NEW TECHNOLOGY, OLD PROMISE: USE OF RIDE SHARING AND RIDE SOURCING TO ADVANCE TRANSPORTATION DEMAND MANAGEMENT STRATEGIES

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New Technology, Old Promise: Use of Mobility Technology to Advance Transportation Demand Management Strategies

by

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INTRODUCTION

Transportation Demand Management (TDM) is a general term referring to a host of public and private strategies that result in more “efficient use of roads”. TDM covers a host of programs and services that enable people to have access to destinations without having to spend a considerable amount of time to get there. Since the advent of automobiles for mass use in the 1950s, increasing numbers of people drive alone to work, school and other destinations, prompting transportation authorities to begin introducing strategies aimed at reducing the number of people that drive alone starting in the 1970s (Hudson, Miller, Moran, & Bricka, 2015). The overall goal of TDM is to reduce or eliminate the general populace’s need to drive. In Canada, TDM is multi-jurisdictional: the federal government has a primary responsibility for fuel consumption, emissions and safety standards and the power to increase fuel taxes; provincial governments also have the power necessary to impose gas taxes and the power to regulate car registration; And regional and municipal governments have power over transportation planning as they regulate the land use and manage TDM strategies (Robinson, 1997).

FIGURE 1 VANCOUVER BIKE SHARE PROGRAM. THE BIKE SHARE PROGRAM OF THE CITY OF VANCOUVER IS ONE OF THE MANY TRANSPORTATION DEMAND MANAGEMENT PROGRAMS SPEARHEADED BY THE CITY OF VANCOUVER.
There is much debate about who should tend to the mobility needs of city residents (Schabas, 2012). Most cities have been very efficient at fulfilling basic transportation needs such as providing bike lanes, paved roads and connected sidewalks. Yet while many local governments have been proactive in reducing congestion, most regions of North America remain car dependent. This is partially because municipalities lack adequate geographical and financial capacity to provide adequate TDM services to their residents. In addition, transportation is a regional activity and people often cross municipal boundaries to go to work or school (Schabas, 2012).

Transportation authorities are organizations that act in the interest of the public with responsibility for a functioning and integrated transport system within their area (Kellermann et al., 2012). Transportation authorities are responsible for the “planning, organization and financing of public transport” (Kellermann et al., 2012). They ensure that public transportation has priority on the roads and that public transportation is easy to use. They advocate for services such as fare management, integrated ticketing and scheduling and marketing campaigns. High functioning transport agencies have other responsibilities such as managing land use, urban planning, street management, parking policy, and business settlement policy. Such agencies might be considered a “mobility and urban development agency” (Kellermann et al., 2012, p.5).
Transportation authorities play a significant role in how mobility is understood and approached and what transportation demand management strategies are implemented. Considering the complexities of today’s urban areas, some scholars argue that the role of transportation authorities should evolve to reflect the complexities of today’s transportation systems (Cass & Faulconbridge, 2016). The image below summarizes some of the services offered by TransLink, the regional transportation authority in the Greater Vancouver Regional District.

![Services Offered by TransLink](image)

In this report, I explore ways in which regional transportation agencies can benefit from technology-enabled ridesharing and ride-sourcing systems. Ridesharing refers to services such as carpools and vanpools, as well as real-time ridesharing services in which people use a mobile application to find rides. Ridesourcing is a type of ridesharing in which the driver and the passenger connect using a mobile application such as Uber and Lyft. These services sometimes overlap, for instance in the cases of UberPOOL and Lyft Line, allowing drivers to carry extra passengers riding the same route (What is Shared-Used Mobility?, 2016). Mobility sharing falls into two categories; sequential and concurrent sharing. Sequential sharing pertains
to users taking turns using cars, bikes, and other modes of transportation, while concurrent sharing refers to multiple riders using a vehicle at the same time. While there are some benefits unique to sequential sharing, concurrent sharing has the highest potential for reducing the number of cars on the road (Taylor, et al., 2016).

FIGURE 4: AS A RESULT OF A PARTNERSHIP BETWEEN UBER, MEMPHIS AREA TRANSIT AUTHORITY AND GOTRIANGLE TRANSIT AUTHORITY RIDERS IN TENNESSEE, RALEIGH/DURHAM AND NORTH CAROLINA CAN INCORPORATE TRANSIT RIDES AND UBER RIDES IN THEIR TRIP PLANNING

I first envisioned carrying out this research project when I was commissioned to devise a demand management strategy for staff working at the Vancouver Police Department’s Graveley campus. Through consultation with VPD staff I learned that many of them feel they have no other “choice” but to drive alone as no alternatives are available to them or because they do not know how to access alternative services. What surprised me was that 40 percent of people who responded to my work commute survey indicated that they want to change their mode of transportation, but do not know how.
My observations were in line with the national trend in work commutes. According to a national study done by Martin Turcotte titled “Commuting to Work: Results of the 2010 General Social Survey”, the majority of Canadians commute to work alone in their personal vehicles. In 2010, 82 percent of all Canadians commuted to work by car, 12 percent took public transit and 6 percent walked or cycled (Turcotte, 2011). Turcotte concluded that this was mainly due to the average transit commute time being nearly twice the average vehicle commute time (44 minutes versus 27 minutes), despite transit trips covering shorter distances on average. Another reason that Canadians use their cars is that living in low-density residential areas is not conducive to taking transit (p. 33).

