

Mobility as a Service

This paper is based on work completed as part of The University of Minnesota's Transportation Futures Project. More information about The Transportation Futures Project can be found on the [project homepage](#).

INTRODUCTION

Recently, there has been an increase in innovation of transportation choices available to consumers. While the modes available have not changed substantially, the delivery and means of accessing them has. Currently, many cities have programs in place to share cars, rides, and bicycles.

For the most part, personal motorized and non-motorized modes have always been considered a good—one that is owned by one or very few (in terms of a single family). However, companies have recently been developing models of sharing these goods, creating a market where these previously owned goods may be shared among many as a service that can be easily accessed and called upon to get you from point A to B. This is part of the greater “sharing economy”—the market of many types of goods owned by a single entity (be it large company or single owner), but rented or “shared” by many others.

Renting and “sharing” a vehicle isn't a new concept. However, cars and taxis have been traditionally rented in a way that was inconvenient or costly for customers¹. For example, a vehicle rental would usually require a trip to a rental center typically located in airports, central business districts or auto dealerships. In many urban areas, it is now possible to rent cars and rides from individuals with excess capacity at the push of a button through a smartphone app.

The degree to which American and international markets have embraced shared mobility varies depending on several reasons that will be discussed in this paper. Minnesota, and in particular the Twin Cities metro area, has seen shared mobility expand rapidly since modern car and bike sharing began locally over ten years ago.² To better understand the role mobility as a service might play in Minnesota's future, it is important to have a better grasp of shared mobility, its presence outside the region, as well as an understanding of innovation and future trends in the market.

CARSHARING

“Carsharing” is a marketing term for modern short-term car rental services. There are a number of different types of carsharing occurring both locally and elsewhere. However, they all currently rely on mobile information technology to streamline the system for their customers. The use of this technology allows the customer and the company to avoid the logistics of repetitive contract negotiations that are common in more traditional vehicle rentals.³

Models of Car Sharing

Traditional or round-trip carsharing. The most common model is one where the services and vehicle fleet are owned by a private for-profit company (although there are a select few non-profit companies). The cars are parked and stored at designated locations, reserved by members for a set amount of time, and returned to the initial location at the end of their reservation. The charge to the user is based on mileage driven, the duration of the trip, or some combination of both.⁴ Zipcar and HOURCAR are examples of round- trip carshare.

¹ Levinson, D. et al. “The Transportation Futures Project: Planning for Technology Change.”, Minnesota Department of Transportation Research Services & Library, 2015.

² “Car sharing - Good for drivers and for cities,” Star Tribune: Newspaper of the Twin Cities (Minneapolis, MN), March 12, 2005: 20A, accessed January 26, 2016, <http://infoweb.newsbank.com/resources/doc/nb/news/108DC3D28B19D39A?p=NewsBank>.

³ Levinson, D. et al. “The Transportation Futures Project: Planning for Technology Change.”, Minnesota Department of Transportation Research Services & Library, 2015.

⁴ [Shared Use Mobility Reference Guide](#)

One way or point-to-point carsharing. This type of carsharing is very similar to the traditional or round trip type, except the user is not obligated to return the vehicle to the same location from which it was first taken, as long as it is dropped off in the defined home boundary area. ⁵ Car2go is an example of point-to-point carshare.

Peer-to-peer (P2P). In peer-to-peer carsharing, a car owner may offer to make their personal vehicle available for rent. Using web based technology provided by a car share company as a platform to advertise their car, a prospective renter may browse, rent, unlock and return the vehicle without ever interacting with the owner. The carshare company provides insurance and hardware to the vehicle owner in addition to collecting a fee from each rental. ⁶ Getaround and Turo are examples of peer-to-peer carshare.

