Response

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

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

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Acknowledgements

1. General status of DRT in the country

The last 10 years the growth in public transport in Norway has been strong and significantly higher than the growth in population. Society is rapidly changing, and there are ever-increasing demands and expectations for more flexible and individualized services. In order to maintain satisfied customers, it is necessary to develop the services in line with changes in society and offer services that meet the market demand.
(https://samferdsel.toi.no/)

Developing the DRT services plays an important part in meeting the increasing expectations that people have for more flexible and individualized services (M2016, ruter.no). DRT is to some extent part of the total public transport service. There are also several ongoing DRT pilot projects all over the country, that are testing more individualized services. There is still a need for more testing and learning about how to operate in different types of areas to be able to develop a future sustainable service. DRT- services in Norway is not yet very common, and there is no specific national plan for the DRT-transport. However, the goals in national transport plan open for new thinking in how we organize our public transport. The national transport plan outlines the direction for the development of the transport system until 2050 and states that "The transport system is of great importance to both people and the business community. Good mobility gives people an easier life and freedom to settle wherever they want, with access to goods and services, the opportunity to take education, get a job and participate in leisure activities". The focus on the importance of reducing car traffic and enabling everyone to get around without a car makes DRT a natural choice in a country where many people live in rural areas. In addition, technological development makes it increasingly easier to book and optimize driving routes. (Nasjonal transportplan)

Different types of DRT are being tested around the country, costumed for different user groups. An example is DRT costumed for elderly people. Many cities in Norway have started DRT projects costumed for elderly people, and more cities are planning to start similar services. One of these cities is Oslo. Oslo is a member of the WHO age-friendly world network and is in the starting line of becoming an age-friendly city. The municipality points out that an increased proportion of elderly people presents challenges to the city in connection with transport, urban development, social engagement, health and care services. At the same time, the municipality points out that the new older generation has better education, health, living conditions and finances than previous generations. An age-friendly Oslo must, therefore, make it possible for them to utilize their resources and have the opportunity to live independent and active lives. This entails measures that give the elderly everyday coping and good quality of life (Oslo aldersvennlig by /Age-friendly city). Getting out and meeting other people is an important factor for well-being. Getting around is therefore important. One of Oslo's 6 main focus areas in the quest to become an age-friendly city is transport. In this connection, the collaboration between Oslo Municipality and Ruter on the pilot "age-friendly buses in Oslo" is an important project both for Oslo locally, but also to contribute learning to the rest of Norway (Leve hele livet – En kvalitetsreform for eldre).

2. Examples of demand-responsive transport services

2.1. Case study No. 1 HentMeg, Kolumbus

HentMeg is the first demand-responsive transport in the rural area of Rogaland. The population in the area is 4 760. This service is for people who do not live along the main transport routes with the highest route frequency.

Customers order their transport on the web or by calling. The earlier the customer orders their transport the greater the chance that they will be picked up just when they want. The car or bus pick-up time could differ from the customers ordered time plus-minus 15 minutes.

This is a door-to-door service so that after ordering their transport customers only have to go outside of their homes to be picked up. This enables the elderly to get around much more conveniently and frequently than before. Different orders of transport are combined, which means that there could be more than one passenger in the car or bus. Customers will receive an SMS shortly before their retrieval with a more exact time, but they can also follow their order online. Passengers pay regular bus fare and other passengers can be picked up during the ride. Customers pay with the Kolumbus Ticket app, Kolumbus card or cash on board.

HentMeg is available from 9 AM to 2 PM and from 4:30 PM to 8 PM on weekdays, and from 10 AM to 3 PM on Saturdays, but during the times when HentMeg is not available ordinary buses can be used as an alternative.

The average monthly cost of providing the demand responsive transport service is 13 400 € and the average monthly income is 760 €. Kolumbus pays the full price for running the service and receives the total ticket revenue.

