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TUTKIMUKSIA JA SELVITYKSIÄ

MaaS Services and Business Opportunities

Minding

Organizing

Investing

Institutional change from self-service mobility to mobility as a service

Transfer

Manufacturing

New innovations and business models in mobility services

MaaS Services and Business Opportunities

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Photo on the cover: Concurrent changes in mobility institutions and mobility services and business

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Summary

This report evaluates the emerging traffic service markets and analyses the impacts and business opportunities of the Mobility as a Service, MaaS paradigm change for Finland.

A key element in the development of MaaS are the organizing and platform services, as these facilitate innovations and services for efficient and sustainable mobility. For example, Uber provides underutilized car and driver resources for sharing while it does not operate the transport services. Planning, organizing, paying and evaluating mobility are thus the novel services required by MaaS. The potential for new business is in global, digital and platform businesses, rather than in local transportations services, so we expect to see a shift of focus from transfer services and manufacturing over to organizing and platform services in the mobility ecosystem.

Market-based services are the drivers of this mobility transformation, and market-based innovation needs to be supported and enhanced. This poses an opportunity for Finland if we are to create an open, capital luring experimental environment, a "MaaS Valley" where new scalable and exportable innovations and services can be developed and experimented for the new mobility ecosystem waiting to revolutionize the current ways people and goods are moved.

Recent trends of sharing of resources and servitization is promising to make mobility more efficient. New internet-based network solutions and platforms connect people who possess underutilized resources with those wanting to rent those for short periods of time. Sharable resources include work, housing, tools, as well as vehicles. Recent conflicts, and even legal actions show how traditional players see new sharing-based businesses and start-ups as threats for their established business models, as they are bringing new services and disrupting traditional institutions.

Profound changes were recognized in organizing activities related to traffic service markets. These include for example allocation and sharing of transport resources, route planning, ordering transport and other mobility supporting activities, which extend and complement the range of public mass transportation services. These new innovative services are referred as *organizing services*. Such service elements play a key role in the servitization of mobility. Such services are also typically *born global*, rather than local, creating vast scalable business opportunities with their new innovations.

Breaking the self-service institution of using one's own car, which is still by far the most typical mode of mobility worldwide, is hard to break even with good services and new technological innovations. Servitization of mobility will therefore also demand change of attitudes and activities of public authorities, as the behavior of neither people nor businesses is based only on rational facts and reasoning, but is heavily influenced by earlier experiences, social environment, and emotions.

The development of MaaS is under way with new service innovations and players. For Finland, this transition period offers many economic and business opportunities, based on our competencies in developing digital products and services. To exploit the opportunities connected to servitization of mobility, public authorities should be creating an innovative environment, a "MaaS Valley", to lure market-based domestic and foreign funding for developing and experimenting exportable mobility innovations in Finland.

MaaS-palvelut ja liiketoimintamahdollisuudet. Liikennevirasto, liikenteen palvelut -osasto. Helsinki 2015. Liikenneviraston tutkimuksia ja selvityksiä 56/2015. 24 sivua. ISSN-L 1798-6656, ISSN 1798-6664, ISBN 978-952-317-152-7.

Asiasanat: Mobility as a Service, liikkuminen palveluna, palvelut, markkinat, henkilöliikenne, kuljetus

Tiivistelmä

Palvelumarkkinat ovat murrosvaiheessa, mutta muutosten tahti ja kehityspolut vaihtelevat toimialoittain. Havaitsemme kuitenkin tiettyjä yhteisiä piirteitä. Palvelullistuminen (servitization), joka lähti liikkeelle suurten tuotantoyritysten havaitessa tuotteista saatujen marginaalien pienentyvän, ja palveluliiketoiminnan volyymin ja kannattavuuden kasvavan. Digitalisoituminen tuki tätä kehitystä. Ensimmäisessä muutosaallossa kulkivat alat, joiden tuotteet olivat joko helposti digitalisoitavissa, kuten valokuvaus. Henkilöliikenteen palvelujen osalta digiajan murros on merkittävässä mittakaavassa vasta tulossa. Uusimpana trendinä palvelukehityksessä on resurssien jakaminen, ja start-up yritykset haastavatkin perinteiset jakamistalouden keinoin. Uudet Internet-pohjaiset verkkosovellukset, platformit, tuovat yhteen ihmiset, joilla on osaksi hyödyntämättömiä resursseja ja ne, jotka haluavat vuokrata näitä resursseja lyhytaikaisesti. Näitä resursseja voivat olla työtunnit, asunnot, työkalut ja myös ajoneuvot.

Analysoidessamme liiketoimintaa henkilöliikennetoimialalla toimintopohjaisen mallimme avulla, havaitsimme, että suuri muutos on tapahtumassa niissä toiminnoissa eli aktiviteeteissa, jotka liittyvät kuljetustapahtumaan, mutta eivät itsessään liikuta tavaroita tai ihmisiä. Kutsumme tämäntyyppisiä aktiviteetteja hallinnoivia palveluja järjestely- eli organizing-palveluiksi. Näitä ovat muun muassa kuljetusresurssien allokointia ja jakamista tukevat palvelut, reitinsuunnittelu ja kuljetusten tilaaminen, sekä monet niitä tukevat palvelut. Nämä palveluelementit ovat myös merkittävässä roolissa liikkumisen palvelullistumisessa (Mobility as a Service). Näiden kiinnostavana puolena on, että ne ovat jo syntyessään globaaleja ja liiketoimintapohjaisia.

