Demand-Responsive Transport to ensure accessibility, availability and reliability of rural public transport

WP 3.2: MAPPING STUDY OF INNOVATIVE DRT BUSINESS MODELS - ESTONIA

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1 General status of DRT in the country

Public transport usability has fallen constantly in recent decades. Marginalization and private car triumph have a particularly significant role in this.

Households in Estonian rural areas are scattered and therefore regular transport lines do not meet everybody's expectations. In relation to the continuing decrease in the population, there are forming regions where residents are dependent on their personal transportation. However, these kinds of areas should be exceptions rather than the rule. Public transport often has great social significance for the residents in remote areas. In current situations, traditional bus transport doesn't always meet the resident's needs. Traditionally in such situations, public transport is ensured with sparse graphs, for example, one exit per day or week, if even that. This level of public transport doesn't allow residents to use it for work-, education-, training-, social-, medicine- or free time purpose.

Even though Demand Responsive Transportation (DRT) system is not very common in Estonia at the moment, several public transport coordinators have started to offer DRT services on a smaller scale. Implementing DRT is reasonable primarily in situations where demand is low and users locate diffusely. The comprehensive offering on DRT but the lack of common approach has created a situation where the concept is used differently. For example, there are some lines in rural areas that are operated in a way where the last (or first) stops are served only when a client has pre-ordered (usually by phone) the bus to this stop. Some lines could be 100% DRT.

The national transportation plan is revised at the moment and will become into force from 2021. Developing DRT in rural areas will be certainly one objective in this plan.

There are four pilot projects regarding DRT planned to start in 2019 in Estonia. These are mostly concentrated on social transport services but one pilot (in Saaremaa) is also piloting DRT services for regular customers. The first result of the pilots should be seen in 2020.

Demand responsive transportation has started getting more attention in Estonia over the past five years. Already in 2013, when the Ministry of Economic Affairs and Communications drew up the Transport Development Plan 2014-2020, it was stated under the Measure 5.2 (Development of regional public transport connections, page 44) that the main activities to be carried out under this measure are:

1. The network of lines will be modernized.
2. The procurement documents shall be adapted to meet the requirements of the service standard.
3. Regional public transport arrangements will be moved from the county level to the level of larger regions covering different counties.
4. Flexible public transport solutions, such as demand bus, social transport or taxi, are introduced in sparsely populated areas. (Ministry of Economic Affairs and Communications, 2019)

During the years 2015-2016, another important document, "The basic principles of climate policy up to 2050", was written which was approved on April 5, 2017, by the Government. In this document (Transport section, page 10) it is stated that:

Among public transport, the role of convenient and fast passenger rail transport in the entire public transport system will be enhanced. Sparsely populated areas are developing demand response bus services, bus and train compatibility, and parking systems for cars and bicycles to expand public transport service areas (Ministry of the Environment, 2019).

On 23.08.2017, Ministry of Economic Affairs and Communications, Department of Transport Development and Investment gave an overview presentation about the future of the transportation in Estonia. The main plans for the future foresaw flexible and knowledge-based planning and financing of the transportation in Estonia, putting more emphasis on innovation, creating synergies through private sector involvement, increasing the role of integrating different services, flexibility, real-time planning and analysis capabilities, new trends in transport (including demand-responsive transportation and self-driving vehicles). (Vahter, 2017)

In February 2018, several municipalities in Estonia had shown interest in starting to develop a demand-responsive public transportation system. (Raiste, 2018)

On 14.03.2018 during the Roundtable in the Parliament, it was realized that demand-driven public transport should be developed in rural areas to offer more flexibility for the people. The Roundtable about focusing on the future of public transport was organized by e-Estonia support group and Social Democrats faction.

