Flexible, Digital and Integrated: Public Transport of the Future in Suburban and Rural Areas

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1 INTRODUCTION

Historically, urban transport networks were built for horses and pedestrians, resulting in the typical medieval structure of cities, which can still be found across Europe. A first transformation occurred during the period of industrialization, where public transport systems (tramways, railways) enabled the expansion of urban centers into the countryside and fostered the separation of residential areas and places of work. Then, boosted by the ideas of the Athens Charter 1933 (Le Corbusier, 1943) and a new reliance on motorized transportation, urban economic areas expanded into much larger metropolitan areas, by building low density suburbs that blurred into rural zones. In these areas, driving replaced more sustainable modes of transport and today suburban and rural environments experience severe mobility problems such as high levels of congestion, expansive parking lots, low accessibility for people who cannot or do not wish to drive and underserved sectors. Traditional public transport is less competitive in such low-density areas, service is often infrequent, concentrated during peak-hours and serving mainly city-commuters. The dispersion of origins and destinations makes it difficult to establish fixed high-performance routes and high car ownership means low patronage. Land use planning, including regulation to manage population and employment density, as well as walkability and cycleability policies, is the most efficient instrument for building more sustainable, public transportation friendly environments. In the meantime, however, shared mobility digital platforms and their customer-centric business models provide a new opportunity to improve mobility in suburban and rural areas.

Keywords: Digital, Integrated, Rural, Suburban, Flexible

1.1 A changing role for public transport operators

Much has been said about how shared mobility providers have contributed to declining public transport ridership or could become a threatening competitor for public transport operators (Ryerson CBI, 2019). Private transportation network companies (TNC), such as Uber, may increase driving, congestion, and even contribute to increasing car-ownership by helping their drivers acquire and pay-off their cars (APTA, 2018). This erodes public transport's user base, as well as deteriorates travel times. And while their services cost more, riders seem to be willing to pay a premium for the convenience of the service (City of Toronto, 2019). On the other hand, TNC's and other shared mobility platforms, have also greatly improved customers' travel experience, by providing real time, flexible and integrated transportation and by making the process of ordering and paying for the service seamless and easy. TNC's are asset light; they are nimble and can set up a service in a matter of weeks. They often operate small vans or minibuses that are better adapted to both congested urban centers and narrow residential streets.

These new shared modes are disruptive, and the public sector must adapt, and regulate if necessary, to ensure public transport remains the backbone of the urban transport system. Considering this, two complementary approaches are emerging (APTA, 2019, The Conference Board of Canada, 2019):

(1) Reinforcing rapid transit networks by increasing the efficiency of public transport along high capacity corridors and by making public transport the best option on those routes through improved reliability, higher frequency and higher speed (rail, light rail and subway networks and expansions, but also BRT's and even busways such as New York City's 14th street busway) (New York City, DOT, 2019).

(2) Providing flexible, digital and integrated solutions by leveraging new technologies and data, such as on-demand responsive systems (microtransit), as well as making improved station access a priority, through the integration of different transport modes both physically (e.g. mobility hubs, carsharing, bikesharing, micromobility solutions) and virtually (e.g. MaaS, integrated fares).

While the first approach is inherent to public transport planning, the second consists in a shift away from operators' traditional role and towards acting as mobility providers for regions, cities and citizens.

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2 DIFFERENT BUT SIMILAR: STADREGION+ AND MONTREAL METROPOLITAN AREA

While urban development has evolved differently in North America and Europe, suburban and rural areas are facing common challenges. In both cases, urban development since the 1950's has favoured car-centric sprawling suburbs. Car ownership has accelerated continuously in the last decades (CMM, 2020)[1], as has solo driving. Examples from OBB in the Stadtregion+ (Austria) and exo in the outer rings of the Montreal Metropolitain Area (Quebec, Canada) will be explored to illustrate how public transport agencies operating in different contexts but sharing common challenges are adapting their services.