Niche carsharing services. These services include those that rent out private cars left in airport parking lots as well as closed network carshare systems that serve specific communities, like housing complexes or universities. ⁷

Local Context

Car sharing began in Minnesota in May of 2005⁸ with the introduction of several cars in the Uptown and Loring Park areas of Minneapolis. The non-profit organization known as HOURCAR has since expanded operations in both St. Paul and Minneapolis to include 60 locations. The service, which locates their cars primarily around commercial corridors, colleges and universities, and transit corridors, allows members to rent various different vehicle types by the hour⁹. The user must begin and end their trip in the same space.

Zipcar, the nation's largest carshare provider, started service in the Twin Cities at the University of Minnesota in January of 2006.¹⁰ Now owned by the traditional car rental provider Avis, the fleet has expanded to include the cities of Mankato and Winona, both of which are home to universities. Similar to HOURCAR, the user must begin and end their trip at the same location.

Car2Go, the most recent carshare provider in Minnesota, offers a one-way service. Arriving in the fall of 2013 in Minneapolis, and St. Paul a year later¹¹, Car2Go allows users to end their trip in most areas of Minneapolis and St. Paul, as long as the local parking regulations are obeyed. In addition, the cars are allowed to be dropped off at the Minneapolis-St. Paul International Airport for an extra charge. This offers a new flexibility—the user only pays for the time they spend in the car. If a user requires the vehicle for a return trip, they simply reserve a vehicle once the trip must be made. However, there is no guarantee the car is where it was left—all vehicles are available to all users whenever not reserved.

Finally, the peer-to-peer company Turo (formerly known as RelayRides) operates in several Minnesota cities, wherever a vehicle owner is willing to rent their car. Aside from avoiding the costs of fleet ownership, the company attempts to distance themselves from other competitors by focusing on those looking to rent for longer durations—days or weeks. Turo claims that their rental costs can be as much as 35 percent less than traditional car rentals¹². Coverage in the Twin Cities was limited as of 2016, and it remains to be seen if this model will show growth locally.

Current and Future Trends

While carsharing is another option for users of the transportation system, it is not designed to serve as a replacement for traditional rental cars, which are still standard in their market of airports and auto replacement during servicing — though that may change as well (see above for discussion of the company Turo). More importantly, it is also unlikely to be cost-effective as a replacement for daily commuting trips. However, if

⁵ [Ibid](#)

⁶ [Shared Use Mobility Reference Guide](#)

⁷ [Ibid](#)

⁸ "Car sharing - Good for drivers and for cities," Star Tribune: Newspaper of the Twin Cities (Minneapolis, MN), March 12, 2005: 20A, accessed January 26, 2016, <http://infoweb.newsbank.com/resources/doc/nb/news/108DC3D28B19D39A?p=NewsBank>.

⁹ [HOURCAR](#)

