# Transport services benchmarking

## Best practices from North Sea Baltic Commuting Corridors

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# Abstract

This study was carried out as part of North Sea Baltic Connector of Regions project in 2017. The objective of the study was to benchmark existing smart passenger transport concepts and service developments in urban nodes and along commuting growth corridors. The focus was to find the barriers of entry to markets, best practices and public sector action points. The main method of information collection was interviews of transport service providers. The geographical area of interest was the commuting corridor stretching from Germany to Poland, Lithuania, Latvia, Estonia and Finland. Unfortunately, service providers were reached only in Finland. The key findings were the following:

- Few actors in the transport service sector are at a viable business stage
- Public sector assistance is needed in
    - Creating enabling legislation
    - Assistance in market entry, for example by financial support, marketing assistance and steering group mentoring
    - Providing adequate infrastructure, such as rail and road capacity and parking spots for shared vehicles
- Subsidization is not viewed necessary for most services in the long run.

This report describes this study, and key outcomes are recapitulated in conclusions of this report, as well as exhibited in a separate slide show. The report and slide show serve as background material for an upcoming Innovation Labs Roadshow, in which results are shared and further developed with project partners in the commuting corridor.

The project was contracted by the City of Hämeenlinna. The steering group included Sakari Saarinen and Malla Paajanen from Helsinki-Uusimaa Regional Council; Anne Horila from Growth Corridor Finland; and Ismo Hannula, Markku Rimpelä, Tarja Majuri and Niklas Lähteenmäki from City of Hämeenlinna. The consultant was Sito Oy, and the project group consisted of Pekka Eloranta, Maiju Lintusaari and Nina Frösén, and Jukka Lintusaari from University of Tampere.

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## 1.1    Background

The City of Hämeenlinna and Growth Corridor Finland are project partners in the Interreg project **North Sea Baltic Connector of Regions** and a co-leader in **work package 3: commuting growth corridors**. Work package 3 leader is State of Berlin.

NSB core project is led by Helsinki-Uusimaa Regional Council and has project partners from Finland, Estonia, Latvia, Lithuania, Poland and Germany. The project aims to improve the sustainable accessibility of the Eastern Baltic Sea Region in freight and passenger transport. NSB CoRe contributes to the TENT (The Trans-European Transport network) strategy by taking its implementation to the regional and local level by connecting the TENT core network corridor of North Sea Baltic to its catchment area and access routes in Eastern Baltic Sea Region. NSB CoRe implements from a regional development perspective TENT Regulation and brings the needs of peripheral regions to the core network corridor context. Furthermore, work package 3 agenda is defined as:

*"The strategic aim is to strengthen the cities and regions along the North Sea Baltic core network corridor through organizing intensive links, especially in cross border regions, access routes and services for business and labor mobility. This includes improving cross border transport connections and services, enhancement of last mile solutions and digital services in interurban and urban transport. NSB CoRe enhances interaction between infra development (passenger terminals), planning of transport services (timetables and tariffs) and smart mobility services."*

Project partners along The Finnish-Estonian commuting growth corridor focus on smart mobility services.

The object of this project is **the benchmarking of existing smart passenger transport concepts and service development** in urban nodes and along commuting growth corridors, taking into account the Mobility as a Service concept. The project is carried out as a part of WP3.

The focus of the benchmark is in the following issues and questions:

- Development of multimodal passenger transportation in urban nodes

    o  Especially first and last mile solutions

- How to enable private sector to create new economically sustainable transport services as part of public transport system

    o  Technical requirements

    o  Administrative requirements

- What kinds of co-operation models exist between public authorities and private companies in the field of smart transport

- In the field of smart mobility, what kind of regulation exists, set by local, national or EU-level authorities

- How to take advantage of smart solutions in order to enhance efficient use of expensive space in urban nodes

Benchmarking report serves as background material for Innovation labs roadshow, which will be organized by NSB CoRe in the corridor countries in 2018. In the Innovation labs, ITS developers, startups, NGO's, open data experts and transport service providers meet with national, regional and local authorities and regulators of transport services in a series of thematic workshops along the NSB core corridor. Indicatively, events will take place in Berlin, Poznan, Tallinn and Helsinki.

The Interreg project, work package and this benchmark are closely connected to the changing operational environment in urban development, transport systems and digitalization. There are some certain and some uncertain effects of this change; some positive and some negative. The changing operational environment can lead to more effective and equal transport system with smaller negative externalities. However, there are uncertainties especially regarding technological development and human behavior. A SWOT analysis of the changing operational environment is presented in table below.

*Table 1. Strengths, weaknesses, opportunities and threats of digitalizing transport. Source: Transport and Communications Architecture 2030 and 2050. Ministry of transport and communications reports 7/2017.*

| Strengths | Weaknesses |
|---|---|
| - More effective transport and travel<br>- Real-time condition and traffic information<br>- Emission reductions<br>- Big data, open data, broad exploitation of data<br>- Internet of Things, smart cities where data moves between different elements (traffic, homes)<br>- Higher equality of mobility<br>- More flexible and more versatile transport solutions | - Utilizing new technology in traffic requires more efficient, faster and more reliable communication networks<br>- Infrastructure Requirements<br>- Opening data interfaces and utilizing information<br>- Technical deficiencies of autonomous vehicles<br>- Attitudes and slow behavioral changes<br>- Possibility to utilize information in an unwanted way<br>- Unsolved information security and data protection issues |
| **Opportunities** | **Threats** |
| - Increased mobility<br>- Versatile, shared and personalized information-based mobility services<br>- Easy to test the routes of autonomous public transport<br>- Enhancing the use of time by autonomous vehicles<br>- Business potential in logistics and mobility services<br>- Setting up a wireless 5G network<br>- 3D printing, the possibility of improving the performance in logistics | - Building an efficient communications network and network overload<br>- The vulnerability in co-dependency between actors in communications, mobility and other fields<br>- Conflicts of communication, traffic, and variability of different actors<br>- Increasing information, cyber security and data protection risks and misuse of information<br>- Natural disasters and accidents<br>- Military threats<br>- The increasing requirements for telecommunication connections and frequencies (the current wireless network capacity is not enough for IoT-traffic or traffic automation) |

## 1.2       Methods

Chapter 2, exploring regulation in transport services, is based on an interview of Susanna Metsälampi, ministerial adviser of Ministry of Transport, who is the contact person for the preparation of the legislation reform. The interview was conducted in August 2017.

Benchmarking data for chapter 3 (benchmark of service providers in Finland) was collected through interviews in April–August 2017. Interviewees were selected developers of transport services – start-ups, companies that have been running for several years, and traditional, well-established companies. Interviews were semi structured – an outline of questions was prepared, and in some cases, sent to interviewee in advance. However, interviewees were allowed to discuss more deeply about the most interesting themes to their company. After interviews, data was standardized to the question form, and analyzed in regard to performance comparison, and best practice and market model identification. Some interviewees requested data to be reported in non-identifiable form. As a result, analysis was conducted according to the following transport service themes. The interviewees are presented in appendix 1.
- Smartphone apps for advanced trip planning and route optimization solutions
- Travel chains and integrated services, including first and last mile solutions
- Ride hailing / sharing services
- Car and bike sharing
- Smart parking solutions
- Enabling service providers: smart ticketing, payment and clearing
- Automated vehicles.

Additionally, the following themes were identified to be interesting, but current, interesting actors were not available:
- Shared bikes
- Integrated mobility management.

Chapter 4 was based on a desktop study from internet and other literature sources, as well as from project group's experiences.

Chapter 5 is based on project group's experiences and vision.

Chapter 6 draws together main conclusions from this study, which are focused on results of benchmark described in chapter 3.

## 1.3       Terms

Shared vehicles:

> Demand-driven vehicles are used in the services, in which travelers share a vehicle either simultaneously (e.g. ride-sharing) or over time (e.g. car sharing or bike sharing), and in the process share the cost of the journey, thereby creating a hybrid between private vehicle use and mass or public transport. (Wikipedia).

Ride sharing:

> Ridesharing is the sharing of vehicles by passengers to reduce vehicle trips, traffic congestion and automobile emissions. Types of transportation that are considered ridesharing include carpool, vanpool, and transit or public transport. (Wikipedia)

On-demand transit/demand responsive transport:

> On-demand transit/demand responsive transport is an advanced, user-oriented form of public transport characterized by flexible routing and scheduling of small/medium vehicles operating in shared-ride mode between pick-up and drop-off locations according to passengers' needs. (Wikipedia)

Smart parking:

> Smart parking means parking solutions where applications to control and communicate space occupancy, planning and booking, etc. are being used.

Integrated mobility:

> Integrated mobility includes travel chains (parts of a trip made by different modes, such as walking to a train station, then riding a train, and in the end riding a local bus to destination, or taking a taxi to airport, taking a flight and in the end a tram to destination), smart ticketing and payment, integrated first/last mile solutions and systems and applications that are used to plan, manage, and monitor the mobility solutions.

MaaS:

> Mobility as a Service, in which a transport system is built from user and service points of view, instead of the perspective of ownership.

API:

> Application program interface: Set of definitions, protocols and tools for building application software. A code, which allows software programs to communicate with each other. Enables different applications and systems to be combined.

## 1.4  Further reading

<u>General topics</u>

- MaaS White Paper

    ERTICO (European non-profit organization developing advanced ITS systems to European markets, http://ertico.com) activated MaaS interest group in 2014 Helsinki ITS European congress. Target was to enhance understanding of MaaS and create unified market for the solutions. The group was divided into sub-working groups (Single Market, User Perspective, Regulatory Framework and Technical Architecture) with a target to create common business and technical rules for MaaS and share the knowledge of MaaS.

    The group was developed further for legal entity and it was launched in ITS Europe Strasbourg in 2015.  The targets of MaaS Alliance (http://maas-alliance.eu ) is to drive new mobility solutions in Europe, having focus in MaaS deployments. MaaS Alliance working groups finalized their work in spring 2017 and after that the results were combined into White Paper, which was launched in Sept 4th 2017.

Among other themes, the white paper demonstrates the potential of MaaS in different geographical scopes – all present in the study area commuting corridor (see figure below).