2.1 Land use trends in the Stadtregion+

The Stadtregion+ comprises the city of Vienna (1,8 million inhabitants), the adjointing districs of Lower Austria and parts of northern Burgenland. It is the economic core of Austria with a total population of about 2,7 million people. Population density varies between 27,000 inhabitants/km² and 99 inhabitants per km² (PGO, 2015). Since 2000, all areas within a 50 km radius from the city of Vienna have seen a strong increase population (+5 to 10 %); the strongest increase being in the city of Vienna with more than 20 %. However, some suburbs have also seen a rapid population growth, such as the district of Tulln at the outskirts of Stadtregion+ (14,5 % between 2003 and 2018) with some communities growing even more than 54 % during this period (Statistik Austria, 2020). An increase that is, in the case of Tulln, strongly linked to the new Western Railway high-speed section.

2.2 Mobility trends in the Stadtregion+

The Stadtregion+ is crisscrossed with public transport services (mainly railway, tram and bus) and public transport ridership has been increasing since at least the 1990s. The city of Vienna has experienced a strong increase of public transport ridership; e.g. growth of annual season ticket holder: 2011 363,000; 2019: 852,000 (Wiener Linien, 2020). The parking policy of the city of Vienna has also contributed to strongly reduce commuting by car inside the city as well as from outside the city. Nevertheless, more than 180,000 (60,000 by rail; 120,000 people by car) are commuting every day to the city of Vienna (Arbeiterkammer, 2015). Interestingly, car ownership per capita has developed differently in major cities and rural areas: it has declined in Vienna, from 391 in 2008 to 374 in 2018, but has strongly increased in rural ares as well as areas of suburban areas such as the city of Tulln (441 to 641) (Statistik Austria, 2020).

2.3 Land use trends in the outer rings of Montreal Metropolitan Area

The Montreal Metropolitan Area (MMA) is constituted of 82 municipalities. 4,1 million inhabitants live in an area of 4,300 km2. The Agglomeration of Montreal (2 million inhabitants) is the economic core of the MMA, 21 % of all jobs are in the CBD. There is, however, a sharp contrast between land use, growth and mobility patterns between the center and the outer rings. The Northern ring (pop. 589,000) and Southern ring (pop. 508,000) are constituted of rural and suburban communities. Almost two-thirds of the territory is in agricultural use (CMM, Portraits Territoriaux, 2019). Average population density in the urbanized areas is between 1,500 and 1,700 persons per km2 (ARTM, 2019). Most households live in single-family homes (more than 60 %) (ARTM, 2019, CMM, Portraits Territoriaux, 2019, Statistic Canada, 2016). These suburban communities are thriving, creating most population and job growth in the region. 83 % of the region's population growth occurred off the island of Montreal between 2006-2016 (CanU, 2018) and although only 19 % of jobs are in the outer rings, 54 % of job growth and an increase of 12 % in work trips where registered in these areas since 2013 (ARTM, 2018).

2.4 Mobility trends in the outer rings of the Montreal Metropolitan Area

Mobility patterns in the outer rings of the MMA have evolved towards increasingly high levels of solo driving and a continuous decline in walking and cycling (CMM, Cahiers Métropolitains, 2019). Trip distances made by residents of these areas are typically 1,5 longer by car and twice as long by public transport as trip made in the rest of the region (Statistics Canada, 2016). Only 15 % of commute trips are destined to the city center, which is where most of the rapid public transport networks are oriented. Driving accounts for more than 80 % of trips. While 95 % of the population lives within a walking distance from a

[1] From 2013 to 2018, the number of passenger vehicles on the road rose from 1.84 million to 1.96 million, an increase of 6.8 %.

bus stop, only 6 % to 8 % use public transport on any given day (ARTM, 2018). For everyone else the service may be too infrequent, too slow or not go at all where they need to go.

2.5 Stadtregion+ and MMA: different trends, common challenges

Both regions show different trends in terms of population density and car ownership. Vienna's Stadtregion+ has managed to reduce car ownership and driving through a very comprehensive public transport network and strict parking policies, however the expansion of the rail network, while reducing car commuting to the city, comes with station access challenges in new developments. In the outer rings of the MMA, combined low density and a vast territory have favored driving and car ownership to the extent that 80 % of trips use an automobile. However, these communities are thriving and in need of more efficient mobility services. Common challenges include providing sustainable options for station access, beyond park and ride lots, serving dispersed low-density destinations efficiently and providing last mile solutions. Both ÖBB and exo have developed market-proven and innovative pilot solutions aiming to reinforce rapid transit networks and provide flexible, digital and integrated transportation services in these areas.

