Tallinn Transport Department

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Interreg Central Baltic

FINEST SMART MOBILITY

CIVITTA

FinEstSmartMobility Exploitation Plan

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1. INTRODUCTION

FinEst Smart Mobility (FESM) is a project started from the Interreg Central Baltic programme 2014-2020 and focuses on improving the mobility of passengers and cargo between Helsinki West Terminal and Tallinn Old City Harbour. The Central Baltic Programme 2014-2020 is a European Union cross-border cooperation programme financing high quality projects with European Development Funds in Finland, Estonia, Latvia and Sweden.[1]

Helsinki West Terminal and Tallinn Old City Harbour both have decided to keep the ports next to the city centres, where new residential areas are built next to the ports. To make matters more difficult, the total mobility has been rapidly growing in these areas and is expected to keep growing everywhere. Both the travellers and local residents are affected by the current inbound and outbound traffic of the ports, the congestion, noise and other negative effects associated with higher traffic level. Smart ICT-based mobility solutions are needed to solve the problems caused by rush hours of loading and off-loading the ferries and the peak congestion events that are the result of port traffic merging with the daily commuting traffic.[2]

The FESM project aims to solve specific, highly visible mobility challenges by using smart mobility solutions, which are potentially a cost-effective way for increasing and improving the mobility flow. Firstly, a procurement was made to gather ideas about smart mobility solutions and mini-pilots were carried out with the selected ideas. Secondly, the results of the mini-pilots were validated and new ideas were gathered. As a result, 6 project entities were chosen to develop and test the smart and innovative solutions to relieve the traffic load around the harbours. [3] The planned pilot projects and relevant parties were:

TABLE 1. OVERVIEW OF THE PILOT PROJECTS

PILOT CODE	PILOT THEME	PILOT NAME	RESPONSIBLE PROJECT PARTNER	PILOTING COMPANY
Pilot A1	Smart guidance for heavy good vehicles (HGV) at port	GoSwift	City of Helsinki	GoSwift OÜ
Pilot A2		Fleetrange		Fleetrange Ltd
Pilot B	Smart management out-bound traffic	Infotripla		Infotripla OY
Pilot C	Smart Park & Ride for ferry passengers	Smart Park & Ride	City of Tallinn	-
Pilot D	Smart approach to Helsinki Airport from Estonia	Kyyti	City of Vantaa	Kyyti OY
Pilot E1	Feasibility study of smart management on Tallinn ring road for HGVs	Feasibility study of Tallinn ring road	Estonian Road Administration	Estonian Road Administration
Pilot E2	Sustainable Urban Mobility Plan (SUMP)	SUMP	Estonian Road Administration	Estonian Road Administration

Source: Civitta

[1] The Central Baltic Programme 2014-2020. <link>
[2] FinEstSmartMobility project application, provided by Tallinn Transport Department (TTD)
[3] FinEstSmartMobility project application, provided by TTD

In addition to the responsible partners and piloting companies, ITL Digital Lab, Forum Virium Helsinki Ltd, Helsinki Region Transport Agency and Port of Helsinki and Port of Tallinn were involved with the FESM project as active partners.

City of Helsinki coordinates the whole FESM project and focuses on pilots A (GoSwift and Fleetrange) and B (Infotripla). City of Tallinn focuses on the pilot C (Smart Park & Ride) and pilot E (the implementation of intelligent traffic notification system (ITS) on the truck parking area at the beginning of Tallinn Ring road and takes part in the SUMP planning). Estonian Road Administration is responsible for the SUMP planning in the project and for compiling a feasibility study with Pilot E. City of Vantaa is responsible for the Pilot D (Kyyti). The ITL Digital Lab will execute the living lab trials and mini-pilots in Tallinn. Forum Virium Helsinki Ltd is responsible for open data, API harmonization and planning and Helsinki Region Transport Authority is bringing experience needed to ensure the project plans are best aligned to both the needs of the Helsinki and Tallinn region.[4]

Each pilot was developed and implemented by a piloting company during the piloting period: pilots A and B were developed and implemented from March 2017 until the end of 2018, pilot C was started in June 2017, pilot D was started in September 2016 and pilot E was started in January 2017.[5] Each pilot ended with the final report, where the goals, carried out activities and results were described. The implementation phase of the FESM project will finish in May 2019 and the whole project ends in August 2019.

Each of the pilots defined their own set of goals to be reached during the FESM pilot project. Some pilots had established very specific measurable goals, but other pilots defined their outcome only as a solution or a general effect. All of the goals and outcomes that were defined in each of the pilot reports' have been brought out in the description of the pilots.

Tallinn Transport Department as the representative of the City of Tallinn has launched the current study for developing the exploitation plans for pilots A-E (see Table 1). The study has three goals:

1) assess the pilot projects;

2) develop an exploitation plan that gives guidance and an action plan to exploit the pilot projects after the end of the project;

3) provide a proposal for the cross-border collaboration in the mobility domain, taking into account the weaknesses of the pilot projects.

The current report briefly describes the traffic trends and passenger statistics of ports of Tallinn and Helsinki. In the second chapter, the report gives an overview of the methods used for the study and relevant parties involved in the study. The methodology chapter is followed by the description of the FESM pilot projects - the main activities, goals and results by each of the pilots during the project. The description of the pilots is followed by the main part of the report - an exploitation plan that consists of positive and improvement factors that each of the pilots have to consider for the further implementation of the developed solutions. The proposed factors are categorized into factors that will help with the exploitation of the pilots and into factors that need improvement to potentially develop into strengths.

As the Smart Park & Ride and SUMP pilots did not manage to finalize their activities during the FESM project period, only the description of the pilots and actions carried out by the pilots are included in this report. In addition, this report includes the further steps planned for the SUMP pilot until the end of the FESM project. The report concludes with a summary of all of the follow-up activities suggested for the pilots of the FESM project and the opportunities to continue with the cross-border collaboration between Tallinn and Helsinki.

[4] FinEstSmartMobility project application, provided by TTD

[5] FinEstSmartMobility project application, provided by TTD

2. METHODOLOGY

The current study was conducted based on qualitative methods – document analysis and interviews. A review of the information available was made for the assessment of the pilot projects. The review included information available on the FESM website.[6] In addition, final reports of the projects, presentation slides and any other reports including the statistics and user feedback were taken into account. Interviews and project meetings were conducted with relevant project partners to get additional information. After the overviews of the pilots were drafted and all the results of the pilots were analysed, an exploitation plan was developed together with the proposal for cross-border collaboration. The methods used in every stage are explained in detail below.

DOCUMENT ANALYSIS | Document analysis and desk research methods were used to create an overview of the pilot projects by concentrating the information available about each of the pilots. Document analysis took into account the information about the pilots presented in final reports, presentation slides and information available online. An overview of all of the pilot projects was prepared based on the described sources (public information about the pilot projects, surveys and reports prepared by the companies and the information received at the meetings).

PROJECT MEETINGS | After compiling the overview, additional data collection was carried out in the form of project meetings. Data on current activities and latest results was gathered in meetings with project partners and companies involved in pilot projects (see Annexes). Meetings were held on 12th of December, 2018 and 17th of January, 2019. The first meeting involved all of the project partners except the representatives of Forum Virium Ltd. and Helsinki Region Transport Agency. The second meeting involved representatives of City of Tallinn (Pilot C), FESM project manager, Infotripla (Pilot B), GoSwift (Pilot A), Fleetrange (Pilot A) and a project manager from Forum Virium Helsinki. The main aim of the project meetings was to gather information about the pilots and their preliminary findings, obstacles and achievements.

SEMI-STRUCTURED INTERVIEWS | Semi-structured interviews were conducted with project partners and companies involved in the pilot projects. A total of 7 interviews were carried out during the project. The interviewed companies and their representatives are listed in the annex to the report (see Table 8).

The aim of the interviews was to gather feedback from those directly involved in the planning and implementation of pilot projects and to evaluate the positive factors of the implementation of the pilot projects, the possible obstacles, and their solutions. Interviews were conducted on the basis of a semi-structured interview plan to keep the conversations focused on important topics. Analysis based on the data collected allows to develop an exploitation plan for successful pilot projects.

[6] Finest Smart Mobility home page. <link>

3. OVERVIEW OF THE PILOT PROJECTS

FESM project aims to provide sustainable intelligent transport solutions and cooperative mobility planning to solve cross-border mobility issues in Helsinki and Tallinn by researching different ways to impact the mobility between Helsinki and Tallinn with different pilot projects. One of the shared goals for many of the pilot projects was to explore different ways to significantly lower CO_2 emissions, noise and the time it takes to transport passengers and cargo by using smart solutions.[7] The ferry connection between Helsinki West Harbour and Tallinn Old City Harbour is one of the busiest in the world. There were 8,8 million passengers on the Tallinn-Helsinki line in 2018, with more than 500 000 passengers travelling every month.[8]

Presently, the ports in Helsinki and Tallinn still have some available room for truck drivers and travellers with private cars to arrive early to the harbour and wait for their time to check-in. As both of the harbours are situated inside the city, the area for parking is gradually decreasing and there is already a need for solutions to better manage the traffic generated by the ports. On the other hand, daily traffic is greatly affected by the outbound trucks and cars driving out of the harbour and according to the Port of Tallinn, in some instances it might take up to 2 hours for a vehicle to exit the city centre. Problems also persist for the people travelling with public transport from Tallinn to Helsinki or vice versa as the trams and buses are sometimes full of people during peak hours. Smart solutions can help with the aforementioned problems but before the FESM project there were no real-time data about the ferry schedules for third parties and no overall mobility planning for the Tallinn region.

