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Author(s)	Aapaoja, Aki; Eckhardt, Jenni; Nykänen, Lasse
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Business models for MaaS

Aki Aapaoja[1*], Jenni Eckhardt[1] & Lasse Nykänen[1]

1. VTT Technical Research Centre of Finland Ltd, Finland,

P.O. Box 1000, FI-02044 VTT, Finland, +358 40 7444 823, aki.aapaoja@vtt.fi

Abstract

Changes in the society, for instance tightening environmental and financial targets, require new ways of organizing transport and mobility. Cities have challenges with emissions and congestion while rural areas have problems organizing transport services efficiently due to long distances, sparse population and narrow flows of people and goods. Thus, a collaboration of different stakeholders and combining different transport services are a prerequisite for viable and attractive MaaS services. MaaS business models presented in this study are based on the findings of two MaaS projects: European MAASiFiE project studying the MaaS concept widely at European level, and a Finnish MaaS project concentrating on identifying and developing preconditions for accessible and lasting rural mobility.

The business models can facilitate the development of MaaS services in different contexts, and especially in rural areas by offering extensive business models for service development. The focus is especially on MaaS durable business models for rural areas including the organizing of statutory social and health service transportation, which inefficiency has been a big debate in Finland. A total of five business models were identified including two commercial ones, one publicly operated and two different kinds of public-private models. The paper also discusses service agreements and revenue models of MaaS.

Keywords:

Mobility as a Service, MaaS, business models, mobility, transport, services, rural

Introduction

Current megatrends, such as urbanization, climate change, globalization, digitalization and demographic shifts are constantly affecting the movement of people and goods – some changes happen faster and some slower. However, most of these megatrends and trends are causing pressure to intensify and decarbonize the current transport system. For example, when housing is concentrated in urban areas and the current transport system is firmly based on the usage of private cars, it is hard to reduce congestion and emissions with traditional transport solutions. However, digitalization can be seen as an exception to other megatrends, because at the moment the common understanding is that digitalization will mostly result in positive impacts in the transport sector by providing new kinds of solutions to support remote working for example. In general, digitalization and IT-related services are seen to provide new solutions and improvements to connectivity, transparency, situational awareness and effectiveness of the transport system. (Pöllänen et al., 2015)

Mobility as a service (MaaS) is an emerging mobility concept that heavily relies on digitalization and an end-user oriented approach. The great vision in the MaaS concept is to connect all available transport and mobility services in a one-stop-shop package and hence provide an agile, sustainable and efficient competitor to private cars, which can be tailored according to the needs of end users. Since the MaaS concept is holistic and still emerging, it can be defined and approached from many different points of view, but the definition adopted in this study is the same definition within the MaaSiFiE project, namely: *"Multimodal and sustainable mobility services addressing customers' transport needs by integrating planning and payment on a one-stop-shop principle"* (König et al., 2016).

The purpose of this paper is to present potential business models for Mobility as a Service, by presenting and analyzing existing business models of MaaS operators and pilots, which were identified in the international research project titled *Mobility as a Service for Linking Europe (MaaSiFiE*) and national research project titled *Mobility as a Service Concept - promoting service and livelihood development in rural areas (Rural-MaaS*). The study consists of seven sections, where the first two present a general background and connect the study's context to the theoretical background. Sections 3 describes the background and methodology employed. Section 4 introduces MaaS cases analyzed in both projects and the fifth section the MaaS business model illustrations. Section 6 consists of the main findings and Section 7 summarizes the study.

Attaining competitiveness through a robust business model

Every successful company has a sound business model (Johnson et al., 2008; Magretta, 2002). Various definitions of a business model exist, for instance a business model explains how enterprises work (4). A successful business model answers fundamental questions such as "Who are the customers and what do they value?", "How is money generated in this business?", moreover, "How can the value be delivered to customers at an appropriate cost?" Business models force managers to thoroughly think about their business and assess how well all the elements of a system fit together as a whole (Magretta 2002).

Some researchers have defined business models more formally. Most of them relate to the company's logic for creating and capturing value, which are the most fundamental functions that all organizations must perform to survive and stay competitive (Shafer et al., 2005). Osterwalder and Pigneur (2013) state that: "a business model describes the rationale of how an organization creates, delivers, and captures value". Business model innovation is the only way to avoid competition even temporarily.