Hyväkään uusi palvelu ei takaa sen menestymistä automaattisesti. Etenkin liikkumisen palveluinnovaatio haastaa usein omaan kulkuneuvoon perustuvan liikkumisen. Yksityisautoilu, jota voidaan sanoa liikkumisen itsepalveluksi, on edelleen ylivoimaisesti yleisin liikkumisen muoto ainakin kehittyneissä talouksissa. Tämän vahvan itsepalveluinstituution murtaminen ja liikkumisen palvelullistaminen vaatii uusien palveluinnovaatioiden lisäksi sekä julkisen vallan toimenpiteitä että ihmisten asenteiden muutosta. Kuten uudet talouden tutkimussuunnat, institutionaalinen taloustiede ja behavioristinen taloustiede ovat tunnistaneet, ihmisten ja myös yritysten käyttäytyminen ei ole puhtaasti rationaalista, vaan siihen vaikuttavat myös aikaisemmat kokemukset, sosiaalinen ympäristö ja tunteet.

Suomen kaltaiselle pienelle, kehittyneelle taloudelle, jossa on kansainvälisesti mitattuna erittäin korkea osaamistaso digitaalisten tuotteiden ja palvelujen kehittämisessä, toimialan murros on liiketoiminnallinen ja taloudellinen mahdollisuus. Jos haluamme hyödyntää tätä mahdollisuutta liikkumisen palvelullistumisen ja digitalisoitumisen murroksessa, viranomaisten on tasoitettava tie, mutta sen ei tulisi sotkeutua itse liiketoiminnan kehittämiseen. Tässä taloudellisessa tilanteessa valtiovallalla ei ole edes varaa riittäviin taloudellisiin tukitoimiin. Tarvitaan kansainvälistä rahaa ja ulkomaalaisia investointeja. Tässä voisimme hakea oppia eteläisestä naapuristamme, Virosta, joka on julistautunut julkisten digitaalisten palvelujen kehitysympäristöksi ja houkutellut ulkomaalaisia hakemaan virtuaalikansalaisuutta (täysin uusi käsite) ja näin luonut pieneen maahan suuren määrän digipalvelujen koekäyttäjiä ja innovoijia. Toimisiko vastaavanlainen malli liikkumisen palveluissa? Voiko Suomi luoda avoimen ympäristön, jossa liikkumisen palveluja on houkuttelevaa kokeilla ja kehittää?

MaaS-tjänster och affärsmöjligheter. Trafikverket, Trafiktjänster. Helsingfors 2015. Trafikverkets undersökningar och utredningar 56/2015. 24 sidor. ISSN-L 1798-6656, ISSN 1798-6664, ISBN 978-952-317-152-7.

Sammanfattning

Denna undersökning innehåller en utvärdering av de nya marknaderna för trafiktjänster samt en analys av effekterna och affärsmöjligheterna som Mobility as a Service, Maas (mobilitet som tjänst) erbjuder.

En viktig del av utvecklingen av MaaS är organiserings- och plattformstjänsterna, eftersom dessa underlättar uppkomsten av innovationer och tjänster för smidig och hållbar mobilitet. Till exempel erbjuder företaget Uber delvis outnyttjade bil- och förarresurser för delad transport, fastän företaget självt inte fungerar som trafikidkare. De nya tjänsterna som MaaS kräver gäller därför planering, organisering, betalning och utvärdering av mobilitet. Det finns större affärspotential i globala, digitala och plattformsföretag än i lokala transporttjänster, och därför kommer fokus sannolikt att flyttas från transporttjänster och tillverkning till organisering och plattformstjänster i ekosystemet för mobilitet.

Det är de marknadsbaserade tjänsterna som driver på denna förändring inom mobiliteten, och därför behöver de marknadsbaserade innovationerna stödas och förbättras. Detta innebär en möjlighet för Finland om vi ska kunna skapa en miljö som är öppen för experiment och som lockar till sig kapital – en "*MaaS Valley*", där det vi kan utveckla och testa nya mätbara och exporterbara innovationer och tjänster för det nya mobilitetsekosystemet som bara väntar på att revolutionera de befintliga sätten för att transportera människor och varor.

De senaste trenderna gällande delande av resurser och tjänstefiering är lovande med tanke på att få till stånd smidigare mobilitet. Nya webbaserade nätverkslösningar och plattformar kopplar samman sådana människor som har delvis outnyttjade resurser med dem som vill hyra resurserna för en kortare tid. Delbara resurser är bland andra arbete, bostäder, verktyg och fordon. De senaste konflikterna och till och med en del rättsliga åtgärder visar att de traditionella aktörerna uppfattar den nya affärsverksamheten som baserar sig på resursdelande som ett hot mot deras etablerade affärsmodeller.

Det upptäcktes omfattande förändringar i hur verksamheten organiseras i fråga om marknaden för trafiktjänster. Dessa inkluderar till exempel allokering och delande av transportresurser, ruttplanering, beställning av transport och annan verksamhet som stöder mobilitet som utökar och kompletterar utbudet på tjänster för kollektivtrafiken. Dessa nya innovativa tjänster kallas *organizing services* (organisering av tjänster). Sådana tjänsteelement spelar en viktig roll för tjänstefieringen av mobiliteten. Typiskt för sådana tjänster är också att de inte är lokala, utan *born global*, dvs. möter en global världsmarknad på en gång, och att de genom sina innovationer skapar omfattande mätbara affärsmöjligheter.