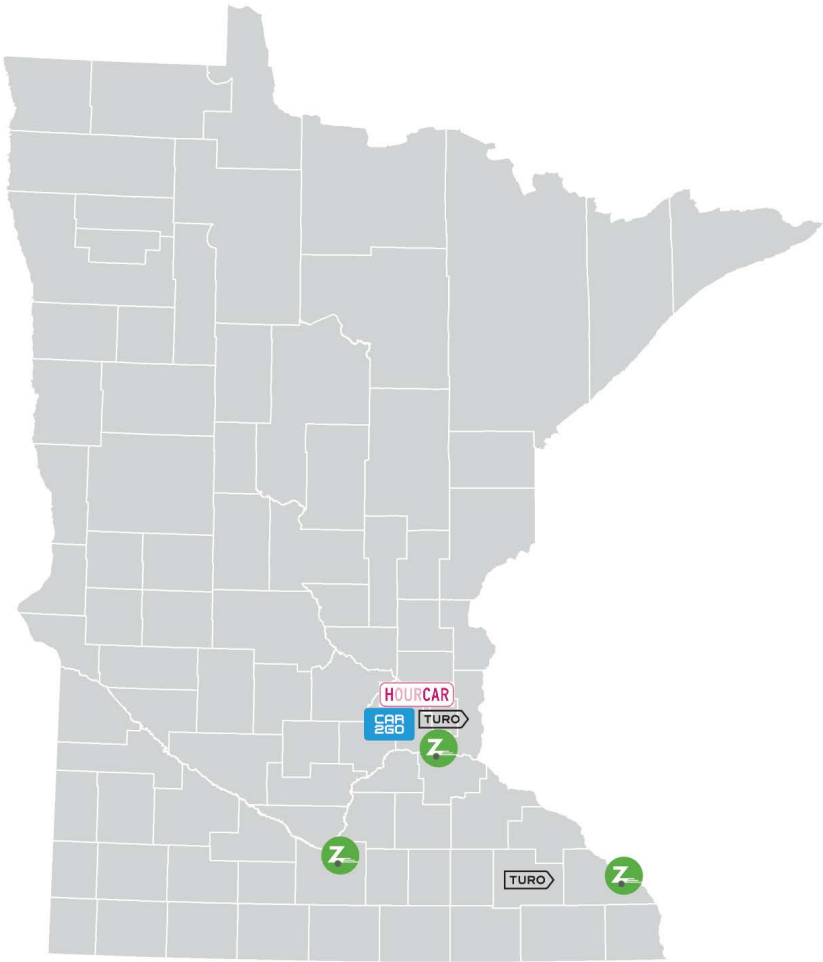
¹⁰ "U gets its motors running for car-sharing service," Star Tribune: Newspaper of the Twin Cities (Minneapolis, MN), January 18, 2006: 3B, accessed January 26, 2016, <http://infoweb.newsbank.com/resources/doc/nb/news/11086E9EFB283C7F?p=NewsBank>.

¹¹ DUCHSCHERE, KEVIN. "Car sharing is on a roll in Twin Cities - Car2Go expansion to St. Paul adds options for getting around without owning vehicle.," Star Tribune: Newspaper of the Twin Cities (Minneapolis, MN), July 03, 2014: 01B, accessed January 26, 2016, <http://infoweb.newsbank.com/resources/doc/nb/news/14ED7EF0A4F9F528?p=NewsBank>.

¹² [Kessler, 2015](#)

other modes like walking, biking, or taking transit to work are available, carsharing may be an option to replace owning a car or second car. The success of carshare is also related to the availability of free parking. Generally speaking, car sharing is less promising in areas with plentiful free parking¹³, where there is no extra cost of storing your vehicle. However, in areas where little free parking is available, people don't want to own a personal vehicle and constantly have to pay for parking. Carsharing allows a driver access to a car when they need it, and not have to worry about storing it when they don't. Carsharing has also shown to be successful in and around college campuses, where car ownership is relatively low and free parking is limited. Figure 1 shows the location of carsharing services in Minnesota.