Tanel Talve, Chairman of the Riigikogu e-Estonia Support Group, says that we have to move on with demand-responsive transportation and see whether and in what degree the laws should be changed for the DRT to work. (Äripäev, 2018)

On 29th of May 2018, news came that Läänemaa is starting to develop and pilot a DRT service. It is still running; some bus lines are full demand-based and some are semi-demand based (fixed times and bus stops). For ordering the bus to stop in a demand-bus stop, one needs to call the previous day (until 18:00) and order it. In order to go off in a demand-bus stop, one needs to tell the bus driver when starting the drive. (Oja, 2018) (Maakonnaliinid, 2019) (Ladva, 2019)

2 Examples of demand-responsive transport services

2.1 Case study No. 1 Saaremaa

Saaremaa local government will be launching their own DRT service. They are focusing on social transport customers, but also on elderly people who have difficulty using public transport, children and on those whom the current transportation times are not suitable.

In the beginning, the ordering should be done at least 24 hours in advance. There is an idea to create the opportunity for a standing order. The prices and routes and other details are still under development. The first carrier procurement fell through in the fall of 2019, but the second call is up now (January 2020).

Table 1. Saaremaa questionnaire

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	**Saaremaa DRT**
2	**Organization**	*Organization responsible for the service*	Saaremaa Municipality with the Republic of Estonia Road Administration and Ministry of Social Affairs. The Road Administration and Ministry of Social Affairs finance the project.
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	mixed
4	**Population**	*What is the population in the service area and how are they located?*	Approximately 30 000 people, of which 15 000 lives in Kuressaare or near Kuressaare and the rest in rural areas and small towns.
5	**Customers**	*Please describe what customer group are you targeting, if any (Disabled/elderly/children etc.).*	It is aimed at social transport customers. In addition, of course, for elderly people who have difficulty using public transport, for children and for those whom the current transportation times are not suitable.
6	**Network topology**	*Please describe your DRT network topology and what are the reasons behind it. (Fixed routes, door-to-door or fully flexible, partly flexible, combined with public transport). On which basis did you forecast the demand?*	Door-to-door service. For longer routes, the local government also thought to provide the pre-drive and last-mile solution, but this solution seemed too complicated. Door to door solution was chosen because they intend to provide demand-responsive transport on a social transport basis, which must be a door to door service. Demand cannot be predicted, the local government knows how many social transport customers are expected, but how many other people could start using the service has not been predicted.
7	**Frequency/availability of service**	*What is the DRT schedule, how frequently does the service run, i.e. only when requested, set number of journeys per day?*	Only on demand
8	**Notice requirements**	*When is booking required (on the day/when required, in advance, repeating booking)?*	In the beginning, the ordering should be done at least 24 hours in advance. There is an idea to create the opportunity for a standing order.
9	**Pick-up location**	*Where are users picked up and dropped off (many-to-many,*	Combine trips of different people. On what degree we are making it more uncomfortable for people to commute compared to a taxi, for example, is not yet

		one-to-one, one-to-many/many-to-one)?	clear. In the beginning, we start with a very personal approach and later set some general rules.
10	**Transport type**	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	The local government hopes that the procurement will include both buses and cars and that there will be a separate category for vehicles with wheelchair access so that people with disabilities can also use this service.
11	**Sharing a ride**	*Please describe if passengers share a ride or get their own ride.*	Sharing.
12	**Fares**	*Please give an overview of the ticket fares. Are there any discounts? Is it per kilometre or fixed price etc.? Do the customers pay it themselves or is it funded by local government? Can they pay in cash or with a card?*	No rates have been set as the service is not yet available. Social transport is currently free in Saaremaa, but there is a desire to set a price. It will also certainly set the price for demand transport, which will probably be zone-specific.
13	**Total cost**	*What is the cost of providing the service? How much do you as a transport organizer pay for it? What is the share approximate/precise share of revenues from tickets?*	This cannot be answered at the moment because this pilot is still being developed. The funding comes from social transport in Europe and the funding for the transport of ordinary people comes from Local Government. The Road Administration has also promised to support this pilot.
14	**Ordering**	*How do users book their journeys? Please describe the transport ordering process shortly and why you chose it to be like this. (App, web, phone call*)	At the moment Modern Mobility OÜ is developing the ordering platform. Besides ordering on the internet, it will be also possible to order by phone. Modern Mobility OÜ itself finances the creation of the platform because the local municipality does not.
15	**Concept**	*Is your DRT service together with regular public transport or separate? Why is it so?*	At first, the DRT service will be separate from the regular public transport. But the plan for the future (2020), when the new public procurement will take place, is to combine the two. The old public procurement allows only parts of the regular public transport to be demand responsive.