Additionally, a business model itself can provide a competitive advantage if the model is sufficiently differentiated to meet particular customer needs and is hard to replicate (Teece, 2010). An appropriate business model is also required for commercialization of new ideas and technologies. Otherwise they have no objective value and their economic value will remain latent (Chesbrough 2010).

A business model is usually described as containing three elements that explain how value is created: value proposition and providing, value creation system, and revenue model (i.e., value capturing) (Pekuri, 2015). A business model is built on customer value since the ultimate purpose for a buyer and seller engaging in a relationship is to work together in a way that creates value for them. Sometimes value is just defined monetarily, although nowadays a broader definition is often utilized that also includes non-monetary revenues, such as competitive advantage, competence, customer experience, market position and social rewards.

Successful companies find a way to create customer value (Magretta, 2002), but only some companies have been able to define and measure created customer value (Anderson and Narus, 1998). To make customers focus more on total costs (i.e., life-cycle) rather than only on acquisition price, a supplier must have a clear understanding of what is of value to their customers. The providing covers the output of the value creation system including both products and services. Companies strive to solve problems of the customers and satisfy their needs with the providing and hence the primary objective of any offering is to provide value to a particular customer segment (Teece, 2010).

The last part of the business, value capturing, is commonly forgotten (Osterwalder and Pigneur, 2013). Unfortunately, this means that companies also fail to achieve revenues relative to the value they create. Value capturing measures a company's ability to translate its value proposition into revenue sources (Osterwalder, 2004). Usually, companies do not have just a single revenue stream because they may have different pricing models for different services or products. Therefore, their revenue models should be in line with the markets in which they compete.

Overview and methodology

In this study, the findings and analyses are mainly based on qualitative data. It has been collected via a literature review and expert interviews, which were conducted within the MaaSiFiE project during the spring of 2016. To understand the current and forthcoming challenges and preconditions for the mobility and accessibility of transport in rural areas a literature review and a set of national expert interviews extending the knowledge gained in the MaaSiFiE project was conducted within the rural-MaaS project.

MaaSiFiE (2015-2017) was a two-year project financed by the CEDR (Conference of European Directors of Roads) Transnational Road Research Programme (MAASiFiE, 2016). The goal of the project is to analyze the state-of-the-art and future trends of Mobility as a Service concepts including multimodal traveler information services, ticketing/payment systems and multimodal or sharing concepts. The MaaSiFiE project also develops business and operator models, as well as analyzes potential impacts, technological requirements and interoperability issues, legal enablers and challenges. The main expected results of the MaaSiFiE project are a medium-term European Roadmap 2025 and

recommendations for the implementation of MaaS. The roadmap includes roles and responsibilities of different stakeholders and especially national road administrations. Thus, the understanding of different existing and emerging business models is seen to be crucial to the MaaSiFiE project and all the MaaS stakeholders.

Rural-MaaS (2016-2017) was a yearlong national project co-funded by the Ministry of Agriculture and Forestry (rural-MaaS, 2017). The project aimed at creating a national vision for MaaS in rural and sparsely populated areas focusing mainly on recognizing emerging and potential business models for both commercial and publicly supported transport services. The project also improved the awareness of MaaS concept in rural areas by sharing knowledge but also by providing measures and recommendation for the development of mobility regulation and on technical aspects of the new mobility services.

During the projects, literature reviews made identification of existing MaaS pilots and operators easier and helped to formulate a general understanding of MaaS state of the art and the business and operation models used by MaaS service providers. In addition, the current literature was used to connect MaaS business models to the general business model theories. Because the MaaS concept is still developing, the availability of MaaS-related scientific studies is still insufficient, and thus the primary focus of the literature review was on the websites and public material of the MaaS operators and pilots.

Expert interviews (Table 1 and 2) were used to form a more sophisticated and concrete understanding of the business and operation models of the exploited business models in the identified MaaS cases. The interviews were an essential part of collecting data, because the public material and websites of the operators are mainly meant for the exact target audience such as end users, and therefore business and operation models are explained relatively universally on websites. Analyzed MaaS business model cases are listed and described below in the next section.

Because informal discussion and flexibility were considered essential for this study, the interview questions were relatively broad and loosely defined and followed more like theme interview structure. The interviews aimed at forming a robust view of both current and expected potential business models, transport service providers and service descriptions, and service combinations in different regional areas. Because MaaS is holistic concept and hence it touches various societal levels and various stakeholders, the interviews were carried out both with public organizations (e.g., public and road authorities) and private organizations (e.g., service and product providers) to identify roles and responsibilities of different stakeholders.