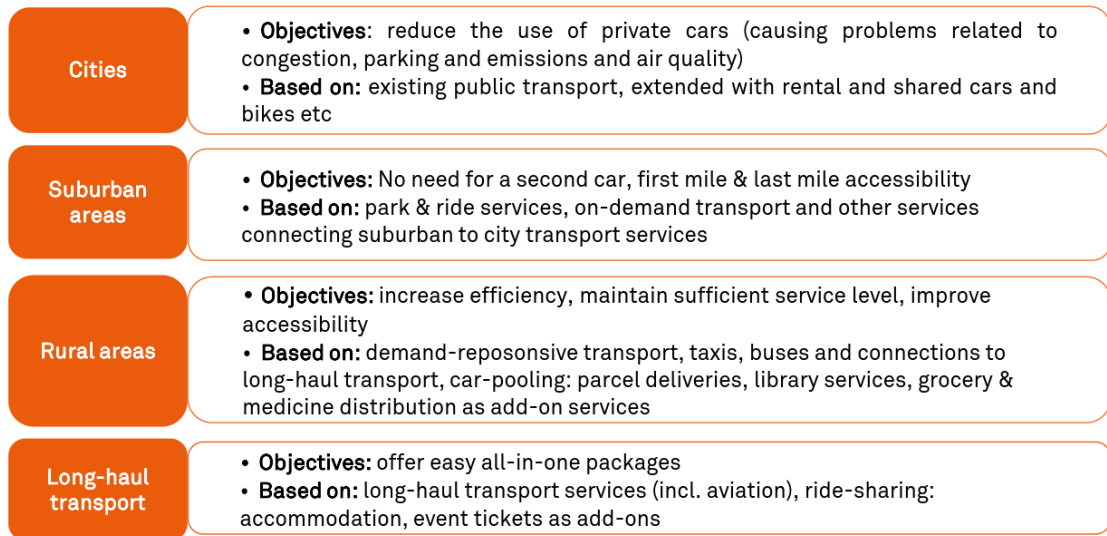| Cities | • **Objectives**: reduce the use of private cars (causing problems related to congestion, parking and emissions and air quality)<br>• **Based on:** existing public transport, extended with rental and shared cars and bikes etc |
| --- | --- |
| Suburban areas | • **Objectives:** No need for a second car, first mile & last mile accessibility<br>• **Based on:** park & ride services, on-demand transport and other services connecting suburban to city transport services |
| Rural areas | • **Objectives:** increase efficiency, maintain sufficient service level, improve accessibility<br>• **Based on:** demand-reposonsive transport, taxis, buses and connections to long-haul transport, car-pooling: parcel deliveries, library services, grocery & medicine distribution as add-on services |
| Long-haul transport | • **Objectives:** offer easy all-in-one packages<br>• **Based on:** long-haul transport services (incl. aviation), ride-sharing: accommodation, event tickets as add-ons |

*Figure 1. Potential of MaaS in different geographical scope. Source: White Paper: Guidelines & Recommendations to create the foundations for a thriving MaaS ecosystem, Fig. 10.*

https://maas-alliance.eu/wp-content/uploads/sites/7/2017/09/MaaS-WhitePaper_final_040917-2.pdf

- MaaS evaluations

MaaS has attracted multiple stakeholders to write their opinions and define the positions with new mobility solutions, including MaaS. As markers are just emerging, many of the are "marketing material" for the authors future opportunities in MaaS. However, there are multiple good articles like Deloitte University Press "The rise of mobility as a service – Reshaping how urbanities get around."

https://dupress.deloitte.com/dup-us-en/deloitte-review/issue-20/smart-transportation-technology-mobility-as-a-service.html

KPMG has also launched a document about MaaS requirements, especially different scenarios from user perspective. Target for the document is to help transport authorities to redefine and optimize their services. The document includes also first version for MaaS Requirement Index Model, which in the future will be key tool for regions like cities and growth corridors.

https://home.kpmg.com/uk/en/home/insights/2017/08/reimagine-places-mobility-as-a-service.html

- **New mobility In Sweden**

  Sweden has been one of the most active countries in defining and opening public transport data under Samtrafikens projects, for example in ticketing systems (https://samtrafiken.se/projekt/biljett-betallosningar/ ). They have also in summer 2017 established Swedish Mobility Program to combine different national programs, prestudy is good reading (https://samtrafiken.se/wp-content/uploads/2017/03/Swedish-Mobility-Program-summary-english.pdf ).  The high level umbrella program KOMPIS (Kombinerad Mobilitet som tjänst I Sverige) is driven by RISE Sweden (previous Viktoria Institut) - https://www.viktoria.se/media/news/rise-viktoria-leder-fardplan-for-framtidens-mobilitet

- **MaaS investments**

  One excellent source for MaaS growth comes from investment markets. There are dozens of technology companies acquired by companies targeting strong positions in MaaS mar-ket, one example is advanced MaaS routing: Ajelo Oy (key company developing KutsuPlus in Helsinki) was first sold to US Split Technolog Inc and recently the competencies was sold to Volkswagen's MaaS (car sharing) company MOIA (https://www.sttinfo.fi/tiedote/moia-acquires-finnish-tech-company-split-finland?publisherId=61317839&releaseId=61323926 ).

  DIDI (Chinese MaaS operator) invested into Taxify – Uber type car sharing company, just as another example (https://techcrunch.com/2017/08/01/chinas-didi-invests-in-taxify/ ).

- **Transport and Communications Architecture 2030 and 2050**

  The Ministry of Transport and Communications appointed three rapporteurs to produce a vision of how bold development of the transport and communication system could be used to create favourable conditions for Finland's well-being, competitiveness and econ-omy in 2030 and 2050.

  https://julkaisut.valtioneuvosto.fi/bitstream/handle/10024/79795/Raportit%20ja%20selvitykset%207-2017.pdf?sequence=1 (report in Finnish, abstract additionally in English and Swedish)

- **Mobility As A Service For Linking Europe, MAASiFiE**

  MAASiFiE is a project financed by the CEDR Transnational Road Research Programme 2014 on Mobility & ITS. The main scope of MAASiFiE is to identify and analyse MaaS mod-els and create a Roadmap 2025 for MaaS in Europe. In this context, a common under-standing of MaaS needs to be gained for both public and private stakeholders.

  http://www.vtt.fi/sites/maasifie

- **Finnish Growth Corridor**

  Growth Corridor Finland stretches from Helsinki to Tampere region as a string of cities. It forms the forefront basis of national competitiveness; more than 50 % of Finland's GDP is produced in this area. Growth Corridor Finland is the biggest pool of workforce in Finland with more than 301 000 daily commuters. The organization of *Finnish Growth Corridor* is dedicated to building Growth Corridor Finland to become the leading experimental plat-form on intelligent transport services and systems in Europe.

  http://suomenkasvukaytava.fi/briefly-in-english/

Smartphone apps for advanced trip planning and route optimization solutions

- Links to apps lists

  Several lists are available, such as:

  https://www.tomsguide.com/us/pictures-story/491-best-travel-apps.html

  https://www.ricksteves.com/travel-tips/phones-tech/apps-for-travelers

Travel chains and integrated services, including first and last mile solutions

- Ylläs Around impact study

  The Ylläs Around MaaS experiment (Mobility as a Service) is an R&D procurement jointly financed by commercial operators and the authorities, the purpose of which was to study and experiment with a new environmentally friendly, cost-efficient and safe mobility service customized for the needs of travelers in the Ylläs area. The impact study on the Ylläs Around mobility service specifically concerns the winter season 2016–2017, considered against comparable data from the previous season. For this report, the impact of the project was studied from the business perspective and the social perspective along with service challenges and suggestions for further development.

  http://www2.liikennevirasto.fi/julkaisut/pdf8/lts_2017-31_yllas_around_web.pdf   (report in Finnish, abstract additionally in English and Swedish)

- Fluidtime services

  Fluidtime is Austria's leading, award-winning provider of IT-services in the fields of integrated mobility and mobility-as-a-service (MaaS).

  https://www.fluidtime.com/en/integrated-mobility

Ride hailing / sharing services

- Uber

  Uber Technologies Inc. is an American technology company headquartered in San Francisco, California, United States, operating in 633 cities worldwide. It develops, markets and operates the Uber car transportation and food delivery mobile apps.

  https://www.uber.com/

- Lyft

  Lyft is a transportation network company based in San Francisco, California. It develops, markets and operates the Lyft car transportation mobile app.

  https://www.lyft.com/

Car and bike sharing

- **Public officials' vehicles to sharing systems in Porvoo and Tampere**

   Research to find an operational model, in which public sector employer (municipality) offers a common car service to its employees, instead of all units owning their own vehicles. The aim is to increase the rate of utilization and to minimize the investment costs. The vehicles may even be offered for use for the public outside office hours.

   https://www.motiva.fi/files/8596/Virka-autot_yhteiskayttoon_raportti.pdf (available only in Finnish)

- **Car sharing business models in Germany: characteristics, success and future prospects**

   Study on 101 car-sharing providers in Germany in 2016. Findings include that different car sharing schemes (cooperative, business-to-consumer roundtrip and one-way, peer-to-peer) have significantly different fleet sizes, and that all models seem viable, and as a result will continue to co-exist at least until Internet-of-Things applications and autonomous cars will be common.

   https://link.springer.com/article/10.1007/s10257-017-0355-x

Smart parking solutions

- **Forbes article on the future of smart parking**

   Summary of the future development in the USA.

   https://www.forbes.com/sites/pikeresearch/2017/01/26/smart-parking/#49f91a5762f6

- **Overview on the smart parking solutions on the market**

   Several links to solution and technology provider's pages.  Also projects and case studies are available.

   https://www.postscapes.com/smart-parking/

Enabling service providers: smart ticketing, payment and clearing

- **Smart Ticketing Alliance**

   The Smart Ticketing Alliance (STA) represents a platform for cooperation and a coordinated approach for establishing ticketing interoperability for the Public Transport sector. The Alliance drives a coordinated effort towards global ticketing interoperability for the public transport sector. This includes the establishment of a trust scheme that mirrors the schemes used in the mobile phone industry, banking sector and with other stakeholders.

   http://www.smart-ticketing.org/

- **PayiQ. Mobile Payment Solution for Smart Cities**

  PayiQ develops intelligent cloud-based mobile solutions for public and private transport utilizing Microsoft Azure technology. We are the leading mobile payment solutions enabler for Mobility as a Service (MaaS) operators. Our focus is on mobile tickets, security and safety serving all travel means including various flavors of shared economy.

  https://payiq.net/en-us/

<u>Automated vehicles</u>

- **Automated vehicles in the EU**

  A briefing document that includes, potentials and challenges of vehicle automation, different levels of automation, automation technologies and their deployment, regulatory and legal framework, general regulatory environment and ongoing work in the EU.

  http://www.europarl.europa.eu/RegData/etudes/BRIE/2016/573902/EPRS_BRI(2016)573902_EN.pdf

- **Nordic conditions drive automated vehicles to the Finnish line**

  Article concerning autonomous vehicles in artic conditions.

  http://www.goodnewsfinland.com/feature/nordic-conditions-drive-automated-vehicles-to-finnish-line/

## 2 Regulation in transport services business opportunities

## 2.1 Background

Transport services are regulated by several laws, for example legislation about taxis, public transport, passenger rail transport, customer data and package travel. The actors in transport markets are facing drastically varying laws in different countries. Moreover, EU legislation is in many aspects insufficient and unfinished regarding for example new technology (such as automated driving) and service models (such as integrated trip chains) – although this is a general feature of legislations. Technologies and services are developing faster than legislation This gives opportunities for research and development activities, so that regulation would not prohibit actions before its impacts are known.