**FIGURE 5 MODAL SPLIT IN METRO VANCOUVER**
RESEARCH QUESTION

Motivation

Two demand management planners at TransLink and two with the City of West Vancouver were consulted to better understand the magnitude of the issue at hand. In conversations with the planners, it was shared that although the Greater Vancouver Regional District (GVRD) has one of the most progressive transportation authorities in North America, with a demand management mandate, the range of demand management services in the region remains limited. The planners that I spoke with pointed to the need for a unified coordinated strategy that governs demand management in the region and has the capacity to use technology to advance the demand management agenda.

Research Questions

The following research questions were explored:

1. What opportunities does the new technology has presented to transportation authorities?
2. How does new telecommunication technology enhance the ability of transportation companies to pursue demand management strategies?
3. What governing features enable transportation authorities to be flexible and use alternative approaches to a traditional utility approach to transportation?
4. What are the regional implications of Questions 2 and 3 for transportation planning and governance in the Lower Mainland?*

*In this report Lower Main Land and Greater Vancouver Regional District (GVRD) are used to refer to the geographic area that is governed by Metro Vancouver Regional District
Research Objectives

Based on the research questions above the following research objectives were devised:

1. Review the existing literature on how North American cities are pursing demand management in the era of telecommunication;
2. Review the existing literature on how transportation authorities are learning to grow their scope of operation in response to the evolving mobility paradigm.

Literature Review

Official publications from key transit advocating agencies such as Shared Mobility Center, United States Department of Transportation and Transit Center were surveyed. In addition, the following databases were used to locate relevant reports, scholarly articles and official documents: Google, Google Scholar, UBC Library, Transport Policy Journal, and Colwiz. Keywords used in search queries included: “transportation demand management”, “governance of transportation demand management”, “Lower Mainland demand management”, “definition of demand management”, “the impact of urban mobility”, “mobility pricing and mobility culture”, “between public and private transportation boards”, “good transit governance”, “governance structure of transit authorities in Canada”, “governance of transit and shared mobility”, “public transit challenges”, “regional governance structure in Canada”, “sustainable mobility paradigm”, “tdm reducing demand”, “wireless Communication Applications for Transportation”, “shared mobility”, “transportation network companies”, “governance in public transportation”.

While TDM is a vast field and encompasses many stakeholders, this report mainly focuses on two areas: ridesharing and ride-sourcing through the introduction of mobile technology, and governance characteristics which enable transportation agencies to take advantage of these new innovations.
BACKGROUND AND REGIONAL CONTEXT

Congestion in GVRD

The Greater Vancouver Regional District (GVRD), also known as Metro Vancouver, has one of the worst congestion problems in North America, coming second only to Los Angeles, a city whose name is almost synonymous with traffic congestion (Metro Vancouver traffic congestion 2nd worst in North America, 2013). The reduction of road congestion and decrease of the residents’ dependency on their cars are important issues that needs to be addressed if Metro Vancouver is to continue to be one of the most livable regions in the world. In addition to livability, sustainable growth in Metro Vancouver is dependent upon reducing stress on the roads. According to the Regional Growth Strategy and the Mayor’s Plan, an additional 1 million residents and 600,000 jobs are expected to arrive in GVRD by 2040. If GVRD is to manage this growth in a sustainable and ecologically sound manner, strategies need to be put in place to manage the added demand on the roads. The following graph illustrates the anticipated growth in the region:

FIGURE 6 GRAPH OF POPULATION, EMPLOYMENT AND DWELLING GROWTH IN METRO VANCOUVER
Like most big Canadian cities, congestion in Metro Vancouver is a direct and indirect result of 40 years of building roads, followed by low transportation spending budgets in recent years, an interrupted and insufficient rapid transit network, and most importantly, a road network that is underpriced and overused (Arnold 2011, p 2). The cost of road maintenance, combating air pollution, and road construction is almost exclusively absorbed by the government making driving “artificially cheap in terms of money, and artificially expensive in terms of time” (Arnold 2011, p 2). As a result, the main road arteries in the region become heavily congested during peak periods of the day, which is predicted to get worse as the region grows.

![Map showing travel time between Surrey and Vancouver during peak and off-peak hours.](image)

**FIGURE 7 ESTIMATE OF TRAVEL TIME BETWEEN SURREY AND VANCOUVER DURING PEAK AND OFF-PEAK HOURS**

More recent research, conducted by the firm TomTom using GPS data from millions of road users, indicates that travel times in Metro Vancouver are 45 percent longer during the morning rush hour and 61 percent longer during the evening rush hour when compared with times when traffic is flowing freely. They estimate that a daily commute of 30 minutes could add up to almost 83 hours in traffic per year (CBC, 2013).

In addition, the areas around rapid transit lines are vulnerable to gentrification (Jones, 2015). This pushes low income community members further into the suburbs, a trend that is also observed in other parts of North America (Madden, n.d.). As a result some of the fastest growing areas in Metro Vancouver do not have access to rapid transit lines (“Surrey, Port Moody Fastest Metro Vancouver Growers in New Census,” 2012). Strategies are needed to ensure that people have access to reliable mobility options when not on major transit lines.
The image below is taken from a recent study about how walkable this region is. As the map below illustrates as we move away from rapid transit lines, residents’ car dependency increases.