Table 1 – MAASiFiE interviews

ASFINAG, Austria	VR, Finland	SNCF, France	E-Mobility, Austria
Victoria Swedish ICT, Sweden	Finnish Taxi, Finland	Gothenburg University, Sweden	Sunfleet carsharing, Sweden
DLR, Germany	Tuup, Finland	Tieto, Finland	Trivector, Sweden
Ubigo Innovation, Sweden	MaaS Global, Finland	Forum Virium Helsinki, Finland	Finnish Transport Agency, Finland
Telia Company, Finland	Region of Västra Götaland, Sweden	Ministry of Transport and Communications, Finland	Finnish Transport Safety Agency, Finland
Sito, Finland	Siemens, Finland	Samtrafiken, Sweden	ÖBB, Austria
Västtrafik public transport, Sweden	ÅF Consulting, Sweden	Trafikkontoret, Gothenburg, Sweden	Vinnova, Swedish innovation agency, Sweden
Mobisoft, Finland	PayiQ, Finland		

Table 2 –Rural-MaaS interviews

Association of People with Disabilities	Ministry of Agriculture and Forestry	Regional Council of South Karelia	The city of Rovaniemi
Centre for Economic Development, Transport and the Environment of Lapland	Ministry of Agriculture and Forestry	Soite - Central Ostrobothnia joint municipal authority of social and health service	The council of rural policy MANE
Centre for Economic Development, Transport and the Environment of South Ostrobothnia	Municipality logistics of Finland	South Karelia Social and Health Care District	The hospital district of Lapland
Centre for Economic Development, Transport and the Environment of Southeast Finland	Petri Pekkala (trade name)	Tampere University of Technology	The hospital district of North Ostrobothnia
Finnish Transport Safety Agency	Posti Group Corporation	Technical Research Centre of Finland	The social insurance institution of Finland (Kela)
Growth Corridor Finland	Regional Council of Central Ostrobothnia	The Association of Finnish Local and Regional Authorities	Tuomi Logistics Ltd.
Linna business development (Hämeenlinna)	Regional Council of Lapland	The city of Hämeenlinna	Uber Finland
		The city of Imatra	Visit Rovaniemi

MaaS business cases

The MaaS business model cases analyzed in this study are: Tuup, Whim by MaaS Global; Telia Finland – Ylläs Around and Sonera Reissu; Sito – Kätevä Seinäjoki; Kutsuplus - Helsinki Region Transport (HRT); SNCF – iDVROOM, iDCAB, iDAVIS, iDPASS; UbiGo; and SMILE/Beam-Beta. The selected cases represent state of the art in field of multi- and intermodal transport and mobility in urban, suburban and rural areas.

Tuup (Finland)

Tuup is a Finnish mobility service providing access to all the locally available transportation options through a mobile application. The service is marketed for travelers, cities, municipalities and even for enterprises that want to make work-related trips more cost-effective and to steer employees to use sustainable transport solutions. Tuup's mobile application has been available since April 2016 and currently the service includes the information on the prices, routes and timetables of the available transport; either it is public transportation, taxi, rental car, bicycle or a combination of these.

The application also reminds users about the upcoming trips, deviations, pick-up locations and the general real-time traffic situation. The Turku Region Traffic, also known as Föli, was the first mobility service providing ticket purchase via Tuup. (Tuup, 2017). Tuup has also launched Kyyti taxi-pooling service in three cities in Finland: Turku and its neighboring municipalities Naantali, Raisio and Kaarina, and the cities of Oulu and Tampere. Kyyti provides dynamically priced taxi rides and it is a first-/last-mile solution. The service has thousands of registered users by now and it delivers hundreds of rides daily (Honkanen, 2017).