In Finland, the legislation that regulates the operations about transport services is one of most cultivated to enable pilot projects and running services in the field of transport services. Yet, the legislation is under a thorough reform under the current government. The Finnish Government Programme of Prime Minister Juha Sipilä prioritizes digitalization, experimentation and deregulation. To achieve these goals, a new Act on Transport Services will fade out many previous laws. The Act on Transport Services aims to
- Integrate and equalize laws regarding transport markets
- Support new transport service models and improve user experience
- Promote interoperability of the transport system
- Reduce administrative burden
- Create a culture for experimentation.

The preparation of the Finnish Act on Transport Services is in process, and will be implemented stage by stage in the next few years (see figure below). In the international framework, such legislation is scarce. In fact, one objective is to set examples of best practices in legislation, which can be considered later for example in development of EU or national legislation.

| Stage I: Improving the service markets | Stage II: Driver and professional qualifications, transport registers | Stage III: Remaining provisions |
|---|---|---|
| Emphasis is on road transport. The provisions of the Public Transport Act, Taxi Transport Act and the Act on Transport of Goods on the Road will be harmonised. Market access and functionality will be improved. Legislation restricting competition will be removed and lighter public guidance introduced. Combining passenger and freight transport will be made possible. Stage I of the Act on Transport Services was approved on 24 May 2017. The Act will enter into force mainly on 1 July 2018, the provisions concerning the promotion of new electronic services on 1 January 2018. | New teaching techniques will be supported and possibilities for moving from training requirements to knowledge requirements are being looked into. National provisions adding to European Union requirements on demonstrating professional competence will be critically reviewed. Regulations concerning transport registers will be brought together and renewed in accordance with the objectives set in the Government Programme. Draft government proposal for consultation in April 2017, government proposal to Parliament in summer 2017 . | Provisions that have not been covered in earlier stages. It will be ensured that objectives with regard to the transport system and digital services are comprehensively covered in the Act on Transport Services. Draft government proposal for consultation in June 2018, government proposal to Parliament in December 2018. |

*Figure 2. Preparation and implementation process for the Act on Transport. Source: Act on Transport Services, Factsheet 57/2017, Ministry of Transport and Communications. Available: https://www.lvm.fi/en/-/factsheet-57-2017-act-on-transport-services-941001*

Even if the transport legislation is enacted successfully, the formation of a stable transport service market depends on many aspects, such as taxation, technological development and customer mindset. If one or several successful stakeholders operate in the market, more are attracted. However, markets can be small and not all business opportunities can be translated to different operational environments. There has been hype about new transport services for a number of years, with only few successful applications emerging. The legislation reform can prolong the hype, and improve the operational environment regarding the public opinion nationally, and the different stakeholders internationally.

## 2.2    Opportunities

New legislation for transport services opens opportunities in development of the transport system, for example in the many aspects of digitalization as well as enhancing the efficiency of transport services.

Businesses has been digitalizing in stakeholders' own terms for a long time, and companies have created digital services and data even without binding legislation. Some stakeholders consider transparent and open data to be the basis of the industry. On the other hand, some data has been opened only under contracts. A risk is that few large actors will create an oligopoly to control available data. New legislation is being developed to prevent this. The new legislation aims to create an infrastructure of information which does not depend of stakeholders' own terms. The new laws require all actors to share essential information about publicly available transport services and to provide single tickets available to be re-sold. This creates business opportunities for refined transport services – integrating information to compare, merge or package modes or parts of a travel chain. Having more options available, the end user can make more informed transport choices, regarding for example time, price and environmental friendliness of the trip.

There is immense potential to improve the efficiency of the large mass of publicly funded transport, for example transport of school children, disabled or elderly people and hospital patients. The new legislation aims not only to improve the integration of these transportations, so that trips are collected to same vehicles either simultaneously or in subsequent trips, but to increase the supply of public transport by making these transports available to all users, when possible. To achieve this, the operational, business and regulation models of taxis needs to change – since taxis are the main means of transport for the publicly funded trips. The new legislation deregulates the taxi business, and there are doubts about the impacts. Nevertheless, the ministries that have developed the legislation in collaboration, are convinced that the level of service will not drop, or the price level will not escalate – and have created tailgate mechanisms, in case the market will not develop as expected. Besides reforming the transport system, the new legislation will enable the usage of appropriate sized vehicles for each transport, dissolving the in some cases unreasonable separate legislations for taxi and bus operations. In addition to enhancing the efficiency of operations, deregulation enables new forms of transport services, such as providing companies with taxi services with fixed pricing, for example monthly fee.

The legislator is aware of not even perceiving all opportunities opened by the legislation reform, and aims to encourage innovation. The main function of the legislation is to provide equal opportunities and remove barriers of entry as far as possible, ascertaining vital functions and safety, in both traffic and social points of view, for example personal data security.

## 2.3    Challenges

In addition to opening new opportunities, there are several challenges in the reformation of legislation, especially due to the objective of deregulation. Challenges regard several technical aspects in integrating separate existing laws under one, more general legislation; the ways legislation controls and affects operational environments; and equality of citizens from the point of view of utilization of digitalized services.

Legislation reform aims to deregulate operations in road and rail traffic, enabling integration of parts of the travel chain. However, such deregulation is not yet possible in aviation and seafaring, impeding such integration of air and sea travel. In aviation and seafaring, collecting passenger information is mandatory, and such information cannot be shared though open APIs, according to personal data protection laws. The issue is being investigated in the Finnish legislation reform, and solutions can be expected to be found in the concept of *my data*, in which the end user can authorize transport service providers to make reservations. The concept is parallel to the existing EU-legislation about payment services. Since solutions have been found to similar issues in other fields, the issue is expected to be resolved also in the field of transport services.

Another technical challenge in combining several laws to one regards integrating transport chains. National and international regulations for different transport modes is fragmented, and legislation about packaged travel has been developed in separation from legislation about transport in general. For example, in different transport modes the rights of passengers concerning cancelled trips or accessibility are diverse. Moreover, under the new legislation integrated transport chains can be offered under different roles, with different responsibilities: a ticket broker can have no responsibility in the actual fulfillment of the chain, and a mediator can cover all situations from delays to cancellations. Yet it is undetermined, what is the market willing to pay and for what level of services. As the market and customer desires are still forming, the responsibilities of operators are challenging to define in the legislation.

Having liberal legislation about, for example, automated vehicles in Finland, can lead to business risks. Currently, EU-legislation does not limit national legislation, and Finland can be liberal in allowing business and technical development. However, when EU legislation will be formed, it can be stricter. National legislation cannot be controversial to EU legislation, and thus, the national operational environment previously feasible, can become illegal. Nevertheless, having liberal national legislation enables testing technologies as well as business models, and create innovations that can be scaled internationally. This promotes the national economy in addition to developing the industry. The Finnish legislators are even willing to take risks to enable developments in the transport sector. For example, in freight transport, delivery vans were given an exempt of freight transport permission, despite planned extortion in the EU legislation. The hypothesis is to be able to present good user experiences and have an impact on the EU-legislation that is being developed.

The transport sector as a public service needs to be equal to all citizens, which creates controversy in the development of new services. Yet the definition of equality is not unanimous. If not all citizens use smart phones, can smart phone applications be promoted by the public sector? If better services can be provided to the large majority with less inputs, does not the whole public gain benefits? The point of view of the legislation is that new innovations benefits everyone, even those who cannot use them. Having new services does not mean that present services will be deteriorated. There will always be a part of the population who cannot function independently, and differences between rural and urban areas and different business models - for example taxi and bus companies - will always exist, and the operational environment can never be equalized.

With a reform in the operational environment of an industry, come challenges – both challenges that were predicted and anticipated for before the changes, as well as unpredicted challenges, that will arise after the change has taken place. The above-mentioned challenges are either anticipated for with special formulation of legislation, or by accepting that the reform will have negative or neutral impacts, in addition to the more substantial positive impacts.

## 2.4    International regulation

Most of current EU and other international laws are based on an outdated operation model, which is relatively formal, and based largely on paperwork, heavy regulation and authorities' approval. The aim in all regulation is to ease the burden of the authorities in the public sector.

The key point of view in all transport legislation, whether national or international, is safety. Yet the operational environment in Finland varies from central EU environments, and as a result, some developing applications can be tested, or waivers of laws can be applied for.

## 3        Benchmarking – Finland

## 3.1      Benchmarked services

### Smartphone apps for advanced trip planning and route optimization solutions

**Tuup** http://tuup.fi/en/

Tuup is an intelligent application that allows users to plan a route, compare the various mobility options and pay for the mobility services. Tuup displays the various options to get from point A to point B, including busses, trains and trams in Finland. The app also shows the available City Bikes in Helsinki as well as the car-sharing stations.

