

# TRANSIT ON-DEMAND

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Case Studies & Recommendations to  
support new mobility options on  
Bowen Island, BC

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FEBRUARY 2019



This report was produced as part of the UBC Sustainability Scholars Program.

The opinions, recommendations, and errors in this report are those of the author, and do not necessarily reflect the views of TransLink, The University of British Columbia, or movmi Shared Transportation Systems.



# EXECUTIVE SUMMARY

## Report Overview

In many lower-density parts of the Metro Vancouver region, where transit demand is low, buses tend to operate on fixed routes with infrequent schedules. Recently, on-demand mobility services have been seen as a way to reduce the cost of transit while improving the customer experience by using technology to request a ride. In 2018, TransLink launched the Bowen Island Pilot Project to test on-demand service which could be replicated into other low-density areas. This report serves as a best practice review of on-demand mobility services to assist with future implementation of on-demand service in the Metro Vancouver region. The recommendations in this report are directed towards Bowen Island, BC, but are applicable to other areas with similar characteristics.

## Scope

On-demand mobility is seen as a combination of regular public transit services (fixed route, fixed schedule) and personalized taxi services (flexible route, flexible schedule). They are used where traditional public transit services are lacking. On-demand services can be split into four broad categories: Microtransit, Ride-Split, Ride-Source, or Ride-Share. The scope of this report will be on the first two categories. Additionally, microtransit and ride-split are achieved through two main delivery models:

- 1) *Public and Private Partnership Model*
- 2) *Private Enterprises Model*

## Case Studies

Several public and private sector organizations have decided to absorb the risk and attempt to implement on-demand service. Some ventures have been successful while others have ceased all operations. The cases presented in this report categorize on-demand services by variety and delivery model. The report provides an in-depth discussion of five case studies, selected to highlight unique and distinctive features. The lessons and takeaways from these case studies are highlighted to express the potential for future implementation.

### Public and Private Partnerships

#### *Belleville, Ontario & Pantonium*

Belleville is a small city in eastern Ontario with approximately 50,000 residents. In 2018, Belleville Transit launched an on-demand service for its night bus routes only. During the pilot, Belleville Transit was able to double ridership on the night route due to technology benefits from understanding transit demand patterns.

#### Lessons Learned

1. Know when and where on-demand service will be most useful.
2. Flexible and robust technology to handle trip request.
3. Automation is critical for both routing and on-boarding.
4. Use the infrastructure you've already got.



*New York City, NY & Via*

Via is both a technology vendor and microtransit operator. In 2018, Via announced it had provided over twenty-five million microtransit rides to over a million customers. Via also announced it had over 2 million members in 15 cities worldwide. Via's two operating models are *Software as a Service (SaaS)* and *Transit as a Service (TaaS)*.

**Lessons Learned**

1. Dynamic & responsive solutions to address demand management
2. Scale service while maintaining expectations
3. Find a technology vendor who understands public transit constraints

*Innisfil, Ontario & UBER*

Innisfil is a town with a small population and vast area located north of Toronto. The town was evaluating a one or two fixed route bus option to address residents' concerns. In 2016, Innisfil was the first Canadian city to partner with a ride-hailing company. Uber was the official transit operator. As of February 2019, the service is still on-going. The town estimates it saved more than \$8 million a year compared to using an equivalent door-to-door bus service.

**Lessons Learned**

1. Identifying a minimum time limit before a trip can be requested after one trip ends
2. Introducing a limit on the number of transit trips each user can take per day
3. Reducing the hours that on-demand service is available

**Private Enterprises***Kansas City, MI & Bridj*

Bridj is private microtransit operator which launched in 2014. It started in Boston, but later expanded to Washington DC, and Kansas City. However, due to lack of additional funding and operating losses, it stopped all US operations in June 2017. In 2018, the company was acquired by an Australian transit company and currently operates in Sydney, Australia.

*San Francisco, CA & Chariot*

Chariot launched in San Francisco with four buses. In 2016, Chariot grew to operate more than 50 buses on seven routes during weekday mornings and evenings in the SF Bay Area. Chariot was acquired by the Ford Motor Company in 2016 and halted all operations in January 2019.

**Lessons Learned (Bridj & Chariot)**

Creating and maintaining a successful microtransit service requires a strong partnership or a private organization which has a flexible business model. Overall, microtransit must cater to all socio-economic groups if it expects to gain traction in the transportation industry.

1. Competing interest between public transit and microtransit
2. Lack of schedule or route consistency
3. Reducing cost to provide service (labour, operational, and capital cost)
4. Evolving routing decisions by computers

## Recommendations

The transition towards on-demand service in cities will require a better integration of mobility services, as well as access to real time public transport data. Based on data gathered from the literature review and case studies, this report suggests the following general recommendations future phases of the Pilot Project or other on-demand services:

### Know when and where on-demand service will be most useful.

On-demand service can thrive in several environments, so the key is to know when and where your service is best utilized. Generating the highest passenger load per trip requires planning, which can be simplified by the use of technology to monitor demand patterns and habits of commuters. By integrating more accurate travel demand data, TransLink could utilize this data to create on-demand services which could yield a higher ROI.

### Use the infrastructure already in play.

The next suggestion is to utilize the current network and operate on-demand services as a feeder system to fixed routes. Since the BC Ferries schedule is fixed (and residents heavily rely on it), some buses on Bowen Island should also remain fixed routes to ensure travellers are able to catch corresponding ferries. Furthermore, it ensures service levels remain consistent and reliable, while on-demand service can capture ridership from areas that are underserved or in high demand.

### Examine Flexible Fleet Options.

Since transit agencies evolve and adapt to market responses, it would be worth developing a business case to see the cost associated with swapping current community shuttles or purchasing smaller, more efficient vans. As the case studies demonstrated, on-demand services tend to operate with 9-15 passenger vans (wheelchair support available) as they serve low-density areas. By reducing the operational cost, some savings can be reinvested into on-demand services. Additionally, it's worth noting that the province of British Columbia passed legislation to support ride-hailing services. This could impact transit operations significantly, but also has the potential to reduce the burden on transit agencies similar to the case of Innisfil, Ontario.