16	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	The service has not yet begun. The local municipality hopes to start providing the service at the end of February.
17	**Operator/Procurement**	*Who is operating your service? Did you have to conduct a procurement process to find the operator for your service? On which grounds are you billed by the operator for providing the service?*	Procurement to find the carriers is underway, initially the operator logistics will be done by the local municipality and when/if the Modern Mobility IT platform has proven itself then the municipality will think about finding a contractor through procurement. Initially, the local municipality wants to keep the transport operating in hand because the goal is to match rides and if the program can not do it at the beginning then the logistics manager can do it.
18	**Improvements/changes**	*If you would change or improve some aspects of your transport service what would it be and why? Also, how would you improve or change it?*	There is a need for better funding because there is no separate funding for the IT platform and people expect the experts to find a way to save some money on the rides/trips. In reality, it is better to get additional funding to provide better service, at least in the beginning, so that the service can work nicely and then look at the connection points.

2.2.1 Data barriers related to the Saaremaa DRT service

Table 2. Identification of data barriers related to the DRT case study: Saaremaa

No	Question	Optional answers	REPLY
1	What are the most important KPIs for the evaluation of your organization related to the transportation of passengers?	Cost, accuracy, customer satisfaction,	Cost per passenger. As the service has not yet started, it is not possible to say exactly what will be the main indicator of service evaluation.
2	Are you collecting data from the transportation of passengers?	What type of data are you collecting? 1. Pickup and drop-off points? 2. Number of passengers 3. Vehicle types 4. GPS data 5. Fuel consumption 6. Accuracy of pickup and delivery? 7. ...	We will collect the pickup and drop-off points and the travel times data. We will also collect data on how many passengers are in one car together, so we know how many trips we tie together.
3	Are you using the data collected to monitor in real-time the transportation?	YES/NO (additional comments)	The capacity to monitor in real-time the collected data is there, but we do not know yet if we will be using it.
4	Are you storing the data and using the historical data from analysis and optimization?	1)Please describe the currently existing data platform used for the planning and operation of special transport services (STS) and DRT. (Information flow, which type of GIS data is used, how is data updated, where is data stored, how is data retrieved). Is this data platform specific to 1 organization or is this country-wide? 2)Please describe the major challenges related to the currently available data platforms (cost, data availability, accuracy of data, etc.) 3)Please explain the pricing on the use of various proprietary software & data providers for the use of special transport	1. We currently use the Google platform in certain situations. As the service has not been actively tested yet, the final solution at the moment is unknown. All travel information is the service providers property. Our goal is to create software that is easy to implement in Estonia and also in other countries. 2. The currently available data platforms are too expensive, so politicians do not see the benefit of using them. (Right now Saaremaa local municipality will get the platform for free) 3. -

		services (STS) & DRT systems (app-s, maps, ticketing, etc.).	
5	Is there any information about the real-time monitoring of the vehicles you are missing?	If possible prioritize the information that could benefit your organization the most 1)Would you like to know how the passengers evaluate the quality of the service you provide? 2)Would you like to know how accurate you are at pickup and drop-off of passengers? 3)Would you like to be able to compare the accuracy of your current service with the service last year? 4)Would you like to be able to do green accounting? (how large is the CO_2 emissions from your entire organization, or per passenger kilometre)	Once again this is hard to answer because the service has not yet started, but from experience: 2,4,1,3.