Despite the fact that the number of passengers has been increasing and the current traffic itself creates considerable congestion, noise and other negative effects, there has not been any common mobility planning or no cross-border Intelligent Traffic System (ITS) solutions. The FESM pilot projects seek to solve the main transportation bottlenecks between Helsinki and Tallinn and optimize the arrival and departure of passengers, vehicles and heavy good vehicles (HGV) in the harbours.[9]

3.1. GOSWIFT (PILOT A1)

3.1.1. DESCRIPTION OF THE PILOT

INTRODUCTION AND RESULTS | More than 300 000 trucks travel through the city centres of Helsinki and Tallinn to reach the harbours every year. The Old City Harbour of Tallinn and West Harbour of Helsinki are located in the centres with heavy traffic, where the lack of extra parking spaces and narrow nearby streets make it a necessity for the HGVs to arrive to the port early enough to make it to the ship right on time and by using the road network in the best possible way so that the trucks would not be blocking the roads for other traffic. Currently, the speed of the check-in process is dependent on the number of check-in stalls at the ports and in the coming years the parking spaces for HGVs will disappear due to the continued constructions in the harbour areas and it will be much harder for trucks to spend queue time in the port areas. GoSwift´s main focus is providing a smart guidance system and an online queueing system for HGVs who are travelling into the ports.[10] [11]

[7] FinEst Smart Mobility home page. <link>
[8] Port of Tallinn passenger statistics, 2018. <link>
[9] FinEst Smart Mobility home page. <link>
[10] FinEst Smart Mobility project application, provided by TTD
[11] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.

GoSwift's idea was to develop an application for real-time queuing system for truck drivers and ferry operators. During the FESM pilot, the app was tested by truck drivers who were using the ferry crossing between Tallinn and Helsinki. The target group for this app is not only Estonian truck drivers and logistic companies managing the drivers, but all of the transport and logistic companies whose drivers use the ferry crossing. This app notifies the truck drivers about the exact time when they should drive to the ferry terminal gates instead of waiting at the port gates in the harbour.[12]

GoSwift is using data from logistics companies to know about the truck drivers registered to the system and all of their active and archived ferry bookings. On the other hand, the app is using confirmed booking information from shipping company Tallink to know exactly which trucks need guidance to arrive at the check-in gates in time. During the pilot project, Tallink was able to provide information about confirmed bookings only in one direction from Helsinki to Tallinn. At the same time, GoSwift's service has a benefit for Tallink, because GoSwift can send a notification to Tallink if a truck cannot make it to the check-in stand in time and the notifications ultimately help Tallink to manage the bookings.

The main results of the pilot were:

- the Finest Smart Mobility application (GoSwift app) to be used by the truck drivers;
- a web interface used by the logistic companies responsible for the trucks and Tallink.[13]

The GoSwift app is available in 4 languages (Estonian, Finnish, Russian, English) on Google Play and through SMS for those truck drivers without a smart phone. Even though GoSwift could not track all of the app users, qualitative feedback was gathered from 30 users, who were Estonian, Polish, Finnish, Czech, Latvian or Lithuanian.[14]

EXPECTED GOALS | In the beginning of the FESM project, four goals were set and GoSwift managed to complete all of the goals. The usage of the developed GoSwift app and web interface should have had the following effects:

1. truck drivers who use the application should decrease their time spent in the city 5-10% per truck;
2. 90% of the truck drivers who use the application should use Vesse parking area in Tallinn;
3. 90% of the truck drivers who use the application should stop parking next to or near to West Harbour in Helsinki;
4. truck drivers have an increased user experience when using the truck parking areas.

The app offers drivers the exact time for check-in and a route to make it to the port in time while taking into account the current traffic situation. As a result, the time trucks spend in the city should shorten by 5-10%, which was one of the goals set by GoSwift during the piloting period. Based on the truck drivers´ feedback, Polish or Czech speaking drivers were happy to get information about the official routes inside the city through the app and avoid restricted zones. Even though this made the journey and time spent within the city territory longer, the time spent inside the city centre was shorter. As a result, GoSwift managed to reach this goal with trucks travelling and spending less time in the city centre, where the traffic congestion is the heaviest.[15]

The aim of the second goal was to use the GoSwift app to direct the truck drivers to the Vesse parking area which is located in the suburb of Tallinn. As a result of this, 90% of the application users should use Vesse parking area for waiting instead of the port area in Tallinn City Centre. The achievement of this goal was harder to track because for the exact analysis of the results, the information about confirmed bookings from Tallinn to Helsinki was needed from Tallink who was not able to provide this data during the pilot

[12] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.
[13] GoSwift, FinEst Smart Mobility web portal. <link>
[14] FinEst Smart Mobility home page. <link>
[15] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.

project. By manually checking the app users GoSwift managed to confirm that Vesse waiting area was used a lot more due to the construction works near the Old City Harbour. It is uncertain if the Vesse parking area would have been utilized the same amount by the app users if there had not been any construction works near the Old City harbour during the piloting period.[16]

Third goal concentrated on the traffic problems in Helsinki West Harbour area. The aim was to direct 90% of the app users outside the West Harbour area for parking. This goal was successfully achieved by guiding all the pilot users to the Helsinki West Harbour area just before their registered check-in time. The final goal was to increase the use of truck waiting areas outside the cities of Tallinn and Helsinki. GoSwift accomplished this goal by delivering the location information about the available parking places for truck drivers through the web portal and application, however the exact numerical goal was not defined. GoSwift checked the usage of the waiting areas through the app, which registered the driver's location data every time the truck drivers signed in.[17]

As a result of the pilot project, GoSwift achieved all of the objectives and the service can be considered successful in guiding trucks to the harbours while reducing the unnecessary waiting time in the port areas. GoSwift is also satisfied with the technical and security aspects of the app. Due to the project, GoSwift has taken a strategic decision to start developing products for ports and cities to lessen the traffic congestion, because there is a clear need for such a service. GoSwift managed to develop a good cooperation between the cities of Helsinki and Tallinn, ferry operators and transport companies. In the future, there is a need for remote check-in from remote truck waiting areas and GoSwift will continue to develop the product in cooperation with Tallink.[18]

3.1.2. EXPLOITATION PLAN

Despite the fact that GoSwift has extensive previous experience in providing queueing systems for vehicles at border crossings, it still has to take into consideration different factors, which could impact the successful exploitation of the application. Below is a table with positive factors, which could be considered as strengths that will help with the further exploitation of the GoSwift application and improvement factors that could potentially develop into strengths (see Table 2).

TABLE 2. ANALYSIS OF GOSWIFT OUTCOMES

POSITIVE FACTORS	IMPROVEMENT FACTORS
Working demo solution	Getting booking information from shipping companies
Ongoing negotiations with harbour and shipping company to find the sustainable business model	Check-in system needs access to open ticketing data
Many possibilities for the technological solutions	In talks with only one ferry operator
Remote check-in opportunity	Targeting the right users for the app
Port of Tallinn development plans	
Reached the end users during the pilot	

Source: Civitta

[16] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.
[17] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.
[18] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.

GoSwift has made a strong investment into this application and the developed demo solution is definitely at a stage where it could be progressed into a commercially viable product. The queueing system continues to work at the time of writing this report. The further exploitation of this application is supported by the fact that GoSwift OÜ has a strong will to continue with the further development of this service for the long term.

POSSIBLE BUSINESS MODEL WITH TALLINK | In order to maintain and further develop the existing demo solution, GoSwift needs to find a suitable business model. In addition to the truck drivers and logistic companies, the users of this application could be the shipping companies and ports. GoSwift is in talks with Tallink who has the interest to go forward and reach an agreement with GoSwift. It is equally important for Tallink to know the exact time of the truck's arrival to the port and to get an automatic notification, which alerts when a truck will not make it to the check-in area in time. If the data provided by GoSwift makes Tallink more dynamic and flexible than other ferry operators then it will create a market advantage for Tallink.

PORTS COULD BENEFIT FROM THE APP | It is a matter of business model, whether GoSwift reaches an agreement with the port and starts to receive a fee from the harbour for every client who uses the app or will GoSwift use the same solution as it has implemented on the border crossings.[19] Another option for the future business model is the possibility of selling the whole system to the ports and continuing with the maintenance or further developing of the application. One of the best business solutions for GoSwift would be to create a permanent source of income from the ports, but currently the harbours still have free parking spaces available for HGVs and they have time to consider all available options.

ADVANCED AND AUTOMATED OPTIONS | The result of the FESM pilot project is the demo application that needs additional investments and real-life testing with Tallink to become a working and more advanced solution. The further developments assume additional input data from shipping companies, but can reduce the manual work and provide additional features for the users.

One essential factor that can improve the existing app is the availability of confirmed booking information from the ferry operators. It may be that the ferry operators do not want to share booking information because the exact data about how many cars, trucks and people are onboard the ship could be considered as their business secret. Without the access to the booking information, GoSwift app cannot automatically check if the trucks have a confirmed need to drive to the port. In the current demo version, all of the data needed to suggest the best journey route needs to be entered manually. According to GoSwift OÜ, they have ongoing negotiations with Tallink about how their system could be implemented and which information Tallink is willing to share. In conclusion, booking information is a key factor to make some of the processes more automated.

Currently, there is a lot of work done manually as the logistic companies have to manually insert the entire fleet into the system. The logistic companies have to insert every truck and booking information into the system separately if the companies want to track the truck's movements through the app. If the application could get the information about confirmed bookings from Tallink, then the usage of the app would be more comfortable for the logistic companies and the number of users would probably increase.

Another additional automated feature that could be provided by the application is the information whether the trucks could make it to the ferry check-in terminal in time or not. For example, when a truck cannot make it to the terminal in time, the system could send an automated notification to Tallink, who could make adjustments to the reservations accordingly.

Moreover, GoSwift is currently only using the fleet data from logistics companies and the booking information from Tallink. It is not a priority to include any more data sources into the GoSwift system, but with additional funding there could be different traffic information sources integrated in addition to Google Maps API, which is currently used. Artificial intelligence solutions could also be added to the app, which

[19] GoSwift operates a queue management service at border checkpoints, where the truck drivers pay for the service. <link>

could predict certain events in traffic (e.g. artificial intelligence can take into account holidays and other events when planning the truck's journey to the port). To conclude, additional functions could be added in the future with further funding.

REMOTE CHECK-IN | The current situation in ports is that the truck drivers arrive early to the ports so they could be sure they make it to the check-in gate in time. The check-in stalls at the port still require to check the documentation of every truck before they can enter the port, which makes the process time consuming. It is not effective to have a check-in team for every ship operator separately, as it would be more effective to combine the check-in teams into one place. Furthermore, it would benefit the harbour to have it placed away from the port to decrease traffic inside the port. This way the trucks could check in away from the port and wait at the remote check-in area. Once it is their time for boarding, truck drivers can start to drive to the harbour and arrive just in time. As reported by GoSwift, they are planning to offer a remote check-in solution, which benefits both the ship operators and the ports. The possibility to offer a working remote check-in product, which improves the traffic flow in ports is a strength factor for the overall GoSwift service conception.