Figure 1. Locations of carsharing services in Minnesota.¹⁴

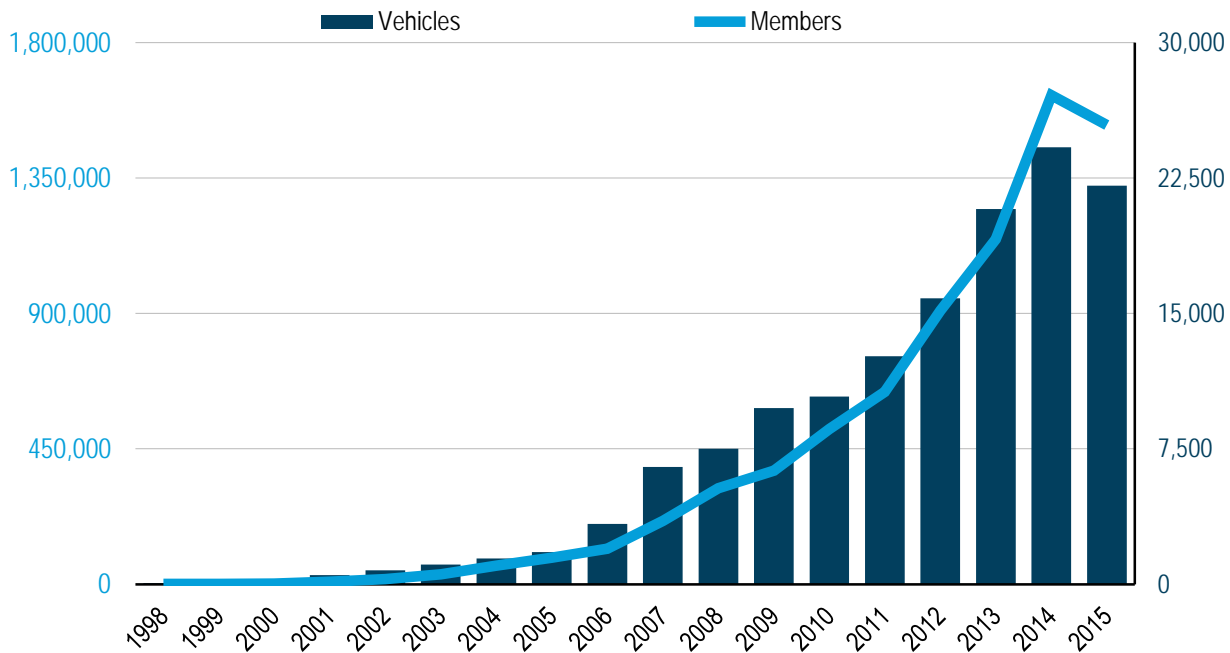


As urban-rural population trends change, more cities may develop an urban form that is more conducive to carsharing. Additional discussion of changing population distributions can be found in the Urban & Rural Population trend paper. See Figure 2 which illustrates the increase in vehicles as well as members of carsharing services between 1998 and 2015.

¹³ Levinson, D. et al. "The Transportation Futures Project: Planning for Technology Change." , Minnesota Department of Transportation Research Services & Library, 2015.

¹⁴ Zipcar. While this is a simplified representation of car share coverage across the Midwest (only showing one company and one area of the country), it does illustrate how car share is most frequently available in cities, and oftentimes in areas containing colleges or universities. For example, Zipcar is available in Mankato and Winona, MN (home to Minnesota State University and Winona State University, respectively) and not in Rochester.; Car2Go; Turo; HOURcar

Figure 2. Carsharing service and members in North America¹⁵



The future of this trend likely depends on the availability of carshare vehicles as well as the number of households that are willing to surrender a second or first car for the occasional trip. A study from researchers at University of California-Berkeley showed that every car available to share replaces as many as 13 private vehicles¹⁶. However, each trip made using a carshare vehicle must be convenient enough (and continue to be so) for a user to be willing to forgo the “freedom” that owning a personal vehicle provides. The convenience of carshare and willingness to “shed” a vehicle also depends on the availability and access to other modes. Notice the dip in 2015, caused by the Las Vegas car share service SHIFT going out of business.¹⁷

There also is a question of suppliers in the market. General Motors recently announced a new carsharing program called Maven to begin in Ann Arbor, Michigan. With this announcement, Maven incorporates and expands previous (and recent) GM carsharing to include traditional and peer-to-peer models. With competition from car rental services, it may be that large car companies will attempt to carve out a portion of that market themselves¹⁸.

Carsharing has often been seen as a service available only to the wealthy—those who can afford to live in areas that are walkable and have the financial flexibility to spend money on hourly rentals. However, a company known as WaiveCar is piloting a low-income electric vehicle program in Los Angeles¹⁹. The program allows for two hours of free car usage for drivers under a certain income. The program is said to be sustainable by covering the cars in advertisements and making them act as driving billboards. These advertisements hope to cover the costs otherwise needing to be picked up by the driver. While this program is only just underway, this concept does begin to address the equity issue when it comes to carsharing, and could impact the sharing economy as a whole.