**Liikuttaja**

Liikuttaja allows users to search for the services available in Savonlinna area and to choose the fastest and most sustainable modes of transportation. The application gathers all available modes of transportation into one view that allows users to quickly select the route they want, or to compare the different travel times, routes, emissions data, or computational health benefits of different alternatives. The application provides also a channel to give feedback on the urban environment and infrastructure by means of image and text. Liikuttaja is a service provided by Sito Oy, the City of Savonlinna, Pohjois-Savo ELY Centre (Centre for Economic Development, Transport and the Environment), Appmill and Offsiteteam.

### Travel chains and integrated services, including first and last mile solutions

**Ylläs Around** http://www.yllas.fi/en/area-info/yllas-around.html

Ylläs Around is a pilot service supported by the Finnish Transport Agency, the municipality of Kolari, Ylläs Travel Association and Semel Oy. The aim of the service is to provide easy central access to transport services in Ylläs so that visitors can easily move around the village and local attractions without needing a car. The smartphone application helps visitors to find different options for each desired journey, showing all available modes of transport and schedule for those and providing a chance to purchase tickets for the preferred journey. The application provides also an opportunity to book a taxi for the journey and benefit from lower costs by sharing the taxi with other people wanting to visit on the same day, traveling together for less.

The service aims to expand in stages, so that eventually the entire travel chain from home to holiday accommodation can be managed through a single application, and potentially billed as one with the accommodation. The first phase of the experiment was conducted in the spring of 2016 and the second phase from November 2016 to beginning of May 2017. The third phase will start in December 2017.

**Whim** http://whimapp.com/fi-en/

The Whim application is available in the Helsinki Region, making more than 2 500 taxis, rental cars from Sixt and HSL public transport available from the same mobile app. The application makes it possible to find all the routes, fees, tickets, timetables, booking and travel options in one place. The user can choose a monthly package to cover all the daily journeys, or to pay-as-you-go.

### Kätevä

Kätevä was a new kind of mobility service concept developed for the residents of Seinäjoki. Kätevä offered three different mobility service packages. The total service consisted of the city's public transport, demand-responsive public transport (DRT) and the modernized taxi services. The basic idea of the service was simple: the customer selects the most appropriate service package and pays the service for a fixed monthly payment of the service package. In return, the customer gets the mobility services for a lower price. The mobility services were booked with a search and routing application, which allowed the user to search for public transport connections, view the location of local buses (Komia Liikenne) in real time and order contracted taxi or DRT services.

Kätevä was a service provided and developed by Sito, Komia liikenne, Pahkakankaan liikenne, Seinäjoki central taxi, the City of Seinäjoki, Into Seinäjoki and Etelä-Pohjanmaa ELY Centre. The service was piloted from November 2016 to beginning of May 2017.

VR https://www.vr.fi/cs/vr/fi/ovelta-ovelle-palvelut#Foli (only available in Finnish)

The Finnish national passenger rail transit operator is developing first/last mile solutions to compliment trunk transport by rail. At the time of publication, VR, offers door-to-door travel chains in Turku region and Tampere. A local public transport *Föli* single ticket can be purchased in conjunction with a train ticket to or from Turku. The cost of the ticket is 3 euros – same as when bought in the buses – but the benefit to the user comes from the ease of payment, integrated to the train ticket. In Tampere, VR frequent customers were able to receive unlimited ridership on the summertime bus line 100, which connects city center, including the train station, to key points of interest. The service was available 8.6.2017–13.8.2017 on the day of train travel as well as the following day.

VR is developing new services both internally, as well as with partners. Themes of interest are at least taxi rides before or after train ride – in shared or private taxis – and park-and-ride. IT system is currently under development at a natural part of its life cycle, and requirements and possibilities of new mobility services are taken into account in the development process.

## Ride hailing / sharing services

### Uusikaupunki commuting pilot

The Uusikaupunki commuting pilot consisted of ride sharing between Uusikaupunki and Rauma. The aim of the pilot was to develop demand-responsive mobility services for the commuters living in Rauma and working in Uusikaupunki. The 3 months long piloting was carried out in co-operation with the employer in Uusikaupunki.

### KutsuPlus
https://www.hsl.fi/sites/default/files/uploads/8_2016_kutsuplus_finalreport_english.pdf

Kutsuplus was an intelligent demand-responsive transport pilot carried out from 2012 to 2015. The fully automated, real-time demand-responsive public transport service was developed by Helsinki Regional Transport Authority (HSL) and Split Finland Ltd. (earlier Ajelo Ltd.).

### Kyyti http://tuup.fi/en/

Kyyti is a taxi-pooling service for door to door rides. The Kyyti system is based on the efficient use of vehicles and combination of trips, which enables the offer of cost efficient rides. There are three types of rides to choose from:  the "taxi-like" Express option, the slightly more flexible Flex option, or the cheapest Smart option for the travel needs that don't require to be on a tight schedule (flexibility in travel and waiting times). The service is always paid in advance.

### Deployment of the Helsinki region MaaS platform (pilot project)

The main objective of the project is to connect public transport services in the Helsinki region and statutory city-funded passenger transport services into one service package, to which also new kinds of mobility services, developed by the private sector, can be connected. The project makes most of publicly funded rides (for example school transport and rides based on the Social Welfare Act) open for all, and thus increases the amount of available connections from the passenger point of view.

### Tampere pilot on combining publicly funded rides and work trips

Opening publicly funded transports (for example school transport and rides based on the Social Welfare Act) to being available to work travel during the work day can affect mode choice between home and workplace, eliminating the need for private can during the work day. A pilot project to selected companies will commence in 2018 by Tuomi Logistiikka.

## Car and bike sharing

### Share it https://www.shareitbloxcar.fi/

Shareit Blox Car is a peer-to-peer car sharing service that helps car owners find someone to rent their car to when they don't need it.

### 24 Rental Network https://www.gonow.fi/en/

24 Rental Network offers two types of rental services: a free-floating, charge per minute service called **go now!** and a round-trip, charge per hour/day service called **24Rent**.

Go now! is a pay-per-minute carsharing service that takes you from A to B in Helsinki, Espoo and Vantaa 24/7. The Go now! application allows users to manage reservations, control the car doors and pay for the service. The target group for the service are the short one-way trips in the city generated by work, leisure time or in surprising situations.

## Smart parking solutions

### Rent-a-park https://www.rentapark.fi/en/infos/about

Rent-a-park makes private parking spaces, owned by individual or companies, available to open market while not in use by their owner. It gives motorists the chance to find and book a convenient parking space even before leaving, eliminating circling around for parking altogether and parking owners the possibility to list their space and get paid when somebody rents it.

### Enabling service providers: smart ticketing, payment and clearing

IQ-Payment https://payiq.net/en-us/

PayiQ provides operators a pay-as-you-go service with access to all common digital payment methods and strong fraud prevention that meets the changing demands of today's transportation industry. With PayiQ it is possible to buy all the tickets to the whole travel chain, and even to events, with one app. With PayiQ's cloud-based and completely mobile ticketing solution Smart Cities meet the needs of modern urbanization to efficiently produce traveling services for growing number of people with less pollution.

### Automated vehicles

Sensible4 http://sensible4.fi/

Sensible4 creates technology to automated vehicles. The focus is on public transit, in addition to shared vehicles. Sensible4 offers transport operators either systems to automate existing vehicles or a complete automated system, including sensors and software, to mobility service provider. The company was founded in February 2017 and is currently in development phase. However, automated vehicles have been developed since 1985, and finished products will be expected to be released soon.

## 3.2 Business models

### Smartphone apps for advanced trip planning and route optimization solutions

Trip planning and route optimization could be considered as a mandatory service for transit orientated cities and regions. Multiple solutions exist in traditional app and in browser based platforms (mobile and desktop environments). Trip planning solutions are targeted to give user options how to travel with different modes of transport (bus, metro, tram, ferry, etc.). Usually services also include biking and walking capabilities.

Apps and web-services could be categorized in two differentiated segments in trip planning: 1. Global and nationwide and 2. Regional and local. Global and nationwide services tend to make use of open public transport databases and are well known for all smart phone users. Solutions like Google Maps, Here Transit and more are known brands for consumers and public transport navigation is an elemental part of wider navigation offering. Regional and local solutions have more variation and usually solutions are offered to customers by local PTA.

Global and nationwide services are easy way to start advanced trip planning and optimization services. Good thing for the user is that it is very easy to use the application, when it is almost every time already installed in ones' device. Downsizes are lack of local variation capabilities and installation of special features which are more and more necessary when PTA's are trying to gain more customer base. Also, route optimization in local level could be mediocre at best and various new and commonly known bike lanes are missing due to old network data. Business model is usually advertising and usage data based in global and national services.

Regional and local trip planning services are much more suitable platforms for building truly optimized and locally connected trip planning solution. Local solution gives freedom to build connected systems such as vehicle real time tracking and payment in addition to routing. Business models in these trip planning and route optimization cases usually are publicly funded. Private companies will offer the services needed by public transport agency through tendering process. However, there are some business cases for operationally funded trip planning software, where in addition to the usual revenue from advertisements, there is also revenue streams from application payments, such as additional advanced features.

## Travel chains and integrated services, including first and last mile solutions

In integrated services, the customer pays a monthly fee and the mobility operator pays for the operators (buses, taxi etc.)

Diverse income flows: in some cases, the service provider is a re-seller and in some cases a broker. The demand for different roles of the service provider, and the users' willingness to pay yet to be seen.

The income of the mobility operator is gathered as a share (%) of the price collected from passengers. (No self-supporting services yet)

Establishing the business requires investments to software (platforms) and personnel.

## Ride hailing / sharing services

The mobility operator pays for the operating costs (operating costs, personnel costs etc.)

The income of the mobility operator is gathered as a share (%) of the price collected from passengers. (no self-supporting services yet)

Establishing the business requires investments to software (platforms) and personnel.

## Car and bike sharing

The income of the mobility operator is gathered as a share (%) of the price collected from users. (no self-supporting services yet, but the growth of business is strong and the trend is promising)

Establishing the business requires investments to software development, personnel and the fleet (leased).

## Smart parking solutions

The income of the mobility operator is gathered as a share (15 %) of commission between the parking spot owner and renter.

Establishing the business requires investments to software (platforms) and personnel.

## Enabling service providers: smart ticketing, payment and clearing

Three sources of income flows:

- Access and maintenance fee from software

- Transaction fees (margins)

- Consultation on software customization

Self-supporting services. Need for external funding in service development.

Establishing the business requires investments to software and personnel.