### Find a technology vendor who understands public transit constraints

On-demand technology vendors vary and so does the way their systems dynamically-route vehicles. However, some systems are better suited at integrating fixed routes, bus schedules and other important inputs required by transit agencies. Both, Belleville Transit and Via stress the importance of finding a technology vendor who understands these constraints because being able to integrate them into the software, can save a lot of issues, inefficiencies and money.





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# INTRODUCTION



## Overview

In many lower-density parts of the Metro Vancouver region, where transit demand is low, buses tend to operate on fixed routes with infrequent schedules. Recently, on-demand mobility services have been seen as a way to reduce the cost of transit while improving the customer experience by using technology to request a ride at custom pick-up and drop-off locations. As technology continues to disrupt the transportation industry, it has also shifted customer expectations, forcing public transit agencies to be more responsive. As part of this shift, TransLink has vowed to explore, test, and implement innovative ways to improve mobility in Metro Vancouver.

With the goal of understanding how an online, app-based booking tool may be used by TransLink as a means of customer interaction and provision of on-demand transit services, TransLink launched the Bowen Island Pilot Project in 2018 for twelve months. In addition to testing on-demand service in the region, the pilot would serve as a framework and test case which could be replicated into other low-density cities.

This report serves as a best practice review of on-demand mobility services to assist with future implementation of on-demand service in the Metro Vancouver region. The recommendations in this report are directed towards Bowen Island, BC, but are applicable to other areas with similar characteristics.

## Acknowledgement

This report was completed for TransLink's New Mobility Office through the UBC Sustainability Scholars program. Zak Zenasni is a graduate student of the UBC School of Community and Regional Planning. The author would like to thank Ashley Cho for her input in this report.



**CONTEXT**

## BOWEN ISLAND

Bowen Island is a tight knit community with approximately 3,600 residents located north-west of Vancouver, BC. The community currently has three community shuttle routes (see Figure 1) operated by First Transit Canada. The community relies heavily on the BC Ferries service, water-taxis and personal vehicles to commute and travel. As the population steadily increases, the transportation infrastructure has become strained due to the sprawling-built form and topography. Since communities in similar situations have turned to on-demand solutions, TransLink has agreed to explore this new service delivery model to analyze its benefits and trade-offs.

## THE PILOT PROJECT

The primary objective of the Bowen Island Pilot Project is to explore the feasibility of a flexible, on-demand solution. On-demand services are aimed at providing Bowen residents with features such as;

- Custom pick-up and drop-off locations instead of fixed routes.
- Allow residents to book seats through the use of a mobile app or phone service
- Provide Bowen residents with a way to track the bus (no service currently available to see "Next Bus" information).

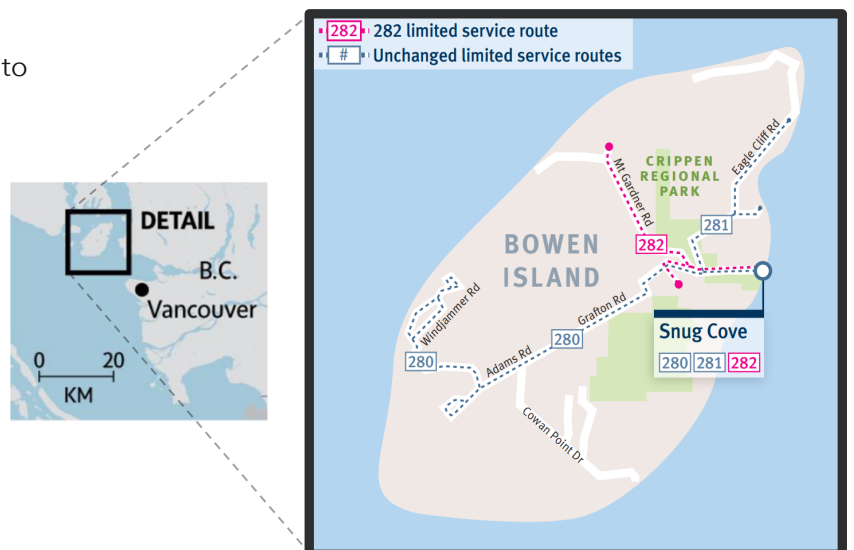
This service is completely new to the lower mainland and will serve as a case study for future projects on-demand projects developed by TransLink.

In 2017, the community shuttle service on Bowen Island, provided approximately 7,000 hours of service (annual) and the buses travelled over 150,000 km. There are few transit facilities on island (bus stops, bike lanes, sidewalks) and all bus routes operate on a flag stop basis.

Between May 2017 and July 2018, the average weekday ridership was 169 passengers while weekend ridership was at 96 passengers (see Figure 2). The community shuttles use Snug Cove as the terminus due to its proximity to the BC Ferries dock, and the town's major recreational and municipal amenities.

A major constraint on Bowen Island, is the fact that all bus schedules are based around the BC Ferries Schedule. For example, the incoming bus drops off passengers for the departing ferry at Snug Cove and within five minutes, picks-up passengers from the arriving ferry and heads outbound. In Horseshoe Bay, ferry commuters can catch connecting services to downtown Vancouver, West Vancouver, or Lions Bay.

*Figure 1: Bowen Island Transit Service Map (Translink, 2018)*





The implementation process for on-demand service will be split in two phases:

**Phase One:**

This phase will establish the technological requirements, transit service trade-offs, and gather customer experience feedback. Phase One will be closed to the public as beta testers evaluate the technology and mobile application. The main objectives of Phase One are to:

- I. Allow customers to request rides and book seats via phone or mobile app
- II. Track the bus location in real time
- III. Receive an ETA on bus arrival time
- IV. Receive push notifications that bus arrival is imminent.