Whim by MaaS Global (Finland)

Maas Global is a private Finnish mobility service provider (established in 2015) owned by a group of Finnish national and international transport and mobility service providers. The company has an application, Whim, through which Maas Global provides two different mobility packages on a monthly basis based on user needs. The application also provides an option to travel on a pay per ride basis. In addition, fully tailored packages can be provided to business users. (MaaS Global, 2017)

Whim contains travel planning, routing and mobile ticketing for mobility services such as public transport, taxis and rental cars. City bikes and bike sharing should be available soon. For the travelers, the application is free of charge but the user pays for the mobility services via their package's mobility points. A number of monthly points depends on the selected packages. All the fees and pricing used in the service are based on the bilateral agreements between MaaS Global and transport service providers. (MaaS Global, 2017)

Ylläs Around by Telia Finland (Finland)

Telia's Ylläs Around public-private-partnership (PPP) service is a two-year MaaS pilot in the Ylläs ski

resort area in Northern Finland. The pilot started in spring 2016 and will continue at the beginning of skiing season 2017, if the service is considered feasible. The service is a part of the Aurora Snowbox test ecosystem managed by the Finnish Transport Agency and is operated by Telia Company in cooperation with the primary stakeholders: local transport operators, local municipality Kolari, Ylläs Travel Association and the Finnish Transport Agency. (Telia company, 2017a)

The primary goal of the Ylläs Around to provide one-stop-shop transport and mobility services in the Ylläs ski resort area and connect it with the main local transport hubs, Kittilä airport and Kolari railway station. The Ylläs Around contains multimodal transport services available through a mobile application, which also includes mobile payment and ticketing. All the fees and prices are based on bilateral agreements between the MaaS operator and transport service providers, such as fixed taxi prices and minor commission fees on re-sold bus trips. (Telia company, 2017a)

Sonera Reissu by Telia Finland (Finland)

Sonera Reissu provided (pilot was carried out in 2016) transport services in the city of Hämeenlinna for rail/bus and (shared) taxi. The Reissu service strived to provide mobile application enabling end user trips on a one-stop-shop basis. The application comprised mobile payment and ticketing and it combined both taxi and train/bus trips to Helsinki on the same ticket. However, it preserved separate ticket IDs according to the service providers' ticketing systems. Sonera Reissu had fixed prices for taxies depending on the distance from Hämeenlinna city center, and it took a minor commission fee on re-sold train tickets. (Telia company, 2017b)

Kätevä Seinäjoki by Sito (Finland)

Sito Ltd. coordinated Kätevä ("*Handy")* Seinäjoki MaaS pilot in the municipality of Seinäjoki from November 2016 to April 2017. The first phase of the pilot was funded by Tekes, the Finnish Innovation Agency. Kätevä mobile application integrates traditional bus and taxi services and therefore provides more agile and handy travel chains. The pilot involved 20 travelers as a test group and included the following services: taxi, shared taxi, on-demand and traditional route- and schedule-based public transport, city bikes and walking. The service had three different priced monthly packages. Currently Sito ltd. is mapping out the options to carry out and develop the pilot further. The aim is to enlarge the test group and add more services at least. The Kätevä application is available for IOS and Android. (Kätevä Seinäjoki, 2017)

HRT Kutsuplus (Finland)

HRT (Helsinki Regional Transport) Kutsuplus service was one of the first large-scale pilots which strive for reinventing carpooling for the algorithm age. The public operation started in 2013 and lasted until the end of 2015 when there was 15 vehicles in use. By providing an on-demand minibus service combining traditional taxi and city bus services into one, Kutsuplus tempt motorists to switch to public transport. (HRT, 2016)

Kutsuplus used a dedicated algorithm to optimize and route scheduled and spontaneous trips heading roughly in the same direction. The Kutsuplus service was available in the Helsinki metropolitan area on daytime, when it provided the option to travel in the city area cheaper than with a traditional taxi service but much more flexibly than with the normal public transport bus service that only has fixed routes. To have a ride required logging in the service website and filling in the origin and destination, and finally walking to the closest bus stop to wait for the pick-up. The price depended on the following aspects: traveled distance, the number of other passengers, and the flexibility on waiting and pick-up time. Kutsuplus provided a worthy option for transverse traveling against main public bus lines to and from the Helsinki city center. (HRT, 2016)

SNCF (France)

SNCF is a French nationally, state-owned railway company, which offers several service combinations based on the new multimodal services. This development aims to tempt more train use via improved customer experience and integrated services. The results so far have been positive. The ultimate goal is to be able to provide door-to-door services that could be integrated with international services. Currently SNCF mobility initiatives listed below:

- iDVROOM is a car pooling service. Frequent users have a guaranteed return journey by taxi if the driver unexpectedly cannot bring one back. iDVROOM also offers a free automatic toll badge, no management costs, and a monthly downloadable invoice. (SNCF 2017a)
- iDCAB is a taxi or equivalent with fixed price and advance payment. The reservation can be done on the website iDCAB or using the iDPASS application. (SNCF 2017b)
- iDAVIS makes a simultaneous booking of rental car and train ticket possible. Users possessing a discount or loyalty card will get reduced prices. The service is available at over 170 railway stations in France and over 90 stations across the Europe. (SNCF 2017c)
- iDPASS is a mobile application for door-to-door transportation planning for the first and last mile. The mobile application includes: Wattmobile, a self-service electric vehicle rental service; Zipcar, a self-service car rental/sharing service; bike sharing service pointing out the locations of self-service bicycle stations and the number of available bikes; Parking feature visualizing the available parking places nearby and navigation to the destination. (SNCF 2017d)

UbiGo (Sweden)

In Gothenburg, Sweden, the Go:Smart project ran a six-month (November 2013 - April 2014) Field Operational Test (FOT) of the UbiGo service, involving around 200 participants from private, urban households. The objective was to test the business concept and the service looked to reduce or eliminate the need to own a (second) private car. Even though the test-users were highly satisfied and used the service to test new and more sustainable travel behaviors, the service was ceased after the pilot ended since there was difficulties in finding an appropriate cooperative model that worked for both the region/PT-provider and UbiGo as an emerging *private, commercial* service (Sochor et al.,

2015a; Sochor, 2015b).

UbiGo operated on a reseller basis, based on bilateral agreements between transport service providers. UbiGo included a relatively inclusive set of features and services:

- access to public transport, bike and car sharing, taxi and rental cars; a personalized, monthly household subscription (and single invoice)
- a customer service phone line serving 24/7; subscription access via a smartphone, in which users could activate tickets/trips, make/check bookings, etc.
- a smart card, used for instance to check out a bicycle from the bike-sharing service or unlock a booked car, but also charged with extra credit for the public transport system in case there was any problem using the UbiGo service.

BeamBeta/WienMobil-Lab (initiated by the SMILE project)

The SMILE project, ended in 2015, provided an enabling platform for integrated mobility based on the multimodal traveler information platform VAO (Verkehrsauskunft Österreich), which development started by public transport associations and financed through public projects. The SMILE engaged 1000 external users who tested SMILE over several months. Based on their questionnaire results, the project had positive effects on transport mode usage; for instance according to 26 % of respondent, they have changed their habits towards less use of private cars. (Smile mobility, 2014)

As a follow-up to SMILE, Beam-Beta (Fluidtime, 2017) is in development and currently mainly public or partly public-owned organizations are involved in the SMILE and Beam-Beta pilot activities. Providing integrated multi- and intermodal information services combined with mobile and ticketing, payment as well as shared-mobility features, e.g., real-time routing and dynamic timetables, traffic events information (including road, public transport, trains, cycling, walking and intermodal transfer points) is a vital part of SMILE and BeamBeta. Both pilots provide all these services on a one-stop-shop principle over one standard application programming interface (i.e., API).

MaaS business and operator models

The MaaS concept strongly rest upon a data platform approach enabled by the digitalization. For the transport sector this means a new way of thinking which may confront some resistance from the traditional actors. Apparently it may take some time to gain end-user acceptance too. However, MaaS also requires interoperable solutions which not only require a more inclusive understanding of available solutions and customers' needs, but also exploitation of new value capturing models. MaaS operators are mostly acting as an intermediary between customers and service providers and hence it is crucial to understand the needs of both and to enable the development of agile, integrated solutions by dispensing an appropriate middleware environment or B2C interface with several fit-for-purpose payment methods.

All MaaS business models seem to have a wide mutual range of key stakeholders and customers as well as revenue streams, which ultimately illustrates the business potential of MaaS. A range of involved stakeholders simultaneously enables but also requires the development and provision of interoperable and integrated services, where some stakeholders attract more customers than others. Based on the case analysis, several business models with different approaches exist when the MaaS operator can be either a private, a public entity or a mix of those.

Figure 1 describes two operator models – reseller and integrator – that would propably be managed by commercial MaaS operators. The reseller model rest upon various services from several transport service providers (TSPs) that combined and provided to end users via one interface (e.g., mobile application). The integrator model contains traditional transport services extended with some extra services/features from a mobile service provider (MSP), for example key enabling technologies and services such as mobile ticketing and payment.