## Automated vehicles

Income is based on initial investment of selling products. Continuous services, such as maintenance are under development.

## 3.3     Best practices and lessons learned

**Smartphone apps for advanced trip planning and route optimization solutions**

### Best practices:

- Seamless cooperation is needed towards operators

    o Finding the right partners is crucial

- Viable contracts are the key

### Lessons learned:

- Administrative requirements

    o Crucial role in opening the APIs

    o The possibility to sell public transport tickets is crucial to the service

    o The state: to bring out the ongoing pilots and to form an image of the current supply of mobility services (cities as a target group: what is available and what can be achieved?)

- Biggest challenges and surprises in entering the market

    o The slow opening of APIs

**Travel chains and integrated services, including first and last mile solutions**

### Best practices:

- Proof of concept: the service packages can be a profitable business to the operators

- Key aspects in contracting

    o Defining the role of the service provider as a customer to the operators (ticket purchasing)

    o Defining the benefits to all the parties

    o Ensuring the availability of the APIs (only operators with payment APIs can be integrated to the service)

    o Pricing of the service (monthly fees, single ticket fees)

    o Terms of service (running times, ability to share the mobility package with family or friends, subscription terms and times, terms of customership)

- A system with many service providers is beneficial to all (freedom of choice to the customer)

- The profits are best for big scale operators (the ability to buy a large amount of tickets for a low price for re-selling)

- At its best, a MaaS service can significantly increase the accessibility and attractiveness of its service area (verifiable benefits especially from the tourism industry). This encourages to integrate MaaS services to larger entities, for example tourism, events and accommodation services.

- The pre-paid ticketing makes transactions in the vehicles smoother, which increases the travel speed

- Keys to profitable business:

  o competitive pricing, that lures new users to the public transport market

  o clever route matching to lower the costs

  o early purchases of the trip

  o co-operation between the trunk route- and local operators (for example in cases of delays)

Lessons learned:

- The service should allow mobility between cities and even internationally (roaming practices). MaaS should not be only a local service based on local public transport!

  o Studies show that public transport is a crucial part of the service to the users

- Shared rides and demand based traffic form a crucial part of the service

- The service could exploit publicly funded rides more comprehensively, which would benefit both the MaaS service provider (more less expensive rides to offer) and the public sector (decrease in the funding needs of the rides).

- The business model should include also other income flows than the one from the ticket re-selling. A profitable business model must be built in co-operation with the local operators (bus, taxi etc.), and everybody must gain from the system for the model to be profitable.

- MaaS needs a certain critical mass of users (which can take 2-3 years to achieve)

  o Finding the right segments and customers demands time, effort and money

  o How to sell the service for motorists, cyclists or random public transport users? (requires acceptance of new information and new habits from the customer)

- Biggest challenges in entering the market

    o APIs and negotiations with potential partners require the biggest amount of work

    o The ability to sell tickets also to the trunk routes (train, airplane etc.) is crucial

    o Market-making role: the challenge of establishing the market and gain credibility to the service

    o Marketing: how to make the potential customer aware of the new service already while planning the trip? (first and last mile connections may have a big role in defining the main way of transportation, so the user should be reached already when planning the trunk route)

    o Integration of certain transportation modes (e.g. taxi) can take a surprisingly long time

    o Different entering strategies; the current market defines the success for each

    o Defining and pricing of the service packages

    o To find a common commitment to the service (including all parties and operators)

    o Availability of coders with insight in mobility services limits technological development

- Technical requirements

    o Clearing can be automated

    o Importance of APIs: the service can be expanded to places where APIs are available

    o Internationally common API standards are needed for international services

    o Establishing the system requires a lot of manual work

    o Up-to-date maps are crucial as a base on the service to be able to provide useful information to the users (the ease in finding the right locations)

- Administrative requirements

    o Crucial role in opening the APIs

    o Enabler for the pilots and co-operation

        ▪ Co-operation between cities and pilots leads to formation of an ensemble

    o The role of the provider of traffic systems as an enabler

    o The possibility to sell public transport tickets is crucial to the service

    o De-regulation of transport services contributes to the operation of the service

    o Taxation policies

        ▪ VAT rate has an impact on the profitability of the service

    o The ability to co-operate with publicly funded rides: which kind of combinations can be formed and who can have the access to the databases on public rides? (school transport, rides based on the Social Welfare Act etc.)

    o Support from the public sector creates credibility towards customers

    o Public sector responsibility to maintain sufficient road and rail infrastructure

Ride hailing / sharing services

Best practices:

- Good scalability of the services

    o Potential implementations in commuting (labor-intensive working places and districts)

- Pilot projects can be established quickly

- A need for a high-quality service marketing

- Proof of concept from the piloting projects: Automated real-time scalable demand-responsive transport services that can optimize routes and add value to vehicular efficiency have a bright future

    o As the vehicular capacity is gradually increased, the efficiency in combining trips grows and the subsidizing level of transport decreases (an increasing number of passengers in each vehicle as the number of simultaneously serving vehicles in the area was increased)

        ▪ A level between the efficiency of a typical traditional bus service and that of a typical taxi service can be achieved already in piloting phase

    o A good "temporal reliability" of the trip-combining can be reached despite the partially unpredictable traffic

- Reliable estimation of driving time is a critical success factor in a service based on automatically combined trips.

  o Reliability and punctuality are prerequisites for efficient operation and for smooth journeys with co-passengers. Therefore, the control and service system should be aware of the traffic situation at hand.

  o A proper implementation of trip order, payment, driver's instructions and navigation information all must happen in real time to enable efficient and optimized real-time routing of moving vehicles. These are also pre-requisites for service scalability in terms of service area and fleet size.

- The ability to gain a large number of users in a short time

  o According to modelling, a significant modal share is possible to achieve through clever route matching and aggressive dynamic pricing

- The ability to gain new user groups

  o Exceptionally high customer satisfaction and a strong demand can be achieved despite the small service area and the small fleet

  o Ride sharing can be a competitive alternative to the private car and the leased car

    ▪ More passenger kilometers per vehicle kilometer, more trips per vehicle hour than are made in a typical taxi service

    ▪ According to studies, most of the users have one or more private cars in their household and a driving license

  o A strong demand in orbiting traffic, where private cars have been the dominant mode of transport due to the scattered starting points and destinations

  o A different age and gender distribution compared to public transport users

- Strong connections to the public transport system

  o The service can lure private car users and serve as a gate to the use of both the service and public transport (requires optimization between the two modes), which would result as environmental benefits

  o Potential as a transfer connection: the transport mode can be further developed to increasingly complement traditional public transport.

    ▪ Transfers could be, for example, guided with augmented reality-enabled smartphones

    ▪ When coupled with real-time information, such as the estimated arrival time of a delayed train in a snowstorm, the demand-responsive services could adapt and provide fluent transfers with shorter waiting times.

- Good experiences from the differentiation of services (a service that can take even only one passenger at a time when necessary, and that can also at other times effectively combine trips in real time within the price and time-limits desired by less busy individuals)

  o As the quality of service increases, it is possible to increase the price of the trips

  o Dynamic pricing would also contribute to the service profitability: Vehicular efficiency could be further boosted with an automated auction over an open interface between the automated subscription centers that the taxi services provide and the passenger application (with time management personal valuation, €/min). This would also reduce congestion in peak hours.

  o Regarding service packetizing, the wider the set of services, the greater the potential benefit

- The fluency and ease of ordering, payment, and consumption of a shared trip and travel chain increase demand

- The ability to collect big transit data (service development, data sales)

Lessons learned:

- Establishing a profitable business requires large numbers of passengers (because of the high driver costs)

- A profitable business model based only on mobility services is difficult to build and understand

  o Integration of other services (groceries, accommodation services etc.) or actors (co-operation with public rides, employers, shopping centers etc.) can change the balance towards the right direction

- A pilot is comparatively easy to establish; the real challenge lies in establishing continuous service (requires continuous users)

  o How to integrate the new services into everyday life of the users?

- Establishing the service requires a big initial investment

  o Small-scale operation requires substantial investments or subsidies. Once the capacity is brought up to a large scale, service reach will be improved, and according to the simulations, vehicular efficiency will be multiplied. Expanding the service will improve service quality, which will increase customer satisfaction, which in turn also supports the trend for better economy.

  o The lack of capacity growth severely hurts the service development in terms of efficiency, economics, and quality development

- A strong co-operation with the local operators (taxi, bus, DRT) is needed from an early stage while establishing new services

  o The business must be profitable from the point of view of all parties

- In terms of achieving sufficient demand, the timing is crucial: the best moment to establish new services is when a change in travelling occur (for example establishment of a new work place). Afterwards the demand can be difficult to achieve even if there is a potential for the service (passengers have already adapted the change in another way and are not so willing to try new services)

  o Pricing of the service is not necessarily the key to a large demand or profitable service (although the service has to be priced reasonably for sufficient demand)

  o A bigger impact from the time saving effect?

    ▪ Services that enable utilization of travel time (e.g. a fast, free wi-fi connection) are a must!

- Technical requirements

  o The increase in automation increases the efficiency of the system

  o A database for the performances of the car, driver and customer is needed

  o The optimization system has a big impact on the efficiency of the system. Key questions

    ▪ If the customer is given a registration number instead of the license plate number, the optimization can be done near the requested trip, which allows to increase the efficiency of route matching

    ▪ What kind of information is requested from the customer: a specific departure/arrival time or a range of suitable times?

- Administrative requirements

  o Funding (Tekes, cities) plays a crucial role in establishing pilot projects

  o Taxation policies play an important role in the generation of demand

    ▪ the current tax reduction system favors private cars and ride sharing systems at the expense of public systems

    ▪ Renewal of the tax reduction system: from employer-subsidized commuter tickets (only public transport) to subsidized MaaS-services

  o Support offered by the transport infrastructure to the new services: dedicated bus lanes, prioritized traffic lights, land use for parking and parking costs, should be included in the toolbox

- Main challenges in entering the market:

    o Cost level (especially driver costs)

        ▪ In a large-scale operation, an estimated two-thirds of the costs are based on drivers' wages, so autonomous vehicles will create an interesting opportunity

    o Geographical location (sparse population challenges the route optimization and increases the operating costs)

    o Technological risks

    o The reserved attitudes towards new services

- Biggest surprises in entering the market

    o Negative attitudes towards walking (door-to-door service as a requirement)

    o The importance of the possibility to place an order

        ▪ 30-60 minutes before departure

        ▪ right before the departure and

        ▪ 1-8 hours before

    o The increasing importance of ordering the trip using smartphones

    o The slow opening of APIs

    o The surprisingly big demand

- Major risks in establishing new services:

    o Software problems

    o Inappropriate cost structure

    o The kind of information requested from the customer

## Car and bike sharing

### Best practices:

- High customer satisfaction

- A worldwide growing interest and demand towards new mobility services

- Co-operation with construction companies

    o Cost savings in the building phase to the company (need for fewer parking places, if a shared car is available)

    o Free parking places provided to the service provider

    o A useful service available to the residents/users of the building

- Co-operation between service providers and insurance companies: new tailored insurance models have been developed to enable the new services.