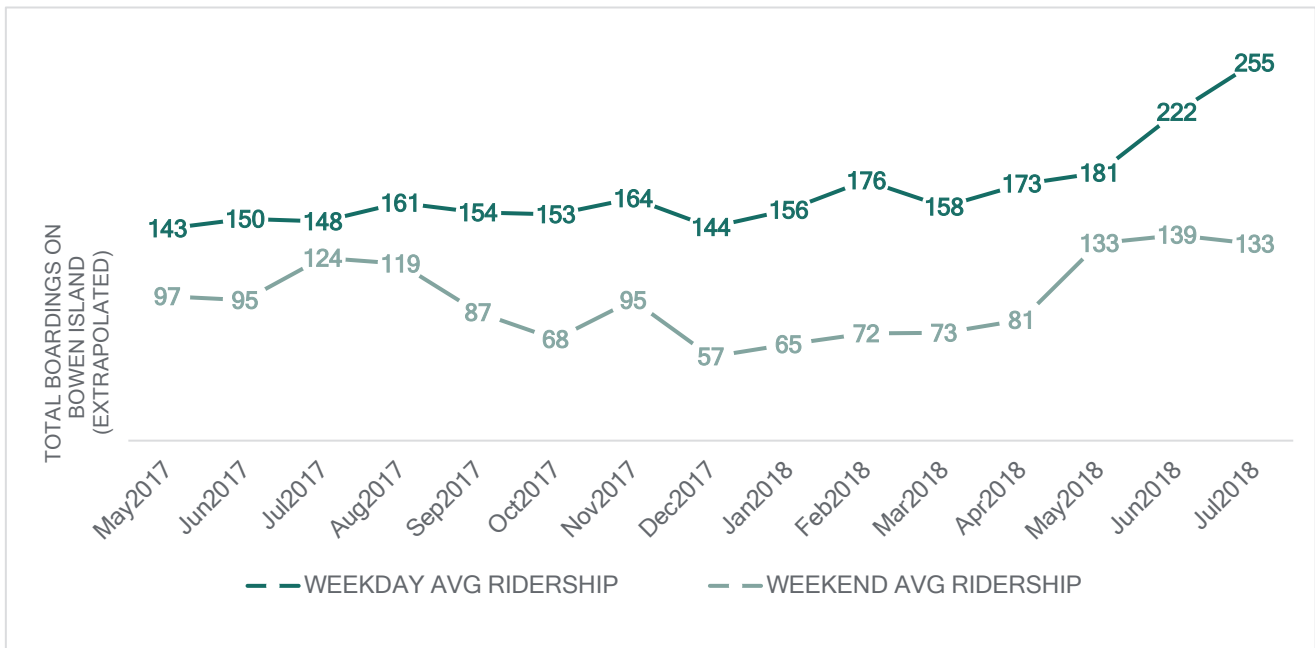
The first phase of the project does not allow for additional service hours, so schedule or geographical area improvements are not possible. Instead, buses will operate with the same schedules and routes (fixed routes & service) but customers will be able to book rides and set custom pick-up and drop-off locations only if it's along the bus's fixed route.

**Phase Two:**

Based on feedback obtained in Phase One, this stage will pursue the introduction of on-demand service, a first for the region. This could be in the form of additional service hours (new flexible trips), extension of service area (new routes), the addition of new fleet (new buses), or a combination of the above. Also, since altering any transit service can heavily impact the lives of residents, Phase Two will also ensure the same level of service prior to Phase One.

Phase Two enables TransLink to try a flexible, on-demand service while assessing demand and improving overall ridership. If the flexible service is capable of increasing ridership while conforming to service standards and requirements, it could be deployed in other parts of the region to improve mobility.

*Figure 2: Weekday & Weekend Boardings for Bowen Island Community Shuttles (Data provided by TransLink)*







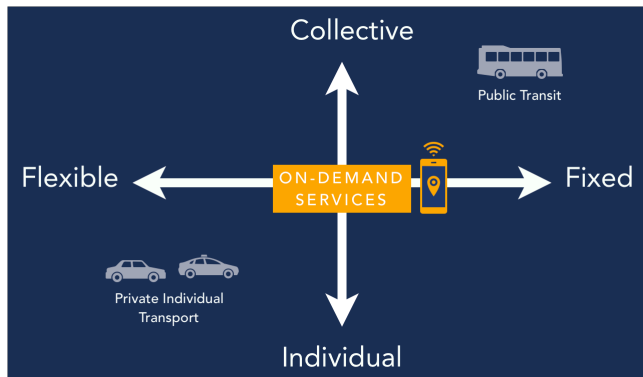


**BACKGROUND**

## ON-DEMAND MOBILITY

On-demand mobility (see Figure 3) can be described as a range of services characterized by flexible routing and scheduling which allows users to share rides or request rides with custom pick-up and drop-off locations.

*Figure 3: Graph representing flexible service models*



Some research indicates that on-demand services can reduce personal vehicle usage leading to a reduction in GHG emissions as well as reducing congestion and increasing public transit ridership. Yet, other research suggests that there are several negative impacts associated with such services, such as causing an increase in the number of vehicles on the road increasing congestion and GHG emissions, or an increase in the number of kilometers travelled by vehicles. Agencies must be conscious of the trade-offs when implementing this service, because in some cases it may not be a strategic investment if other mobility options are available.

This section will explore the on-demand service model and the various delivery platforms.

## THE MODEL

On-demand mobility is often seen as a combination of regular public transit services and personalised taxi services. They are used where traditional public transit services are lacking, or not cost-effective, to cover the

demand areas. On-demand transit can also help close the first/last mile problem due to the flexible nature of the service. There are four main types of on-demand mobility services (see Figure 4).

*“On-demand service thrives in markets where demand is too low for conventional buses (e.g. rural areas, night and weekends) or where greater flexibility is needed than what can be provided by conventional buses...”*

Davison et al., (2012), provide a simple and precise definition of on-demand mobility:

- Service features which are fully flexible, in terms of:
  - Routing (no fixed origin or destination pattern)
  - Timetable (operate based on demand)
- Technology reliant via a mobile app
  - Allows for pre-booking of a seat vs. the traditional first-come-first-serve model.

## DELIVERY MODELS

On demand mobility requires a high level of collaboration between transit operators, technology providers, municipal officials and

transit users. Since there are various on-demand services, the method of deployment also varies (see Table 1). This section will explore the three primary methods.

*Figure 4: On-Demand Service Spectrum*



### Public-Private Partnership

Public-private partnerships (P3's) provide local governments, transit authorities and private enterprises the opportunity to collaborate on initiatives that otherwise may be construed as competing interest. P3's ensures stakeholders collaborate on cross-purposes regional priorities through partnership-based agreements which aim to benefit all parties. It also acts as an accountability tool to enforce regulations and address feedback. P3's can solve complex problems by sharing responsibilities among partners. On-demand P3's require a lot of financial and human capital. They also require a longer project timeframe in order to ensure all parties have a chance to express concerns.