Kolumbus started to provide this service in 2018 and it is still on-going. (Kolumbus, 2019)

Table 1. Parameters of DRT case study: HentMeg, Kolumbus:

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	**HentMeg**
2	**Organization**	*Organization responsible for the service.*	Kolumbus AS
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	Sauda municipality in Norway, Rogaland. Rural area.
4	**Population**	*What is the population in the service area and how are they located?*	4 760
5	**Customers**	*Please describe what customer group are you targeting, if any (Disabled/elderly/children etc.).*	This service is for people who do not live along the main transport routes with the highest route frequency.
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. Formerly three alternating routes, run by the same bus. Now offering door-to-door on-demand transportation, enabling especially elderly people to get around much more convenient and frequently than before.
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?*	On weekdays from 9 am to 2 pm and 4.30 pm to 8 pm, and on Saturdays from 10 am to 3 pm.
8	**Notice requirements**	*When is booking required (on the day/when required, in advance, repeating booking)?*	The earlier the better chance of being picked up when you want.
9	**Pick-up location**	*Where are users picked up and dropped off (many-to-many, one-to-one, one-to-many/many-to-one)?*	Passengers are picked up from their home or where they have set the pick-up location and are dropped off in the agreed location.
10	**Transport type**	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	Car or minibus

11	**Sharing a ride**	*Please describe if passengers share a ride or get their own ride.*	Passengers share a ride.
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?*	Customers can pay with the Kolumbus Ticket app, Kolumbus card or cash on board.
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?*	Average monthly cost: EUR 13,400.00 (NOK 130 000). Average monthly income: EUR 760.00 (NOK 7 400). Kolumbus pays the full price for running the service and receives the total ticket revenue.
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)*	Customers book their trip in the HentMeg app or on the HentMeg website.
15	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	Started in 2018 and is on-going.
16	**Concept**	*Is this DRT service separated from the regular public transport in terms of routing, booking, ticketing and payment?*	Kolumbus has the same provider for both regular bus transport and HentMeg, there is only one minibus that drives for HentMeg, there used to be 3 public transport routes in the area that HentMeg now serves in. HentMeg usually drives from door-to-door, but in the Suda town centre, there are 4-5 bus stops it stops at.
17	**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?*	Describe criteria that define what is a suitable area (geography/population). The area must not be too big, which can result in long-distance driving. Costs associated with HentMeg must be based on the existing offering. Municipalities must contribute financially. If no current offering, a budget must be approved.

2.1.1. Data barriers related to the HentMeg, Kolumbus DRT service

Table 2. Identification of data barriers related to the DRT case study: HentMeg, Kolumbus

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,	The most important KPIs are: • Passenger Satisfaction (collected by survey) • Cost (compared to fixed route) • Vehicle mileage vs passenger kilometre
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. ...	Pickup and drop-off points. Number of passengers. We have a solution to lower the accuracy of pickup and drop-off data points to assure GPDR compliance (swap exact address with a circle of radius 50m)
3	Are you using the data collected to monitor in real-time the transportation?	YES/NO (additional comments)	Yes, we monitor real-time transportation, occasionally, but not necessarily as the system works well without monitoring. But when problems occur both real-time monitoring or historic playback is useful
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) Yes, data is stored in the Spare platform. We do not use raw data for analysis but use the analytics tools within the Spare platform. Hence we do not relate to data formats. But we do have access to raw data if needed. 2) As we provide an address to address service in a residential area, an address alone without attachment to a name is still personal data. Hence we have a solution to lower the accuracy of pickup and drop-off data points to assure GPDR compliance (swap exact address with a circle of radius 50m). 3) We are using the standard ticketing solution for or ordinary bus service, with the same price as route bus. This was decided since the on-demand bus replaced an ordinary route-based solution. Hence users with a monthly bus pass can travel with HentMeg for

			free. We see that this is not an optimal solution as the on-demand service has a high marginal cost, and we see some over-usage especially by teenagers.
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)	1) Yes, we have considered to implement this, but not yet done it. But we have done a general survey to evaluate satisfaction. 2) No 3) No 4) Yes, this could be interesting. But we do this easily manually now. And we see that emission-wise the solution is approximately equal to or slightly better than the fixed-route bus it replaced. But it is less good than a private car. We have a vehicle to passenger-km ratio of approximately 1.5.