3 SOLUTIONS DEVELOPED FOR RURAL AND SUBURBAN REGIONS

3.1 Examples from ÖBB

As Austria´s largest mobility services provider, the ÖBB corporation moves 474 million passengers and 110 million tons of goods to their destinations in an environmentally friendly way every year. ÖBB operates 1,061 railway sations and railway stops and 20,648 ÖBB Postbus stops. Today ÖBB offers 47,000 Bike&Ride stations and 64,300 Park&Ride stations at railway stations all over Austria. Due to different geographical conditions and transport policies, more than half of ÖBB-Park&Ride can be found in Lower Austria: (34,000 plus 19,600 Bike&Ride). In other parts of Stadtregion +, such as Burgenland (2,700 and 1,300) and Vienna (1,100 and 1,300) the figures are much lower. The new Western Railway high-speed section in the western part of Stadtregion+ has strongly increased railway usage as well as attractiveness of suburban and rural areas. Similar urban developments are expected with ongoing and planned railway development projects. In these low-density areas, effective transport solutions to access high speed rapid transit lines are badly needed. Three different solutions (railway station services, ÖBB Postbus Shuttle, ÖBB Carsharing) ÖBB has developed to respond to these challenges are presented below.

3.1.1 MeinBahnhof: Railway station services

ÖBB has set up an internal programm "MeinBahnhof" ("My railway station") which is developing and testing solutions to increase services for railway stations including:

Purpose-centered access: as Park&Ride is also significantly used by non-rail commuters, technologies are developed to limit access to railway stations only to customers. These include, among others, parking meters, ticket validation systems, as well as boom barriers which verify tickets.

Carsharing: ÖBB-Rail&Drive, a carsharing service operated by ÖBB, is available in more than 28 cities in Austria.

Bike&Ride: considering the high costs for Park&Ride, ÖBB supports Bike&Ride solutions such as bikeparking boxes which are accessible only via a mobile application.

Bahnhofsgreißler: mini supermarkets ("Greißler") with longer business hours, designed for the needs of commuters, have been installed, most notably in and around Stadtregion+ (Hollabrunn, Mistelbach, Melk).

Parcels pick up boxes: ÖBB boxes, which allow to pick up parcels from railway stations, are available since autumn 2019 at more than 15 railway stations.

The example of Bahnhof Tullnerfeld: The railway station Tullnerfeld was opened simultaneously with the Western Railway high-speed section between Vienna and St. Pölten in 2012 and has since then much contributed to the attractiveness of the area, resulting in a remarkable increase in urban development. The station is 1,5 km away from nearby villages and, from the start, Park&Ride services were deemed insufficient; hence more than 1,600 Park&Ride spaces plus more than 250 Bike&Ride lots are available today. To further increase the level of service, ÖBB has also implemented its first grocery pick-up boxes: in partnership with a food store chain,where commuters can easily pick up their groceries. In addition, since

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January 2020, ÖBB carsharing is also available at Bahnhof Tullnerfeld. This is of interest, since this station is almost exclusively used by commuters. Other railway stations with carsharing are largely used by tourists or day visitors.

3.1.2 ÖBB carsharing

In 2012, ÖBB began offering its own fleet to its employees (e.g. service cars, company cars) for private use. Due to its success it was opened to the public in 2017. Currently ÖBB CarPool (ÖBB-internal Carsharing) has about 9,000 users and ÖBB Rail&Drive about 8,500 "external" customers. In total, 520 vehicles (including 24 electric vehicles) are available in 28 cities all over Austria; the service itself is based on fixed parking stations. The service is not limited to major railway stations but can be also found in touristic regions. Today, Rail&Drive is one of the largest carsharing systems available in Austria and has also helped to position ÖBB as an integrated mobility provider. Challenges, which need to be adressed in the upcoming years are carefully expanding the network, including solutions to increase usage per car, the number of e-cars as well as integrating the service with DeutscheBahn carsharing ("Flinkster") and further improving the application.