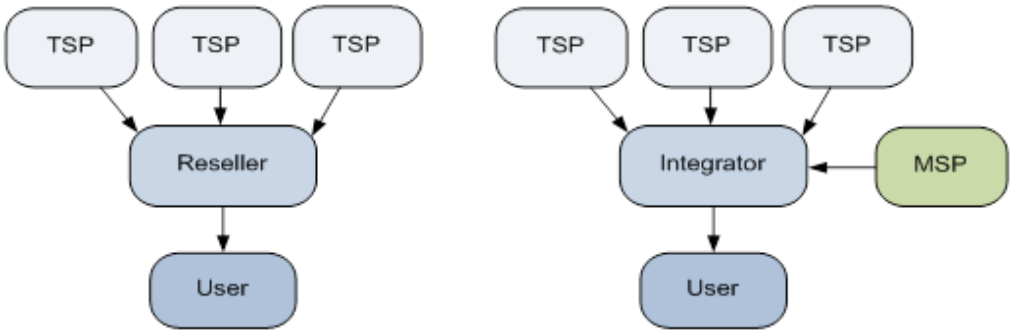

Figure 1 - Commercial MaaS operator models (Eckhardt and Aapaoja, 2016).

The public transport service operator (Figure 2) have traditionally been a focal actor in the transportation sector. As a MaaS operator, the public transport operator may focus on enriching its services by integrating other transport-related services into its regular service portfolio. These additional services can cover taxis, carpooling, city bikes and some inclusive digital services by the MSPs, e.g. mobile ticketing and payment, and multimodal planner and (re)routing.

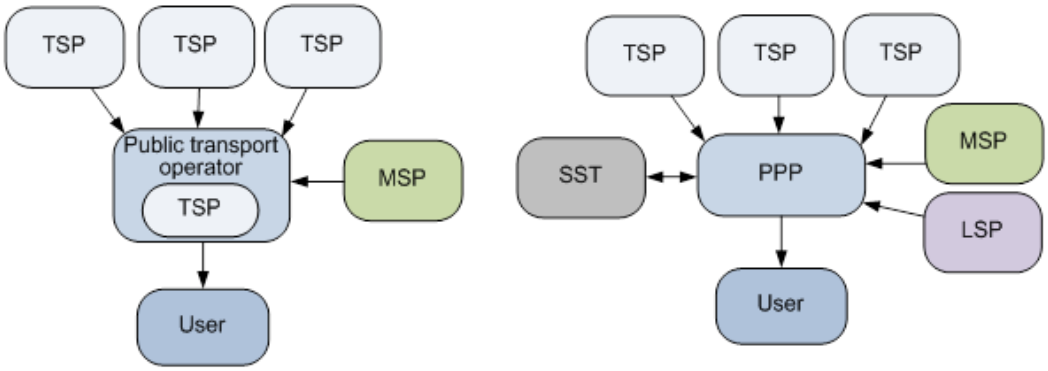

Figure 2 - Public transport operator as MaaS operator and PPP MaaS operator models (Eckhardt and Aapaoja, 2016).

Figure 2 also illustrates the public-private partnership (PPP) MaaS operator model, which in this case

is mainly based on the Kätevä Seinäjoki/Sito case in Finland. As mentioned above, Kätevä Seinäjoki pilot is a collaborative initiative by a consulting and planning company Sito ltd., the municipality of Seinäjoki, and some local transport operators proving new mobility services in Seinäjoki.

Compared to other illustrated business models, the PPP MaaS operator business model may consist of local logistics service providers (LSP) in addition to other services providers. Kätevä Seinäjoki also strives to intensify statutory social service transportation (SST), i.e. trips for disabled and elderly persons, etc., by connecting the organizations responsible for these trips to the MaaS service.

According to the initial results and findings, the PPP MaaS business model could be especially suitable in rural or sparsely populated areas, where overall transport volumes are low, but travel distances are relatively long. In an environment of this kind, efficiency is a key enabler and thus combining logistics services as well as school and statutory social service transportation together with MaaS, is seen to be an efficient solution for future development. N.B. while all operator models can include logistics services and other additional services, the PPP model usually integrates logistics services from the beginning, due to available transport capacity and long distances.

Based especially on the interviews and findings of the rural-MaaS project, Figure 3 illustrates an extended version of PPP business model, PPPP (public-private-people partnership) which is considered as a way for organizing future mobility and transport in primarily rural and sparsely populated areas and regions. In Finland, health and social services along with regional government reformation are currently ongoing in which transport and mobility as across-cutting theme present a vital role within the established regions. A growing need for integrating publicly compensated transports (i.e., statutory social service transportation) and self-paid transport exists. Public expenses on statutory social service transportation transport in Finland are too high and have reached 1 billion euros annually but simultaneously the accessibility of public transport should be improved in order provide sufficient service level through reorganized and complimentary transport services for the citizens in rural areas. It is also worth noting that many regions may have seasonal demand factor (e.g., tourism) which increases the demand for the accessibility public transport.