2.2. Case study No. 2 Nes, Ruter

Ruter has developed several DRT concepts that are currently being tested in different geographical and demographic areas. Ruter will start a new DRT pilot in a rural area in the municipality of Nes in Akershus county. We have another ongoing pilot in Oslo (urban area) that is based on the same concept as this new pilot. Pilot Nes, as this new pilot is called, will start in the fourth quarter of 2019. This pilot will be Ruter's delivery into RESPONSE and we will report on and give insight and learning from this pilot. The output will be documented in pilot product sheets and a compiled set of recommendations on innovation process management related to public transport development.

Pilot Nes will have a door-to-door service with flexible routes. Bookings must be made within one hour before departure. Forecast of demand is, and will be, specified based on; figures obtained from existing transport in the area, which today is a very limited offer, assumptions based on learning we have from other pilots in Oslo, and on the background of conveyed desire from the municipality and user involvement in the starting phase. A description of the relevant pilots and concepts are included below, as we will use combined learning from these ongoing pilots in development of the service in Pilot Nes.

The pilot will be adjusted in case the user insight will be received, that indicates that the service should run differently to meet customer needs (iterative process).

Table 3. Parameters of DRT case study: Nes, Ruter

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	**Pilot Nes**
2	**Organization**	*Organization responsible for the service.*	Ruter AS
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	Our pilot will be in a rural area- Nes municipality in Akershus County. The pilot will start in Q4 2019. We also have other ongoing pilots testing different DRT services in urban and mixed areas. We will use our combined learning from these pilot projects to develop the service.
4	**Population**	*What is the population in the service area and how are they located?*	The current population consist of about 22 000 citizens. Population density is 35 per km². This is a rural municipality, but the population is clustered together in several different areas. 2/3 of the citizens live in these clusters, and 1/3 of the citizens live outside of these clusters in even more rural areas.
5	**Customers**	*Please describe what customer group are you targeting, if any (Disabled/elderly/children etc.).*	Our main target group is elderly with mobility challenges. We will focus on the elderly with an age-friendly service (door-to-door service, trained drivers to help elderly people, focus on social arenas etc).
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 with flexible routes. Bookings within one hour before departure. Forecast of demand is, and will be, specified based on; figures obtained from existing transport in the area, (which today is a very limited offer), assumptions based on learning we have from other pilots in Oslo, and on the background of conveyed desire from the municipality and user involvement in the starting phase.
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 will be available from 9 am to 5 pm, Monday - Saturday. We will adjust the pilot if needed if we get user insight that indicates that

			the service should run differently to meet customer needs (iterative process).
8	**Notice requirements**	*When is booking required (on the day/when required, in advance, repeating booking)?*	The customer can book in advance, with no limitations as to how long before departure the booking can be made. Bookings can also be made on the day/when required as long as they are made at least one hour before departure. The customer can also reserve with a fixed frequency (e.g every Monday at 10:00).
9	**Pick-up location**	*Where are users picked up and dropped off (many-to-many, one-to-one, one-to-many/many-to-one)?*	They are picked up and dropped off wherever they like within a predefined area in Nes municipality. If several passengers are going in the same directions, they will be picked up along the way (optimized driving logistics).
10	**Transport type**	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	Buses with room for 11 passengers in addition to 1 wheelchair.
11	**Sharing a ride**	*Please describe if passengers share a ride or get their own ride.*	They will share a ride. If several passengers are going in the same directions, they will be picked up and dropped off along the way (optimize driving logistics).
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 the local government? Can they pay in cash or with a card?*	Fixed price. At start-up, the service will cost the same as for ordinary public transport. This means that there will be a relatively high degree of subsidy (see item 12 below). The price of the service will be assessed during the pilot phase. The customers can pay with a travel card, cash or app on a mobile phone.
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?*	We have estimated approximately 4 million NOK (approximately 400 000 EUR) for one year. Akershus county will pay for the operating cost (minus ticket revenues). Ticket revenues are difficult to forecast, but we have estimated that