- Co-operation with other service providers

  o Data provision, especially to mobility app providers

  o How to bring out the brand and the nature of the service in services provided by other parties?

  o The growth of the business is generated by new partnerships and co-operation

**Lessons learned:**

- The service must be flexible, easy and accessible (within a few hundred meters' radius) to gain demand

- Technical requirements

  o Verification (profiling and identification) of the customer is crucial

- An oversized optimism is common while setting goals and schedules

- Administrative requirements

  o The city's possibility to provide parking places to the service provider is crucial from the service point of view

    ▪ a need for a minimum of 10-20 places in city center and additional places in the surrounding area (the requirement for accessibility must also be met in suburbs)

    ▪ a need for both passenger cars and vans

    ▪ a need for easier dialogue concerning parking issues (decision makers are difficult to reach and administrative processes long to make the change in relation to the matter to be corrected)

    ▪ the need for agile pilots

    ▪ the need for shorter and more agile contracts

  o The city's possibility to give support/marketing channels to the service?

  o An access to Trafi's (Finnish Transport Safety Agency) database for checking the customers background information would benefit the service

  o The legal change that will allow the customer to remove his background information from the CRM in 2018 will complicate the maintenance of the system (providers' ability to keep a record on the misuses of the service)

  o The renewal of the Transport Code and the regulation related to required interfaces enables a stronger co-operation between different parties and the birth of new business models in the field of mobility business in Finland

- o Co-operation with public transport (common campaigns) and the even-handed opening of public transport to all service providers that fulfill the terms of the national regulation

- Biggest challenges in entering the market:

    o How to get the customers to try the service?

    o How to find the right segment and the right pricing for the service (high customer expectations and low willingness to pay for the service)

    o Funding

    o New concept with small marketing budgets

    o Negative attitudes towards rental companies

    o The size of the provider (big company gets benefits in vehicle acquisitions)

    o Legislation differences, and differences in insurance policies regarding car sharing in different countries and continents.

    o The lack of insurance models considering peer-to-peer renting.

    o The missing key in extending the service is the lack of international, uniform frames and ground rules.

    o Assembly of the international service providers can be considered as a positive challenge

- Biggest surprises in entering the market

    o the low demand of the service on short trips

## Smart parking solutions

### Best practices:

- The operation fits well to the current regulatory system (both state and the cities)

- Development of the service requires analyzing and forecasting behavioral models, which has succeeded well

### Lessons learned:

- Biggest challenges in entering the market

    o Funding

    o The slow renewal of the parking industry vs. small-scale service provider's possibilities to wait for things to happen (generates the need for decentralization as adaptation to the situation)

    o Lack of experience of different parties in carrying out the needed IT-development: very few IT-projects have been carried out in the parking industry, so the parties have very little experience on purchasing IT development

- Technical requirements

    o Challenges in the speed of real-time data processing.

- Administrative requirements

    o Funding (Tekes, cities) plays a role in pilot projects

    o Public sector is the primary partner in scaling the service (public sector has strong connections to the parking problematics, so a strong co-operation is needed)

    o A better integration to the parking control system would benefit the service

    o A more flexible customer relationship with public sector (current procurement laws and auditing processes challenge small-scale service providers)

## Enabling service providers: smart ticketing, payment and clearing

### Best practices:

- Key aspects in contracting

    o The ownership of IPR to each customer

    o A revenue share model must be agreed on at an early stage of co-operation

### Lessons learned:

- Administrative requirements

    o The cities have a big role in reaching for the smart city concepts

    o Open APIs to the purchase of single tickets

    o Strong connections to the financial control legislation (payment transactions) and privacy protection legislation (processing of personal data)

    o Conscious avoidance of giving one provider a monopoly position

    o Slow decision making makes it hard to gain customership with the public sector (long waiting times are a challenge for entrepreneur)

- Biggest challenges in entering the market:

    o How to find the right partners to build business (a need for local partners and resellers for credibility!)

## Automated vehicles

### Best practices:

- Products are interesting to international stakeholders, from small start-ups to large global brands, and customer acquisition has been successful

## 4 Benchmarking – International Growth Corridor

### 4.1 Estonia

Tallinn

| Theme | Company / System | Service | Scale | Funding (assumed) |
|---|---|---|---|---|
| Bike sharing | Sixt bike rental, part of Nextbike public bike sharing (more than 45 German cities and 23 countries) | Station-based city bike system | 15 stations, more than 100 bicycles | Private? |
| Smart parking | Barking | Peer-to-peer parking space rental service. Includes reservation, opening gates, payments | 35000+ sessions every month, 2500+ active users, 10 000+ parking spaces | Private |
| Ride hailing | Uber | private cars and drivers offer rides | | Private |
| Ride hailing | Taxify (Estonian company) | private cars and drivers offer rides, also includes traditional taxi vehicles | | Private |
| Ride sharing | Hopp | Connecting traveler to driver between Tallinn and Tartu | | Private |
| Ride sharing | Wisemile | Social transport network for drivers, passengers and packages | includes private cars, official taxis, and public transit as part of the travel chain | Private |

Pärnu
no findings

### 4.2 Latvia

Riga

| Theme | Company / System | Service | Scale | Funding (assumed) |
|---|---|---|---|---|
| Bike sharing | Sixt bike rental, part of Nextbike public bike sharing (more than 45 German cities and 23 countries). Formerly operated by airBaltic | Station-based city bike system | 28 bike sharing spots in Riga and Jūrmala, total of 250 bicycles available for use. By paying a registration fee of 9 euro, a code for the bicycle you chose is sent to your mobile phone. A 30-minute ride costs 90 cents. 10 000 rides in 2014 | Private? |
| Ride hailing | Taxify | private cars and drivers offer rides, also includes traditional taxi vehicles | | Private |
| Smart ticketing | e-ticketing / Rigas Karte PP joint venture: Riga public transport operator 51 % / Conduent, French multinational e-ticketing solutions provider 49 % | Payment for public transit, car parking, park and ride, register for social services (free meals, entrance to schools), receive discounts Main functionalities of e-ticket system: - Open technologies Open to various types of smart cards, smart tickets, contactless bank cards, mobile phones i.e. to accept the preferred payments means of the passengers. - Multimodality Buses, trams, trolleybuses, trains, | 50 % of Rigas population have the card Turnover 15 mill € (2013) Transportation system includes: - Riga city public transportation - Riga city official microbuses - Public and school buses in various Latvian towns | Subsidized |

| | | | | |
|---|---|---|---|---|
| | | regional routes buses, microbuses, taxi, park&ride system etc... <br> - Multi-operator <br> Able to manage data of various transport operators by guaranteeing the data integrity and confidentiality between various operators <br> - Interoperable <br> Clearing of operations between our various clients <br> Card also functions as e-wallet | | |
| Travel chains | Park and ride / Rigas Karte | Car drivers can leave their cars in protected car parks and then take public transport. With 2 validations on any public transport during the day, they can exit the park free of charge. | Multi-storey car parking with 676 places. As the car park's capacity is loaded only by one third, the free parking places were reserved for the needs of park&ride | Subsidized |

## 4.3 Lithuania

Vilnius

| Theme | Company / System | Service | Scale | Funding (assumed) |
|---|---|---|---|---|
| Smart ticketing / integrated mobility /smart parking | Smart Vilnius / m.Ticket, m.Parking | Integrated route planning and ticket purchase <br> Mobile pay for parking | Various types of tickets, discount groups, payment methods. Available for many tickets on one phone. | Subsidized |
| Ride hailing | Uber | Private car drivers offering rides | | Private |
| Ride hailing | Taxify | Taxi booking; private car drivers offering rides | | Private |
| Ride hailing | eTAKSI | Taxi booking; private car drivers offering rides | Started as a pilot, and decided to continue service. <br> More financial beneficial to drivers than Uber (0.58 € vs. 25 % commission) <br> Obliged to pay VAT. | Private |
| Car sharing | SPARK | station-based electric car sharing <br> App for reservation, accessibility and billing | 36 stations (charging points) | Private |
| Car and bike sharing | CityBee (operates in Vilnius, Kaunas, Klaipeda coast) | Station-based car and bike sharing | 53 car stations (3/2015) <br> Plans to have 400 cars (3/2016) <br> Includes also electric cars <br> 2 bike stations | Private |
| Bike sharing | Dropbyke | Stationless bike hire <br> App for finding vehicles and payment | Launched in 7/2015 <br> 50 bikes (4/2016) <br> Aims at co-sharing private-owned cars | Private |
| Bike sharing | Cyclocity Vilnius, operated by JCDecaux | 24/7 self-service bike hire <br> App for finding docking stations and available bikes, and managing subscription | Launched in spring 2014 <br> 37 docking stations, 300 bikes (4/2016) <br> Several cards can be used as identifications, such as student cards, ID-cards or public transit cards | Private |

Kaunas

| Theme | Company / System | Service | Scale | |
|---|---|---|---|---|
| Car and bike shar-ing | CityBee (operates in Vilnius, Kaunas, Klai-peda coast) | Station-based car and bike sharing | 22 bike stations with 150 bikes<br>28 car stations<br>Launched in 5/2016 | Private |