3.1.3 ÖBB Postbus Shuttle

The aim of ÖBB Postbus Shuttle, which began test-operating in the regions of Klopeiner See and Lustenau in 2018, is to offer public transport services in rural, low-density areas through easily accessible on-demand solutions. Postbus Shuttle complements existing rail and bus services and targets mainly the following user-groups: tourism, local companies and local population. Hence, it therewith contributes to reducing car-ownership. It uses vans, like taxis, and its service is limited to a specific rural region. Until now, the service has been operated in partnership with local taxi drivers. Thus, bringing together local taxi companies' knowledge with the technological expertise and brand value of ÖBB. Customers can choose between three different options to book a ride: via shuttle-app, shuttle-interface or telephone call. The IT-system, being a core element of the system, is easy, accessible, self-learning and integrates local destinations (e.g. doctors). It allows Door-2-Door mobility, virtual stops as well as fixed timetable routing. One of the main challenges remains funding. Until now, the system has been funded up to 30-40 % by the state, 40-50 % by the communities and 20 % via fares. As it is a new service offer, it also needs to be heavily promoted among local communities; this need also spurs from the changing role of ÖBB from a railway and bus operator towards a mobility integrator. ÖBB is now actively offering new mobility solutions to small communities.

3.2 Examples from exo

Exo is the second largest public transport operator in the MMA, operating all bus and most parapublic transport services in the Northern and Southern rings as well as all commuter rail in the MMA. Exo serves 45 million trips per year, operates 237 bus lines, 60 taxibus lines and 6 train lines. It was constituted in 2017 by joining a government agency operating the commuter rail and 13 municipal public transport agencies from the outer rings.

Some of exo's challenges are reinforcing rapid transit lines while minimizing capital investment and improving multimodal station access in order to increase ridership and reduce pressure on park and ride lots. Exo is conducting a network redesign and looking to develop solutions that are tailored to the community, especially through creating suburb to suburb connections, which often don't exist, as well as better serving local destinations. The increase of jobs and population in the suburbs has sparked the need to serve suburban destination and off-peak travel more. Exo works closely with municipalities to develop services are curated to the local context and consider the mobility needs of seniors, students or specific underserved areas.

3.2.1 Exo duo - integrated rail and bus lines

Commuter rail service in the MMA is mostly a weekday peak service, resulting in a lack of frequency and flexibility. The commuter rail network was expanded in the 2000's, growing from 2 rail lines in 1996 to 6 in 2012, and rail ridership went from 6,9 million to 19,2 million trips per year. Expanding the network or adding frequency is difficult since the rail infrastructure is owned by private rail companies. The REM, an LRT network (67 km, 26 stations), is currently being built by the CDPQ Infra (a subsidiary of Quebec's pension fund). This new LRT network, expected to open it's first branch in 2021, will replace one existing exo commuter rail line and add a rapid transit connection to several suburban neighbourhoods. Exo is

currently redesigning its bus network as bus services that now go directly to the CBD will be redirected to REM stations. This redesign is an opportunity to increase service on higher ridership routes. In order to reinforce its rapid transit network quickly, while limiting capital costs, exo has created combined rail and bus corridors. In one case, a bus line was redesigned to ride along the Mont Saint-Hilaire train line and serve the three furthest train stations from the CBD. Off-peak service was added and a single fare combining bus and train services is available. The combined service is advertised as one corridor and branded as exo duo. The schedule includes both buses and trains.

3.2.2 Improve local coverage networks – on demand or local shuttles

Exo runs 60 taxibus lines, these lines run on fixed route and about two-thirds must be reserved at least one hour ahead of time by phone. They are operated by local taxi companies and operate much like a regular taxi but cost a public transport fare. In 2018, exo worked with the city of Terrebonne, on the Northern ring, to set up a service to increase youths' mobility. Three new taxibus lines were created to serve students going to a regional college campus nearby, the trip required taking two bus and lasted about 50 minutes. The new service is more time competitive, taking about 24 minutes by taxibus. On-demand services by taxi are very promising to serve low density neighborhoods and they can eventually be scaled a larger vehicle once demand has been built up. Some challenges are the difficulty to advertise them and integrate them into trip planning apps. One looming challenge is the deregulation of the taxi industry, that will go into effect in October 2020 in Quebec. The new law will eliminate permits and quotas and allow surge princing. It is feared that this will impact the supply of drivers and vehicules, especially in low-demand areas and during peak hours.