Contrarily, a possible improvement factor to develop the described solution for the remote check-in process, is that ferry ticketing data from any of the shipping companies operating between Tallinn and Helsinki is not automatically available for third party apps to use. If ferry ticketing data is not open then other more efficient check-in options won't be made in the future by other external companies. For example, airlines have many different ways to check-in only because all the airlines make their ticketing data publicly available.

DEVOLEPMENTS IN PORT AREA | Port of Tallinn development plans for Old City Harbour for the years 2018-2023 see that the port will have an automatic check-in for passengers with vehicles. They have set the following principles for the development: the land resource in the port must be deployed more efficiently; the service must be simpler, more convenient and provide higher customer satisfaction.[20] GoSwift's application will directly help with these goals as the smart guidance and online queueing system will reduce the time trucks need to wait at the port area. It creates an opportunity for GoSwift to provide their service to the port directly. Conversely, it is a benefit for GoSwift to be in negotiations with one of the biggest ship operators in the region, but it is always a possibility that the negotiations with Tallink will fail. To reduce this risk, GoSwift should be looking for other ship operators and ports, because currently they have not had talks with any other possible client besides Tallink.

AWARENESS AND FEEDBACK | One essential factor to ensure the success of the service is the awareness about the service and wider usage by the end users. According to GoSwift, there was no budget for an awareness campaign during the FESM pilot project. Still, GoSwift reached out directly to the truck drivers and created leaflets and posters for the campaign, which were distributed at the check-in kiosks. GoSwift also communicated directly with the truck drivers. At the same time, GoSwift received feedback from truck drivers, who say that they do not find value in the information provided by the app. The reason being that the drivers have been travelling along the same routes for a very long time and do not need any external help to arrive at the port at the right time. Many of the truck drivers know the route by heart. Even though, the truck drivers will be using the application, the marketing message should have been delivered directly to the logistics companies who are managing the truck driver's schedules. Compared to the truck drivers who sometimes do not need external help to plan their trip to the port check-in area, the logistic companies would find more value in knowing that their truck's will arrive in the port at the right time.[21]

[20] Port of Tallinn development plans 2018-2023. <link>

[21] GoSwift, West Harbour and Old City Harbour Just-In-Time Queueing System for Heavy Good Vehicles (Pilot Report), 2019.

Recommendations for an action plan:	Target:
• Continue the cooperation with harbours and shipping companies to set up the sustainable business plan	• GoSwift, Ports of Tallinn and Helsinki, Tallink
• Consider other shipping operators, logistic companies and ports as potential customers	• GoSwift, ports, shipping operators, logistic companies
• Create a clear communication plan to reach the users of this application	• GoSwift
• Consider the development of a working remote check-in solution which would benefit ports	• GoSwift in cooperation with Ports of Tallinn and Helsinki
• Gather feedback from clients to realise the demand for advanced and automated options of the app	• GoSwift

3.2. FLEETRANGE (PILOT A2)

3.2.1. DESCRIPTION OF THE PILOT

INTRODUCTION AND OBJECTIVES | Some smart mobility solutions need high quality and accurate data about the exact time of arrival and departure for ferries. This information significantly improves the efficiency of smart traffic systems. The aim of the Fleetrange pilot project was to get the automated and real-time schedule tracking of ship traffic between Helsinki West Terminal and Tallinn Old City Harbour. Currently, historical vessel tracking data is available, but there is no easy access to machine readable real-time data about ship traffic and schedules.[22] Also, free automated tracking system data is not a global standard. No other countries in the world beside the United States, China and Finland publish the real-time ship transponder data.[23]

The outcome of the pilot project helps to optimize traffic flow for the arriving and leaving HGVs in ports of Helsinki and Tallinn. Better traffic flow is achieved with more accurate real-time data of the ship's arrival. Thanks to the improved timing HGVs can avoid spending unnecessary time in the harbour's proximity and this will directly improve the traffic flow for all modes of transportation in Tallinn and Helsinki ports.[24]

Real-time ship tracking data can be used by the city or port infrastructure system, traffic light system or other service provider to guarantee a better traffic flow around ports. In other words, by knowing the exact time the ship arrives into the port, dynamic traffic light and traffic management systems can predict peak traffic and turn several intersections of traffic lights green to help with the outflow of traffic from the ports. Specifically, the aim of the pilot project was to track the Tallink and Eckerö Line ships Star, Megastar, Europa and Finlandia and compare the scheduled departure and arrival time to the real-time tracking data from May until October 2018.[25]

The development phase of the pilot project started at the beginning of April, 2018 when Fleetrange started to develop the prototype. The development phase was continued with the implementation phase and the exploitation phase, which was dedicated to making a commercially viable product. The end result was the FESM API that combines data from various public open data sources such as the ship's automatic tracking system data, schedules, ship parameters, historical tracking data and weather observations to provide real-time data about the ship's departure and arrival. The end result of the pilot is an API, which could be easily

[22] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[23] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[24] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[25] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.

used by other smart IT solutions. It does not have a user interface and it is not meant to be used by the end users.[26]

During the pilot project, 2362 voyages were tracked with the FESM API. Analysis of the data collected showed that on average the tracked ships were departing - 7.8 minutes ahead of schedule and the arrival accuracy was on average 0.6 minutes behind schedule. It means that the ships had outstanding schedule accuracy during the piloting period and managed to arrive on time even when the departure was delayed.[27] The FESM API was maintained until the end of February, 2019.

OUTCOMES | Fleetrange pilot project resulted in two outcomes:

1. A statistical database containing the historical tracking data of 4 different ships;
2. An API that provides real-time data about ship's arrival and departure.

The ship sailing patterns from all of the tracked voyages of the 4 ships were collected to one database during the whole piloting period. As a result, a useful and unique statistical database was formed that will be uploaded by Fleetrange to Helsinki Region Infoshare open data service in March 2019 for free and public usage. Students or scientists could use the database for academic purposes. Shipping companies or ports could be interested in the database to analyse the ship's navigation. According to Fleetrange, 3-4 minutes of quicker manoeuvring of ships in the ports could mean that the average speed of the voyage can be 1 or 2 knots slower out at sea and for the ships, 1-2 knots slower overall average speed saves 2500 EUR worth of fuel a day which amounts to 500 000 EUR saved per year. Furthermore, knowing the total area needed for the ship's manoeuvring inside the harbours could be taken into account when developing new docks.[28]

During the pilot project Fleetrange managed to develop the FESM API and provided it publicly to software developers. The FESM API was intended to be used by other FESM pilot projects such as Kyyti (see subchapter 3.5) and Infotripla (see subchapter 3.3). Kyyti planned to use the FESM API to integrate the ferry real-time schedules to their service (the aim of the service is to combine and provide all transportation modes to one application), but in the scope of the project Kyyti could not develop a standardized way to integrate the real-time data. Infotripla used the FESM API data for its real-time traffic information system that analyses data from several sources to improve traffic flow at ports. When Infotripla started to use the FESM API, the system crashed but the API was fixed quickly. Infotripla also reported an inconsistency between the predicted and actual arrival time when the ship arrives in Helsinki. As a result, Fleetrange changed the algorithm of the FESM API to improve the estimation of the arrival time in Helsinki, but the results of the improvements were not available during the piloting phase.

During the pilot project, Fleetrange also made contact with Ampron OÜ that produces LED displays and this opened up a new cross-border collaboration and business opportunity for the future. In conclusion, the low number of FESM API users was a surprise for Fleetrange. Fleetrange was hoping that other pilot projects would use the FESM API but due to scheduling conflicts the other pilots might not have been ready to integrate the FESM API.[29]

3.2.2. EXPLOITATION PLAN

Even though Fleetrange completed the pilot project according to schedule and all the goals were reached, the FESM API created during this project is mostly affected by the uncertainty of who the end users could be and how big the demand for this service is. Despite the fact that Fleetrange does not have a plan to go forward with this software for the immediate future, the strengths and opportunities, which are considered as positive factors (see Table 3) and the improvement points of the current project need to be considered for the exploitation of this pilot after the FESM funding ends.

[26] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[27] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[28] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[29] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.

TABLE 3. ANALYSIS OF FLEETRANGE OUTCOMES

POSITIVE FACTORS	IMPROVEMENT FACTORS
Open data availability	Automated ferry schedule information not yet available
Technical knowledge and human resources availability	Interest of the piloting company
Statistical database availability	Communication messages not directed at potential customers
Potential to be used by different smart solutions	Demand for this kind of service
Wider implementation possibility	Additional testing periods needed
	Specific marketing messages required

Source: Civitta

Fleetrange believes that smart mobility solutions, which help to improve the traffic conditions in the city should be publicly funded and controlled and maintained by the city. The public authorities should be in the leading role but can outsource the IT development and maintenance work. To sum up, Fleetrange has the technical knowledge and human resources for further implementation, but Fleetrange does not see a business case and is not interested in going forward with the FESM API unless the City Governments or Ports of Tallinn or Helsinki finance the maintaining of the software.

DATA AVAILABILITY AND IMPROVEMENTS | A strength for the FESM API is that the API uses publicly available open data, which make the running costs very low. While the low maintenance costs of the FESM API would be considered an advantage, the automated tracking system data would be more accurate if it uses multiple data sources.