Figure 8 Car, truck or van commuters in relation to existing and proposed transit services routes and areas in Metro Vancouver. Metro Vancouver My Health, My Community Survey 2013 – 2014

High levels of traffic and congestion is not unique to Metro Vancouver or even to North America. It is a global trend that needs to be mitigated (Tillema, Ben-Elia, Ettema, & van Delden, 2013). It has been proven that building more roads does not alleviate the congestion levels as the added capacity will soon be taken up by new road users (Goodwin, n.d.; Ladd, 2012). The most recent decision by the Mayor’s Council to reject the 3.5-billion-dollar bridge to replace the George Massey tunnel attests to the growing desire within the region to steer away from continuous road expansion (Metro Vancouver mayors reject replacement of Massey Tunnel with 10-lane bridge, 2016). Comprehensive transportation demand management (TDM) has long been seen as an answer to the ever growing reliance on automobiles (Robinson, 1997; “Victoria Transport Policy Institute,” 2016). Comprehensive TDM strategies often encompass “hard infrastructural decisions, as well as soft policy measures that foster attitude change (Fujii et al., 2009 cited in Zhang, Stopher, & Halling, 2013). The rapid increase in availability of telecommunication
technology has created new opportunities for transportation authorities to pursue demand management (Taylor, et al., 2016; Hudson, Miller, Moran, & Bricka, 2015). In the next sections sample of these opportunities are explored.
History of Transportation Planning in the Greater Vancouver Regional District

The Greater Vancouver Regional District (GVRD) oversees the development of the region and provides services such as water, sewage, solid waste disposal, 911 emergency telephone and labour relations. GVRD is governed by a Board of Directors comprising 32 locally elected representatives, and has long advocated the provincial government for larger power over transportation. This goal was fulfilled in 1999 and TransLink was constituted (Puil, 1999).

TransLink is a “single political authority for regional roads, transit, transportation, demand management, promotion of transportation alternatives, and vehicle emission control” (Puil, 1999, p.1). TransLink derives its revenue from “fares, fuel tax, fuel taxes, [and] parking sales taxes”, and “has the power to implement additional revenue sources such as vehicle charges, parking taxes, tolls, [and] other user charges” (Puil, 1999, p. 1).

Initially it was said that the new authority “must operate within the Greater Vancouver Regional District’s policies and plans for growth management” (p. 1). Since TransLink’s inception, TransLink was set out to achieve control over “transit and transportation demand management, to establish a network of major roads within the region and to implement the livable region strategic plan/transport 2021” (p. 8). The legislation gives power and authority to TransLink to “plan, develop and operate urban transportation services in Greater Vancouver”, “to provide transit, support for a major road network, transportation demand management services and vehicle emission control services” (p.8). TransLink has the regulatory and pre-emptive power to approve “independent transit services”, expropriate property and power to establish fares, charges and taxes. TransLink is mandated to support “carpool/vanpooling, regional parking strategy, road pricing, and other strong measures” and is capable of influencing transportation demand (p. 9).

There has been some conflict between the municipalities and the province over how much authority GVRD should have in setting regional priorities for TransLink. This conflict peaked at the time of the construction of the Canada Line when the provincial government disregarded the regional transportation priorities set out by GVRD (Tylor, 2013 cited in Schabas, 2012). In 2007, the province changed the structure of TransLink and effectively removed the “GVRD’s influence over the TransLink board...through the removal of elected politicians from the TransLink Board” (Schabas, 2012 p. 84). The implication of this separation is discussed in a future section.

Overall, TransLink has played a significant role in increasing transit ridership. Researchers looking at GVRD and Metro Toronto have concluded that since TransLink’s inception in 1999,
transit ridership has been increasing in the region at a growth rate that is 4 times faster than the rate of population growth. In the period between 2000 and 2010, the average resident’s annual trips on transit increased from 66 to 93, an almost 41 per cent increase (Schabas, 2012). At present, the Toronto and Vancouver census metropolitan areas remain leaders in North America for transit use (Schabas, 2012, p. 9). In both Toronto and Metro Vancouver, transit ridership has been on a rise as a result of the presence of a unique regional transportation system.

Figure 9 SKYTRAIN AT RUPERT STATION, VANCOUVER

While it is commonly acknowledged that there is a need for a regional structure that promotes the transit needs of an entire region, little is known about the exact structure that is optimal for promoting transit use (EnoCenter for Transportation and TransitCenter, 2014).
Below are some governance elements that have been identified as contributing to the success of transit authorities that have been identified as being present in TransLink. Presence of these characteristics contributes to the capacity of transportation authorities to pursue demand management. Over all having higher level of power over decision making allows transportation authorities to make plans and implement them.

<table>
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<tr>
<th>Element of strong transportation authority</th>
<th>TransLink’s Structure (on scale of 1 to 5 some of the results are based on a study done by Acuere Consulting (2013)).</th>
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<td>The presence of a regional body with adequate fiscal responsibility and jurisdictional authority, which enables creative solution finding (Schabas, 2012, p. 11)</td>
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<td>Intervention of the regional government (EnoCenter for Transportation and TransitCenter, 2014)</td>
<td>❀❀❀</td>
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<td>Transit structures that are easy to navigate. Transit structures that simplify the customer’s experience by providing centralized fare structure and planning.</td>
<td>❀❀❀❀</td>
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<td>There is a way for riders and localities to have direct input into the operating decisions and capital planning</td>
<td>❀❀❀</td>
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<tr>
<td>Transportation agencies are involved in land use decisions(Enocenter for Transportation and TransitCenter, 2014, p. 34).</td>
<td>❀❀❀</td>
</tr>
<tr>
<td>Local government bodies have fiscal autonomy, jurisdictional flexibility and involve local transit operating knowledge in transportation policy formation (Schabas, 2012).</td>
<td>❀❀</td>
</tr>
<tr>
<td>The board selection process that is representative of the entire region (Enocenter for Transportation and TransitCenter, 2014)</td>
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MOVEMENT TOWARDS SUSTAINABLE MOBILITY

Introduction to Sustainable Mobility Paradigm

Suburban living, sprawl and lack of access to transportation alternatives are often the reasons that people drive (Cosgrave, Tryfonas, & Crick, 2012). As land-use planning directly impact people’s access to sustainable transportation options, to create opportunities for people to reduce their reliance on automobiles, regions around the world are increasingly seeing transportation systems as a part of other integrated systems within a region and striving to create synergy between land use planning and transportation planning. In this section, I explore some of the theoretical implications of this movement towards sustainable mobility and integrated mobility management for transportation authorities as it relates to technology enabled mobility options.