### Combined Mobility Service:

The concept of combined mobility service has recently found traction in North America. By aggregating multiple modes of transportation services into a single platform, commuters make better travelling decisions, while private

organization customize travel options to suit behaviors. This service has the potential to encourage more sustainable travel choices, however these platforms are costly to build and tend to get lost in legal agreements among providers.

Due to the scope of this report, Combined Mobility Service will not be explored.

### Private Enterprise

Private enterprises can complement and augment existing infrastructure, or it can compete, causing public transit ridership to fluctuate. The operational advantage with private organizations is that their low overhead cost and flexible fleet/routing allow them to fill gaps in public transit. By using technology, several tasks can be automated, reducing the overall labour cost. End users benefit from this model since they can track, pay, and retrieve information in real-time.

However, these private enterprises also run the risk of competing with or even replacing transit, while also posing the risk of creating additional mobility inequalities. These transportation inequalities tend to affect population groups already vulnerable to price or service modifications.

*Table 1: Summary table of benefits and drawbacks to three types of service delivery models*

Model	Benefits	Drawbacks
<i>Public-Private Partnership</i>	<ul style="list-style-type: none"> <li>▪ Allows local governments, transit authorities and private enterprise to collaborate and leverage their strengths <ul style="list-style-type: none"> <li>○ Helps expedite systems that benefit the public good (i.e. accessibility)</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ May take more time to execute</li> <li>▪ Can be costly</li> <li>▪ May erode the flexibility of services offered</li> </ul>
<i>Combined Mobility Service (Not in the scope of this report)</i>	<ul style="list-style-type: none"> <li>▪ Can serve to aggregate existing options, making it easier for consumers to plan trips</li> <li>▪ Can result in data that is useful for transportation planning</li> <li>▪ Can be designed to incentivize more sustainable choices <ul style="list-style-type: none"> <li>○ Helps households without vehicle ownership</li> </ul> </li> </ul>	<ul style="list-style-type: none"> <li>▪ Can require significant technological development time and financing</li> <li>▪ Most uptake to date has been by early adopters.</li> <li>▪ Application to broader public remains to be tested</li> </ul>
<i>Private Enterprise</i>	<ul style="list-style-type: none"> <li>▪ Potential to augment transit networks by backfilling low density and underserved areas</li> <li>▪ Can be rapidly implemented to meet areas of high demand</li> <li>▪ Costs &amp; risks held by private sector</li> <li>▪ Allows market to innovate freely</li> </ul>	<ul style="list-style-type: none"> <li>▪ Potential to draw away transit ridership and increase vehicle trips, congestion and environmental impacts</li> <li>▪ Could further marginalize low income groups and lower mobility</li> <li>▪ Potential resistance from public and private transportation sector incumbents</li> </ul>

# CASE STUDIES

## INTEREST

*“How do you best integrate on-demand services into a fixed route, highly timed service?”*

As transit agencies continue to offer safe, equitable, and reliable transit service, they are also faced with an ultimatum to adapt their services or risk losing riders to private operators. Public agencies are more susceptible market influences than private organizations because they don't have the luxury of experimenting with many different ideas until it finds the right model. Private organizations can test various models without creating a large impact on the lives of community members.

## SCOPE

Several public and private sector organizations have decided to absorb the risk and attempt to implement on-demand service. Some ventures have been successful while others have ceased all operations. The cases presented in this report categorize on-demand services by variety and delivery model. The report provides an in-depth discussion of five case studies, selected to highlight unique and distinctive features. The lessons and takeaways from these case studies are highlighted to express the potential for the future implementation.

This report will focus on case studies which relate to municipalities or transit agencies implementing a form of on-demand service (with the exception of: Combined Mobility Services and Dial-a-Ride Services). The following section will breakdown case studies based on service delivery model.





## PUBLIC & PRIVATE PARTNERSHIP

One of the most common ways to deploy on-demand mobility is to partner with private organizations.

There are typically three types of public-private partnerships:

1. Collaborate with transportation network companies (TNC) to address gaps in service
2. Work with technology vendors & application developers to create a system which the agency brands as its own
3. No collaboration but allow legislation for private transportation operators

### TRANSIT AGENCY AND TECHNOLOGY VENDOR

#### Belleville Transit + Pantonium



Credit: Google Images

#### Overview

Belleville is a small city in eastern Ontario with approximately 50,000 residents. In 2018, Belleville Transit launched an on-demand service for its night bus routes. Through the use of an app or website, it allowed customers

to request a bus ride with custom pick-up and drop-off locations, rather than the traditional fixed route system. During the pilot, Belleville Transit was able to double ridership on the night route due to technology benefits from understanding transit demand patterns.

Belleville's technology vendor was Pantonium, a tech company based in Toronto. This partnership solved transportation issues while reducing the technological burden on the transit agency. Belleville is looking to expand the pilot in 2019 to daytime service.

#### Lessons Learned

Belleville's nightbus service runs from 9:30 p.m. to 12:00 a.m. on weekdays and starts a little earlier on weekends. During the pilot, one bus was dedicated to customers who booked a ride while another bus drove the conventional route. This ensured reliability and convenience for those who did not use on-demand service

Belleville's on-demand service was also unique since it was fully automated. Booking, scheduling and navigation, are all completed through the app since there are no available customer support agents during the evening.

#### Lessons Learned

Key take-aways from the Belleville Pilot are:

1. Know when and where on-demand service will be most useful.

On-demand transit is not a good option in a downtown core because they have so much demand that they need massive capacity to move people (which require high frequency, fixed routes). Additionally, Belleville was offering bus service to areas where people

rarely travelled. By using data generated by the pilot project, Belleville Transit was able to use origin-destinations data to analyze trips. After the analysis, they altered their service to be better utilized by residents.

Similarly, Belleville Transit noticed an area with continuous demand, yet there was no bus route. The on-demand heat maps representing pick-up locations allowed for better planning by allowing more service to this area.

### 2. Flexible and robust technology to handle trip request.

Not everyone wants to call or use an app to ride the bus. Also, as populations grow, residents don't always know about pilot projects or upcoming service changes. Therefore, the technology must accommodate riders on an ad hoc basis. This is important because public transit has an obligation to provide service to everyone. Rather than removing all fixed routes and forcing operators to pick up people who order via the portal, this pilot's approach was to change operations as little as possible, to ensure continuous service.