Currently there are two possible factors that could improve the API quality. Firstly, the API uses free ship location Automatic Identification System (AIS) data that is provided by the Finnish Digitraffic service, which is noticed to be unstable at certain times and could be replaced by more reliable alternative data source. And secondly, although a legislation in Finland states that all passenger mobility services must make the route and schedule information publicly accessible [30] the shipping companies' systems are very old and the ticketing service and schedule information cannot be integrated automatically to other smart IT solutions.[31]

During the piloting period the software had two downtimes, when Infotripla took the software into use and when a new statistical calculation method was used. The software downtimes during the piloting period suggest that further work needs to be done to guarantee the stability and self-healing of the service when new users start to use the API. Moreover, seasonal variation must also be taken into account when estimating the time taken to complete the voyage. During the piloting period the weather did not significantly impact the departure and arrival of ships as the data was collected from August till November, but ice and other weather factors may affect the ship's journey.[32]

PUBLIC STATISTICAL DATABASE | Fleetrange has been keeping the statistical database of ship's voyages running for 6-8 months and they will be uploading the statistics to Helsinki Region Infoshare to be accessed publicly. In theory, this database could be very useful for academic purposes or the shipping companies and ports could use it to study the ship's navigation and find ways to make it more efficient. On the other hand, these various ways to utilize the database and the value of the collected statistical data needs to be clearly communicated to the users, so the shipping companies or students would know of this opportunity. There is no communication plan to reach the end users and where they could find this database. Even when Infoshare users in Finland know about this database, the potential users such as research institutions or other private companies in Estonia need to be reached separately. In the future, it would be useful to

[30] Ministry of Transport and Communications, Act on Transport Services, 2017. <link>
[31] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.
[32] Fleetrange, FinEst Smart Mobility Final Report (Pilot Report), 2018.

collect feedback from the users of the statistical database in order to have a better understanding how this data could be utilized.

CUSTOMERS AND LOW DEMAND | The data provided by Fleetrange can be easily integrated into many different smart mobility solutions and there is no similar data provider in the market. However, currently there is a lack of demand for this kind of service outside the scope of the FESM project. During the pilot project, Fleetrange managed to confirm that the ships have outstanding schedule accuracy and the ships manage to arrive on time even when the departure is delayed. This is certainly one factor that causes the low demand. If on average the ships arrive to the ports 0.0 minutes (median delay) after scheduled arrival, then there is no additional value for this information for other smart mobility service providers or traffic control systems. It means that dynamic traffic management systems could just check the ship's official schedule information available online instead of receiving the real-time tracking data.

In theory, it is possible to use this API across the globe and in different ships and ports, but in practice every port and ship line must be entered and timed manually and the tracking data requires additional testing periods, continuous monitoring and development, which means extra work for each new ship line tracked.

Currently, the data provided by FESM API is intended to be used by the developers and software companies and not by the travellers. But the communication messages were not directed at the other service providers as possible clients. Instead, mostly features of the service and a vague call to action were used to communicate the service. Specific marketing messages directed at the owners of the ports, city officials or software developers bringing out the true potential of the service should be used in the future to better communicate the added value of real-time ship tracking data and finding more interested parties.

In summary, during the pilot project Fleetrange concluded that the ferry schedule data is very accurate and the ships arrive on time to their destination. For the FESM API, this means that the demand for this kind of service is much lower than previously anticipated. If there would be more variety in the time the ships arrive, then different traffic management systems, taxi and public transport companies would have a bigger interest to receive the real-time data. Further work needs to be done to reach the target group who would be interested in this solution and to understand how big the demand for this service could be.

Recommendations for an action plan:	**Target:**
• Make the statistical database public	• Fleetrange
• Consider other options where the API could be used or which users could benefit from the API	• Fleetrange, ports & cities around the world
• Create a communication plan to find potential users for the database and the FESM API	• Fleetrange
• If needed, carry out additional testing periods to ensure reliability of the service	• Fleetrange

3.3. INFOTRIPLA (PILOT B)

3.3.1. DESCRIPTION OF THE PILOT

INTRODUCTION | Infotripla is a real-time and predictive traffic information system aiming to monitor and predict existing traffic situations around the harbour and generated by the harbour. The tool is based on a traffic fluency model that analyses data from several sources to improve traffic flow at ports during peak traffic. The main task during the FESM pilot was to feed the traffic management authorities information on how the traffic flows in ports. Specifically, Infotripla monitored the traffic flow in Helsinki West Harbour during the pilot project and their traffic fluency model offered short-term traffic prediction information to data and web user interfaces. As a result, their technical solution offers an

overview of the current traffic situation in the harbour, recommended routes for outbound traffic and alerts sent to the traffic management officials.[33]

Infotripla's software is mainly aimed at the traffic management operators, but an additional target for the pilot project was to find out what is the possible value that can be delivered to the end users. The end users of this software are truck drivers and private car travellers using the ferry.[34]

OUTCOMES | During the exploitation phase, Infotripla developed the following features:

1) West Harbour's Dashboard
2) Traffic Situation Snap Shot
3) Route Suggestions for Harbour's Outbound Traffic
4) Twitter Alerts – Arrival of Ferries and Traffic Pulse
5) Harbour Event Tool
6) Open Data – for harbour's route suggestions and events

All of the relevant traffic information was collected to the West Harbour's Dashboard and provided to traffic management authorities via web and by any device: Traffic Snap Shot information, traffic events, route suggestions and relevant traffic camera feeds. For the end user, the dashboard gives an overview of the current traffic situation in the harbour and the user can choose routes for exiting the port.[35]

The Traffic Situation Snap Shot is where all of the relevant traffic situation is collected and displayed on a map: traffic fluency model information, traffic events, route suggestions, traffic cameras and road weather. This map is a part of the dashboard and was made available for traffic management and by any user in the future. Route Suggestions for Harbour's Outbound Traffic feature is the real-time and estimated route suggestions provided to heavy trucks and other traffic. Suggestions are based on the traffic situation, fluency model and events and the Route Suggestions are included in the dashboard, Snap Shot and via a separate interface. Twitter Alerts sends a Twitter message to the traffic management and traffic signal operators when any ferry arrives to the port. The Harbour Event Tool provides information about traffic events near the port and this information is included in the fluency model and Snap Shot information. Finally, Open Data provides information about route suggestions and traffic events to 3rd parties and their services.[36]

MAIN GOAL | The main goal for the FESM project for Infotripla is the smart management of outbound traffic from the harbours. Specifically, the goal was to improve the flow out from the port so that the time from the ferry to a specified end area is shortened 15-20 minutes per trip. This objective was decided in the development phase, but since then Infotripla has reached the conclusion that it is not possible to shorten the route as much as previously planned. There are many factors that influence the total time to complete the route, such as no alternative routes out of the harbour and the traffic generated by public transport and the daily commuting traffic. Infotripla recognized that it is possible to minimize the delay but they cannot reach the end goal because there are a lot of other issues to take into account. Normally, if you are the first truck arriving to the harbour, it takes about 5-10 minutes for the truck to reach national roads (the specified end area). But it takes about 35 minutes to reach the national road if you are the last truck arriving to the port because you have to wait for the first trucks to clear the road in addition to the local traffic. It is possible to shorten the trip by 5-10 minutes, but 15-20 minutes is not realistic.

Infotripla's task for the FESM project was to feed the traffic management centre information on how the traffic flows in ports (via West Harbour's Dashboard, Traffic Situation Snap Shot and Twitter Alerts). Specifically, as a result of their pilot, Infotripla provided traffic situation information and short-term traffic prediction information to data and web user interfaces (Dashboard and Snap Shot). Infotripla interviewed

[33] Infotripla, FinEst Smart Mobility Final Report (Pilot Report), 2019.
[34] FinestSmartMobility home page. <link>
[35] Infotripla, FinEst Smart Mobility Final Report (Pilot Report), 2019.
[36] Infotripla, FinEst Smart Mobility Final Report (Pilot Report), 2019.

the officials operating the traffic management centre, ferry travellers with personal cars and had a meeting with shipping company Tallink during the FESM project. Based on these discussions, Infotripla found out that their software has a benefit for the traffic management system - the main benefit is to know exactly when the cars and trucks being offloaded from ferries are coming to the street network.[37]

During the pilot project, Infotripla also collaborated with other pilots. Infotripla has used the information from the Fleetrange's API since summer 2018. Infotripla believes that the collaboration with Fleetrange was successful, because Infotripla and Fleetrange both learned how to integrate each other's information and how to improve their services during this period. Infotripla caused some technical problems for Fleetrange but the problems were quickly fixed. In addition, Infotripla made the traffic fluency system data available for GoSwift, but GoSwift did not have the additional resources to integrate Infotripla's data.

Even though the Infotripla´s software provides benefits to the traffic management system, there is still a need for paying customers to keep it operating. Infotripla does not see the end users as the customers who should be paying for it. The potential customers could be the traffic management service providers, the city, harbour or local real estate companies next to the harbours. Currently, there is interest for Infotripla's service from the officials who are managing traffic in the city of Helsinki and from the Helsinki City Police who is responsible for the traffic control in Helsinki. In summary, Infotripla managed to complete the tasks set out for the FESM project and the software is ready to be used in other ports.

3.3.2. EXPLOITATION PLAN

Infotripla has previously developed and implemented other city level apps around Finland and they are having discussions with other harbours who could implement Infotripla's software as well. Infotripla estimation is that their traffic fluency software could be developed into a commercial product and the piloted software could be easily modified to be used in other ports. Infotripla has to take into consideration the positive and improvement factors listed in Table 4 for the further exploitation of the pilot project.

TABLE 4. ANALYSIS OF INFOTRIPLA'S OUTCOMES

POSITIVE FACTORS	IMPROVEMENT FACTORS
Demand for the service	Willingness to use the service
Possibility of wider implementation	Some data may not be available
Future developments of the system	Smaller ports may not benefit from the service
Different clients who could benefit from the software	

Source: Civitta

WIDE USABILITY | There is a traffic management centre in Helsinki, where the national roads and the city traffic of Helsinki is monitored. In total there are three organisations in the traffic control centre – the police, traffic management authority responsible for the monitoring of national roads in Finland and the traffic management authority responsible for the city of Helsinki. The police are responsible for the traffic control in Helsinki. Currently, there is interest for Infotripla's software from the city of Helsinki and the police. A positive factor that will definitely help with the exploitation of this pilot project in the future, is that Infotripla has developed the system to a stage, where the officials who manage the traffic in cities can start using Infotripla's service quite easily.

There is demand for Infotripla's service from the city officials of Helsinki who could benefit from the additional information. In traffic management, there is a need for an easily accessible solution that combines different sorts of traffic data with improved timing. At the same time, there is a chance that when Infotripla gives new tools and data to take into consideration, the officials who control the traffic

[37] Infotripla, FinEst Smart Mobility Final report (Pilot Report), 2019.

have to change their duties and the way they work. With more information, the everyday tasks of the officials would change and the officials might need extra time to get used to Infotripla's service. Infotripla itself does not see any big technical problems with the further implementation of this software. For example, there might be a situation where some officials might have an old phone and cannot access Infotripla's system but these problems are small in scope.