Since the rise of the automobile in the 1950s, the quality of most transit systems have been in decline and many transit companies face financial difficulties. Today public transportation is often synonymous with public transit and refers to a network of buses and trains that run within certain parameters, often the boundaries of a city. These modes provide a rather small amount of flexibility as routes are fixed and carrying capacity and service schedules are always set to maximize the system’s efficiency over its convenience. Public transit systems are often publicly owned and operated, which implies that most decisions related to urban mobility are made by political bodies under tight budget constraints and competing priorities. In such an environment, transit systems are sometimes perceived as social good with certain groups such as the elderly, low income families and students as the “captive audience of the [public] transportation systems” (Chapter 6 - Urban Transportation, 2016), causing many to believe that transit systems lack a competitive market edge (Molander, Fellesson, Friman, & Skålén, 2012).

As argued by the United Nation's report on Sustainable Development (UN Habitat for Better Urban Transport, 2013), the main goal of transportation systems is to enable people to have access to destinations, activities and goods. The Sustainable Mobility paradigm focuses on reducing the need to travel, “to promote modal shift, to reduce trip lengths, and to increase the efficiency of public transport systems” (Gori, Nigro, & Petrelli, 2012, p. 153). Overall, sustainable mobility is about helping people gain access to opportunities rather than simply helping people move. It is based on the understanding that creating more sustainable transportation systems is not a matter that can only be resolved by use of technology or building more roads, and a
“broader structural and societal transition is needed in technology, the economy, culture, behavioural patterns and institutions” (Nunen, Huijbregts, & Rietveld, 2010, p. 5).

Overall, the sustainable mobility paradigm seeks to (Banister, 2008):

1) Reduce the need to travel;
2) Introduce land-use policy measures which contribute to distance reduction;
3) Create a new transport hierarchy through reallocating space to public trans;
4) Encourage technological developments that facilitate walking cycling, ridesharing and ridesourcing.

Regional transportation authorities play a substantial role in how mobility is understood and approached in a region. For many decades transportation planning was approached as “utility planning” (Cass & Faulconbridge, 2016) and transportation authorities were seen as bodies that “optimize” the performance of pieces of infrastructure and move as many people as quickly as possible. The sustainable mobility paradigm helps us see that urban transport is a derived demand that arises from how we arrange people, jobs and opportunities. Today, strong transport authorities approach their role as “debate and decide”, focusing on outcome, urban form, environment and other ecological factors (Acure Consulting, 2013). Various cities and regions across the globe have devised different arrangements to attend to the mobility needs of their citizens. Some transportation authorities have control over the operation of buses and trains only, while others have a broader mandate and control and regulate all aspects of how roads are used (Kellermann et al., 2012). As it was illustrated in the previous section, the broader mandate often enables transportation authorities to have a greater say in how roads are used and enables them to implement more rigorous TDM strategies (Hudson, Miller, Moran, & Bricka, 2015).

Beyond Compact Growth: The Role of Integrated Demand Management Strategies in Modal shift

As we have established, movement towards sustainable mobility encourages the application of integrated demand management strategies and the incorporation of various elements of land-use planning in transport planning. This results in creating walkable, mixed-use communities (Nunen, Huijbregts, & Rietveld, 2010). While we can reduce the need to travel through creating compact communities, implementing other strategies that influence people’s behaviour and change their attitudes is also important (Zhang et al., 2013). Expensive studies in the United States and Europe have shown that land use has a relatively small impact on overall travel patterns (Aditjandra, Mulley, & Nelson, 2013). To reduce the demand for travel, planning
policies must be implemented that work on people’s attitude towards alternatives to driving alone as residents have to know that “opportunities exist” for them to pursue different travel patterns. These policies need to be supported “with adequate infrastructure and supporting facilities to [help] residents to pursue low carbon-based travel behaviour” (Aditjandra, Mulley, & Nelson, 2013, p.64). To create opportunities for people to reduce their reliance on automobiles, regions around the world are experimenting with integrated demand management strategies. The chart below illustrates the broad range of strategies that transportation authorities can pursue, often in tandem, to reduce demand (“Victoria Transport Policy Institute,” 2016). An integrated demand management strategy usually has elements of all of these categories. Later in this report, we explore some elements of governance structures that allows transportation authorities to utilize many of these strategies.