Även med bra tjänster och nya innovationer inom teknologi är det svårt att bryta det invanda mönstret med att alla använder egen bil, vilket ännu är det överlägset vanligaste mobilitetssättet i världen. Tjänstefieringen inom mobiliteten kommer därför att kräva en förändring i offentliga myndigheters attityder och verksamhet, eftersom varken människors eller företags beteende grundar sig på rationella fakta och resonemang, utan påverkas starkt av tidigare erfarenheter, den sociala omgivningen och känslor.

MaaS håller på att utvecklas med hjälp av nya tjänsteinnovationer och aktörer. För Finlands del, som besitter expertisen som krävs för utveckla digitala produkter och tjänster, erbjuder denna övergångsperiod flera ekonomiska och affärsmässiga möjligheter. För att kunna utnyttja möjligheterna som tjänstefieringen av mobiliteteten för med sig borde de offentliga myndigheterna skapa en innovativ miljö, en "*Maas Valley*", för att locka marknadsbaserad inhemsk och utländsk finansiering för att utveckla och testa exporterbara mobilitetsinnovationer i Finland.

Foreword

Mobility is transforming into a service (MaaS, Mobility as a Service). This development is accelerated by both megatrends (e.g. congestion, environmental factors, servitization, sharing economy, digitalisation and advanced technology, such as robotisation and automation) and by political will and objectives. As far as passenger transport services are concerned, the digital revolution on a significant scale has only just begun. This report includes an analysis of the change in the ecosystem of the traffic service markets and an evaluation of the opportunities and risks associated with the development of service markets in Finland and globally.

The aim of the public sector is to enable the creation of a new MaaS ecosystem and the development of business activities. A thorough understanding of market development helps when choosing the best course of action to take and helps clarify the roles of the actors. The MaaS approach has not yet been the subject of any extensive academic discussion, and this report aims to accelerate the initiation of such discussions.

The report was ordered by the Finnish Transport Agency, the Ministry of Transport and Communications and the Finnish Transport Safety Agency Trafi.

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Helsinki, October 2015

The Finnish Transport Agency
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Table of contents

1 Introduction: Megatrends and trends – drivers and enablers of MaaS

Mobility as a service, or MaaS, is a *paradigm change* in mobility, transforming both customer experience and utilization of physical resources. Maas brings new transportation alternatives and modes, as well as new digital services for arranging and coordinating effective and efficient planning and use of various travel opportunities. It has also impacts on city planning, land use, role of public organizations and welfare of citizens.

Argumentation for the need of MaaS is convincing, as many megatrends and political aspirations drive and enable it (EU White Paper 2011). However, the MaaS *vision* has largely remained descriptive *(*e.g. Heikkilä 2014, Kulmala 2015). Consequently, the steps and leaps to its realization and systematic descriptions of the MaaS structure and activities are still missing.

It is commonly claimed that we are in the midst of a transition period of servitization and digitalization, where the development paths in different sectors differ from each other mainly by the speed and impact of disruption of the traditional structures and players in the industry. However, similar common features can be recognized. Servitization started in late 1990's, when large product companies were faced with diminishing product margins while finding new growth and profitability in service business.

This development was, is, and will be supported and facilitated by digitalization. In the first wave were those sectors whose products could be easily digitized, such as photography, with dramatic transition from chemical film cameras and films to digital cameras and software. The music business followed in the early 2000's, with companies outside the traditional industry, such as Apple and Spotify leading the way. Furthermore, product logistics has been looking for new service solutions with tracking technologies. In personal mobility the service and digital turning point in large scale is yet to happen.

Among the most recent trends is sharing of resources, whereby start-ups challenge established companies by innovating and launching sharing economy-based solutions to make mobility more efficient. New internet-based network solutions, platforms, connect people with unused resources with those wanting to rent these for short periods of time. Sharable resources include work, housing, tools, as well as, vehicles. While traditional models are still dominating the markets, the conflicts, and even legal actions, show how traditional players see new sharing-based businesses as threats for their established business models.

Transport sector is often regarded as conservative in attitude, and its range of services has for decades remained much the same. There have been some as drastic innovations, such as budget priced airlines, first challenging the national airlines, and later completely restructuring the airline industry. The rise of sharing services (car and bike sharing, bringing packages to neighbors on one's way home, etc) is another institutional development, where also traditional car manufacturers (e.g. Daimler Benz a, b, BMW, Belak 2014) have moved into service business by introducing their own car sharing concepts. Carpooling and ridesharing have grown in many congested metropolitan areas (Viehnicki, 2015), and demand responsive transport (DRT)

services, such as Kutsuplus (Jokinen et al 2014), are extending the range of public transport services towards to door-to-door offering.

In addition to transport services, a vast array of digital and wireless services enhances personal mobility. For example route planners and other information services for public transport, ordering and payment systems for more autonomous mobility, congestion info and route planning for private car drivers. The digital services present vast business potential for scaling up for global market. Even in the small economy like Finland, the business volume of mobility related activities has been estimated to be in the range of several billions.

This change of the dominant market logic offers vast business potential and opportunities for players, who have capabilities to offer key services and concepts for 'servitized' mobility. In other drastically changed industries, such as telecom-sector, many of the novel services are initiated by players outside the traditional ones. Thus, these "Facebook's and Spotify's" will likely be introduced by novel mobility service companies.

This report focuses on evaluating the impacts and potential of MaaS by analyzing it with a structural framework. The key activities in the mobility services ecosystem are recognized with the FABBLAS framework and described systematically. In addition, business opportunities for Finland as well as testing and piloting possibilities are analyzed.