Infotripla's interest to go forward with the development of the piloted software and the readiness to use this solution in other cities is a positive factor. During the piloting period, the main focus was to provide the software in the city of Helsinki. But the city of Tallinn was the second city to look at Infotripla's pilot project results. A possible improvement factor Infotripla has to take into consideration is the legal options and willingness of other cities to provide the open data about traffic to Infotripla. According to Tallinn Transport Department, some of the public services in Estonia are not willing to share public data, whereas the mindset in Finland is much more open. It should be taken into account that it might take a lot of time to get access to the same public information that is freely accessible in Finland.

In addition, Infotripla did not receive the traffic signal data in Helsinki which could have made their fluency model more reliable and this was one of the reasons why the service was not launched for end users (travellers and truck drivers). The city of Helsinki is currently working to make the traffic light data available in the future and Infotripla is prepared to start using the data.

ADDITIONAL DATA SOURCES | During the FESM pilot, Infotripla used estimations about how many cars and trucks are arriving to the port in their calculations for the dynamic traffic fluency model. Currently, the information about the number of cars and trucks arriving to the ports is mostly unavailable, because ferry operators are not sharing this information publicly. The information about cars and trucks arriving to the harbour should be sent to the software before the cars and trucks arrive to the port. This way the software could operate better with the traffic light system and predict what to do at intersections to avoid traffic jams. In parallel with the FESM project, Infotripla is participating in another pilot project inside the harbour development area, where the harbour is providing Infotripla the data about exactly how many trucks and cars arrive to the port. In this project, Infotripla is developing a system for the harbour to count the traffic in ports. Infotripla is having negotiations and could potentially start using the data about cars and trucks arriving to the ports, which is definitely a positive factor. If the harbour decides that Infotripla can use this data in the future, it could mean that their FESM software could be even more accurate.

Infotripla targeted their FESM software mostly to the city officials responsible for the traffic management in Helsinki, but a positive factor for the exploitation of this pilot is that there could be many potential customers of this software. On a technical level, the developed FESM software is very flexible thanks to its' modularity, which means that different parts of the software could be added or removed to meet the clients' needs. Firstly, real estate companies operating near the harbour could benefit from this software by providing real-time traffic information to the people living in port areas. Secondly, the harbour could share valuable traffic information on screens in waiting areas for travellers. Thirdly, ferry operators could provide real-time traffic data to travellers with private cars so they could know the quickest routes out of the port. An improvement factor for Infotripla is that smaller ports may not benefit from the service if there are no alternative routes out of the port. For example, there are limited options for outbound traffic in the Port of Tallinn and therefore the software may not be as beneficial. In conclusion, Infotripla has identified the need for the service and different customers who are willing to pay for it and mainly the success in negotiations is what will decide the further exploitation of this pilot project.

Recommendations for an action plan:	**Target:**
• Create a communication plan to reach cities with ports as potential customers	• Infotripla, ports and cities
• Consider developing a tutorial for officials to know how to use the software	• Infotripla, city authorities responsible for traffic management in Helsinki
• Look for other potential uses of the software for different target groups	• Infotripla, cities, ports, other private companies, ferry operators

3.4. SMART PARK & RIDE (PILOT C)

INTRODUCTION AND GOALS | The City of Tallinn has five Park and Ride car parks on the edges of the city and is planning to build more parking lots in the future. The aim of these car parks is to lower the congestion in the city centre with a simple idea - people travelling to the city centre can park their cars at the edge of the city for free and take the public transport to the city centre. Parking the cars in the parking area is safe, because the car parks are equipped with cameras and the parking areas are convenient to use as they are located right next to the public transportation stops. Standing in traffic jams and looking for a parking spot in the city centre creates many problems and stress for the people involved, thus a solution to help alleviate these problems is needed.

In the FESM project, Park & Ride car parks were intended to be used by ferry passengers with private cars to increase the use of public transport for the port entry and exit and reduce the car usage in Tallinn City Centre and nearby ports. Specifically, the main aim was to reduce the amounts of private cars to the ports by 5%.[38]

ACTIONS AND RESULTS | The first plan was to develop a cross-border Smart Park & Ride solution in cooperation with Tallinn and Helsinki cities, public transport and ticketing operators (Helsinki Regional Transport and Ridango OÜ on the Estonian side). The idea was to connect Park & Ride and public transport data between Tallinn and Helsinki so people could use the service in both cities. Unfortunately, this idea was too challenging for the Tallinn public transport authority and for the ticketing company Ridango OÜ[39] and legally impossible for Helsinki Regional Transport.[40]

After a year of developing a plan and discussions with important stakeholders, it was decided at the beginning of 2018 to run the procurement as a cross-border innovation competition similar to FESM mini-pilots and pilots A&B. The plan was to organize an "Innovation Partnership" tendering process, but the City of Tallinn lacks experience in running non price-related competitions except for architectural ones. The City of Tallinn organized a workshop with the City of Helsinki representatives who provided an in-depth overview on how to run innovation competitions. Due to project deadlines the City of Tallinn did not manage to run it as an innovation competition. Finally, City of Tallinn together with ITL Digital Lab drafted a new price-based competition, but only one offer was received which unfortunately lacked a sufficient level of innovation and a smart approach.[41]

FURTHER STEPS | Both ports have reduced the available parking spaces due to ongoing construction works and both cities have improved their Park & Ride areas. Besides, Helsinki has extended the tramline to the passenger terminal and Tallinn is planning to extend the tramline to the passenger terminal. All of these activities make travelling without a car smoother and it is clear that there is a need for a smart Park & Ride solution for cross-border travellers. If the City of Tallinn wants to go further with the procurement, then the officials need to first understand the volume of possible P&R users and which sort of data-driven solutions can be implemented.[42]

To sum up, it could be concluded that the City of Tallinn should improve its current procurement capability. As the official procedures inside the institution are very complex, it could cause a big risk of failing the procurement. In these innovation projects, a price-based competition is not a good approach. For a more efficient procurement process, procurements should be made with open conditions instead.

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[38] FinEstSmartMobility, Updated documentation on Smart Park & Ride, provided by TTD.
[39] Ridango OÜ provides the ticketing service for the public transport in the City of Tallinn. <link>
[40] FinEstSmartMobility, Updated documentation on Smart Park & Ride, provided by TTD.
[41] FinEstSmartMobility, Updated documentation on Smart Park & Ride, provided by TTD.
[42] FinEstSmartMobility, Updated documentation on Smart Park & Ride, provided by TTD.

3.5. KYYTI (PILOT D)

3.5.1. DESCRIPTION OF THE PILOT

INTRODUCTION AND RESULTS | Besides the truck transport traffic and travellers who are using private cars, there is an increasing number of travellers who use the public transportation to go to the ferry and continue their journey in Tallinn or Helsinki. Among them are lot of Estonian people who travel from Tallinn to Helsinki with the purpose to continue their trip from Helsinki airport located in Vantaa.

The goal of pilot Kyyti was to lessen the congestion and promote better mobility chain between Estonia and Helsinki airport by focusing on sustainable and public transport options. The aim was to decrease the use of private cars between West Harbour and Vantaa Airport by offering an affordable shared taxi service and public transport route information together with ticket sales through one application – the Kyyti app. Kyyti app tries to solve the last and first mile problem by offering a mobility solution that combines all mobility modes to one application: public transport in the city, intercity buses, car rental & sharing, trains and payments and ticketing. The target group of the piloted service is mainly Estonian travellers going to the Helsinki Airport in Vantaa. The app is currently available in Finnish, English, Russian, Swedish, German and Estonian. During the piloting period, there were 148 Kyyti trips with 251 passengers in total in the Helsinki region, but only 3 trips where the destination was West Harbour, 2 trips that started from West Harbour and 2 trips to the airport.[43] This means that Kyyti's service did not attract users travelling between Estonia and Helsinki airport located in Vantaa.

GOALS | Kyyti set out four goals to be reached by the end of the piloting period:

1) Shorter travel time from Tallinn Old City Harbour to Helsinki Vantaa airport without a car;

2) Information about travel chain is available in one application when making the choice for travel mode;

3) Defined pilot users have used the service and public transport or shared taxi instead of using their own private car;

4) Improved user experience for the end user and the reduction of travel chain pain points.[44]

At the end of the piloting period Kyyti managed to reach two targets set for the pilot. One of the goals met was 5% shorter travel time from Helsinki West Terminal to Helsinki Vantaa airport by using shared taxi compared to public transport and walking. Even though there were not enough trips made to evaluate the results, their journey planner calculated 31-46 minutes of travel time with the shared taxi and one hour for the public transportation chain, which would indicate a 25-50% shorter travel time for the shared taxi.[45]

The second goal was to provide an app that gives all of the information about different transportation nodes (public transport, walking, cycling and shared taxi) in one place and the app lets you pre-order rides when booking the ferry trips. This goal was also achieved as the app offered route alternatives for public transport and shared taxi, including walking and cycling trips for shorter routes.[46]

The third goal was to have at least 50 users of the app who have tried the shared taxi service when travelling between Helsinki West Harbour and Helsinki Vantaa Airport and 500 users who have used the journey planner and bought a ticket from Helsinki Regional Transport (HSL) through the app or used the shared taxi service. The set goal was to have 10% of the shared taxi users and 5% of the public transport users to use the service instead of a private car in the future. Unfortunately, this goal was not reached

[43] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.
[44] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.
[45] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.
[46] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.

because the total amount of trips made with the app was too low to evaluate the result. During the piloting period there were only 3 trips to West Harbour, 2 trips starting from West Harbour and 2 trips to the airport. Moreover, HSL ticket sales API was not implemented during the scope of the pilot project, because due to commercial issues, Kyyti should have paid to HSL the same price regular customers pay to HSL. It means that Kyyti would have needed to add its expenses to the ticket price and this would have made the service less attractive than buying the tickets straight from HSL. Therefore, the local transport ticketing system and HSL travel chain solution could not be implemented during the project.[47]

The fourth goal was to provide an improved user experience for the end user by reducing the travel chain pain points. Specifically, the pilot owners predicted that travelling from the harbour to the airport especially with luggage will become easier with a door-to-door service, pre-ordering a taxi is possible without worrying of being late and in-app payments and company billing will save time. The fourth goal was not reached as there were too few trips made in order to evaluate the result. [48]

The main finding with Kyyti piloting was that even though the pilot service was launched successfully and the general feedback from the app and shared taxi service was good, the demand for the service was low and the main negative feedback was the poor availability of the taxi service.[49]

3.5.2. EXPLOITATION PLAN

Kyyti tries to solve the last and first mile problem by offering a mobility solution that integrates different kinds of transportation services to the app. Kyyti integrated the taxi service, public transport, walking and cycling information to one platform, together with dynamic pricing for the taxi service and a route planner. There was no possibility to buy the tram tickets or combined shared taxi and train tickets from the Kyyti app during the project. If Kyyti decides to go further with the exploitation of this pilot, it needs to consider the following positive and improvement factors listed in Table 5.