**Figure 10** A taxonomy of travel demand management (TDM) strategies
Role of Ridesharing and Ridesourcing in Creating Integrated Demand Management Strategies

As previously mentioned, to reduce people’s reliance on automobile it is important to implement policies that change people’s perception of alternatives to driving alone and provide infrastructure that makes the change to low carbon alternatives possible and relatively easy. Technology has opened new doors in this regard. Technology is rapidly altering the way in which people interact with transportation systems. Information and communication technology (ICT) is altering our concept of mobility and casing a shift from automobiles to “regime of multi mobility”, (Lyons, 2014 cited in Fonzone, Viti, & Schmocker, 2016, p. 311). Through the use of technology the traditional “system-based demand” in which travelers purchased ticket for one mode of transportation is being replaced with “service-based demand” in which travels purchase a bundle of mobility options mostly through the use of smart phone technology. Millennials who will be the majority of travelers in coming year prefer this type of services as they provide flexibility and allows them to work and socialize as they travel (Fonzone, Viti, & Schmocker, 2016, p. 311).

Smartphone technology has enabled large number of people to “request, track and pay for trips via mobile devices” (Shared-Use Mobility Centre, 2016, p. 3). The mobility on demand menu includes services such as: carsharing, bikesharing, microtransit services, and most importantly transportation network companies (TNCs) such as Uber and Lyft. All these services fall under an emerging movement towards a micro-shared economy, in which people connect to others in their community to fulfill various needs. While TNCs are major players in this field, all forms of shared mobility are growing in recent years and have made impacts on reducing greenhouse gas (GHG) emission, reducing car dependence and possibly even car ownership (Taylor, et al., 2016).
Dynamic ride sharing services automatically match drivers and rides in their geographical vicinity. Smart phones are used to request rides, arrange them and pay for services. Drivers are notified that there is a person in their vicinity that needs a ride and are given the location of the individual. In ridesharing services or peer to peer sharing the driver is reimbursed for some of the costs associated with driving, such as gas and tolls. In taxi-like services the driver is an independent contractor acting much like a taxi driver. Fees are established by the service operator and drivers tend to try to accommodate the riders spatial and temporal needs (Rodier, Alemi, & Smith, 2016). Companies like Uber and Lyft provide platforms for the interaction between the driver and the passenger. Drivers usually receive 80 percent of the fare and the rest is received by the company (Rayle, Shaheen, Chan, & Dai, 2014). The demand for this kind of services have increased significantly in recent years. For instance, as of January 1, 2014, there were 1,228,573 car share members in the US sharing 17,179 vehicles and 24 operators (Kodransky & Lewenstein, 2014).
FIGURE 12 ALL COUNTRIES WITH UBER JOB LISTINGS.

The map above illustrates all the areas of the globe in which Uber is hiring drivers, clearly illustrating the extent of Uber’s operation. Other services, such as carsharing companies like Car2Go and Evo, are also widespread today. For instance, 26 countries across the globe have some sort of carsharing program and carsharing’s share of overall trips is increasing (S. A. Shaheen & Cohen, 2013).

Ridesharing through TNCs can influence people’s ability to access TDM strategies and can enable them to use public transit in new ways. This is because using ridesharing services can lead to significant lifestyle changes. Of 4500 people who were surveyed by researchers from the Shared-Use Mobility Centre (Shared-Use Mobility Centre, 2016), during their research on the relationship between ridesharing and public transit, many indicated that they “have become more physically active since they are using a ridesharing mode” (P.8) and 30 percent reported that they now drive to work less. These services often boost transit ridership as well.
The graph below shows how, regardless of income, people who use shared mobility take public transit most frequently.

FIGURE 13 TOP SHARED MOBILITY CHOICE BY INCOME LEVEL.

The Relationship between Ridesharing, Ridesourcing and Transit Use and Vehicle Mile Travelled

Public transportation services such as buses and trains follow fix schedules, and fixed level of service. Many scholars have advocated for transport services that fall in between the bus and train and the personal car. The concept of para-transit was introduced in 1970s to refer to "all various forms of flexible transportation that do not follow fixed routes or schedules such as shared taxis or carpooling" (Martinez et al., 2015, p.475). These services often fill a gap in the transportation system and allow user flexibility and level of service that buses and trains cannot accommodate. Services such as ride sharing and ridesourcing have the potential of acting as para-transit services and increase access to alternative modes of transportation for people who drive alone. Two questions should be explored:

1) what are some barriers that prevent people from taking transit and can ridesharing and ridesourcing remove some of these barriers;

2) If the overall goal is to reduce Vehicle Mile Travelled (VMT) and congestion, how do these services contribute to that goal.
A number of researchers have explored people’s attitude towards driving vs. taking public transit (Innocenti, Lattarulo, & Pazienza, 2013; Shaheen & Cohen, 2013; Tillema, Ben-Elia, Ettema, & van Delden, 2013; Zhang, Stopher, & Halling, 2013; Martinez et al., 2015; Gardner & Abraham, 2007). Gardener and Abraham (2007) have compiled a list of reasons why people drive to work. They have identified two category of driving motivations. The categories are listed in the table below.