## 4.4 Poland

Warsaw

| Theme | Company / System | Service | Scale | |
|---|---|---|---|---|
| Shared cars | GoGet | Station-based car sharing | Across Poland (two stations in Warsaw)<br>Dozens of stations | Private |
| Shared cars | 4Mobility<br>Partners: BMW Group, Mini, PayU, fleetster, etc. | Station-based car sharing | | Private |
| Shared cars | Tender by municipal transport authority to distribute a fleet of 500 cars (electric or hybrid engine) | Follow-up info not found | Aim to be the Veturilo of cars | Subsidized |
| Shared cars | SharCar | Electric car sharing | Information only in Polish<br>Not launched yet(?) | Private |
| Shared bikes | Veturilo (operator Nextbike Polska) | Station-based bike sharing | Launched in 8/2012<br>337 stations and 4925 bicycles<br>Also electric bikes, chil-dren's bikes (60 bikes at 6 stations) and tandems (45) available<br>Total of almost 8 million rentals in the first five seasons; 1,9 million rentals in season 2016 | Subsidized |

Poznan

| Theme | Company / System | Service | Scale | |
|---|---|---|---|---|
| Car sharing | Public-sector driven attempt to create a service of shared electric cars | | | Subsidized |
| Bike sharing | Nextbike<br>German company, launched in 2004, present in 23 coun-tries and over 100 cities and 35.000 bikes | Station-based bike sharing | seven stations in Poznan<br>Available in several cities in Poland with 11.000 bikes and 1.000 stations. | Private? |

## 4.5 Germany

Berlin

| Theme | Company / System | Service | Scale | |
|---|---|---|---|---|
| Car and bike sharing | Free2move | Combines existing car/scooter/bike sharing companies on one platform: stationary, free-floating and peer-to-peer | Available where providers are. Car2Go, DriveNow, Emmy, Multicity, Driveby, Flinkster, Stadtmobil, Cambio, Multicity, Tamyca, Coup. Aiming to grow by building more partnerships. | Private |
| Car sharing | Car2go (by Daimler Mobility Services GmbH) | Free-floating (all public parking lots in home area) car sharing B2B services | Germany (6 cities), Austria, Canada, China, Italy, Netherlands, Spain, USA | Private |
| Car sharing | DriveNow (by BMW, Sixt) | Free-floating (?) car sharing | Launched in Munich 6/2011 5000 of cars in seven countries (Germany, Austria, UK, Denmark, Sweden, Belgium, Italy, Finland) with 800 000 customers (9/2015) | Private |
| Car sharing | Driveby | Station-based car sharing B2B services | 18 stations in Berlin Plans to expand to other cities | Private |
| Car sharing, bike sharing, integrated mobility, | Car.sharing: Flinkster Bike sharing: Call a Bike (by: Deutsche Bahn Connect GmbH) | Station-based round-trip car and bike sharing Fleet solutions, chauffer service, consulting, integrated mobility services B2B services | Bike sharing: dozens of stations in Germany Car sharing: hundreds of stations in Germany, Switzerland, Austria, Italy, Netherlands | Private |
| Car sharing | Stadtmobil | Station-based round-trip car sharing | 4000 cars 1600 stations 180 cities | Private |
| Car sharing | Cambio | Station-based round-trip car sharing B2B services | 32 stations in Berlin 894 stations in Germany and Belgium | Private |
| Car sharing | Multicity (by Citroën) | Station-based car sharing | Berlin 264 cars, 22 stations | Private |
| Car sharing | Tamyca / Snappcar | Peer-to-peer car sharing | Available in Germany, Netherlands, Denmark and Spain Includes various insurance options and payment methods | Private |
| Scooter sharing | Emmy | Electric scooter sharing | Berlin | Private |
| Scooter sharing | Coup | Electric scooter sharing | Berlin | Private |
| Bike sharing | Nextbike German company, launched in 2004, present in 23 countries and over 100 cities and 35.000 bikes | Station-based bike sharing, temporarily also free-floating for extra charge | 2000 bikes, plans to extend to 5000 bikes by 2018 | Private? |
| Demand responsive public transport | Allygator (by door2door) | On-demand shuttle | Service available every Friday from 5 pm to 1 am in Eastern Berlin | Private |
| Smart parking | Siemens | Radar to identify available street parking | Pilot started in 2015 | Subsidized? |
| Smart parking | Park Here | Sensor to identify available street parking | ? | Subsidized? |

| Theme | Company / System | Service | Scale | |
|-------|------------------|---------|-------|---|
| Smart parking | EasyPark, ParkNow, Yellowbrick, TraviPay, Trafficpass | Means to pay for parking | Available in 40 cities in Germany | Private? |
| Ride hailing | Uber | Private car drivers offering rides | | Private |

## 4.6 Umeå, Sweden

The Swedish municipality of Umeå has procured an external car pool that should be available to Umeå municipality staff during office hours, and is open to the public in the evenings and weekends. The vehicle pool consists of 19 vehicles. By procurement specifications, 50 % of the vehicles should be electric by October 2017, 75 % by October 2018 and by October 2019, all vehicles should be electric, depending on the deployment of charging areas. Umeå municipality pays for parking and electricity.

The procurement process begun with a dialogue with possible supplier before the tender documents were made public, in order to map out what should be included in the tender documents. The winning tender had a low price per kilometer (1 SEK/km) but a high price per booking (190 SEK/booking) and a low price per hour (6 SEK/h). The other tenderers offered 0 SEK/km, a low price per booking (20 SEK) but a high price per hour (129 SEK or 100 SEK). The municipality had hoped for a combination of these prices, like 0 SEK/km (since charging has no costs for the supplier), a price per booking at around 20–25 SEK and a price per hour at around 50–75 SEK.

The municipality experiences have been positive with the supplier, Sunfleet (www.sunfleet.com). The average distance driven by municipality personnel is about 32 km and average time about 3,5 hours per booking, and respectively about 64 km and 9 hours for the public.

## 5 Case studies and future views

This chapter presents some case studies and views of the future trends and developments.

## 5.1 Park and ride

Park and ride solutions are getting more and more common, especially in growing cities and urban areas, where instead of driving into city center, people are encouraged to leave their cars outside the city and continue with public transport. Park and ride service offers a convenient way to combine walking, cycling or driving with mass transit to the city region. On the other hand, park and ride services are being used by the commuters who want to leave their cars, motorbikes and bicycles to safe places and continue with trains, long distance buses, airplanes, etc. Park and ride facilities include often services that are useful for the drivers and commuters such as traffic information services, charging stations for electric vehicles, public transport ticket vending machines, car wash services, rest rooms, etc. Park and ride services can also be offered for car owners who want other transport services such as carpooling, vanpooling, carsharing, etc. In future, the parking facilities (including park and ride hubs) may play a significant role in the MaaS ecosystem.

There are several variations of the park and ride services and it seems that the amount of these services will grow also in the North Sea Baltic Growth Corridor. For instance, the FinEst Smart Mobility project (Central Baltic Programme 2014-2020) aims to strengthen links between Helsinki and Tallinn by piloting smart solutions such as park and ride.

## 5.2 Cross-border commuting

According to the European Commission the long-term aim is to facilitate the provision EU-wide of comprehensive information about travel by air, rail, sea and road with both publicly owned and private transport operators, and thus to offer travelers seamless, multimodal, cross-border, door-to-door mobility options. Based on comprehensive information, customers should be able to identify the most sustainable, fastest or best-value travel option for their specific needs, to book and pay online and to make their journey using a single ticket, irrespective of how many different modes of transport they use on the journey. However, this comprehensive information is not currently widely available. Available systems have been either single mode solutions and/or only regional or national. This also goes with the ticketing and payment. Journey planners (regional, national and international) have been available for years, and international journey planners have offered information for cross-border connections, where open interfaces have been available. Examples of these kinds of services and/or related research activities are for instance:

- Enhanced Wisetrip project (http://www.wisetrip-eu.org/)

- Traveline (http://www.traveline.info/) a multimodal journey planner in Great Britain

- Optygo (https://www.cityway.company/information-trip-optimization/multimodal-intermodal-trip-planner-optygo/) a multimodal/intermodal trip planner by Citiway (https://www.cityway.company/cityway/)

- FluidHub platform (https://www.fluidtime.com/en/integrated-mobility/smart-cities-regions) a MaaS related planning system and a journey planner for Vienna (https://www.fluidtime.com/en/article/web-journey-planner-wiener-linien) by Fluidtime (https://www.fluidtime.com/de/) with a possibility also to pay

- An American journey planner called Roadtrippers, which also works in Europe (https://roadtrippers.com/map?lng=21.672827335155034&lat=59.159956787367946 &z=5.95871149979779&a2=p!vp*18*1*6,t!19407361)

These are just examples and the market is growing rapidly. However, what have been missing are the integrated ticketing and payment systems: there have been no "one-stop-shops" available. The new services are expected soon.  For example, the new Act on Transport Services in Finland aims at opening all the needed traffic information and gradually also the ticketing and payment systems so that third parties, such as MaaS operators, can provide all the needed information in addition to ticketing and payment services for the travelers and commuters. A similar change is simultaneously proceeding in the EU legislation, but with a slightly slower pace. However, this change, when completed and put into practice, will make the developing of new international services to the European market possible from the operator's point of view. This will eventually generate a rapid increase in the amount of the services available for customers, both cross-border commuters and other users in the North Baltic Sea Growth Corridor.

Since all the countries in the North Baltic Sea Growth Corridor are EU Member States, the citizens are free to move within the European Union area. This means that the North Baltic Sea Growth Corridor can be a potential cross-border commuting corridor. When the integrated journey planning, ticketing and payment systems will be available, the use of these services will help commuters and other travelers to move effectively. The travel chain services are important and it is very important that the services cover both short distance (city level) and long distance trips seamlessly. Key enabling factories are legislation and involvement of all the stakeholders, both public and private (PPP – public private partnerships). These are unfortunately missing in many countries.

## 5.3    Shared vehicles

Shared vehicles are used by various people either simultaneously or over time. The vehicles may be, as they have been "traditionally" cars or minibuses, but also other vehicles including bicycles (traditional or electric) and other possible vehicles.

Most current bike sharing systems are station-based, in which a bike (traditional or electric) is taken and returned to a dedicated bike parking spot, a "station". Adding GPS devices on bikes allows "free flowing" bike share systems, in which bikes can be left in any public area in the operating range. Current systems are generally not commercially viable, since they require heavy investments, and additionally cause high maintenance costs of bike repair and balancing bike supply at different stations. Income sources are user fees (based on membership or usage), advertisements and sponsors. Often municipalities procure shared bike operations like public transport procurements. New operators are entering the bike-sharing markets with systems that do not require public funding. As a result, the market is under radical change. Currently, operators are at marketing stage, and have not been able to be contacted for research purposes. Moreover, lighter systems of shared bikes can be operated, in which the users have been restricted to belonging to a certain group, such as employees of a company, residents of a building etc.