2.2 Case study No. 2 Connecting South-East Estonia social transport with public transport

Table 3. Parameters of DRT service: Connecting South-East Estonia social transport with public transport

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	Social transport service for people with special needs
2	**Organization**	*Organization responsible for the service*	Southeast Public Transportation Center
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	Southeastern Estonia(Põlva and Võru County), where the organization of public transport is coordinated by the NGO Southeast Public Transportation Center.
4	**Population**	*What is the population in the service area and how are they located?*	The largest center is the town of Võru (14 thousand inhabitants), the rest can be classified as a sparsely populated area.
5	**Customers**	*Please describe what customer group are you targeting, if any (Disabled/elderly/children etc.).*	Our target group is people with special needs who do not have access to public transport.
6	**Network topology**	*Please describe your DRT network topology and what are the reasons behind it. (Fixed routes, door-to-door or fully flexible, partly flexible, combined with public transport)*	As the activities are targeted at people with special needs, the purchasing service is planned from door to door.
7	**Frequency/availability of service**	*What is the DRT schedule, how frequently does the service run, i.e. only when requested, set number of journeys per day?*	The service is scheduled daily with a two-day application.
8	**Notice requirements**	*When is booking required (on the day/when required, in advance, repeating booking)?*	Advance booking is always necessary as we do not provide line transportation for this project
9	**Pick-up location**	*Where are users picked up and dropped off (many-to-many, one-to-one, one-to-many/many-to-one)?*	According to order
10	**Transport type**	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	Cars and yes.

11	**Sharing a ride**	*Please describe if passengers share a ride or get their own ride.*	They can drive themselves, if the vehicle has free seats, the carrier can also serve other people.
12	**Fares**	*Please give an overview of the ticket fares. Are there any discounts? Is it per kilometre or fixed price etc.? Do the customers pay it themselves or is it funded by local government? Can they pay in cash or with a card?*	The client's own contribution is set by the municipality, and the price is subsidized from the project and the municipal budget. The fare is fixed with a fixed area. The customer pays only part of the cost. Optionally, the so-called "Public transport card", which is also used in public transport, is used for publishing.
13	**Total cost**	*What is the cost of providing the service? How much do you as a transport organizer pay for it? What is the share approximate/precise share of revenues from tickets?*	As the shipment is not yet done and the service provider is in the process of finding out, we cannot tell the specific volume and price. Ticket revenue should cover about 15-20% of the price.
14	**Ordering**	*How do users book their journeys? Please describe the transport ordering process shortly and why you chose it to be like this. (App, web, phone call*)	Our dispatcher registers the travel requests and forwards the bonded route to the carrier through a single platform, which includes vehicle locations for both the carrier and the subscriber, as well as information on the journeys made (kilometres and financial status).
15	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	The planning of the service started on 12.2018. This is a pilot project supported by European funds and requires 24 months' service. We are not currently providing the service as we are preparing the procurement documentation. Approximately it will happen in summer 2020.
16	**Concept**	*Is this DRT service separated from the regular public transport in terms of routing, booking, ticketing and payment?*	We want to integrate it with the "Public transport card" system

2.2.1 Data barriers related to the service: Connecting South-East

Table 4. Identification of data barriers related to the DRT case study: Connecting South-East Estonia social transport with public transport

Nr	Question	Optional answers	REPLY
1	What are the most important KPIs for the evaluation of your organization related to the transportation of passengers?	Cost, accuracy, customer satisfaction.	Customer satisfaction also cost and accuracy.
2	Are you collecting data from the transportation of passengers?	What type of data are you collecting? 1. Pickup and drop-off points? 2. Number of passengers 3. Vehicle types 4. GPS data 5. Fuel consumption 6. Accuracy of pickup and delivery? 7. ...	Yes, we do. 1. Timing 2. Number of passengers 3. Accuracy of pickup and delivery 4. Milage
3	Are you using the data collected to monitor in real-time the transportation?	YES/NO (additional comments)	Yes
4	Are you storing the data and using the historical data from analysis and optimization?	1)Please describe the currently existing data platform used for the planning and operation of the STS and DRT. (Information flow, which type of GIS data is used, how is data updated, where is data stored, how is data retrieved). Is this data platform specific to 1 organization or is this country-wide? 2)Please describe the major challenges related to the currently available data platforms (cost, data availability, accuracy of data, etc.) 3)Please explain the pricing on the use of various proprietary software & data providers for the use of STS & DRT systems (app-s, maps, ticketing, etc.).	1) For planning PT we are using software named PIKAS. https://www.riha.ee/api/v1/systems/ytris/files/6728b151-3909-4579-a87e-83e78666dbed Our partners (bus companies) are in contract with Ridango AS. Bus tickets are sold with using Ridango terminals and all the info is collected in Ridango servers. We have access to that info and we are using data analysing software Tableau to analyse collected data. 2) We would like to use mobile positioning to plan new lines, but unfortunately, the info collected that way is not accurate in sparsely populated areas.