¹⁵ Levinson, D. et al. “The Transportation Futures Project: Planning for Technology Change.”, Minnesota Department of Transportation Research Services & Library, 2015.

¹⁶ Martin, Elliot, Susan Shaheen, and Jeffrey Lidicker. 2010. Impact of Carsharing on Household Vehicle Holdings: Results from North American Shared-Use Vehicle Survey. Transportation Research Record: No. 2143: 150–158.

¹⁷ Rotherberg, 2015

¹⁸ [Irwin, 2016](#)

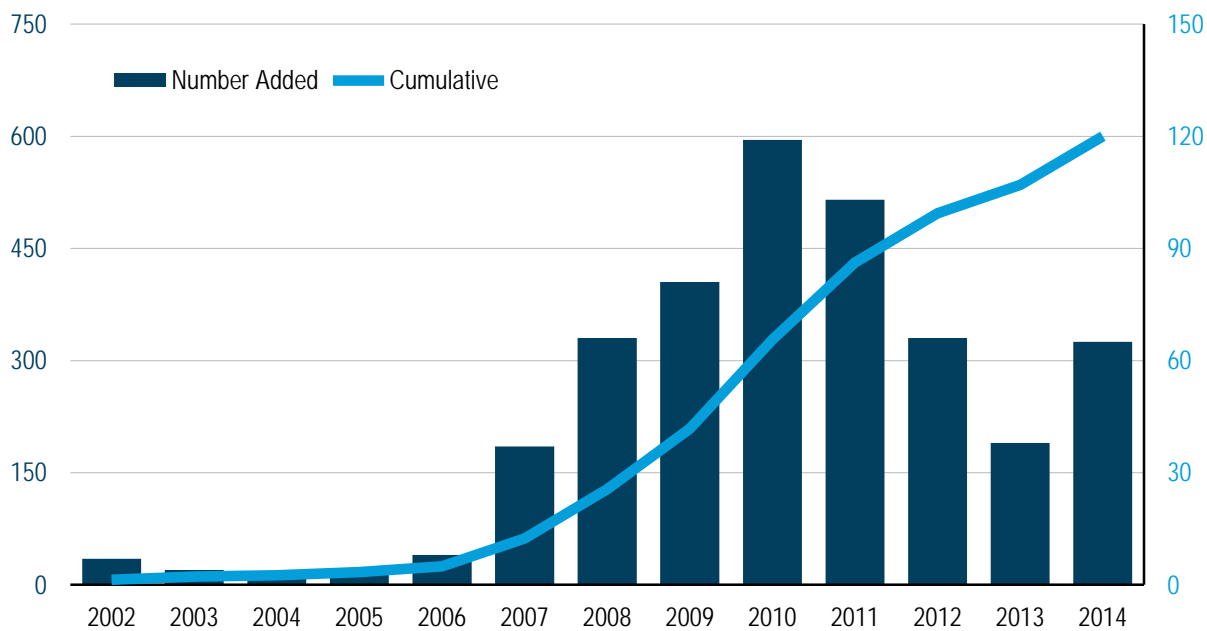
¹⁹ [Edelstein, 2016](#)

BICYCLE SHARING

Bicycle sharing, as the name suggests, involves any sort of system or supporting infrastructure that allows people to rent bicycles. These systems have become increasingly popular in the past ten years, thanks to the availability of real time information technology, which allows balancing the availability of bikes across the system.²⁰ Minnesota has a pioneering history of bicycle sharing in North America, has embraced the modern incarnation of it in Minneapolis and St. Paul, and hopes to continue expansion to Greater Minnesota.

Bike sharing attempts to provide bicycles to those when and where they need it, with the ability to get rid of it when they don't. While it is not as widespread as modern carsharing, the growth of bikesharing brings this freedom closer to reality. As shown in Figure 3, bikesharing systems have grown in number worldwide.