Since flows of passengers and goods are mostly narrow in rural areas, PPPP model relies on the fact that interface enabling integrating private, public and commercial transport services should be established. Especially shared public and private resources (i.e., *shared resources as a part of public transport*) are seen essential for the rural mobility; it may enhance or at least sustain the service level of public transport but also enable new business opportunities and extra income for the local entrepreneurs and firms.

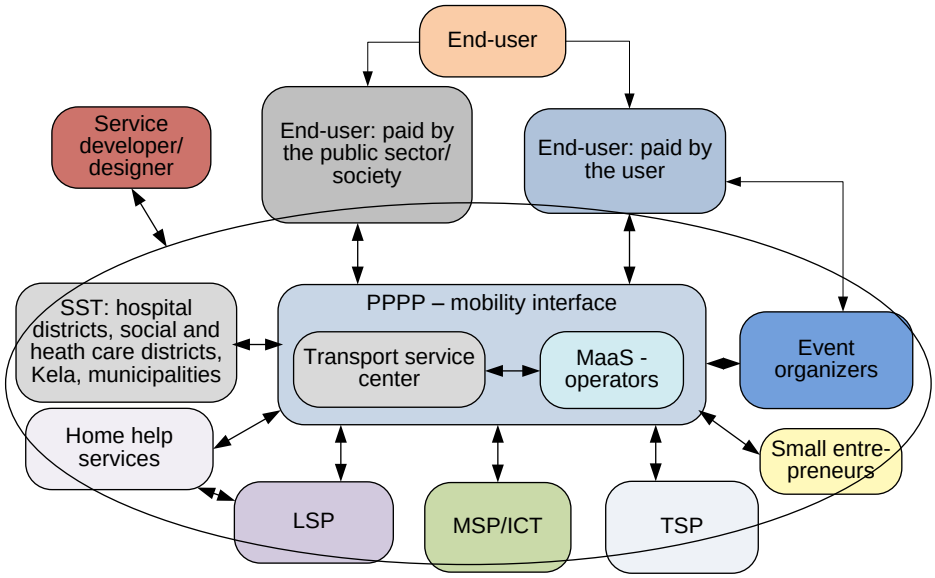

Figure 3 - PPPP model for rural areas (translated from Eckhardt et al., 2017)

MaaS business and operator model analysis

At the top level, four different MaaS operator model categories exist: commercial, public, PPP and PPPP. Moreover, commercial MaaS operator models can be broken down into two types: reseller and integrator. A reseller supplies transport services of different transport modes (e.g. a travel agency). An integrator, also, combines the services of several modes with digital services, e.g. an application for mobile ticketing, travel planning, route planner etc. MaaS can be the main business for some integrators but for the others it can be just a complement to their service portfolio.

In some cases, municipality/city-owned and state-owned public transport operators can act as MaaS operators by integrating additional transport services and digital services with their existing public transport. In the Public-Private-Partnership (PPP), the public actor may combine various types of stakeholders and services in one system, which can enhance and rationalize the services the public actor is taking care of, e.g. legislated special transport services and freight/delivery. PPPP is an extended version of PPP, targeted especially to rural areas where maintaining or even improving the quality and accessibility of public transport probably requires shared resources to be considered as a part of public transport. Figure 4 illustrates the four recognized operator model categories.

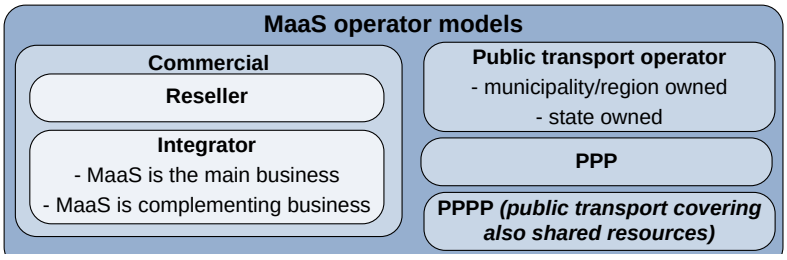

Figure 4 - MaaS operator models (modified from Eckhardt and Aapaoja, 2016).