What is MaaS?

Despite the vast interest to MaaS, there is no commonly accepted definition for it, which has led to different interpretations of the term and the scope. Technically-oriented descriptions of MaaS relate to intelligent traffic (Wang 2010, Nelson 2012, Jokinen 2012), new transport technology and business models changing the roles of public versus private organizations and financing (Schuckmann 2012, Aguilera 2014). The expanding range of traffic and mobility services (Winterhoff, 2009), service packages (UCL Energy Institute 2015), digital informational services (Hannan 2006, Ruhrort, Tinnilä 2012), multimodal and seamless transport chains (Zimmermann 2012, Spickermann 2013), environmental issues (Faivre 2014), as well as changes in consumer behavior and sharing economy (Cusumano 2015). The line between viewpoints is vague, as none of them is incorrect. From the user's viewpoint Mobility as a Service, MaaS, is a bundled market offering for consumers, providing one or several mobility-related services for easy and reliable travelling.

MaaS involves a profound institutional transition from mobility as a self-service towards mobility as a service. To understand the underlying changing factors, we can look into institutional economics as a in a political process. Kingston and Caballero (2008) present three paths in institutional change. 1) Purposefully designed and implemented formal rules with change through political process (see e.g. Libecap (1989), Ostrom (2005)) 2) informal evolution with human behavior and mind (see e.g. Williamson (2000), Veblen (1899) Hayek (1973), and 3) blending evolution and design regarding the interaction of formal and informal approaches (see e.g. North (1990), Hodgson (2006). Kingston and Caballero (2008) emphasize also the inherent inertia of institutional change and the role of history and bounded rationality of the actors.

MaaS is enabled and facilitated by a variety of societal, economic, technological and consumer-related trends. The main drivers for MaaS include urbanization, congestion in large cities, and environmental issues of traffic (Aburdene 2007, for review see Tinnilä 2012, Ahola 2009). MaaS is needed to solve mobility challenges in cities, but demand for it exists in the smaller communities and rural area as well. Tinnilä and Kallio (2015) has recognized that MaaS related background megatrends affect to society, economy and business, technology and consumers. These in turn impact e.g. personal mobility trends, logistics and infrastructure with related services. It is obvious that many of the trends are interlocked and dependent.

Lessons to learn from other industries

While the institutional development and disintegration of the services in the transportation industry is yet rather novel, learnings from other industries that have gone through structural reorganization should be studied and successful business models mimicked. Music industry has changed radically with digitalization. Media industry struggles with internet publications vs. traditional newspapers. eShops are challenging traditional retailers. Forwarders have been between the customer and long haul freight companies for decades, now so call fourth party service providers are breaking in. Telecommunication industry has had numerous significant swerves during the three decades. Many main players in photo industry have disappeared and new have arisen.

Digitalization and technical innovations have changed many industries. It is interesting to notice that the swing has been most significant in the intermediary sector. Service supply chains, order and delivery channels have changed radically in these industries.

Two short case examples have commonalities with mobility industry and MaaS:

> At the end of 20th century the mobile phone markets became saturated and price competition intensified. Mobile phone manufacturers and telecom operators turned to the more emergent mobile service markets. Telecom operators in Europe and in Finland created their own service supply. Japanese operators had a different strategy. NTT Docomo, the market leader, as well as other major operators made delivery platforms for digital service producers, made rating systems in the customer interfaces, and ensured the quality of the services. The telecom operators took care of the customer interface and payments. Their commissions were as high as 9% of the total revenue. Japanese operators succeeded rather well and also the rest of the service ecosystem got own rewards from the emerging mobile service markets. On the contrary, the European mobile service industry stayed in the old footprints, and telecom operators did not win additional rewards. A more detailed description of this development is found e.g. in Kallio et al. (2006).
>
> To take an example of waste collection, a Finnish based company Enevo is providing effective on-time collection and vehicle routing via installing wireless sensors in waste bins, which indicate when it is “time to collect/empty me”. They also offer effective route planning services for waste management companies to optimize their operations and resources. Although Enevo’s service concept is in the early stages, it seems to be more effective to have a specialized operator

offering the service to all companies in the market. Otherwise, each of the carriers would have to repeat the development investments and take care of the various activities of this function in-house. Furthermore, new innovations spread more quickly and widely if they are driven by market-based services as opposed to new innovations and experiments being guarded by individual companies against their competitors in an attempt to try and find competitive advantage.

Direct imitation from other industries without deeper analysis is, however, to be cautioned. The mobility ecosystem is much more complicated and diverse than many other ecosystems. The market is a mixture of local and global features, and the mobility service ecosystem is still quite traditional.

2 Structuring MaaS with the FABBLAS framework

Function and Activity Based Business Logic Analysis, FABBLAS model, is used to analyze the development and structure of mobility service markets (Kallio et al, 2015; Apte & Vepsäläinen, 1987; Hayes & Wheelwright, 1979). The model identifies Individual activities from the integrated processes. For instance, a taxi service uses activities before the actual transit such as booking, transfer activities like transportation from location A to B, and activities after the ride like payment and rating. MaaS related activities (routine, standard, contingent, emergent) and functions (transfer/moving, manufacturing, organizing, minding/persuasion and investing/legislation) are evaluated. Appropriate resources (shared, owned, licensed, public) are included in the model as well as utilizing specialization, competencies, servitization, scale economics, and digitalization. Various mobility institutions relate to each other, and indicate the tradeoffs and inefficiencies between different types of resources for different purposes. In effect, MaaS needs to be understood and evaluated throughout its various activities, elements and services and how they relate to each other, as opposed to seeing MaaS as one integrated system.