			they will be somewhere between 180 000 and 700 000 NOK (18 000-70 000 EUR).
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)*	App or phone call. We need phone operators to be available due to low digital maturity among the elderly. At the beginning of the pilot, it will only be possible to order by phone call. The app will be available after a few months.
15	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	We will start the pilot in November 2019. The pilot will be running for one year.
16	**Concept**	*Is this DRT service separated from the regular public transport in terms of routing, booking, ticketing and payment?*	This a service to complement ordinary public transport. In some cases, the minibuses that pick up at certain points use the same stops as the regular bus lines, but in general, they drive door-to-door(Age-friendly and Pilot Nes) or use "virtual" stops (Oppegård) and drive from point to point without marked stops. Besides the aforementioned pilots, ordinary DRT transport in Ruter is primarily a service in areas where there are few people and no need for big buses, or the roads are too small for large vehicles. It is not the same vehicle providers on large and small buses. It has been a tradition in our area for the providers to offer either minibus and taxi services, or large buses. We currently have very few suppliers offering both concepts on a large scale.
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 process. We are billed per hour (driver and car).
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?*	Not relevant at this point of time. But we will continuously consider items such as; opening hours, geographical area, price of service, route planning etc.

2.2.1. Data barriers related to the Nes, Ruter DRT service

Table 4. Identification of data barriers related to the DRT case study: Nes, Ruter

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,	Passenger Satisfaction (collected by survey) Number of active riders Cost (total and per trip) Average boarding's per vehicle hour Pooled trips ratio
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. …	Data about the user. For example, phone number and birthdate. Pickup and drop-off points. Number of passengers Vehicle types
3	Are you using the data collected to monitor in real-time the transportation?	YES/NO (additional comments)	Yes, we monitor real-time transportation.
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) We test different types of platforms, Spare, Viavan and Pass. Data is stored on the platform. We do not use raw data for analysis but use the analytics tools within the Spare platform or Viavan platform, or aggregated data from Pass. 2) The challenges are mainly related to how you are allowed to use the data, more than which data are available. Legal aspects limit how you can store and use the data. Please see chapter 3 for more details. 3) The pricing for Spare and Viavan is related to the number of vehicles.

| 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) | 1. We collect information through surveys about customer satisfaction and their evaluation of different aspects of the service.
2. We already have information about the accuracy of pickup and drop-off of passengers.
3. No
4. Yes, this could be interesting. |

2.3. Case study No. 3 Oppegård, Ruter

Ruter has developed several DRT concepts that are currently being tested in different geographical and demographic areas. The DRT service that is tested in Oppegård municipality started in September 2019 and takes costumers from home and to/from sports activities. Orders are made in real-time in-app, and the service is a fully automatic and fully digital solution for planning and booking. The main goal for the pilot is to test the digital solution for booking and planning a trip. A description of the pilots and concept are included in the table below.

Table 5. Parameters of DRT case study: Oppegård, Ruter

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	**Pilot Oppegård**
2	**Organization**	*Organization responsible for the service.*	Ruter AS
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	Mixed area, suburban to urban area.
4	**Population**	*What is the population in the service area and how are they located?*	Total population: 27,439 Population density: 660/km² Housing: 57% detached housing, 43% apartments.
5	**Customers**	*Please describe what customer group are you targeting if any (Disabled/elderly/children etc.).*	The service is open for everyone, but the main target customer group is children, aged 8-12, going to sports activities.
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)*	Flexible routes. Customers must travel either to or from specific sports arenas within a given geographical area.
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 available from 16.00 to 21.00, Monday - Friday.
8	**Notice requirements**	*When is booking required (on the day/when required, in advance, repeating booking)?*	When required. Transport comes for pick-up within 8 minutes after booking.
9	**Pick-up location**	*Where are users picked up and dropped off (many-to-many, one-to-one, one-to-many/many-to-one)?*	Many-to-one/one-to-many (depending on the direction of travel).
10	**Transport type**	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	Minibuses Capacity: 15 passengers and 1 wheelchair.
11	**Sharing a ride**	*Please describe if passengers share a ride or get their own ride.*	Shared-ride.
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?*	Same price as ordinary public transport. May be changed at a later time to test customer willingness to pay more for this service.