**Instrumental or Utilitarian Motives**

- Cost
- Convenience
- Flexibility
- Physical effort
- Travel time

**Affective Motives**

- Experience of driving and habits
- Perceived stress
- Excitement
- Safety
- Autonomy

**FIGURE 14 LIST OF REASONS THAT PEOPLE CHOSE TO DRIVE (GARDENER AND ABRAHAM, 2007)**

Other researchers studying people’s attitude towards public transit have shown that people tend to favour driving and down play its negative aspects. In one study it was found that people tend to exhibit preference for cars even when it is not in their economic interest. This relates to the fact that cars are often symbol of status and freedom (Steg 2003 cited in Gardner & Abraham, 2007). Some researchers have argued that travel choices are determined not just rationally but also by “variety of psychological factors and subjective attitudes such as habits and emotions which should be analyzed and taken into consideration” (Innocenti, Pazienza, & Lattarulo, 2013, p.167). They conclude that transport policies should work at changing people’s cognitive perception of their choices. Research on the qualities of transport systems that attract car users by Redman, Friman, Garling and Hartig (2013) confirms this point and adds that people switch from driving to taking public transport when services are reliable and frequent. Beyond this basic expected service level, the characteristics that attract car users are largely connected to
“individual perception, motivations and contexts” of the individual (Redman, Friman, Gärling, & Hartig, 2013, p165). The chart below summarizes some of the attributes that increase the desirability of public transport systems:

![Diagram showing factors influencing public transportation decision](image)

**FIGURE 15 FACTORS THAT INFLUENCE PEOPLE’S DECISION TO TAKE PUBLIC TRANSIT (REDMAN, FRIMAN, GÄRLING, & HARTIG, 2013)**

Ridesourcing and ridesharing can increase the desirability of public transportation systems in a number of ways:

1) **Price:**

The cost of ridesharing is less than taking a taxi, making this option more affordable for many (Rayle et al., 2014). Some transportation authorities have considered integrating these modes into the existing payment structures in their region through the use of smart cards (Fonzone, Viti, & Schmocker, 2016) and others have tried to make them more affordable. Research on the role of shared mobility in connecting low income people to jobs, has shown that Integrated fare systems which allow users to pay for multiple modes of transportation using a single card can reduce the cost of the system over all (Kodransky & Lewenstein, 2014). Some transport agencies use partnership with mobility providers as a
way of reducing the cost for users. Southeastern Pennsylvania Transportation Authority, SEPTA, has an agreement which allows SEPTA Regional Rail riders to receive a $15 credit towards an Uber ride from the trail station to their home. In addition, riders receive a 40% discount for rides that begin or end in the station parking lot (“SEPTA and Uber Announce Transit Partnership | SEPTA,” 2016).

2) Reliability, frequency and speed:

Ridesourcing and ridesharing increase people’s access to destination without having to worry about being left stranded. Participants in a study conducted by Rayle et al. (2014) indicated that they had to wait less time for their ride to arrive in comparison with waiting for a taxi. Also, these services are often available late at night when buses do not run frequently. In some cases special arrangements have been made to encourage these services to cover areas that previously had no access to public transportation (Kodransky & Lewenstein, 2014). People can enjoy the benefits of being driven in a car, being picked up and dropped off in their desired location rather than pre-fixed stations.

3) Access:

By covering the first and last mile these services improve the access to the public transportation network. In many jurisdictions it is now required for shared mobility services to run in low income communities. Some researchers believe that this could open many doors for low income residents to access transit networks (S. Shaheen, Cohen, & Zohdy, 2016; Kodransky & Lewenstein, 2014). In Atlanta getting to and from transit stations might be difficult. In partnership with the Metropolitan Atlanta Regional Transportation Authority, UBER offers services to cover the last mile home (Uber & MARTA: Connecting The Last Mile,” 2016).

4) People’s perception:

Ridesharing technology can change people’s perception and create desirability for some previously declining modes. Take for instance carpooling, which used to be a popular mode of transportation, with people hailing rides around the community being a common occurrence. With increases in private automobile use and privatization of family life, carpooling saw a huge decline. New TNCs’ approach to carsharing and ridesourcing has put carpooling back on the table as an easy, hassle-free transportation option (Taylor, et al.,
One of the primary reasons that people drive to work is because they are afraid of being left stranded away from home late at night (Victoria Transport Institute, 2014). In California, the transportation authority now pays for trips taken by Uber as part of the guaranteed ride home program which covers emergency trips home for transit users (S. Shaheen et al., 2016). The added reliability improves the public’s perception of the need to drive (Shared-Use Mobility Centre, 2016). In addition, this added reliability enables people who do not like taking buses and trains to have alternative options.

5) Reduction in Vehicle Mile Travelled (VMT):

Ridesharing provides a new mode of transportation. It is argued that ubiquitous ridesharing “may result in a series of interrelated behavioral and system-level effects – with both positive and negative impacts – on congestion” (Rodier, Alemi, & Smith, 2015, p. 3). One study from New York has illustrated that sharing rides between multiple people can reduce the number of travelers on the road by roughly 40%. This is because mobile applications can easily allow people to pick up another person on their way to work, or in case of using UberPool, multiple people can share a ride (Rodier, Alemi, & Smith, 2015, p. 3). Several models estimate that VMT can be reduced by 25% for people who use a peer-to-peer ride-sharing system. One study in Switzerland found that between 47% and 87% of all trips made in daily bases can be matched into two-person carpool. Potential changes to travel patterns and (VMT) is outlined in the table in the next page (Rodier, Alemi, & Smith, 2015).
As illustrated in this section, there are a number of barriers that prevent people from using public transportation including accessibility, perception and level of service. Some of these barriers can be alleviated by introduction of ridesourcing and ridesharing as they provide reliable, and convenient services that resembles that of automobile. As these services allow multiple people to share a car the researchers believe that they can still reduce the overall VMT.
MANAGEMENT OF RIDESHARING AND RIDESOURCING

Regulatory Considerations for Transportation Authorities

Research by Rayle et al. (2014) illustrates that there is a latent demand for ridesharing and ridesourcing services and that ridesourcing and ridesharing "serves a previously unmet demand for convenient, point-to-point urban travel" (p. 1). They also show that the experience of users is significantly different than that of using a taxi, making these services more reliable and convenient. Wait time for ridesourcing services, for instance, tend to be shorter than that of taxi. They also show that those using the services tend to be younger and own fewer cars. They argue that by providing an “attractive alternative to driving alone, these services can reduce auto use” amongst some section of the population (p.1).

