental or lease, or a combination thereof. A successful MaaS service also brings new business models and ways to organise and operate the various transport options, with advantages including access to improved user and demand information and new opportunities to serve unmet demand for transport operators. The aim of MaaS is to be the best value proposition for its users, providing an alternative to the private use of the car that may be as convenient, more sustainable, and even cheaper.

Added value builds on open data and interoperability

Development of the MaaS market will rely on access and openness data, open APIs (Application Programming Interface) and more flexible transport and mobility regulations. When defining regulatory principles for a digitalized transport system, it is imperative to encourage the participation of all market players – both existing and new players - and avoid stifling innovation. IT technologies developed for MaaS should support both commercial-interest-driven and public-service types of MaaS deployment, even though the business models and interests behind them may vary. Open IT architecture and standardised sub-element features, such as payment, ticketing, authentication and security, will be enablers to maximise the development of the MaaS market. In addition to open standards, an imperative requirement is a high quality of the data being exchanged.

User-centric, customer-centric, market-centric

A fundamental principle and core motivation behind deployment of MaaS is that MaaS is a user-centric, customer-centric, market-centric proposition within a societally grounded context. MaaS to become the best value proposition for both private and business users, by helping them meet their mobility needs and solve the inconvenient parts of individual journeys, as well to improve the efficiency of the entire transport system.
Open, inclusive and sustainable

While designing and establishing the MaaS ecosystem, the principles of openness and inclusivity should be fully respected, meaning that the ecosystem should be open to all service providers and inclusive for all different kind of users, including persons with reduced mobility or disabilities. In order to build attractiveness and public acceptance for MaaS services, the whole value chain should be carefully and inclusively designed to meet the high expectations related to ecological and financial sustainability.

The MaaS Alliance

Established at the ITS World Congress in Bordeaux in 2015, following the launch of the MaaS concept at the ITS European Congress in Helsinki in 2014, the MaaS Alliance is a public-private partnership working to establish foundations for a common approach to MaaS, and to unlock the economies of scale needed for successful implementation and uptake of MaaS in Europe and beyond. The main goal of the Alliance is to facilitate a single, open market and full deployment of MaaS services.

There are various stakeholders whose committed participation in the development and implementation of MaaS is crucial to its success. The MaaS Alliance facilitates stakeholder cooperation through a shared work programme engaging all relevant stakeholders, inter alia the following:

- Transport service providers and public transport operators
- MaaS operators and integrators
- IT system providers
- Customers
- Cities, local, regional and national authorities

MaaS Alliance members from all sectors collaborate to create the enablers needed for successful deployment of MaaS in Europe and beyond. The Alliance contributes to European policy-making, promotes the added value of MaaS to local government and business, monitors the MaaS market and facilitates the dialogue with the research community. Finally, the Alliance is the voice of the MaaS community for awareness and advocacy.

Find out more! [https://maas-alliance.eu/](https://maas-alliance.eu/)