			3) Because we are not in contract with Ridango, we don't know the pricing.
5	Is there any information about the real-time monitoring of the vehicles you are missing?	If possible prioritize the information that could benefit your organization the most 1)Would you like to know how the passengers evaluate the quality of the service you provide? 2)Would you like to know how accurate you are at pickup and drop-off of passengers? 3)Would you like to be able to compare the accuracy of your current service with the service last year? 4)Would you like to be able to do green accounting? (how large is the CO_2 emissions from your entire organization, or per passenger kilometre)	Estonian Road Administration is working on mapping bus movement in real-time. 1) Feedback of the offered service level is welcomed. 2) Ridango offers the ability to see if the bus is passing trough bus stop at a set time. 3) Not necessary. 4) Because we know passenger kilometres and vehicle emission norm, the suggested green accounting can already be calculated.

3 Barriers in the country related to DRT services

3.1 Legal barriers in the country

The public transport act in Estonia states "Public transport' means the carriage of passengers for a charge by way of regular services, occasional services or taxi services as well as the carriage of a vehicle and its trailer for a charge on a ship, pleasure craft and ferry routes."
Demand responsive transport should classify under occasional services. Which is described as carriage of passengers by road, except for regular services and taxi services, and the main characteristics of which is the carriage of groups of passengers constituted on the initiative of the customer or the centre.
The barriers related to implementing DRT are related to funding public transport and lack of co-ordination and willingness between local municipalities and state. It is also impossible without changing the law to offer DRT at the same time for disabled people and everyday passenger because public transport does not acknowledge so-called social transport that local municipalities are offering to people with disabilities.
The local municipality is responsible for offering transport service for people with disabilities. The service is offered by using taxis, private companies or the service is offered by municipality officials themselves. Car sharing is not possible due to the transport act that does not see car sharing as part of public transport. There is no competition or cooperation between public and private organisations regarding DRT in Estonia.
On 01.11.2017 a new law on public transport regulating the ride-sharing service was entered into force. Amendments to the Public Transport Act were entered into force, levelling the requirements for contract transport services and taxi services. The amendment to the Public Transport Act established ride-sharing as a type of taxi service. Ordering and pricing of this service must be made through the IT platform.
The new law equalizes the minimum conditions for taxi and charter services, both of which must have a permit, a vehicle card and a service card. Also, taxi services are no longer limited to municipalities but may provide service throughout the country.
In addition, the amendments were entered into force, which removed the obligation for vocational training for a taxi driver. (Litau Büroo OÜ, 2017)
From Southeast Public Transportation Center point of view: Today's public transport arrangement, which in most counties of Estonia is free for consumers, is compensated by the state at the expense of the taxpayer. Moving from free regular public transport to demand responsive transport or taxi services raises some problems, such as if the service is also free or could DRT replace regular bus transport altogether or should regular services be reduced. The main problem for DRT is where the financing would come from? Southeast Public Transportation Center also brought out that it is unclear if they offer state compensated taxi service, would be it treated as an unfair competition.

3.2 Competition between other transport solutions

There is no competition and no cooperation.
Demand responsive social transport does not have competition between other transport solutions and it also does not have any cooperation with them, because taxi services are too expensive and regular public transport is not accessible for disabled people. If it becomes possible social transport will be integrated with public transport.

3.3 Procurement schemes and barriers related to this

A pilot project on social transport is currently being carried out in 4 counties. In Estonia public procurements are mainly based on the public procurement law.

3.4 Data flows and the barriers related to it

Today there isn't a working IT solution for demand-responsive social transport in Estonia, which in addition could be applied nationwide. The main barrier for developing a working data platform is the lack of funding.

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