Considering the widespread use of shared mobility, researchers exploring the relationship between public transit and shared mobility have concluded that (Shared-Use Mobility Centre, 2016, p. 3-4):

Since these modes will “continue to grow,” public entities should identify various opportunities to “engage with them to ensure that their benefits are widely and equitably shared…” It is important for transit agencies to seize opportunities to “improve urban mobility for all users through collaboration and public-private partnerships including greater integration of service, information and payment methods.

In addition, millennials, who will be the prevailing cohort of travels in near future, prefer public transportation as it allows them to work and use social media during travel time. Ridesharing and ridesourcing seem natural to millennials as sharing information as well as sharing resources seems to be a prevailing characteristic of this age group. As a result, some scholars suggest that our very notion of public transportation should evolve to accommodate this change in mobility regime. Public transportation may no longer only encompass publicly owned and operated services as now with few clicks one can arrange a ride from another resident. This is a function that was not previously possible (Fonzone, Viti, & Schmocker, 2016).

A number of transportation authorities have already made arrangements to work with new shared mobility providers (S. Shaheen, Cohen, & Zohdy, 2016). There has been collaboration between transit agencies and bikesharing and carsharing companies already, but increasingly more agencies are also partnering with ridesourcing companies. Though more cities are
becoming accepting of ridesourcing, regulation of these services is still a contentious topic (Agatz, Erera, Savelsbergh, & Wang, 2012).

Various cities have adopted different approaches to regulate these mobility trends (S. Shaheen, Cohen, & Zohdy, 2016). The United State’s National Research Council’s Committee for Review of Innovative Urban Mobility Services recommends that “policy makers and regulators should formulate public policies and regulations designed to steer the development of innovative services to improve mobility, safety, and sustainability” (Taylor, et al., 2016, p. 4)

So far regulating ridesharing and ridesourcing has been challenging. For instance, scholars have pointed out that ridesourcing differs from ridesharing, which involves the grouping of travellers into a private car with the goal of reducing VMT and congestion. Ridesourcing shares many characteristics of the taxi companies but it is different from taxi services in that it allows drivers to use the excess capacity in their own car for financial gain. Because of these differences new policies need to be instated to deal with these services. In California, for instance, after much struggle lawmakers created a new category of motor vehicles called Transportation Network Companies (Rodier, Alemi, & Smith, 2015). This different category allows the law maker to distinguish taxi services from ridesharing and regulate it accordingly. Some people believe that ridesharing is no different than taxi services and should be regulated the same. While there is truth to this statement, by comparing taxi data and ridesourcing data researchers from California have found that ridesourcing serves a similar demand to taxi but some of the characteristics of the users differ considerably (Rayle et al., 2014). In addition, it is feared that regulations and monopolistic behaviour that restrict supply in taxi industry can cause reliability and service problems in ridesourcing (Rayle et al., 2014).

Below are the main issues that need to be consider when transportation agencies consider regulating or collaborating with these services:
To address the challenges described above, researchers from the Shared-Use Mobility Centre concluded that transit authorities should act as “convener and gatekeepers”. They can control the service providers and “set the terms of agreement” (Shared-Use Mobility Centre, 2016, pp. 13-18). They can also migrate to new payment systems that makes the integration of these modes into transit systems easier, such as online payment options allowing customers to pay for multiple mobility services using the same card (Pelletier et al. 2011).

The following infographic illustrates the various regulatory areas that needs to be considered when introducing shared mobility (S. Shaheen et al., 2016):
Figure 18 THE ROLE OF PUBLIC AGENCIES IN SHARED MOBILITY REGULATION
In order for transportation authorities to keep up with the change in technology two integrated parts of their operation needs to change. The graph below illustrates these two components.

The hardware part of the transportation system should evolve to suit the new and emerging trends in mobility. Transit authorities should undergo structural change and “evolve into mobility agencies”. This allows public transit agencies to coordinate provision of transit along with “regulation of bikesharing, carsharing, resourcing, shuttles, parking, and curb access” (Shared-Use Mobility Centre, 2016, p. 33). This will allow transit agencies to create plans and policies for the entire mobility scheme with responsibilities that go well beyond acting as a utility provider.

What I call the software component of the transit system needs to evolve to help integrate public transit with shared mobility. Transit agencies need to take advantage of new technology to gather data about their services, create online payment options, and extend and integrate their payment systems with other modes when possible (Shared-Use Mobility Centre, 2016, pp. 31-33).

Figure 19 HOW TRANSPORTATION AGENCIES CAN EVOLVE
A Multiple-Pronged and Integrated Approach to Regulating Mobility

As discussed in the previous section, successful integration of shared mobility in transportation systems requires adequate policy support. Over all, there is a growing need for government agencies to pursue integrated strategies and polices based on measures that respond to today’s problems of mobility (S. Shaheen et al., 2016). A recent study in San Francisco Bay area has shown that a three pronged approach which includes road pricing, encouraging ridesharing and encouraging transit oriented development can significantly reduce the number of miles travelled. These kind of integrated policies require coordination and harmonizing of various policy makers (Rodier, Alemi, & Smith, 2015).