Step 1: Classifying the activities

The first step is to classify activities according to the five main functions in a society and economy. For example, moving from one place to another by taxi, is a **transfer** service and should be analyzed against comparable transfer services, like public transportation or use of own car. Booking is an **organizing** activity that can be provided as a service by a third party service provider. Effective booking services are operated by specialized service providers, as opposed to each taxi company planning, building and operating their own systems. Furthermore, rating a lift or driver belongs to the **minding** function, as it evaluates the actual transfer service and it includes additional business opportunities.

Cash, credit card or any other payment mechanisms are conventions**, investments** made by the society, and should be analyzed as a society level investment and function. Investment is an important element when studying new, disruptive innovations and radical ecosystem changes, which need facilitation, be it legislation, norms, guidance, common acceptance, habits, etc. Finally, vehicle **manufacturing** represents the fifth economic function in the mobility ecosystem. New mobility services, such as car sharing, will have an effect directly on the manufacturing of vehicles, and also design and planning activities of the manufacturing industry.

The framework recognizes different elements and their effective arrangement in the mobility service ecosystem. Today these elements are mostly integrated within an organization. In the future they will most probably specialize to the separate business. Key service elements in the organizing and transfer functions are presented in figure 1.

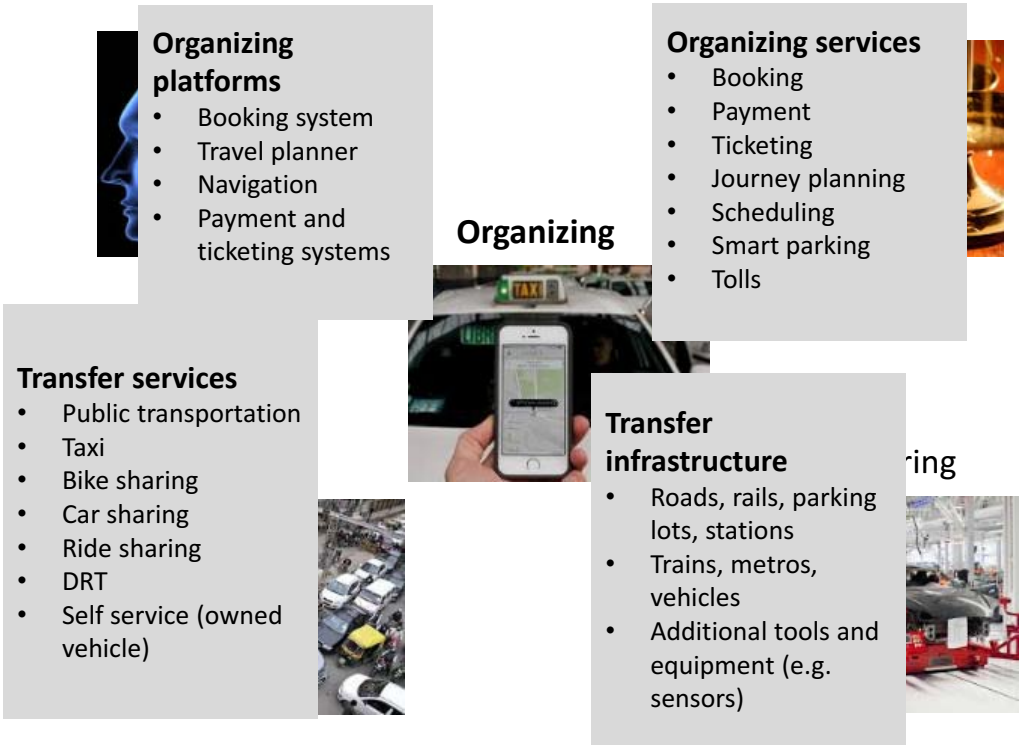

Figure 1. *Transfer and organizing services from transportation services/ operations.*

Transfer operators of MaaS move people and goods. Transfer services include public transportation, taxi, and car sharing. The infrastructure and resources facilitate transportation and mobility, such as roads and rails, but also parking facilities, bus stations, different type of vehicles as well as the sensors and devices for measuring and managing traffic. While this sector has been traditionally managed by the public sector, new market based actors have also entered into this function, such as carpooling and sharing service companies.

Step 2: Dig deeper and drill down the activity level: Organizing is the key

The next step is to dig deeper into each function and drill down to the activity level. Mobility activities are either regular or contingent. The question to be answered is what type of facilities, resources and capabilities are needed to efficiently serve different types of activities? Hayes and Wheelwright (1979) suggest that large production batches need automated assembly lines, but small batches, or 'one of the kind' -products, are most efficiently produced in job shops with tailored resources. We have applied similar logic for analyzing the four other functions in the mobility ecosystem.

Key elements in the development of MaaS are the organizing services and platform services, as these facilitate innovations and services for efficient and sustainable mobility. For example, Uber provides free car and driver resources for sharing, but it does not operate itself the transport services. Planning, organizing, paying and evaluating mobility are the novel services required for the MaaS. These can grow into big business without investments in owning or manufacturing vehicles. It is vital to recognise these POMS services (POMS = Planning, Organizing, and Managing Services).