### 3. Automation is critical for both routing and on-boarding.

Since the on-demand service is deployed for night time routes, the service must run accurately and autonomously. To reduce the burden on operators or dispatchers the system uses QR code to identify riders. This process can also assist public transit agencies to set up automated payments while preparing for a future of driverless vehicles.

### 4. Use the infrastructure you've already got.

Belleville Transit operates 14 buses and has a network of bus stops in its district. Incorporating current infrastructure such as

fleet or facilities can reduce the cost of projects and simplify planning objectives.

## TRANSIT OPERATOR AND / OR TECHNOLOGY VENDOR Multiple Cities/Agencies + VIA



Credit: Google Images

### Overview

Via is developer and operator of microtransit systems. In 2018, Via announced it had provided over twenty-five million microtransit rides to over a million customers. Via also announced it had over 2 million members in 15 cities worldwide.

Via's methodology combines a transit agency's available ridership and performance data, mapping and demographic analysis, computer modelling and dynamic vehicle routing to ensure the most efficient and economical route is chosen while optimizing booking request.

Via has two operating models:

1. *Software as a Service (SaaS)* - A partnership with transit agencies who want to use their own infrastructure (vehicles and operators) and a white label application.

Key Features:

- Service planning and modeling

- Rider and driver apps
- Passenger aggregation and dynamic routing algorithm
- Dispatch tools
- Accessibility Act compliant
- Support for riders without smartphones and credit cards
- Seamless integration with third-party payment and trip planning systems

Cities and agencies which chose this partnership model are: *Austin, TX; Los Angeles, CA; Orange County, CA; Sacramento, CA; Austin, TX; Arlington, TX; Queenstown, NZ; Kent, UK; Paris, France; Newcastle, Australia; Berlin, Germany; Singapore*

2. *Transit as a Service (TaaS)* - A solution for transit agencies which provides technology, drivers, vehicles, and operations management. Essential, Via is the transit operator which works independently or directly with local transit agencies.

Key Features:

- All the features of the SaaS model
- Creation of a service level agreement
- Agency gets all of the benefits of microtransit without the risks of operating the service.
- Fares ranging from \$3 to \$5 per trip (based on city)
- Strategic partnership with vehicle manufacturers such as Mercedes-Benz, providing uniform fleet.

Private transportation operator in:

*New York, NY; Washington, DC; Chicago, IL;*

Via's New York microtransit service is fully dynamic and has no fixed routes. Instead, vehicles are requested and rerouted based on traffic and demand patterns. Routes are determined by the company's algorithms and drivers follow a plotted line on a tablet similar to ride-hailing apps such as Uber. A common concern with on-demand service is that it will either create new congestion and/or compete with existing public transportation. However, Via demonstrated that on-demand initiatives could survive if they can provide a service which can offset private vehicle use.

Similar to on-demand services, travelers' book and pay through a smartphone app. The cost for service in NYC is a flat \$5 fee per trip (if prepaid). In comparison, the public transit agency (MTA) charges \$2.75 for a bus ride.

Via surveyed NYC passengers and found that 27% of Via riders are over 55. This illustrates that older populations are open to using this type of service.

### Lessons Learned

Via's model has successfully increased ridership while increasing the quality of shared-ride experiences. The success can be attributed to three key lessons.

#### 1. Dynamic & Responsive solutions to address demand management

Powering a flexible service that is optimized in real time is a big technical challenge. It is important to ensure technology is capable of handling the request and actions the agencies desire. Models need to be created based on the systems which represent the specific operating environment rather than a universal algorithm or modelling program.

## 2. Scale service while maintaining expectations

By having access to dozens or even hundreds of vehicles every day, Via can scale the required resources through an autonomous process based on real time demand. Also, as the number of vehicles and rides increase, the number of possible rider/vehicle assignments or routing choices also grows, requiring service providers to manage expectations. For example, commuters will usually have to decide between two factors:

- a) Book a trip which will be longer and require less walking
- b) Book a trip which is short in time but requires a longer walking distance

## 3. Find a technology vendor who understands public transit constraints

Running on-demand service with dynamically-routed vehicles requires a different operational approach than a service configured around fixed routes and schedules. Finding a technology vendor who can implement the constraints of transit agency into the software can save a lot of issues, inefficiencies and money.

### RIDE-SPLIT OPERATOR

Innisfil, Ontario + Uber



Credit: Google Images

#### Overview

Innisfil is a town with a small population and vast area located north of Toronto. In 2016,

Innisfil was the first Canadian city to partner with a ride-hailing company. Uber was the

official transit operator. The town estimated that a single bus service would cost \$231,000 in gross capital costs and \$330,000 in operating costs. A two-bus service would cost \$439,000 in gross capital costs and \$541,000 in operating costs in the first year alone. Rather than approve a costly transit option which operated between 7am and 7pm on a fixed route basis, the city created a partnership. The on-demand technology was powered by Uber's "Pool" feature (similar to ride-sharing service).

If a resident shared a trip (several passengers heading in the same direction getting pooled together) then it would be subsidized by the town. The subsidization of transit service offered discounts to any ride to or from Innisfil as well as, travelling to or from city amenities (i.e. library) for a flat fare ranging from \$3-5 per direction.

As of February 2019, the service is still on-going. The town estimates it saved more than \$8 million a year compared to using an equivalent door-to-door bus service. Since it launched, Innisfil Transit has over 3,400 users which completed 26,700 trips in the first eight months of the program.

#### Quick Facts

- Ridership:  
4,436 different people have taken at least one trip (27% growth since 2017). This was achieved by 1,589 different drivers.
- Match rates:  
Average of 30% of trips have matched (two or more riders in the car) – grew

from 17% in 2017 and 25% in Q1 2018 to 35% in Q2 2018

- Average wait-time: (from request to pick up) 7:20 minutes - decreased from 9:10 minutes in 2017 and 8 minutes in Q1 2018 to 6:20 minutes over July and August 2018
- Trip completion rate: (% of requested trips that are completed) 87% in July and August of 2018 - increased from 82% in Q1 2018 and from 71% over 2017

### Lessons Learned

The Innisfil Transit pilot program demonstrated how ridership could grow considerably as a result of on-demand service. However; the increase in ridership produced higher than anticipate service cost requiring city council and transit authorities to generate these key takeaways.