Figure 3: Growth of bikesharing systems globally²¹



Models of Bikeshare

Dock-based system: The most common type of bikesharing in cities today, dock-based bikeshare systems allow users to pick up and drop off bicycles at specific locations. The bikes are nearly all identical to one another, and are checked out using on site payment systems. The fee is paid, and the bike unlocks from the docking station. ²²Nice Ride MN is an example of this type of service.

Dockless or GPS-based systems: These systems allow users to drop off and pick up a bicycle anywhere within the service area. GPS technology is embedded into each individual bicycle as opposed to the docking station, allowing a user to locate it on their smart phone or computer. Each bicycle has a lock on board that enables riders to end their trip in areas where a dock is unavailable. The system also allows for bikeshare companies to incentivize users to help in balancing out the distribution of bikes across the service area—something that dock-based systems have struggled with. ^{23,24} Social Bicycles is an example of this type of service, and exists in several cities and a number of universities across the country and Canada.

²⁰ [Shared Use Mobility Center, 2015](#)

²¹ Levinson, D. et al. "The Transportation Futures Project: Planning for Technology Change." , Minnesota Department of Transportation Research Services & Library, 2015.

²² [Shared Use Mobility Center, 2015](#)

²³ [Ibid.](#)

Peer-to-peer bikesharing: Similar to peer-to-peer carshare, this model allows users to rent their personal bicycle to others for hourly or daily rates. Similarly, and perhaps related to earlier peer-to-peer programs, this model also considers bike shops or bike tourism services who rent bicycles in the peer-to-peer bikesharing category.²⁵ Spinlister is an example of this type of service, and exists in several areas in Minnesota.

Local Context

Bikesharing in Minnesota began in 1996 with the “Yellow Bike Project” in Minneapolis and St. Paul²⁶. This program used coin-operated locks, which gave users access to distinctly painted yellow bicycles. This program was eventually cancelled when bikes were either kept for too long or disappeared altogether.

The dock-based bikeshare program seen today in Minnesota, Nice Ride Minnesota, was formed in 2008 and became operational in June of 2010. What started with 700 bikes at 65 docks (or stations) in Minneapolis has expanded to 190 stations and 1,650 bicycles in Minneapolis and St. Paul, logging 1.8 million total rides at the end of the 2015 season.²⁷ Users can pay a yearly membership for unlimited 60 minute rentals, or pay-as-you-go at the kiosks.

Figure 4. The expansion of Nice Ride, 2010 - 2015²⁸

Year	Number of Stations
2010	65
2011	116
2012	146
2013	170
2014	170
2015	190

In 2014, Nice Ride began a pilot in Bemidji, MN to evaluate the possibilities of bikesharing in smaller cities. There is yet to be conclusive data available, but the program is inspiring other small cities around the state to give bikesharing a try. Hastings, Willmar, and Austin are all either operating or planning to operate bikeshare programs with varying similarities²⁹.

Current and Future Trends

Bikesharing can function as an extension of transit service, where transit riders transfer to a bike, then bicycle to a bikeshare dock nearer to their final destination. However, future bikesharing need not be station-based (with GPS and smart-phone apps). Indeed, updates to current bikeshare programs hope to tackle the two large hurdles facing modern dock-based systems: the distribution and unpredictability of bicycles across the system, and the time it takes to roll out a system large and reliable enough for users to benefit and use it³⁰. Current companies³¹ hope to create a bicycle service similar to Airbnb, which allows for residential property owners to rent out their homes to people as an alternative to a hotel. AirDonkey and Spinlister are peer-to-peer bike sharing models that allow for a renter to pay a bike owner to rent their bike, and unlock it all through a mobile app, thereby eliminating the need for large fleet and station locating.