Shared bikes have been available in Helsinki since 2016. In Helsinki there are 1.400 bikes and 140 bike stations within an area extending from the heart of the city to Munkkiniemi, Pasila and Kumpula. Espoo residents are able to try out the city bike service in Matinkylä and Olari, with 10 city bike stations and 100 bikes (https://www.hsl.fi/en/citybikes).

As shared bikes systems and services also the shared car systems are developing rapidly. Several operators have emerged and some have also left the market. The main categories of services are peer-to-peer sharing, and station-based and free-flowing commercial sharing. The shared car business will grow and develop in the future throughout the North Baltic Sea Growth Corridor. Various shared car services can be found for example in Finland, Estonia, Latvia, Lithuania, Poland and Germany.  Car sharing operators are going to increase in number in the future. Changes in the legislation, as the Act on Transport Services in Finland, will open new markets and opportunities for the service operators.

# 6        Results

## 6.1      Alternative market and service models

There are several possible ways for transport service markets to function. The options in some cases may be exclusive, leading to only one market model to thrive, and in some cases different models can co-exist – at least in varying services or geographic locations.

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**Rural mobility service**

Based on publicly funded transports (school children, disabled or elderly people, health services)

Opening existing transport services to all users (information, ticketing, clearing)

Public sector: major role

**Market-based urban mobility service**

Mobility operator business case runs market-based

Combines available public and private transport services

Public transport essential part of the package, however not great value-adder

Profits from re-selling large number of tickets/rides/vehicles (economies of scale)

Public sector role - enabler: creating positive atmosphere, opening APIs, providing parking spaces, assisting with marketing…

Public funds may speed up starting phase

**Municipality controlled urban mobility service**

Public procurement of mobility operator

Combines available public and private transport services

Procurement period for example 3 years

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*Figure 3. Overview of alternative market and service models*

In addition to currently there being several viable possibilities for the result of transport service markets, there are several possible paths to reach the result. The paths may affect the result, leading to for example monopolies, where long term service development or price level are not optimal (see figure below).
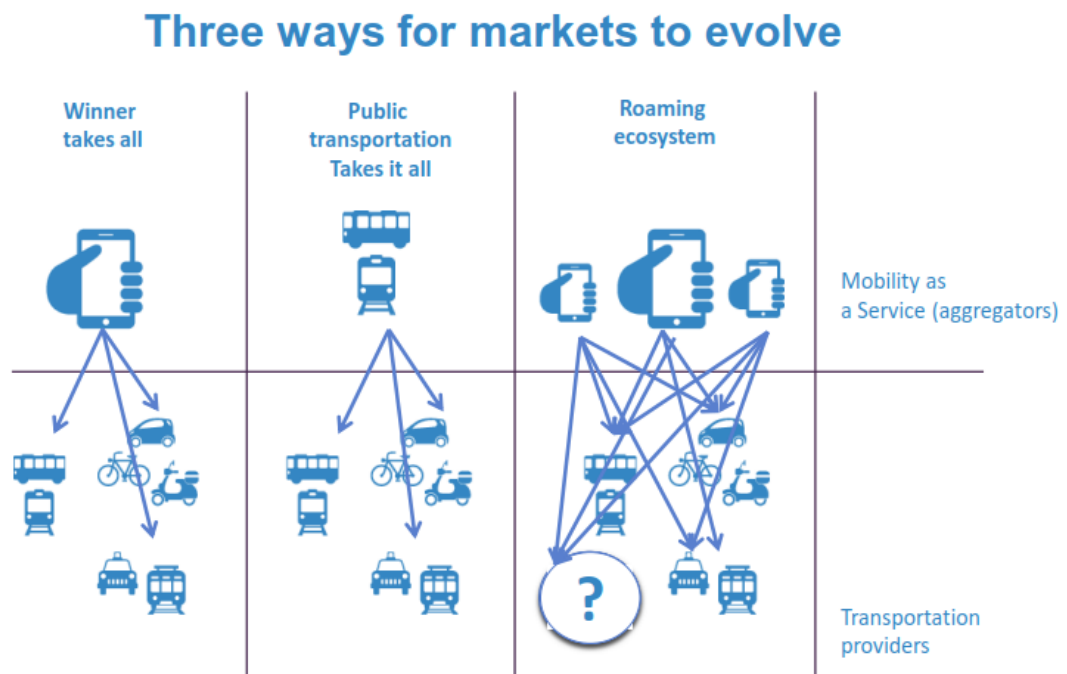


*Figure 4. Possible paths for markets to evolve. Source: Sampo Hietanen, MaaS Global*

Moreover, even if a consensus of a transport system – operated more effectively and offering users better level of service by transport services, compared to cars – a dilemma still exists of how to reach the target system. To convert from using a private car to using transport services requires a good enough level of service available, at a reasonable price. However, changes in car usage are slow, and running transport services without fully developed demand is financially challenging.

## 6.2    Public sector role

The following aspects have been identified as possible roles and responsibilities of the public sector, from financial, infrastructure and regulation points of view.

- Provide **services in areas of low population density** (subsidization)

- Actively develop hubs as **transport nodes**, in which services of different operators merge (hub can be operated by private sector, but need public coordination)

- Steer towards **separation of payment and identification** (enabling innovative pricing and packaging models)

- International actors to steer **automated vehicle regulation** to allow development (national and EU legislation)

*Figure 5. Possible roles and responsibilities of the public sector*

## 6.3 Action points

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**Private and public sector partnerships**

Open source code **APIs**

Open-minded **tests** - but preferably not pilot projects, which have a beginning and an end, and no commercial success

Ongoing **interaction**: What problems need to be solved? What interests are there? What do the end users want or need?

**Public sector**

Public sector opens and **enables** - no need to pay for the operator

Assistance in **marketing**; giving credibility to small private actors

Providing best **parking spots** for shared vehicles

**Challenges**

How to combine slow public decision-making **process** with the fast pace of entrepreneurs?

Municipalities working together to create an **entity** – enabling expansion and scaling of private services, and logical service chain for user

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*Figure 6. Action points for development of transport services.*

# 7 Conclusions

The aim of the study was to benchmark existing transport services in the geographical context of the North Sea Baltic commuting corridor. The focus theme was wide, and focus varied in the geographical study area. As a result, some themes, such as public transport ticketing, electric vehicles or parking, were put off focus.

In-depth information about services available presently or previously was successfully collected, analyzed, and beneficial results were drawn up. However, the found deep information was restricted to cover only services in Finland. However, conclusions can be drawn also from the lack of activity and the cursory information regarding the rest of the study area. There is less activity in the field of transport services, and the available services either are provided by large multinational service providers (such as shared bike operators) or are only used by a small number of clients in a restricted area.

Public sector actors as well as service developers can use the results of this study to enhance provision of services. This study demonstrates the business models in present services and gives several possible directions in which they can develop – nevertheless, the operational environment and revenue generation models can develop unpredictably. Moreover, roles for public sector and action points for development of transport services were identified according to the present service providers. Public sector actors can actively develop their role further, if desired.

Now that the present state of transport services has been identified in the North Sea Baltic commuting corridor, next steps to improve the provision of transport services can be:

- What is the target state of transport services? Regarding which services? At what time range?

- What is the problem that transport services can solve?

- What is the desired level of activity of the public sector? Which actor (municipality/state/other organization)? What kinds of activity can be provided (financial support, steering group aid, providing public spaces etc.)?

Even though many of the mentioned steps are between service providers and operational environment officials, the creation of services can be boosted by a higher lever for example by providing support for opening negotiations or identifying markets. The key method for development of transport services is the continual interaction between all different types of stakeholders.

## Visions for future developments

As the future Mobility-as-a-Service (MaaS) business models and concepts are emerging it is important to note that at the same time the technology that is used to create these services is fundamentally changing. The development of electric vehicles (EV) is strongly tied to the development of assisted and autonomous driving. The deployment of EV charging stations is something that typically has not been well considered in the urban or regional planning. Issues such as availability of parking spots, electricity availability and capacity, cost of deployment as well as the business case for the deployment are some of the concerns that regularly pop up in these discussions. In most cases the deployment happens in a haphazard manner with no planning whatsoever, resulting in less-than-optimal charging networks and capabilities.

As MaaS services' scope continues to expand and new services are added (such as car sharing) the traditional public transport services are mixed with what are currently known as private transport services. The distinction between the two starts blurring and therefore a logical conclusion is to simply start talking about transport services without making a distinguishing between public and private ones. If the MaaS concept truly embraces any transport method as a service, then we need re-define the concept of a hub as well. A hub is not something that is defined by a physical structure or something that has been designated as hub in the urban planning. It is more logical to define a hub in terms of the attributes that a hub is made up of.

In its simplest form, we can define a "Mobility Hub" as a location that combines multiple means of transport, thus providing a point of interest (POI) for MaaS services and operators. A Mobility Hub can thus be formed more easily than constructing a significant piece of physical infrastructure. For example, adding a shared bike station at a bus stop makes it a Mobility Hub and adding EV charging stations to a train stop makes it a Mobility Hub.

**APPENDIX 1: Interviewees**

Interviewees for chapter 3:

Anton Fitzthum (Fluidtime)

Erik Kanerva (Share It)

Kari Lehtinen (Knowhill; Ride sharing between Uusikaupunki and Rauma)

Jan Lundberg (Umeå kommun)

Marja-Riitta Mattila-Nurmi (Council of Tampere Region)

Ville Melkko (VR)

Susanna Metsälampi (Ministry of transport and communications)

Pekka Niskanen (Tuup)

Tuomo Parjanen (PayIQ)

Kaj Pyyhtiä (MaaS Global)

Kari Rissanen (HSL; KutsuPlus)

Harri Santamala (Sensible4)

Sampsa Siitonen (Witrafi)

Oona Takala (Kätevä Seinäjoki)

Asta Tuominen (Finnish Transpor Agency; Ylläs Around)

Elina Törmä (24 Rental network)