			The customers must pay with a travel card or app on a mobile phone. It is not possible to pay cash.
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?*	We have estimated approximately 6,5 million NOK (approximately 650,000 EUR) for one year (excluded ticket fares). Funded by Akershus county council.
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)*	Users book their journey by an app. Transport arrives within a few minutes (estimated waiting time between 2 and 8 minutes). Based on the target group, young technologically adept users, there should be no problem to use technology such as an app. As routes and vehicles are organized in the back-end of the app, this way of ordering is needed to be able to provide this kind of DRT.
15	**Concept**	*Is your DRT service together with regular public transport or separate? Why is it so?*	Together with public transport. (The service is a fully automatic and fully digital solution for planning and booking)
16	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	Started September 2019. On-going. Planned end at the end of June 2020.
17	**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?*	Not relevant at this point of time.

2.3.1. Data barriers related to the Oppegård, Ruter DRT service

See Table *4*. Identification of data barriers related to the DRT case study: Nes, Ruter. It is the same data barriers in this pilot.

2.4. Case study No. 4 Stabæk, Ruter

Ruter has developed several DRT concepts that are currently being tested in different geographical and demographic areas. The DRT service that was tested in Stabæk was started in January 2018, and the pilot period ended in December 2019. The service is for 1st-4th graders that run organized sports activity after school. The children are picked up at school and driven to the sports arena and returned home afterwards. When the child is "subscribed" to this transport, all bookings are made for the following semester. New customers can start using the service during the semester if needed. A description of the pilots and concept are included in the table below.

Table 6. Parameters of DRT case study: Stabæk, Ruter

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	**Pilot Stabæk**
2	**Organization**	*Name of the organization responsible for the service*	Ruter AS
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	Mixed area, suburban to urban area.
4	**Population**	*What is the population in the service area and how are they located?*	Total population: 127,334 Thereof target group (6-10 years): 8,700. Population density: 663/km² Housing: 54% live in apartments, 46% live in detached houses.
5	**Customers**	*Please describe what customer group are you targeting if any (Disabled/elderly/children etc.).*	School children 1st-4th graders (aged 6-10).
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)*	Children are driven from school (when school is finished for the day) to soccer practice (one sports arena). This pilot includes 11 schools and 198 children. After practice, the children are picked up from the sports arena and driven home to their specific home address. By arranging the transport like this we have gathered many passengers in the same vehicle and minimised the need for private cars to go the same distances and at the same time.
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 runs Monday-Friday. Picking up from schools so they arrive in time for practice at 14.30. Practice ends at 16.00 and the kids are then driven home. This means that transportation happens between 13.30 and 17.00 at pre-set departure and arrival times.
8	**Notice requirements**	*When is booking required (on the day/when required, in advance, repeating booking)?*	In advance (repeating bookings).
9	**Pick-up location**	*Where are users picked up and dropped off (many-to-many, one-to-one, one-to-many/many-to-one)?*	Many-to-one/one-to-many (depending on the direction of travel).
10	**Transport type**	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	Minibuses. Capacity: 15 passengers and 1 wheelchair.
11	**Sharing a ride**	*Please describe if passengers share a ride or get their own ride.*	Shared-ride.
12	**Fares**	*Please give an overview of the ticket fares. Are there any discounts? Is it per kilometre or fixed price etc.? Do the*	Fixed price. Customers must have a monthly travel card, costing 370 NOK (37 EUR). Billing is

		customers pay it themselves or is it funded by local government? Can they pay in cash or with a card?	done through the sports club where parents pay both soccer practice and transportation in the same bill.
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?*	2,1 million NOK (ca 210 000 EUR) per year. Ticket revenues add up to approximately 610 000 NOK (61 000 EUR) per year. 1,3 million NOK is funded by Ruter. Bærum municipality contributed with 100,000 NOK in 2018.
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)*	Children are registered for transportation when they become a member of the soccer club, are within the age limit and sign up for the service. This is done through the sports club. All travels are booked when signing up and must be cancelled in an app in case of sickness or other.
15	**Concept**	*Is your DRT service together with regular public transport or separate? Why is it so?*	This a service to complement ordinary public transport. In some cases, the minibuses that pick up at certain points use the same stops as the regular bus lines, but in general, they drive door-to-door(Age-friendly and Pilot Nes) or use "virtual" stops (Oppegård) and drive from point to point without marked stops. Besides the aforementioned pilots, ordinary DRT transport in Ruter is primarily a service in areas where there are few people and no need for big buses, or the roads are too small for large vehicles. It is not the same vehicle providers on large and small buses. It has been a tradition in our area for the providers to offer either minibus and taxi services, or large buses. We currently have very few suppliers offering both concepts on a large scale.
16	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	Started January 2018. Planned end December 2019.
17	**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?*	Not relevant at this point of time

2.4.1. Data barriers related to the Stabæk, Ruter DRT service

See Table *4*. Identification of data barriers related to the DRT case study: Nes, Ruter. It is the same data barriers in this pilot.