TABLE 5. ANALYSIS OF KYYTI'S OUTCOMES

POSITIVE FACTORS	IMPROVEMENT FACTORS
Good technical solution	Demand for the service is low
Experience with communication and marketing activities	Inefficient marketing strategy in general
Service is flexible to meet customer's needs	Some essential ticketing service and real-time data was missing

Source: Civitta

A positive factor that supports the further exploitation of the Kyyti app after the FESM pilot project is that the app gives all of the information about different options to travel from one point to the next - public transport data, shared taxi service and a route planner which provides the estimated time of arrival for walking and cycling trips. Due to the fact that currently there are traffic jams during peak hours in Helsinki and the trams starting from the port are full after a ferry has arrived, there is a need for additional options for travellers who want to transit from the harbour to the airport. Kyyti's app could solve many of the problems for travellers but the main improvement factor for the further implementation of this pilot is that presently the demand for this service is low. According to Kyyti, the ferry travellers do not have an urgent need for alternative mobility solutions since there are enough taxis and relevant applications available due to fierce competition. One way to get more customers to use Kyyti's app and create more demand for the service is to target the everyday commuters who are travelling inside the city because the amount of people who are travelling from the harbour to Vantaa is much smaller compared to all of the

[47] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.
[48] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.
[49] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.

people moving inside the city centre. It would require some time when the app has a steady customer base and then Kyyti could target more specifically the travellers from the port to the airport.

Kyyti managed to do a lot of marketing in different digital channels and Kyyti did a lot of visibility marketing in the West Harbour terminal in Helsinki and Port of Tallinn terminals A & D. It is a positive factor for Kyyti that they managed to put a lot of effort into a strong marketing input but at the same time, it is an improvement factor for them, because Kyyti found this kind of marketing ineffective and this was reflected in the total amount of trips made. The goals set out for the pilot project were not reached because of the low number of trips. Firstly, one of the reasons for the low number of trips could have been because their application has different users that were probably not reached. They are offering the app to taxi drivers who are providing the service, public transport users travelling in Helsinki and private car users. According to Kyyti, the ferry travellers do not have an urgent need for alternative mobility solutions since there are enough taxis and relevant applications available due to fierce competition. Secondly, all of the new taxi services are paying extra to taxi drivers to use the app. Therefore, to attract the drivers to log in to their driver app, Kyyti taxi drivers were paid on an hourly basis regardless of the trips completed during a three-day campaign period, but this did not result in significant increase in trips taken with the app. Thirdly, smooth and affordable rides might not be a message that was received well with the travellers. Instead, travellers could have been better reached by communicating the message that travel time with the Kyyti app is 25-50% quicker compared to other means of transport. Finally, marketing for private car users should be made before they buy their ticket. This is hard to do in close cooperation with the ferry operators since their interest is not in decreasing the cars transported. Alternatively, the pilot users would have been reached most efficiently by requesting employers, whose workers usually take the car to the ferry and drive to the airport, to participate. Large employers with dedicated user groups which can be controlled could have been a good user group for the pilot. To sum up, if there are different kinds of users to be reached, there should be marketing messages that are most relevant to each of the user groups. [50]

A positive factor for the further exploitation of the pilot project is that Kyyti's service and the app is flexible enough to meet different client's needs. In other words, Kyyti's service can benefit the everyday commuters travelling inside the city to work or Kyyti can offer their service to larger companies with workers who need daily commuting to a warehouse or factory situated outside the city. Beyond the scope of this project, Kyyti has a contract with an automotive industry manufacturer who has 6000 workers needing daily commuting to the factory which is situated more than 70 km away from the biggest city. Kyyti offers a solution where the workers can access all subsidized rides from one place and this solution could be implemented elsewhere in Finland and in Estonia. As different companies in Tallinn are already using private transport to get employees to the factories, Kyyti should research different companies in the area with more than 5000 workers to see if there is a demand for this kind of service. Another example of Kyyti's flexibility is the option to offer their app as a white-label product, meaning that Kyyti can provide their infrastructure under the name of another company. For example, Tallink could use the app to provide a service for its customers.

One of the drawbacks of the pilot was that Kyyti could not get automated access to some of the important data that could have guaranteed the end-to-end smart mobility solution. The essential missing data and additional features are following:

- The real-time flight departure and arrival information, which could have made it easier for Kyyti's customers to plan their trip from the harbour to Vantaa airport. According to Kyyti, they did not have the financial resources to get access to the Finavia API which provides this information.
- The ticketing service data from Helsinki City Transport which would have been on fair commercial terms. This solution would have made it very convenient for the app users to buy all of their public transport tickets from one place. Instead, the terms proposed by HSL would have made the ticketing price higher when buying from the app than buying straight from HSL, because Kyyti would have needed to add its expenses to the ticket price.

[50] Kyyti, FinEst Smart Mobility (Pilot Report), 2019.

- Ferry ticketing service is not available which would have made it easier for a traveller in Estonia to buy all of the tickets needed to get from Tallinn to Vantaa airport. If the ferry operators do not make the ticketing service available, Kyyti could consider cooperating with other companies who provide this service. For example, the website laevapiletid.ee[51] offers ferry tickets and they might be interested to collaborate.

If Kyyti wants to provide a complex mobility solution, where a traveller in Tallinn can buy tickets and book all of the necessary services required to travel from their home to Vantaa airport, then Kyyti should consider different options to integrate the public transport ticketing system into the app. Even though buying the combined public transport ticket from Kyyti app would be a little bit higher than buying straight from HSL due to the added expenses, the cost of travel would still be cheaper for the passenger when compared to taking the shared taxi all the way to the airport. In addition, the app needs access to the real-time flight data and ferry operator ticketing services.

Recommendations for an action plan:	**Target:**
• Test the service with a wider user group first	• Kyyti
• Create a clear communication plan for one target group	• Kyyti
• Consider offering the service straight to bigger companies	• Kyyti, city and government authorities and private companies in Finland and Estonia
• Look for available options to provide the combined ticketing service through the application	• Kyyti, ferry operators, public transport and train operators in Helsinki
• Look for available options to gain access to real-time flight data	• Kyyti, flight operators

3.6. FEASIBILITY STUDY OF TALLINN RING ROAD (PILOT E1)

3.6.1. DESCRIPTION OF THE PILOT

INTRODUCTION AND GOALS | The main objective of the Tallinn ring road E265 traffic management study (TMS) is the development of the traffic management solution for Tallinn ring road on national main road No. 11 (E265). Tallinn ring road E265 is the only connector road where cargo flows from Via Baltica (E67) can enter the Muuga and Tallinn ports. Tallinn ring road will be built into a 2+2 highway and the study is a basis for the planning and development of different intelligent traffic systems (ITS) with the aim of making the traffic on the ring road safer, smoother and enabling the better management of incidents causing traffic obstructions.[52]

The extensive study covers the description of the current situation and how different traffic obstructions are managed on the ring road, including an overview and assessment of continuous operation plans. Continuous operation plan is the capability of consistent functioning of the service provider and the ability to restore functioning following an interruption in the service, in this case a traffic accident or any other obstruction. The study also includes the development plans for the ring road and entrance roads to the city; modelling of incidents and possible bypass routes; mapping different probable accident scenarios; describing the possibility and locations of possible traffic jams and preparing bypass routes to avoid bottlenecks. Furthermore, the feasibility of dynamic traffic management is also reported in the study. The report includes the description and total cost of ITS solutions, cost-effectiveness analysis for different

[51] Laevapiletid.ee homepage. <link>
[52] Estonian Road Administration, Survey for developing the traffic management solution for Tallinn ring road on highway No. 11, 2017. <link>

scenarios, selection of optimal ITS solutions and management and optimal realisation plan for ITS solutions.[53] In summary, the findings from this study will affect ongoing and future road reconstructions, traffic management and ITS design.

Another part of this pilot is the Väo intersection truck parking area in the beginning of Tallinn ring road (E265, Väo intersection) with ITS, which contains a message information panel, free WIFI area and harbour route time calculations for truck drivers. The ITS solutions included in the waiting area are a parking system that tells how many free spots are available, an information stand with ship departure times, calculations on how much it takes to make it to the port and other relevant information the ERA can share. The objective of the truck parking area with ITS solutions for the FESM project is to optimize the traffic caused by arriving HGVs in Tallinn port area by providing a waiting area for trucks who need to check-in to the ferries. With the help of a remote waiting area, the traffic flows in ports can be improved as the trucks do not need to spend unnecessary time in the harbour area.[54]

OUTCOMES | The Tallinn ring road E265 TMS was completed according to schedule. It is stated that the traffic management study developed during the FESM project will act as a base document for further investment in roadside technology. In this regard, the feasibility study has reached its goal, because the Estonian Road Administration (ERA) has entered a proposal for the 2018 CEF Transport call to co-finance the renewal of Tallinn ring road with ITS solutions and the development of the smart truck parking lot.[55] It is important to note that a significant input for this proposal came from the Tallinn ring road TMS developed for the FESM project.

Additionally, the Traffic Management Department of Estonian Road Administration is using the results of the TMS in the everyday work of the Traffic Management Centre. By the end of 2019, the Traffic Management Centre will create an in-house GIS-based map application to support the traffic control by solving different traffic obstructions.

Meanwhile, the Väo truck parking area will not be completed during the FESM project, because the Väo E265/E20 intersection reconstruction project is delayed. But Estonian Road Administration is planning to complete the smart parking lot solution with their own finances and they have returned the FESM project funding.