Another notable initative is a new bus shuttle service mainly designed for seniors in the city of Mercier in the southern ring. Exo worked closely with the municipality to develop this service and improve mobility for residents. Residents were consulted in order to design and tweak the service and the approach is tailored to their needs. 73 trips a week are offered between key local destinations, such as grocery stores, medical clinics or hospitals using a minibus. The stops on the schedule are named after the destination they serve (rather than street names) and schedules are printed and mailed to residents. The service has been successful, and ridership has increased steadily. Plans to add new stops and frequency are underway. While this service is low-tech, the customer-centric approach that was used helped ensure its success and played a part in strenghtening exo's role as a mobility provider, as well its ties with the municipaity.

3.2.3 Improve station access – on- demand feeder services

Exo owns and operates over 30,000 parking spots in 65 park and ride lots. Historically, commuter rail ridership has largely followed the provision of parking spots. However, station parking quickly becomes a victim of its success, causing congestion, delays and general frustration among customers. To improve multimodal access to train stations and bus terminals, several cycling amenities have been built, such as 3,500 bike racks and 2 indoor bike-stations, with more currently under construction. Reserved paid parking and reserved spaces for ridesharing are also in effect, but their success is limited, except in some very crowded stations. Continuously increasing park and ride lots is not a sustainable option, furthermore municipalities are planning to develop greater residential densities near stations (transit-oriented developments) and wish to use the land nearby to this end.

In the spring of 2020, exo will be testing a new on-demand service to reduce the need for station parking as well as attract new customers to public transport. This app-based shuttle service using taxis will serve an area close to a train station and a bus station in two municipalities (one in the Northern Ring and one in the Southern ring) and drive customers to and from the station. The service is designed to be flexible, quick, and in real time. The wait time should be around 5 minutes and the travel time around 10 minutes, which is competitive with the car. Exo also hopes to build customers' confidence in shared modes which can increase their multimodality and eventually reduce car ownership and GHG emissions. This pilot project will run for one year, meanwhile exo is examining other options to improve station access, such as electric bike fleets.

4 CONCLUSION

The backbone of a successul public transport service is a rapid transit - high capacity, high frequency- rail or bus network. However, these networks usually take time to extend, and are not always the best response to

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less-densily populated area such as suburban and rural regions. This is why public transport operators should shift towards becoming mobility providers and play a larger role in developping the urban transport system, alongside governements and municipalities. This can be done by successfully integrating a variety of modes and services, such as “virtual services“ (e.g. ticketing application) and “physical services“ (e.g. parking, shuttle-services, parcel pick-up stations) and multiple transport modes (cycling, walking, taxi, carsharing and public transport). With this in mind, it is also necessary to rethink the metrics that drive performance. Current metrics are focused on operational measures such as route ridership, unlinked trips, or passenger revenue miles. Additional metrics taking into account the whole mobility picture, including reductions in solo car trips and increases in linked, multimodal trips should be developped (APTA, 2016). This can be particularily true when evaluating the success of shared mobility projects in lower density areas, where costs will be higher and ridership lower than in dense urban areas. For example, an on-demand service in Milton (Ontario, Canada) had a high success rate, attracting new transit users, one rider even chose not to buy a car because the service served his needs adequately, but ridership was less than the bus that served the same station (ARUP, MaRS, 2018). Setting the proper metrics would help inform decision making and clarifiy the objectives of each service, which may not be high ridership.

A cultural change is also needed for public transport operators to shift towards becoming mobility providers. They can increse their agility by reducing their planning and delivery time and playing an active role in shaping services with communities and strenghthen their partnership with municipalities. They must also become more customer-centric by tailoring solutions to customers needs and ensuring social acceptability. Promoting and developing new shared mobility services is expected to reduce car-use and eventually car-ownership. As studies have shown this can result in an overall increase of public transport use and even contribute to community building (FFG 2019; APTA 2016). Therefore, it is essential to create new partnerships between traditional operators, communities and private transport companies (e.g. local taxi companies, TNC’s). The development and implementation of new mobility solutions is not without risk (e.g. Car2go closure in North America) (CBC, 2019). Hence, it is preferable to set-up pilot projects to learn and accept to sometimes fail while being be fully aware that there is no single-fit solution. However, public transport operators can use their industry knowledge and strong customer relationship to promote theses new services and develop sustainable business models that have regions, cities and citizens best interests at heart.

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