The analysis of activities reveals a wide range of organizing services from booking, reserving and paying services which facilitate real-time information infrastructure, which in turn enables for example wireless and place-independent applications for end-users. The main potential of organizing services lies in the digital nature. The cost structure of digital services differs fundamentally from traditional services. Similarities can be found from banking services, where the cost of a single payment through Internet bank is in the range of 1 cent, while the traditional over-the-counter payment costs several euros (Tinnilä 2013). This is in direct contradiction to traditional transportation services, where personnel costs are typically 50 % of total costs. Furthermore, digitalized services are scalable. Subsequently, developing for example a city- or country-specific DRT system does not make much sense, as its digital elements (such as navigation, travel time, dispatching) can be scaled with little costs to global markets.

In effect, the most rapidly growing business opportunities are connected to **organizing services** (such as arranging, booking, information services, software systems, and digital platforms). These can be built to existing mobility services, or they can be new independent services and businesses. The opportunities for scaling them up globally provide efficiency and effectiveness compared to local or country-specific solutions. Comparing Kutsuplus with Uber, the other is still at a pilot stage (in two cities), while the other has grown to cover hundreds of cities and countries. The growth rate of Uber has been fast, despite the fact that it challenges and even violates existing local regulations. The main reason why Uber has spread rapidly in the global market is its business model. The key point is the division of activities: Uber is providing global organizing platform for local transport service providers.

Consequently, while Finland may be regarded as a test laboratory for innovative mobility services, substantial growth cannot be expected from the domestic Finnish market. Therefore efforts need be made to recognize "born global" services and companies that have capabilities for fast growth. At the starting stage public support is of importance, but a clear exit path toward market based financing and globalization is needed.

Various minding activities of people and society are needed to facilitate the institutional change from mobility as a self-service towards mobility as a service (MaaS). A mix of persuasion and resources affect consumers' awareness, values, norms, attitudes, intentions, experiences and behavior. On the other hand, for a new successful mobility service without unwanted time delays or costs, certain investments in legislation, regulation, and rules, that is a "common ground" that everybody understand, accept, and follow is needed. This requires more than just one legislator's work on an individual issue relating to MaaS. It is therefore vital to focus on supportive standards, financing mechanisms and insurance policies.

Minding and investing activities use organizing services to win and keep customers. For example, customer registration and recognition is a vital element of MaaS. Hence, there is a demand for the customer relationship and experience management. Key questions are, how to join/register, how to activate passive users/members, how to keep using the service(s), or how to manage bottlenecks. Organizing elements and services as membership management, marketing automation, CRM, customer databases, customer data management (CDM), data quality, data sharing, analytics (customer behaviors, big data), predictive modelling, customer loyalty management, and other are necessary for managing customers.

There is a need for quick regulations and maybe for global institutions for aligning regulations and standards to globally scalable services and businesses. In the airplane sector global aviation standards have made aviation much more efficient than it would be if there were not for this investment in jointly accepted rules, regulations, and customs. On the other hand, in environmental preservation such commonly accepted behaviors have not yet been achieved, leading to slow development in the area.

To summarize, it seems that the organizing function is in the key position for enhancing MaaS. However, service providers developing and providing new digitalized services or service platforms need to convince transit service suppliers, manufacturers, consumers, as well as authorities to approve and share the MaaS vision to make it real.

3 Illustrations of new mobility services

Concrete examples of new service elements for MaaS exist in the market. Car sharing concepts, demand responsive transport (DRT) services and new types of ridesharing and taxi services are moving on from experimental stages into expanding businesses.

From manufacturing to car sharing services and operations

The transition from manufacturing to car sharing services shows how the money and earnings in the mobility ecosystem is increasingly moving from physical assets to organizing the use of mobility resources. Car manufacturers are moving into the service business with their own car sharing fleets and organizing services to get a share of this growing business within MaaS. European car manufacturers, like Mercedes Benz and BMW, are already operating car sharing services in for example London. As Bill Ford Jr, the executive chairman of Ford Motor Company, has said, "we are no longer a car seller but a mobility service integrator."

New business, often referred to as "servitization" change earning logics and investment strategy. In a traditional model, a sold car has been paid immediately by the buyer. In the new model earnings come gradually by miles and usage hours. In a global scale the business model requires vast investments in millions of cars and presence in all operative markets. This is not necessarily an opportunity for the Finnish companies, but maybe Finland should try to provoke foreign investors (car manufacturers or other investors) to experiment with new car fleet services, if the MaaS concept is intended to break out in Finland. Repositioning in the mobility ecosystem demands ongoing organizing services and advanced ICT applications, in addition to fleet management capabilities (Figure 2).

Figure 2. Market repositioning from car manufacturing to car sharing.

Start-ups are challenging the traditional taxi business model

A more radical, even disruptive innovation in the mobility markets is an advanced mobility organizing service, Uber. Uber has built an innovative pricing scheme, customer registration, both driver and customer rating system, exploitation of GIS (location), exploitation of current car fleet owned by the Uber drivers, advanced recruiting methods (online recruiting and ongoing follow-up) in hundreds of local mobility markets without significant investments to local car fleet resources or organizations. No wonder that local taxi associations and taxi companies, who have made considerable investments to set up their business and obtain the license to operate, fight against such new competing services.