3.6.2. EXPLOITATION PLAN

Feasibility study focused on usage of the smart traffic regulation technology to improve the traffic flow in Tallinn ring road which have a direct impact to the inbound and outbound traffic to and from the city centre and the port area. Although the study resulted with the exhaustive research document which is the basis to the investment application, the following positive and improvement factors should take into consideration for the further steps.

TABLE 6. ANALYSIS OF THE FEASIBILITY STUDY'S OUTCOMES

POSITIVE FACTORS	IMPROVEMENT FACTORS
Results of the feasibility study are being used daily	Summary of the continuous operation plan
Project partners were motivated to complete the study	Including foreign consultants in future studies
Demand for smart mobility solutions	Procurement and funding risks for Väo parking area project

Source: Civitta

[53] Estonian Road Administration, Survey for developing the traffic management solution for Tallinn ring road on highway No. 11, 2017. <link>
[54] FinEstSmartMobility project application, provided by TTD
[55] 2018 CEF Transport call for proposals. <link>

According to the ERA, the overall road transport between Estonia and Finland will keep on growing for the next 10 years, meaning that the traffic on the ring road will continue to grow. The traffic volume will continue to increase as the economy grows in Estonia, even when different transportation modes are developing further. For example, with the development of Rail Baltic, there will be new industries who want to transport their goods with the railway and their activity in the region will grow the economy and the improved economy will indirectly increase the overall traffic.

RESULTS ARE IN USE | Estonian Road Administration has already started the further exploitation of this pilot by submitting a proposal for the 2018 CEF Transport call to co-finance the renewal of Tallinn ring road with ITS solutions and the development of the smart truck parking lot. Also, the results of the TMS are being used in the everyday work of the Traffic Management Centre. As stated in the study, there is a need for a short summary of the continuous operation plan, so that there would be a brief code of conduct for resolving crisis situations. Currently, the continuous operation plan is too lengthy to be used efficiently in a traffic crisis situation where time is of the essence.

Feasibility studies in the future have to consider that some of the data required for different analyses or modelling scenarios might be missing. Without the specific data, the calculations are based on estimations and the modelling scenarios might not be accurate. In addition, feasibility studies in the future could consider hiring a foreign consultant who could provide expertise about similar studies conducted in other countries.

One of the positive factors of the study was that all the project partners were very motivated to complete the study, because the project partners realized that the study was needed if they wanted to see any improvements on the ring road. Still, a foreign consultant could have been present for the study to provide the necessary expertise needed. Mainly, a foreign consultant could provide examples of feasibility studies conducted in other countries.

DEVELOPMENT OF VÄO PARKING AREA | The Väo parking area is situated at a traffic junction with 3 important roads for trucks, the goal of the parking area technical solution is to avoid the unnecessary driving on highway ramps and circling around to find free parking spaces. The ERA is planning to send out the procurement in the next few months and realize it in 2021. With the development of the Väo parking area, there could be procurement risks and a risk of getting the funding. According to the Port of Tallinn, in a few years there will be a demand for remote check-in areas and it would be a good idea to consider developing a remote check-in option for Väo parking area.

Overall the Tallinn ring road feasibility study is successful, they have a stepwise plan for the future and the finances to complete it. Despite the delayed construction of the Väo intersection, the Väo truck parking area is planned to be realized in 2021.

Recommendations for an action plan:	**Target:**
• Consider preparing a short specific code of conduct for resolving crisis situations in addition to the continuous operation plan	• ERA, City of Tallinn and Police and Border Guard Board
• Review the option of developing a remote check-in solution in the Väo parking area	• ERA, GoSwift, ferry operators, City of Tallinn

3.7. SUSTAINABLE URBAN MOBILITY PLAN (PILOT E2)

DESCRIPTION | In a densely populated and constantly developing city, car-based transport is the most expensive and ineffective way of transit because the land resources which are important for the city and its' people are mainly used to build parking lots and new roads. At the same time, there is an increasing demand for travel and car use in the Tallinn region. 120 000 people are moving in and out of Tallinn by car every day. Inside the city of Tallinn alone, more than 20 000 people move to the city every year and this number is even bigger if other neighbouring regions are counted in. All of this creates a strain on the traffic inside the city, while the need for a human-friendly urban space remains. Mobility plays a big role if Tallinn wants to become a human-friendly city that is clean and takes into consideration our children's future. One way to do this is to attract more people to walk, cycle and use public transport. Currently, there is no overall mobility strategy for Tallinn and the region surrounding it.[56] The Sustainable Urban Mobility Plan (SUMP) aims to:

1) improve the quality of life for the citizens of Tallinn;
2) improve mobility and ensure better access to daily destinations;
3) reduce the time spent on the transport of passengers and goods and the negative impact on the environment.

Tallinn region SUMP will be created to ensure better cross-border traffic between Helsinki, as the SUMP will be matched with the existing Helsinki region transport strategy and plan.[57] The SUMP of Tallinn region aims to bring out 15 main challenges that influence the urban transport and people's movements the most. SUMP is a strategic development document describing the actions needed to make Tallinn a great place to live where everyone can go wherever they want.[58]

ACTIONS | In addition to regular working group meetings with key partners of the FESM project, there have been several important meetings with different scale of priority that focused on the SUMP development. High-priority activities included two steering group meetings in November 2017 where the City of Tallinn departments discussed the output list of goals and Key Performance Indicators of Tallinn SUMP and the overall format of the SUMP. Also, high-priority meetings were held between the SUMP team and the City of Tallinn Deputy Mayor, high-level stakeholders from different City of Tallinn departments and between the Union of Harju County Municipalities. Finally, a high-priority activity was the defining of four main strategic goals and 14 key challenges and relevant Key Performance Indicators for the Tallinn region SUMP.

Medium-priority activities were the steering group meeting held in February 2018 where the key results of Harju County Travel Survey were presented and a consultation seminar with Harju County stakeholders was held. Medium-priority activities were also the hiring of different experts (inclusion expert, external experts, SUMP expert, data and urbanist expert, GIS and urban planning experts) to work on the SUMP project. Lastly, a medium-priority activity was the meeting between the SUMP team and Helsinki Regional Transport Authority to identify common mobility issues and best practices from Helsinki's regional land use, housing and transport plan (MAL 2019).

Supporting activities included a one-day (06.02.2018) study visit where Tallinn City Departments learned about the Helsinki Region SUMP process and development issues from the City of Helsinki and its' partners. Other supporting activities included the ordering of a study on the demand for transportation (origin - destination matrix), which will be a key input to planned mobility studies, the gathering of data about

[56] ERA & TTA, Draft of Sustainable Urban Mobility Plan for Tallinn region, 2019, provided by TTD.
[57] FinEstSmartMobility project application, provided by TTD
[58] ERA & TTA, Draft of Sustainable Urban Mobility Plan for Tallinn region, 2019, provided by TTD.

different mobility related studies and the mapping of different street types in Tallinn, where priority areas that need special focus were identified. According to Tallinn Transport Department, the consultations about the main goals of the SUMP have taken longer between the City of Tallinn departments.

FURTHER STEPS | According to the SUMP project manager, the overall aim for the further steps is to define the vision and goals of the whole mobility plan and to reach a general consensus between different relevant stakeholders. For the period of April – May 2019 the SUMP team will be organizing 7 high-priority activities, 5 medium-priority activities and 12 supporting activities (see Table 7).

High-priority activities will be conducted until the end of the FESM project. The City of Tallinn meeting between the Deputy Mayor, high-level stakeholders from departments of the City of Tallinn and the SUMP team at the beginning of April will be focusing on the feedback to the SUMP document and introduction of scenarios. SUMP scenario analysis with cost-benefit study will be presented at the middle of April and in 24.04, Mayors of Tallinn and Helsinki will meet in Tallinn to discuss the following topics: a single integrated payment option in public transport between Tallinn and Helsinki; Helsinki Region Mobility Plan 2019; freight transportation to Muuga-Vuosaari, which requires decisions from both cities and cross-border M-parking. At the same date in 24.04, the final FinEst Smart Mobility conference will take place in Tallinn. Between 27.05-31.05, the introduction and approval of the Tallinn region SUMP document will take place in City Council together with the signing of a memorandum between the city, region and ministry. In addition, a press conference will take place in May where the signed memorandum will be handed over to facilitate transportation between Tallinn and its surroundings. The last high-priority event will take place between 27.05-31.05 and it will be the final event of the Tallinn region SUMP. The conference titled “Human Centered Tallinn” will discuss the Tallinn region 2035 Mobility Strategy; basics and priorities for mobility planning in the Tallinn region; priority areas for development – very good level of public transport service and high potential; Finland’s experience in prioritizing mobility; how to ensure sustainable funding for urban mobility development and the execution and implementation of Tallinn region SUMP.

TABLE 7. ACTIVITIES PLANNED FOR THE SUMP IN APRIL AND MAY 2019

HIGH-PRIORITY ACTIVITIES		MEDIUM-PRIORITY ACTIVITIES		SUPPORTING ACTIVITIES	
Date	**Activity**	**Date**	**Activity**	**Date**	**Activity**
01.04	Deputy Mayor meeting	03.04	Tallinn parking study final seminar	April	Media coverage in TV or radio
15.04	SUMP scenario analysis	10.04	Tallinn region SUMP seminar	April	PR event covered in TV
24.04	Mayors of Tallinn and Helsinki meet in Tallinn	30.04	Discussion and approval by City Government	30.04	SUMP documentation amendments
24.04	FESM Final conference	03.05	Tallinn region SUMP seminar	April	Radio interview
27.05-31.05	Introduction and Approval of SUMP in city council	15.05	Tallinn region SUMP seminar	May	2 TV appearances
May	Press conference	17.04-22.05	4 SUMP team meetings	May	2 news articles
27.05-31.05	Tallinn region SUMP 2035 Final conference				

Source: SUMP action plan, provided by TTD

Medium-priority activities include the final seminar of Tallinn parking study; Tallinn region SUMP meeting, which will focus on the integrated urban space planning; the discussion and approval by City Government to send the SUMP strategy to City Council; SUMP seminar focusing on the regional transport network and

planning and a Tallinn region SUMP seminar taking place in the middle of May, which will focus on new regional cooperation.