2.5. Case study No. 5 Oslo, Ruter

Ruter has developed several DRT concepts that are currently being tested in different geographical and demographic areas. The DRT service that is being tested in Oslo was started in September 2017. It is an age-friendly DRT service for people aged 67+. The customer is transported door-to-door within a given geographical area. Orders made within one hour before a requested departure. A description of the pilots and concept are included in the table below.

Table 7. Parameters of DRT case study: Oslo, Ruter

NO.	AREA	QUESTION	REPLY
1	**Name**	*What is the name of the DRT service?*	**Pilot Oslo**
2	**Organization**	*Organization responsible for the service*	Ruter AS
3	**Location**	*Please describe briefly the area that the DRT service is covering. Rural/urban/mixed.*	Urban area. This concept is being tested in 3 separate districts of the city; Nordre Aker, Vestre Aker and Sagene.
4	**Population**	*What is the population in the service area and how are they located?*	Nordre Aker: Total population: 51,558 Thereof 67 years and older: 6,213 Population density: 3,800/km² Housing: 56% live in apartment buildings, 31 live in semi-detached houses and 13% live in detached houses. Vestre Aker: Total population: 49,153 Thereof 67 years and older: 7,489 Population density: 3,000/km² Housing: 41% live in apartment buildings, 32 live in semi-detached houses and 27% live in detached houses. Sagene: Total population: 30,942 Thereof 67 years and older: 2,886 Population density: 10,000/ km² Housing: 99% live in apartment buildings, 1% live in semi-detached houses.
5	**Customers**	*Please describe what customer group are you targeting if any (Disabled/elderly/children etc.).*	The main target group is elderly with mobility challenges. Focus on the elderly with an age-friendly service (door-to-door service, trained drivers to help elderly people, focus on social arenas etc).

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)*	Door-to-door service with flexible routes. Bookings within one hour before departure. Forecast of demand is and will be, specified based on; the background of conveyed desire from the municipality and user involvement in the starting phase.
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 available from 10 am to 6 pm, Monday - Saturday.
8	Notice requirements	*When is booking required (on the day/when required, in advance, repeating booking)?*	On the day, within one hour in advance.
9	Pick-up location	*Where are users picked up and dropped off (many-to-many, one-to-one, one-to-many/many-to-one)?*	They are picked up and dropped off wherever they like within a predefined area. If there are several passengers going in the same directions, they will be picked up and dropped off along the way (optimized driving logistics).
10	Transport type	*What types of transportation do you use (buses, cars, trams, trains)? Are vehicles also suitable for people with special needs?*	Minibuses. Capacity: 15 passengers and 1 wheelchair.
11	Sharing a ride	*Please describe if passengers share a ride or get their own ride.*	Shared-ride.
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?*	Fixed price set to 18 NOK. The standard price for public transport for people over 66 years. The customers must pay with a travel card or app on a mobile phone. It is not possible to pay cash.
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?*	Approximately 11 million NOK (approximately 1,100,000 EUR) for one year. Oslo municipality is fully funding this service.
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)*	By app or phone call. Phone operators need to be available due to low digital maturity among the elderly.
15	Concept	*Is this DRT service separated from the regular public transport in terms of routing, booking, ticketing and payment?*	This a service to complement ordinary public transport. In some cases, the minibuses that pick up at certain points use the same stops as the regular bus lines, but in general, they drive door-to-door(Age-friendly and Pilot Nes) or use "virtual" stops (Oppegård) and drive from point to point without marked stops. Besides the aforementioned pilots, ordinary DRT transport in Ruter is primarily a service in areas where there are few people and no need for big buses, or the roads are too small for large vehicles. It is not the

			same vehicle providers on large and small buses. It has been a tradition in our area for the providers to offer either minibus and taxi services, or large buses. We currently have very few suppliers offering both concepts on a large scale.
16	**Start time (ending time)**	*When did you start to provide this service, is it still on-going or not?*	Started September 2017 (Nordre Aker). Expanded to several areas (Sagene in November 2018 and Vestre Aker in January 2019).
17	**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?*	Not relevant at this point of time.