The governing schemes of transportation authorities can enable or inhibit this type of integrated and creative demand management approaches. This is because, the governance body’s decisions determine how funding is utilized, what priorities are set, how mobility is perceived and which projects go forward (Shared-Use Mobility Centre, 2016; Acuere Consulting, 2013). In places where transport planning has flourished and urban mobility is optimized without endless road expansion, there is clear policy direction from elected individuals, with goals and priorities being synchronized between land use planning and transport planning (Acuere Consulting, 2013). In the context of GVRD, this is an area that merits further study to better understand how transport planning and land-use planning are aligned. A recent study for instance, has shown that although GVRD has aggressive plans to reduce sprawl, many jobs are still created away from reliable bus networks or SkyTrains and hence reducing the capacity of the workers to use public transportation (Sykes, 2011). It can be argued that integrated strategies that encourage ridesharing and ridesourcing as well as taking public transit can help these workers get to work without needing their cars.

The regional transportation authority can also create a unifying approach to how various cities regulate taxi industry, ridesharing and ridesourcing within GVRD. As currently stands in British Columbia, the municipal councils and BC Transportation Board share the responsibility of licensing taxi like services. The municipalities are in charge of determining the number of taxis in their jurisdiction, issuing permits and determining the driver training (Ngo, 2015). This could potentially result in different regulations being implemented in municipalities that are within walking distance of each other. As transportation is a regional activity with many people travelling to different municipalities for work and school there has to be a harmonized regional approach to regulating taxi industry and by extension ridesharing and ridesourcing. In this regard TransLink can create unifying policies to oversee the development of ridesharing and
ridesourcing services within the entire region. This includes creating new by-laws to govern ridesharing and ride sourcing services and amending taxi by-laws (Kellermann et al., 2012). Creating such policy framework can create a unified approach to regulating Transportation Network Companies, peer to peer ridesharing and other forms of mobility on demand within the GVRD. This can also allow the regional government to regulate Transportation Network Companies’ level of service in low income neighborhoods and ensure that the services are accessible to those with mobility challenges (Shaheen, Cohen, & Zohdy, 2016).

As municipalities lack the regional perspective to independently manage these services in a manner that is beneficial to the entire region (Rassman, n.d.), it is natural then to turn to the regional government to provide a unified approach to how shared mobility is understood and implemented and how land-use planning is utilized to encourage reduction in VMT.

GVRD has a cooperative approach to the regional governance based on reciprocity between municipal governments in the Lower Mainland (Sykes, 2011). GVRD has been very successful at creating a unified land-use strategy within the region. GVRD’s approach can be beneficial in creating a unified demand management strategy within the region and unifying how various municipalities govern ridesharing and ridesourcing services.
In recent years, transportation decision making in the region has been challenging. The provincial government has been involved in a number of projects and have often opted for the more expensive capital projects, rather than more fine-grained demand management projects. It is not surprising then that little attention has been given to how technology can be used to introduce transportation demand management in the region. As moving forward, it is important that a holistic regional demand management strategy is implemented and a regional approach to introducing ridesharing and ridesourcing is considered. This will ensure that these new services do not simply stay in Vancouver and Burnaby, and reach the municipalities that need them.
CONCLUSION

The emergence of ridesharing and ridesourcing technologies has provided transportation authorities with new opportunities for partnership and collaboration. Regional transportation agencies that have a broader mandate and are accountable to public are able to use these opportunities. In GVRD TransLink operates the entire mobility scheme for the region. Many scholars point out that TransLink, although has a broad mandate, lacks the decision making necessary to execute its mandates. Many even point out that there is a lack of coherence between regional transportation priorities, regional planning goals and municipal decisions as TransLink does not have the jurisdictional power to have any input in land-use decisions and, in return, GVRD has limited input in how transportation decision are being made (Acuere Consulting, 2013)

This report reviewed the emerging literature on how transportation authorities can benefit from ridesharing and ridesourcing services. Based on the studies reviewed it is concluded that:

1) Development of and investment in a holistic regional demand management strategy is essential; public transportation infrastructure alone does not attract ridership;

2) Currently there is no ridesharing or ridesourcing company operating in Vancouver. Moving forward, the region can greatly benefit from these services, but they must be properly taxed and regulated;

3) Regional transportation authorities play an important role in administering transportation demand management strategies, and should be part of decision-making about new modes of mobility;

4) The current structure of TransLink separates it from regional governance and new ways to strengthen the connection between these entities should be explored, including further exploration of the role of the Mayor’s council in decision making processes, how to improve public engagement and municipal engagement in TransLink;

5) The governance structure of TransLink should enable the transportation authority to work closer with GVRD and municipalities to ensure that municipalities across the region are making and implementing unified demand management strategies.
Future Research needs:

1) Current status of transportation demand management in Canada, opportunities and challenges
2) Qualitative and quantitative research on the role of regional governance in demand management
3) Policy research in management of mobility on demand
4) Policy research on the status of mobility management in Canada
5) Policy research on the role of TransLink in regulating Transportation Network Companies
6) Research on how land-use planning is aligned with transportation planning in the region.


*New Solutions and Approaches for Sustainable Transport Systems* (pp. 247-266). New York, United States of America: Springer.


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http://doi.org/10.1016/j.tranpol.2012.06.008

FIGURES


9 SkyTrain at Rupert Station, Vancouver. SkyTrain Vancouver [Online Image].


Areas of Concern Regarding Regulation of Shared Mobility Services Information Adopted from Shared-Use Mobility Centre. (2016). *Shared Mobility and The Transformation of Public Transit*. Shared-Use Mobility Centre, Chicago.