#### 1. Identifying a minimum time limit before a trip can be requested after one trip ends

Innisfil found that people were using flat fare destinations routes to get to non-flat fare destinations causing a spike in ridership and cost. By implementing a time delay between these trips, it may discourage this practice and result in cost savings.

#### 2. Introducing a limit on the number trips each user can take per day

There is currently no limit on the number of Innisfil Transit trips that a user can take each day. Innisfil has noticed that some users are treating this service like a subsidized taxi and

are taking a large number of trips. The town is examining a restriction to limit the number of subsidized trips per day. This may provide cost savings to reinvest into other routes.

#### 3. Reducing the hours that the service is available or alternating routes

The Innisfil Transit service is currently available 24 hours a day / 7 days a week, however; reducing the hours to eliminate off-peak operating hours may help provide cost savings. Additionally, the town has added more flat fare routes based on feedback and has eliminated some more costly routes to ensure it has enough finding to provide residents with adequate transit service.

## PRIVATE ENTREPRISE

Microtransit has been described as generally embracing route deviation with no fixed stops. Although the definition of microtransit varies in the literature, for the purposes of this review, microtransit services are considered flexible transit services which fall into two broad categories:

- I. A 'downsizing' in public collective transport: on demand public transport initiatives such as Bridj or Chariots
- II. An 'upscaling' in private individual transport: using private transportation as a basis for on demand transportation such as Uber or Lyft.  
(Note: In the report, Uber was considered a P3 because it developed a strategy with government partners rather than entering the market as a private operator.)

### MICROTRANSIT OPERATOR

#### Multiple Cities + Bridj



Credit: Google Images

#### Overview

Bridj (pronounced "bridge"), is a privatized version of public transit which operates its own

fleet of vehicles (14-seat passenger vans built by Ford or Mercedes Benz). Bridj originally

launched in Boston in 2014 with \$4M in seed funding. It was later expanded to Washington DC, and Kansas City, however; due to lack of funding and profitability it ceased all US operations in June 2017. In 2018, the company was acquired by an Australian transit company and currently operates in Sydney, Australia.

Bridj app allowed commuters to meet at a central spot based on similar requests and system algorithms. This "pop-up urban infrastructure" model prioritizes flexibility and convenience by optimizing pick-up, drop-off, and routing.

#### Lessons Learned

RideKC was a special year-long pilot involving the Kansas City Area Transit Authority ("KCATA"), and Bridj. It launched in March 2016 and was the first public-private partnership between a major U.S. transit system, and transportation technology company. The pilot was developed to enhance existing mass transit by providing "greater mobility options to Kansas City residents".

Using the Bridj mobile app, riders requested on-demand shuttle service in real time and up to 24 hours in advance. Each ride in KC costs \$1.50 paid through a credit card on the app. The system uses individual rider inputs to command vehicles and triangulate pop-up shuttle stations to identify the best service routes. Service boundaries are based on rider demand.

Bridj also tried to appeal to commuters by operating a shuttle on a high-frequency basis (every 10minutes) but it realized it was too costly.



Before terminating operations, Bridj ran into legal trouble since some their fleet was not ADA compliant. Bridj was fined because it requested customers with disabilities to contact customer support in advance which was deem highly inappropriate.

Boston's Massachusetts Bay Transportation Authority ("MBTA") also explored Bridj as a complement or replacement of its nightbus or paratransit service routes.

## MICROTRANSIT OPERATOR

### Multiple Cities + Chariots



#### Overview

In 2014, Chariot launched in San Francisco with four buses. In 2015, the company secured \$3M in seed funding. In 2016, Chariot grew to operate more than 50 buses on seven routes during weekday mornings and evenings. In 2016, Chariot was acquired by the Ford Motor Company. In January 2019, the company halted all operations.

Chariot operated routes based on crowdsourced feedback which allowed riders to vote for new routes on the company's website. Routes were considered to be viable if

at least 60 people purchased rides. The advantage with Chariot was that it could get a route up and running in a matter of 2-3 days.

Chariot partnered with Ford Motors to incorporate fleet vehicles which accommodate up to 15-passengers. Similar to other on-demand services, user downloaded an app to sign up. Then, users have the option to buy pay-as-you-go, multi-ride packs, or monthly passes. The company did provide wheelchair-accessible service with at least one day's notice.

In San Francisco, Chariot had over 80 drivers and 13 office workers. Before shutting down operations, Chariot served about 700 to 1,000 people per day. In comparison, SF bus lines serve over 33,000 riders a day on average.

Although Chariot offered a more rapid alternative to navigate through San Francisco, its versatility in adapting route service ultimately created its demise. Commuters rely heavily on reliable and consistent transit service which is not always available through microtransit.

It operated in: *Austin, TX; Chicago, IL; Columbus, OH Denver, CO; Detroit, MI; Lake Tahoe, Nv; Los Angeles, CA; New York, NY; San Francisco Bay Area, California; and Seattle, WA.*

#### Microtransit Lessons Learned

As we have seen, creating and maintaining a successful microtransit service requires a strong partnership or a private organization which has a flexible business model. Overall, microtransit must cater to all socio-economic groups if it expects to gain traction in the transportation industry.

Key takeaways from microtransit projects are:

### 1. Competing Interest between public transit and microtransit

When microtransit operates on-top of existing public transit, it creates tension. The best way to reduce this competition is by using microtransit to compliment public transit by using the service to link commuters to existing infrastructure like a rail or bus-rapid station.

### 2. Lack of schedule or route consistency

Like the majority of on-demand services, there are no fixed routes or schedules. From a consumer perspective the lack of reliability makes microtransit unsuitable for the majority of commuters. Since routes are determined by demographic information and crowdsourced data, it was difficult to ensure consistency.

### 3. Reducing cost to provide service (labour, operational, and capital cost)

Microtransit operators have the same challenges as transit agencies; they had vehicles driving around with few or no passengers. Of course, some areas may be profitable but in the case of Denver, the city paid \$250,000 for six months of free rides on a route which operated 110 times over a three-month period.