2.5.1.   Data barriers related to the Oslo, Ruter DRT service

See Table *4*. Identification of data barriers related to the DRT case study: Nes, Ruter. It is the same data barriers in this pilot.

3. Barriers in the country related to DRT services

3.1. Legal barriers in the country

The main legal barriers in the country are related to GDPR and location data, laws concerning universal design and demands of permits to offer public transport.

Laws concerning universal design are highly relevant for DRT and public transport in Norway. Norway has specific legislation concerning discrimination and availability, as well as regulations from EU. In the Norwegian legislation in § 4. "Forbud mot diskriminering" (prohibition of discriminating) it is specified that all forms of discrimination are prohibited. This includes actual, presumed, earlier, future, direct or indirect discrimination. Indirect discrimination is when customers with special need are given the same terms and the same service as people without such needs. Section 9 of the Act explains that universal design means facilitating and designing all physical aspects of the service, such as vehicles and information technology so that as many as possible can use the service.

Legal barriers related to GDPR and location data is described in chapter 3.4. Permits to offer public transport is described in chapter 3.3.

3.2. Competition between other transport solutions

There is not much competition between public transport companies and private actors, except for the competition between public transport and the taxi industry. This may be primarily due to national regulations that prevent private organizations from gaining free access to the public transport market. More information about these barriers is written in chapter 2.3 Procurement schemes.

There is quite a lot of cooperation between public transport and other organizations and municipalities. For example, in connection with activity transport in Ruter (transport to and from organized sports activity after school), we have collaborated with schools to get data that we need to give the children a safe journey from school to the sports activity.

3.3. Procurement schemes and barriers related to this

The Norwegian professional transport Act, and the regulation based on this Act, demands the following permits of any person - our company- that offers public transport in – or outside a route.

Permit to offer passenger transport

Part of DRT is outside a predefined route. The public procurement for such services will mostly be based on a permit for minibuses, which is fine. But for some services smaller vehicles would suffice. However, it is not possible to procure such services on the same Contract, because of the demand that passenger transport with vehicles that are registered for fewer passengers than 9 must be carried out of companies that have a Taxi license (a permit to offer Taxi services).

Permit to offer passenger transport in route

Ruter is Akershus and Oslo county administration's administrative company for public transport in Oslo and Akershus. Therefore, Ruter and operators who have a contract with Ruter, do not need a permit.

3.4. Data related barriers in the country

The data related barriers are mainly related to how you can use the data, more than which data are available. Legal aspects limit how you can store and use the data.

As part of EEA, companies in Norway must be GDPR compliant.

One aspect that is especially significant for Norwegian transport companies is; regulations concerning location data. Location data is used in offering customers DRT. For example, when managing a fleet of vehicles or offering customers the right information on what is available to them based on their location.

In addition to meeting the elementary demands on processing in GDPR act 5, 6 and 9, we must also meet the Norwegian Data Protection Agency strict interpretation of what data- minimalization entails when it comes to processing location data. Such data can be regarded as sensitive personal data because it can potentially give us information for example of the customer health, religion etc (destination has been the doctor or church). This entails that we must not process the customer's location data unless it is strictly necessary, and the processing of any form of location data must also be limited in time. Ruter may for example process data that say which address the customer is to be picked up on, and to which address the customer is going to, but there shall not be further tracking that is not necessary to provide the service. Such data must also be deleted rapidly when it is not necessary with further processing.

GPS tracking of the vehicle is necessary to manage the fleet effectively. But this also means that we are tracking the driver's movements, which potentially could give the Operator important data on the driver's performance, location and thereby monitor the employee. Before an operator can access this kind of information, he must verify that the drivers are informed and that the question has been discussed with union representatives in accordance with the Norwegian Working Environment Act § 9-1.

The customers and drivers must, in any case, be given precise and understandable information in a way that makes the information as easily accessible as possible.

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