Supporting activities planned for the period of April - May 2019 include regular SUMP team meetings; 7 PR events, of which 4 are TV appearances, 2 news articles and 1 radio interview. For example, the PR event covered in TV requires different participants to go to work or school in different transportation modes every day for a week. In addition, there will be amendments made to the SUMP document based on feedback and the cost-benefit analysis will be included into the final SUMP document.

4. CONCLUSIONS

Overall, most of the piloting companies managed to complete the pilot projects and were successful in reaching the goals set out for the FESM project period. Due to different reasons the Smart Park & Ride, Tallinn region SUMP and Väo parking area with ITS solutions were not completed in the scope of this project.

POSSIBILITY OF WIDER IMPLEMENTATION | One of the positive factors that stood out from all of the completed pilot projects was the possibility of implementing the developed smart solutions on a bigger scale or elsewhere in the world. Some of the pilots may not have a demand for their service in the Tallinn and Helsinki area but could be very useful in other cities. The possibility to implement the smart solutions elsewhere in the world directly contributes to the global cooperation in the mobility improvement. Wider implementation of the pilot projects could be limited by the availability of necessary data as some of the pilots were lacking information already in the piloting phase – e.g. direct access to the ferry ticketing service (Kyyti) or confirmed bookings (Infotripla and GoSwift) or ferry schedule (Fleetrange). To ensure the more effective cross-border collaboration between Tallinn and Helsinki in the future, there should be discussions and an action plan ready on how to make the necessary information available to companies developing smart mobility solutions. It is important to note that the lack of accessibility to data (e.g. real-time traffic and traffic control data) is a challenge that needs to be addressed in particular by the Estonian authorities and additionally it should be taken into account that the level of quality for the shared data should be good enough so that smart mobility solutions could integrate the data as easily as possible. The City of Tallinn would benefit from the experiences of the City of Helsinki and from Finland in general, as the mindset and experiences for sharing open data is different in both countries. Estonian authorities could support directly and more efficiently the development of new smart mobility solutions by making the traffic information accessible to third parties.

DETERMINING POTENTIAL END USERS | As the piloting period of the FESM project was quite short, there might not have been enough time to find relevant end users for the developed solutions or this might not have been a priority for the piloting companies. One of the main areas for improvement for the pilots is the fact that the end users were poorly defined and there was a lack of knowledge about their real needs. After the FESM project ends, piloting companies should gather additional user feedback or conduct additional market research to figure out the real demand for their developed solutions and concrete target groups. For example, Fleetrange was one of the pilots that had a good technical solution which could have been used as input data by other smart mobility applications in both Helsinki and Tallinn. Due to the fact that the ferry operators navigating between Tallinn and Helsinki were very accurate during the piloting period and almost never arrived late to the port, there was very little demand for this sort of service in the local region. Regardless, Fleetrange could find a business case for the same software elsewhere in the world, where the ship's schedules may not be so reliable.

Infotripla's software was aimed at the port authorities at first but the real users of this solution are the traffic management authorities controlling the city traffic because the ports themselves are not responsible for the traffic management. At the same time, it is important to analyse whether the developed solution is practical in the local traffic environment – for example, Infotripla's software will remain unused in Tallinn until further notice because Port of Tallinn lacks alternative routes going out of the port area and currently there are no adaptable traffic light systems in the area. Likewise, Kyyti was another pilot project that needs to clearly define the target group. One way for them to find a business case is to expand their service usage and sell the service to Estonian companies whose workers use different transportation types. These examples illustrate quite clearly the different bottlenecks when determining the demand and target users as these are essential prerequisites for the further successful implementation.

COMMUNICATION | Following the identification of the target groups, piloting companies should create a clear communication strategy to reach them. The pilot projects might have potential solutions that could help alleviate the different mobility problems caused by the increasing traffic between Tallinn and Helsinki,

but direct marketing messages that mention the needs of the possible users are still needed. For example, GoSwift created leaflets and talked directly to the truck drivers travelling between Helsinki and Tallinn, which was a good way to create awareness among the end users. But some of the end users did not find the app useful and instead, the main beneficiaries of the queueing system were the logistic companies and ferry operators. Therefore, direct communication messages should be directed at the logistic companies who would find more value in knowing that their trucks will arrive to the port check-in area in time. Additional communication messages should be directed at ferry operators, who could be more flexible with their booking system thanks to GoSwift's solution. Therefore, it is up to GoSwift and the other pilot projects to make sure, that their communication strategy is directed at the real beneficiaries of their solutions. Whether the communication messages will be delivered through brochures and presentations at smart city conferences, content marketing or even TV adverts is up to the piloting companies and their marketing budgets.

On the other hand, the responsibility to communicate the developed smart mobility solutions and the problems caused by traffic should not rely only on the piloting companies. The cities of Helsinki and Tallinn should maintain a more active role in communicating the mobility needs to the service providers, ports and ferry operators and software developers. To illustrate, both, the cities of Helsinki and Tallinn could publish different news articles or press releases to introduce the main findings of the FinEst Smart Mobility project, where the main focus would be to introduce the pilots and describe in detail why these smart mobility solutions are needed in the first place. Even introducing the SUMP to the general public would help to highlight the future mobility challenges the Tallinn region is facing. If different software developers and service providers would understand that the cities have real problems caused by increased traffic that need solving and the officials have an open mindset towards new smart mobility solutions, more and potentially better innovative approaches could be developed in the future. Specifically, the active role of the cities could be achieved by media coverage such as TV news segments or radio interviews. Also, the cities could create workshops or hackathons, where participants need to find alternative solutions to one of the problems presented in the FinEst Smart Mobility project.

OTHER DEVELOPMENTS IN THE AREA | Currently, there are still some parking areas available inside the Tallinn and Helsinki ports and trucks can still spend time in the port area while waiting for the check-in. After a few years there will be a serious need for outside parking areas and remote check-in services due to the extensive real estate developments in the port areas. To avoid a situation where the port and nearby areas are full of trucks heading to the harbour, the remote area check-in solution should be established as soon as possible. Based on the interviewed relevant stakeholders there is a need and willingness to cooperate between harbours, shipping companies and software developers (e.g. GoSwift) to find the effective and reliable business model for further development.

The future implementation of the pilot projects could be influenced by other projects happening in the ports of Helsinki and Tallinn such as the TWIN-PORT 3 project.[59] Twin Port 3 will be carried out from 2018 – 2023 and the project will bring significant changes to the port areas of both cities. The pilots need to take into account the developments planned during this project and analyse if there will be any risks involved. For example, some streets in Helsinki will have new lanes built, which could affect the inbound and outbound traffic to and from West Harbour. GoSwift, Infotripla and Kyyti projects could be directly affected by these new changes and need further software developments. In addition, the tram routes in Helsinki will be improved. If the tram route from West Harbour to Vantaa airport is improved with more capacity for passengers and the first mile or last mile problem is solved with the new multimodal solution, there might be less demand for a shared taxi service provided by Kyyti.

Once the new Reidi Street is finished near the Port of Tallinn it will help the traffic coming out from the Old City Harbour. In addition to the improved traffic flow, Reidi tee will be implementing ITS solutions. Infotripla could potentially use the information provided by the traffic light systems for its dashboard solution.

[59] Port of Helsinki homepage. <link>

Digitransit, as an open-source journey planner software provided by HSL and Finnish Transport Agency, is currently being set up in Estonian Road Administration with the help of a Digitransit expert procured by Forum Virium Helsinki Ltd. The setup is a subproject under FESM with the main aim of more effective cross-border collaboration on mobility planning. Digitransit is a software, which could play an important part in other smart mobility solutions in Estonia once it will be finalized. If Digitransit will be made operational in Estonia, then Kyyti could benefit by getting access to the open data also in Estonia and might be able to offer the full end-to-end mobility solution.

CROSS-BORDER COLLABORATION | One of the most important positive outcomes for the participants of the FESM project is the possibility of reaching a new market and making contacts with relevant stakeholders in the neighbouring country. The technical solutions developed by the piloting companies are all important to solve the problems in traffic, but the additional important aspect of the project is the collaboration between the piloting companies, the harbours, city officials and ferry operators. All interviewed partied confirmed that the newly developed contacts, positive cooperation and common interests create wider opportunities for the development of the smart mobility solutions in the future.

ANNEXES

TABLE 8. LIST OF TARGET GROUPS, INVOLVED STAKEHOLDERS AND INTERVIEWEES

TYPE OF TARGET GROUP	ORGANISATION / COMPANY	NAME AND POSITION	PROJECT MEETING 17.12.2018	SEMINAR 17.01.2019	PERSONAL INTERVIEWS DURING THE PERIOD 28.01.-28.03.2019.
FESM project partner	City of Tallinn	Liivar Luts, Project manager (Tallinn Transport Department)	x	x	
FESM project partner	City of Helsinki	Suvi Hänninen, Project manager (City of Helsinki)	x	x	
FESM project partner	City of Vantaa	Mirka Järnefelt, Senior Advisor (City of Vantaa)	x	x	
Relevant stakeholder	ITL Digital Lab	Ralf-Martin Soe, Project Development Manager (ITL Digital Lab)	x	x	x
Relevant stakeholder	Port of Tallinn	Hele-Mai Metsal, Head of Development Department (Port of Tallinn)			x
Relevant stakeholder	Port of Tallinn	Olari Tammel, Project manager			x
Relevant stakeholder	Forum Virium Helsinki Ltd	Jari Honkonen, Project manager (Forum Virium Helsinki)		x	x
Piloting company	Kyyti Group OY	Jaana Ylikoski, Collaboration manager			x
ESM project partner /Piloting company	Estonian Road Administration	Kristjan Duubas, Product manager	x	x	x
Piloting company	Estonian Road Administration	Siim Vaikmaa, Head of Traffic Management Centre			x
Piloting company	Estonian Road Administration	Hannu Ploompuu, Analytic			x
Piloting company	Fleetrange Ltd	Hendrik Ramm-Schmidt, CEO		x	x
Piloting company	GoSwift OÜ	Madis Sassiad, Board member		x	x
Piloting company	Infotripla Oy	Kimmo Ylisiurunen, Managing director		x	x

Source: Civitta