### 4. Evolving routing decisions by computers

Computers are smart, but they don't have the intuition of planners. Even though they are very complex to model and optimize the real difficulty stems from predicting behavioural of clients to provide more reliable service. Similar to a game of cat and mouse, the operator is trying to plan ahead but level of variability between customers prevents them from being reliable and so on.



# RECOMMENDATIONS

*Table 2: Summary of best ways to implement MicroTransit by scenario. (Toronto-York Region Implementation Guide)*

## General Suggestions

The transition towards on-demand service in cities will require a better integration of mobility services, as well as access to real time public transport data.

The following section will provide general recommendations for future phases of the Pilot Project. The recommendations are based on lessons learned from the case studies analyzed.

### Know when and where on-demand service will be most useful.

On-demand service can thrive in several environments, so the key is to know when and where your service is best utilized. Generating the highest passenger load per trip requires planning, which can be simplified by the use of technology to monitor demand patterns and habits of commuters. By integrating more accurate travel demand data, TransLink could utilize this data to create on-demand services which could yield a higher ROI.

Since Bowen Island is a small community with finite activities, planning for mobility needs can be simplified by reliable data. By knowing when and where events are happening, or specific recreational hot spots, on-demand service can be customized in advance to ensure the system captures the highest volume of trips per day and per direction

By implementing this lesson, TransLink could utilize origin-destination data to create on-demand services which could yield a higher ROI.

Scenario	Description
Lower Density Neighbourhoods Underserved by Transit (trips originating in suburbs)	Use of dynamically allocated services to aggregate demand, especially at peak times, from passengers in underserved areas
Off-peak services to medium-density suburbs	Use of dynamically allocated services to aggregate demand from passengers at off-peak times to increase cost-effectiveness
Commuter Corridors	Publicly or privately-operated shuttle services based on fixed or dynamic scheduling to provide an alternative to fixed public transportation and to create additional capacity
Downtown circulation	Substitute use of personal cars in downtown with microtransit services. This could also include substitution of transit, walking, cycling with microtransit (though the data needed was unavailable to quantify the reverse effect) .
School drop off	Use of microtransit services to substitute for use of personal cars to drop off and pick up children at schools.
Airport drop off	Use of microtransit services to substitute for use of personal cars or taxis to drop off and pick up passengers from airports. This could also include substitution of transit with microtransit (though more data is needed to quantify the reverse effect)
Retail: Suburban malls	Use of microtransit services to substitute for use of personal cars or taxis to go to large retail malls, usually located in suburban areas
Shift workers	Use of microtransit services to provide shift workers with more options to go to and leave work at off-peak hours, where traditional public transit options are scarce.
Trip chaining – home-school-work	Substitute for use of personal cars to drop off children at school and then commute to work
Entertainment: Events	Use of microtransit services to transport a large number of people to sport and cultural events, reducing the number of personal cars on the road.

### Use the infrastructure already in play.

Another suggestion would be to utilize the current network and operate on-demand services as a feeder system to fixed routes. Since the BC Ferries schedule is fixed (and residents heavily rely on it), some buses on Bowen Island should also remain fixed routes to ensure travellers can catch corresponding ferries. Furthermore, it also ensures service levels remain consistent and reliable, while on-demand service can capture ridership from areas that are underserved or in high demand. By acting as a bridge, on-demand service can utilize the current network (buses, schedule, routes) while still increasing ridership, and reducing the need to drive into town to catch a ferry ride, or to use public services.

### Examine Flexible Fleet Options

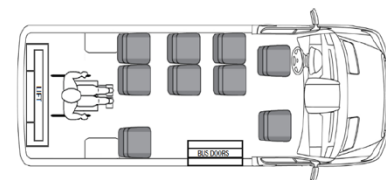
Since transit agencies evolve and adapt to market responses, it would be worth developing a business case to see the cost associated with swapping current community shuttles or purchasing smaller, more efficient vans. As the case studies demonstrated, on-demand services tend to operate with 9-15 passenger vans (wheelchair support available) as they serve low-density areas. By reducing the operational cost, some savings can be reinvested into on-demand services. (See Figure 3)

Additionally, it's worth noting that the province of British Columbia passed legislation to support ride-hailing services. This could impact transit operations significantly, but also has the potential to reduce the burden on transit agencies similar to the case of Innisfil, Ontario.

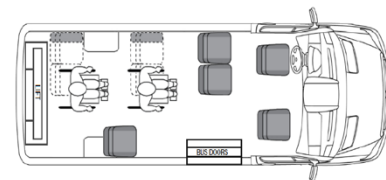
### Find a technology vendor who understands public transit constraints

On-demand technology vendors vary and so does the way their systems dynamically-route vehicles. However, some systems are better suited at integrating fixed routes, bus schedules and other important inputs required by transit agencies. Both, Belleville Transit and Via stress the importance of finding a technology vendor who understands these constraints because being able to integrate them into the software, can save a lot of issues, inefficiencies and money. Some vendors may not have the expertise or experience required to cater to transit operations.

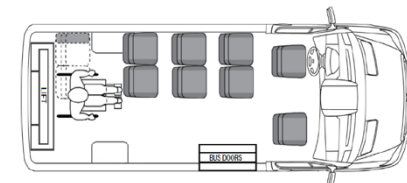
*Figure 5: Seating arrangements for Microtransit fleet vehicles*



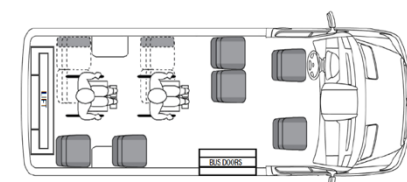
Rear Lift, 9 Passengers, 1 Wheelchair  
ELBR1



Rear Lift, 9 Passengers, 2 Wheelchair  
ELBR3



Rear Lift, 10 Passengers, 1 Wheelchair  
ELBR2



Rear Lift, 10 Passengers, 2 Wheelchair  
ELBR4

**CONCLUSION**

## THE FUTURE OF ON-DEMAND SERVICES

Transportation networks are highly complex with many interdependent processes and inter-related issues that are becoming more vulnerable to changing technology. Also, corresponding market expectations of transit agencies and providers have created a need for new methods of transportation to be explored.

Traditional approaches to introducing new forms of transit service often involve years of research, planning, and engagement which has been disrupted by on-demand companies. By having lower operating cost and access to big data, these enterprises will continue to capitalize on market gaps.