However, Uber, as all new innovations, has mental challenges. How to convince people to trust 'non-licensed' drivers? How to persuade potential car owners to start their business, is it legal? How to fit into current legislation? These are some the challenges Uber has to come over, but also legislators and politicians have to tackle; how, if so, is Uber and similar services allowed and regulated? Without clear investments in the mental side, cities and countries are making life for new services hard to evolve and develop their service in a commonly desired manner and speed. Investors all over the world seem to believe that these challenges will be surpassed , as the valuation of the company has already gone up to 50 billion US dollars being the world's most highly capitalized startup and its growth appears to be accelerating at breakneck speed (Forbes 5/13/2015).

MaaS Business opportunities and development paths for Finland

Transportation is a significant global industry, assessed to thousands of billion euros. People are using 11% of their disposable income to personal mobility, which is the second biggest item in household spending. In Finland annual market in the transport sector is about 30 billion euros, with personal mobility about half. Most of the money are spent to personal cars (investment, fuel, maintenance, insurance), making together over 12 billion euros, as seen in Table 1.

Table 1. Business potential of MaaS in Finland (Finnish Transport Agency, Statistics Finland).

Market of mobility (2012)	
Vehicle investment and operation	
Vehicles	7 bn €
Vehicle maintenance	2,2 bn €
Vehicle spare parts	1 bn €
Operative expenses (insurance, fuel, etc.)	2 bn £
Market of mobility services	
Public transportation	3 bn €
Vehicle leasing and rental	0,6 bn €

The vital question is how much of the 12 billion € expenses of private vehicles could move over to MaaS services?

4 Why MaaS 'living lab' in Finland?

Kulmala and Tuominen (2015) pointed out that a highly efficient and productive transportation system makes an essential contribution to national competitiveness, to overall economy and to people's quality of life. However, we should critically evaluate, whether investments to the MaaS as a living lab are profitable. The below assessment is divided in the five functions:

- MaaS will accelerate R&D activities in the *manufacturing sector*. Electric cars are already used in the car sharing services for example in London (Kamargianni 2015). Autonomous and driverless cars have already been developed by Google and other initiatives are launched by car manufacturers and giants from ICT sector. Consequently, there will be business opportunities in the manufacturing sector.

- Mobility *service providers* have so far been local, with some exceptions, like French-based public transport company Transdev and the Singaporean based taxi operator DelGro group. Instead, among current car sharing are global enterprises from the car rental and car manufacturing industry. MaaS living lab and other mobility experiments will surely entice global transport operators to invest.

- According to our analysis, the most promising area for global business opportunities is in *organizing sector*. There are two parallel paths – solutions for car manufacturers and transit operators, and solutions for consumers. We have already seen some examples like Uber, Lyft and Ajelo, whose services are completely based on ICT. There are also a lot of opportunities deeper in the mobility ecosystem, for example navigation, booking, payment and congestion information systems. The question is, whether a MaaS test bed inspires Finnish-based companies to go global, and entices foreign companies to invest in Finland, e.g. in R&D centers and other operations. This last point might be crucial for the success of the MaaS living lab initiative.

- *Marketing and minding* are extremely important parts of MaaS. Finland has strong capabilities and infrastructure in the ICT sector. However, we have to ask, why the KutsuPlus pilot, based on the most advanced ride sharing system, Ajelo Ride, created by a Finnish start-up, has not been success here so far? Perhaps, because as we are rational ourselves, we expect our neighbors to behave like us, even if they do not have same information as we have. Minding, is it marketing or 'hyping', is an important part of the MaaS living lab.

- Finnish *regulation* in the mobility discipline is quite tight. Vehicles have to be inspected almost every year, taxi permits are limited, public transport services are controlled - even the amount of seats and the width of the doors in buses are highly regulated by authorities. This is not the best basis to create a MaaS living lab. The experimental economy needs speed, flexibility and positive attitude toward new initiatives, even if they might affect negatively some traditional business areas. This has been, is and will be the case in most of the disruptive innovations.

There are several development paths into MaaS. Obviously launching a “full scale” MaaS with all services is challenging, while starting with too modest a package would not reveal the real benefits of it. In effect, the development and adoption of MaaS requires not only new high quality easy-to-use services that travellers try and “buy into” and facilitating and investing in their development, but also mental investments into favoring MaaS, be it facilitation and experimentation by legislation, norms, taxation, and other guidance tools together with vision and goal statements.

The development of MaaS is under way with new service innovations and players. For Finland, this transition period offers many economic and business opportunities, based on our competencies in developing digital products and services. To exploit the opportunities connected to servitization of mobility, public authorities should be creating an innovative environment, a “MaaS Valley”, to lure market-based domestic and foreign funding for developing and experimenting exportable mobility innovations in Finland.

5 Conclusions

A service-based mobility environment of MaaS will be the future of how people and goods move in Finland and globally. New services, such as car sharing, ride sharing, city bikes, to name a few, will not only increase the options and flexibility of mobility, but will also increase the use and thus efficiency of underutilized resources, and cut down environmental and congestion effects. This development is driven by megatrends, including servitization, digitalization and new technologies, such as robotics and automation, as well as, political objectives.

Market-based services are the drivers of this mobility transformation, and market-based innovation needs to be supported and enhanced. This poses an opportunity for Finland if we are to create an open, capital luring experimental environment, a "MaaS Valley" where new scalable and exportable innovations and services can be developed and experimented for the new mobility ecosystem waiting to revolutionize the current ways people and goods are moved.

New mobility services are and will be developed by current players, but particularly by novel actors, who bring new services and solutions for enabling new types of mobility. These innovations include arranging, planning, orchestrating, and paying of mobility services. Public funding will not suffice in supporting the rise of new winning services and therefore market-based investments are needed for start-ups and pilots to gain sufficient financial resources and time to develop and experiment.