Because the history of MaaS services is still relatively short., there is not yet much evidence on the suitability and success of the illustrated MaaS business models, even though MaaS or equivalent services and pilots already exist. In addition, there are hardly any full-scale international, not mention to cross-border, MaaS services providing integrated ticketing, payment and multi-/intermodal traveler information and routing. Business models will obviously evolve; the most successful will remain and the less successful will disappear. Despite the relatively early stage of the MaaS concept, multiple revenue models for MaaS operators can already be identified. The reseller business model is mostly based on commissions and hence requires high volumes since the margins are probably small. The concept provides just minor additional monetary value, but it can integrate multiple transport modes on a one-stop principle.

For the integrators MaaS can be the main business; integrator model would also require large volumes as the revenue model would probably be based on commissions on re-sold services. Additional services combined with transport services would likely be expected to increase volumes. As a common way in mobile business for having additional incomes, advertisement/marketing of other services and products could be utilized as well. An integrator may provide MaaS services to extend and complement their primary business in order to strengthen its market share and competitiveness. For instance, if event organizers, boarding houses or other non-transport service providers act as MaaS operators, transport services can be considered as additional services from their point of view. This can also improve the image of the company as providing all-inclusive service packages. Additionally, customers might be willing to pay a higher price for a trip sold by a MaaS operator, if the operator could guarantee a connection in case of delay in a multimodal travel chain.

When a public transport operator acts as a MaaS operator, the main aim is probably to increase sales and the average vehicle occupancy as well as improve the accessibility of public transport by providing a set of on-demand first-/last-mile services, more extensive and additional services. Public transport operators should also pursue the reduction of emissions in accordance with the political guidelines of the municipalities, region or state (nation). The PPP model does not necessarily aim at profits, but it can result in cost savings for the public sector through improved efficiency and more inclusive services for, in particular, vulnerable social groups or rural areas. In addition to PPP model, PPPP model takes into account the fact that in some sparsely populated rural areas and regions demand for public transports - whether it is set by the local people or e.g., seasonal tourism - cannot probably be met solely by existing public resources but they need to be integrated with both commercial and shared private resources.

In sum, PPP and PPPP models strive more than other models to improve the efficiency of existing transport services and public resources by taking advantage of the personalized approach to develop an inclusive transport system. Enabling new methods for using existing services, for example shared taxis or other forms of demand-responsive transport, may offer a more efficient use of public resources. The

more personalized approach to mobility services could help to attract citizen who now finds difficult to use traditional public transport, such as the elderly, the disabled or foreigners by easing access to door-to-door transport provision.

Conclusions

Business model consists of three elements that together describe the value creation: value proposition and offering, value creation system, and revenue model. In this study, MaaS business and operator models are described and analyzed through existing MaaS services and pilots. Five different types of models were identified; two commercial models – reseller and integrator; the public transport operator as MaaS operator model; and two multi-sector partnership models - the PPP and PPPP MaaS operator models. For all of these models, a wide range of key partners and customers in addition to revenue streams, i.e. multidimensionality, are overarching features and also essential parts of the business model.

Based on the findings, it could be summarized that the public transport operator-based model is likely to be more common in cities, suburban areas and interurban transport because these areas and sectors are already relatively well covered with public transport. The PPP and PPPP models can potentially bring remarkable cost savings for the public sector but also bring huge benefits for the users in rural areas. Hence they could be more viable especially in rural areas and together with subsidized transport and shared private resources.

The reseller model might lose its share as new, more extensive services combinations with mobile applications emerges, therefore it can meet obstacles in the future. The integrator model might provide the most variety regarding the implementation and is hence the most unpredictable model due to the uncertain development of various factors, for instance service combinations, mobile services, one-stop principle and user acceptance, that will impact on the integrator business model. Because the integrator model is purely commercial, novel and there are only a few ongoing pilots or services, many uncertainties currently exist and hence the model could very well disappear in the future, or it can become a huge success. Same goes with the PPPP model that does not exist yet. However, shared resources are already seen as a vital part of future public transport in Sweden, so the idea of combining the transport operations of different sector is not completely new. Regions, municipalities and cities exploiting MaaS kinds of mobility services must ensure that they are accessible and inclusive by involving all the focal stakeholders from the operators to the citizens. By this the situation where MaaS services only addresses the most profitable part of the market leading to a two-tiered approach to mobility can probably be avoided.

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