Thus any future on-demand project will need to encompass public policy, business viability, technology feasibility and consumer desirability, while prioritizing agility, collaboration and timeliness, because of the higher risks involved.



# SOURCES



## Background & Context

- Davison, L., Enoch, M., Ryley, T., Quddus, M. & Wang, C. Identifying potential market niches for Demand Responsive Transport, *Research in Transportation Business & Management*, Volume 3, August 2012, Pages 50-61, <http://dx.doi.org/10.1016/j.rtbm.2012.04.007>.
- Davison, L., Enoch, M., Ryley, T., Quddus, M. & Wang, C., A survey of Demand Responsive Transport in Great Britain, *Transport Policy*, Volume 31, January 2014, Pages 47-54, ISSN 0967-070X, <http://dx.doi.org/10.1016/j.tranpol.2013.11.004>.
- Enoch, M., Potter, S., Parkhurst, G. & Smith, M. (2006). Why do demand responsive transport systems fail? In: *Transportation Research Board 85th Annual Meeting, 22-26 January 2006, Washington DC*.
- Larsen, N. T. ( 2016 ). Adapting the best elements of the Danish approach to combine several types of transportation. Denmark.
- Mulley, C., Nelson, J., Teal, R., Wright, S., Daniels, R., Barriers to implementing flexible transport services: An international comparison of the experiences in Australia, Europe and USA, *Research in Transportation Business & Management*, Volume 3, August 2012, Pages 3-11, ISSN 2210-5395, <http://dx.doi.org/10.1016/j.rtbm.2012.04.001> .
- Ronald, N., Thompson, R. & Winter, S. (2015), Simulating Demand-responsive Transportation: A Review of Agent-based Approaches, *Transport Reviews*, 35:4, 404-421, DOI: 10.1080/01441647.2015.1017749
- Wang, C., Quddus, M., Enoch, M., Ryley, T., & Davison, L. Exploring the propensity to travel by demand responsive transport in the rural area of Lincolnshire in England, *Case Studies on Transport Policy*, Volume 3, Issue 2, June 2015, Pages 129-136, ISSN 2213-624X, <http://dx.doi.org/10.1016/j.cstp.2014.12.006>
- Wright, S. (2013) Designing flexible transport services: guidelines for choosing the vehicle type, *Transportation Planning and Technology*, 36:1, 76-92, DOI: 10.1080/03081060.2012.745757

## Belleville Transit

<https://pantonium.com/initial-results-from-belleville-on-demand-transit/>

<https://business.financialpost.com/technology/belleville-transit-pilot-project-ditches-fixed-routes-for-bus-hailing-system>

<https://www.cbc.ca/news/business/uber-lyft-ride-hailing-on-demand-public-transit-1.4842699>

<https://www.iphoneincanada.ca/news/belleville-bus-hailing-transit-success/>

<https://www.intelligencer.ca/news/local-news/belleville-transit-getting-more-convenient-for-passengers>

## Via

<http://www.citylab.com/tech/2015/04/the-new-york-car-service-that-charges-almost-transit-prices/389985/>

[http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility\\_WhitePaper\\_FINAL.pdf](http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility_WhitePaper_FINAL.pdf)

<http://www.brownpoliticalreview.org/2015/11/magic-pool-bus-the-rise-of-microtransit-puts-public-transit-access-at-a-crossroads/>

<http://www.crainsnewyork.com/article/20150524/TRANSPORTATION/150529933/yet-another-ride-service-only-this-one-is-different>

<http://nymag.com/daily/intelligencer/2015/12/via-ride-sharing-app-seniors.html>

<http://www.nytimes.com/2015/12/31/fashion/with-via-sharing-more-than-just-a-ride.html>

## Bridj

<http://www.brownpoliticalreview.org/2015/11/magic-pool-bus-the-rise-of-microtransit-puts-public-transit-access-at-a-crossroads/>

<http://www.bostonmagazine.com/news/blog/2014/06/11/bridj-service-coolidge-corner/>

<http://commonwealthmagazine.org/transportation/bridj-revs-up/>

<http://www.icic.org/connection/blog-entry/blog-microtransit-movement-looks-to-improve-transportation-access-for-all>

<http://www.metro.us/boston/boston-s-bridj-eyeing-place-in-public-transit-s-future/zsJolo---hfxbAygnhz21Y/>

[http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility\\_WhitePaper\\_FINAL.pdf](http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility_WhitePaper_FINAL.pdf)

<http://www.investopedia.com/articles/markets/082015/startup-analysis-how-much-uber-worth.asp>

<http://web1.ctaa.org/webmodules/webarticles/articlefiles/Ridesharing15Micro-transit.pdf>

## Chariot

<http://www.metro-magazine.com/mobility/news/729953/sacramento-rt-awarded-12m-to-expand-microtransit-service>

<http://www.theglobeandmail.com/news/Toronto/microtransit-cities-should-explore-innovation-that-will-help-move-people/article27931173/>

<http://techcrunch.com/2015/11/29/the-last-bus-startup-standing-chariot/>



<http://www.bbc.com/autos/story/20150903-microtransit-aims-to-civilise-the-worst-part-of-your-workday>

[http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility\\_WhitePaper\\_FINAL.pdf](http://innovativemobility.org/wp-content/uploads/2015/11/SharedMobility_WhitePaper_FINAL.pdf)

<http://techcrunch.com/2015/01/26/chariot-new-route/>

## Innisfil Transit

<https://www.uber.com/cities/innisfil/ride/>

<https://globalnews.ca/news/4084807/uber-innisfil-transit-savings/>

<https://business.financialpost.com/transportation/innisfil-ontario-sticks-with-its-uber-as-public-transit-plan-extending-its-pilot-project>

<https://business.financialpost.com/technology/belleville-transit-pilot-project-ditches-fixed-routes-for-bus-hailing-system>

<https://www.newswire.ca/news-releases/innisfil-and-uber-announce-expansion-of-canadas-first-ridesharing-transit-partnership-676932213.html>

<https://www.iphoneincanada.ca/news/belleville-bus-hailing-transit-success/>

<https://www.intelligencer.ca/news/local-news/belleville-transit-getting-more-convenient-for-passengers>