This paper focuses on the development of passenger transport services. Goods transports were not studied in this paper, as goods logistics has developed as market-based and competitive services, with efficient and specialized services, institutions and structures finding their places on the markets and reshaping and developing market efficiency. Hence, it provides insight for developing passenger mobility services and ecosystems.

Like in other service sectors, radical changes can be inaugurated by outside actors, with new types of user experience and service-based business and earning models, such as Apple and Spotify have done in the music, or budget airlines in travel industries. Traditional players may be wary of business model innovations that cannibalize their existing business.

A key element in the development of MaaS are the organizing and platform services, as these facilitate innovations and services for efficient and sustainable mobility. For example, Uber provides underutilized car and driver resources for sharing while it does not operate the transport services. Planning, organizing, paying and evaluating mobility are thus the novel services required by MaaS. The potential for new business is in global, digital and platform businesses, rather than in local transportations services, so we expect to see a shift of focus from transfer services and manufacturing over to organizing and platform services in the mobility ecosystem.

MaaS should be understood, evaluated, and analyzed from its elements and activities, not as one large entity. This paper brings about a novel structural model of FABBLAS (Function and Activity Based Business Logic Analysis), describing the central elements of the MaaS ecosystem.

Finland has potential for global business connected to MaaS. A related example is Enevo, specializing in waste management optimization rather than in physical transportation. The global "POMS"- Planning, Organizing, and Managing Services, promise the best scalable potential for growth.

We also need to recognise what kind of capabilities and resources Finland has. Resources for substantial investments may be relatively scarce.There are also challenges related to small markets and small sizes of our cities, so we need to choose the right angle, size of experiments, and best environments for piloting of MaaS. Instead of cities with 10 million inhabitants, should we focus on 1 or 0,1 million cities or rural area piloting?

There is a need for a clear development vision for the MaaS. This requires investments in laws and regulation from politicians and authorities to avoid the type of challenges exemplified by for example the Uber case. We need common rules of the game for all actors. This should be seen as a mental investment by the society. Regulations should enable and encourage experimentation and piloting. When markets construct efficient structures and division of labour, regulation should facilitate this development and provide guidelines for desired and acceptable new services.

Adoption of MaaS will be triggered by users experience and introduction of better and more flexible mobility services. Adoption should be influenced with pilots, information, marketing, as well as economic incentives. A change needs to start from customers' activities and solving customers' moving needs in novel ways. A cheaper service is not automatically adopted. Also social acceptance and change in individual mindset is important, as illustrated in figure 3.

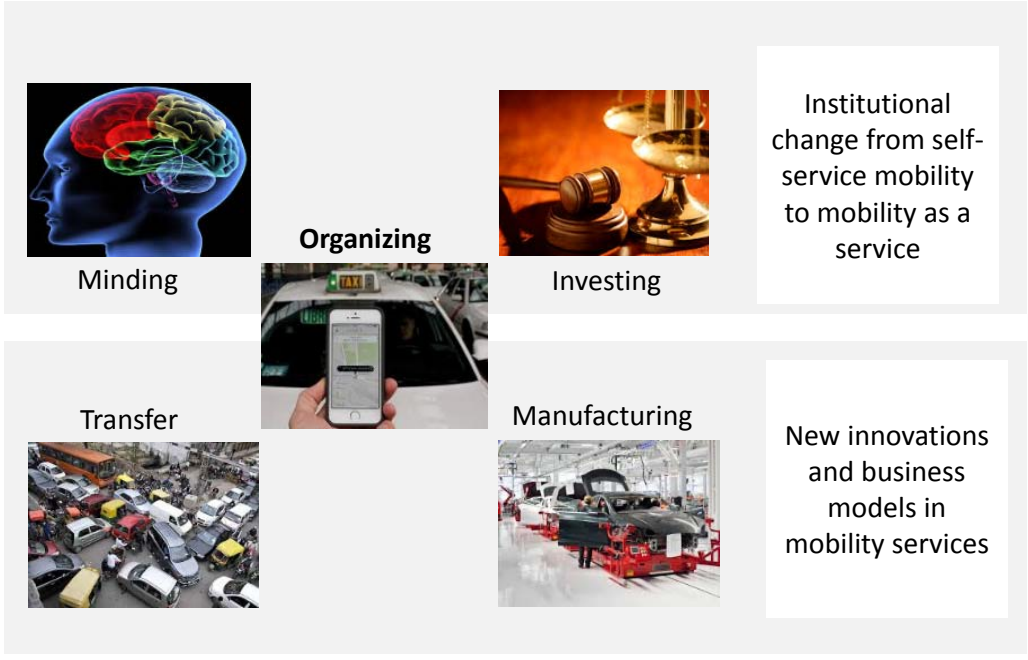

Figure 3. *Concurrent changes in mobility institutions and mobility services and business.*

We are entering a drastic institutional change in mobility with a big division of money spent in it. Finland can assume the role of an active developer or a more passive role of adopting services being created abroad. If MaaS receives adequate support in Finland in the form of pilots, pilot environments, supporting regulation and political will, we can achieve novel efficient mobility services, platforms and solutions. For this, we need novel environments and focused experiments, such as for example a "teen mobility revolution", or local pilots of chosen sized communities. Estonia shows us the way for opening up the public digital service development for luring foreign developers to experiment new innovative and even courageous solutions. What would be our statement to lure foreign investors and mobility service operators to join our MaaS initiatives?

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