²⁴ [WNYC, 2013](#)

²⁵ [Shared Use Mobility Center, 2015](#)

²⁶ Shaheen et al. “Bikesharing across the Globe,” in *City Cycling*, ed. John Pucher and Ralph Buehler, (Cambridge: The MIT Press, 2012), 188.

²⁷ [Nice Ride MN](#)

²⁸ Levinson, D. et al. “The Transportation Futures Project: Planning for Technology Change.”, Minnesota Department of Transportation Research Services & Library, 2015.

²⁹ [Ross, 2015](#)

³⁰ [Marshall, 2016](#)

³¹ <https://airdonkey.com/>

RIDESHARING

Perhaps the most disruptive innovation in shared mobility today is that of ridesharing³², which pairs riders using online platforms with drivers who use personal, non-commercial vehicles³³. Ridesharing companies Uber and Lyft, which offer almost identical services, have gained international attention for their recent influence on the transportation system. Uber currently operates in 68 countries³⁴ across the world, giving drivers the opportunity to make money for their service and riders new options for getting around. Many private vehicle owners have made ridesharing their full time job, while others simply drive when they are able—supplementing their income even on their way home from work.

Rideshare companies are in many ways simply an app with a back-end (rather, "cloud-based") dispatch service instead of a traditional taxi cab dispatch. Lyft claims to be a "transport network company whose mobile-phone application facilitates peer-to-peer ridesharing by enabling passengers who need a ride to request one from drivers who have a car".³⁵

Current and Future Trends

Ridesharing has grown rapidly since Uber began testing the service with three cars on the streets of New York City in January of 2010³⁶. While some have called for regulation similar to those placed on taxi companies in order to level the playing field between the two, provide insurance for drivers and passengers, and address data privacy issues, it is still unclear the extent to which these might affect ridesharing³⁷. With the app iHAIL in the Twin Cities, taxi companies have attempted to replicate the online platform upon which Uber and Lyft rely and prosper, but there is no evidence yet that riders have shifted their loyalties back to cab companies. Rideshare companies have also started offering services catered to the unique needs of those with impaired mobility. Uber ASSIST functions just as the basic Uber request does, except the driver is trained to assist with mobility devices and entry and exit to and from the vehicle. This service is not yet available in Minnesota.

Ridesharing companies have continued to innovate faster than regulation can keep up. Both Lyft and Uber offer several different vehicle types to cater to the users' party size and need, and may be chosen in the app when the trip is first booked. In addition, Uber and Lyft now offer services in select cities that allow riders at two different origins and two different destinations to share a ride for a cheaper fare than riding alone. Lyft Line and the analogous Uber Pool give riders the option of a less expensive ride if they are willing to go slightly out of their way to pick up and drop off another passenger. This service is not yet available in Minnesota. Aside from moving people, Uber recently announced their efforts towards moving into the ever expanding realm of delivery services. What began as a bike messenger service in 2014, UberRUSH launched in October of 2015 as a delivery service by car in Chicago, New York, and San Francisco³⁸--bringing groceries, take-out food and house supplies to the customer.

The future of Uber and Lyft as well as their place in the transportation market is unclear. After General Motors invested \$500 million in Lyft in early 2016, the auto manufacturer acquired all assets of the now defunct Sidecar, a rideshare company that at one time competed closely with Uber and Lyft.³⁹ Although it seems as though GM and Lyft have competing interests (selling cars and eliminating cars on the road, respectively), some believe the move by GM was made to give themselves a place in the future autonomous car market. For more about the potential role of autonomous vehicles in ridesharing services, please see the trend paper discussing autonomous vehicles.

While the degree to which rideshare services impact the transportation network might be debatable, the presence of this impact is not. Some users say they will give up their private cars and instead use rideshare and other transportation services⁴⁰. However, there is also concern that with

³² The service is often labeled as ride sourcing, while traditional ride sharing refers only to carpooling and vanpooling. This paper will consider the services provided by companies similar to Uber and Lyft as ride sharing.

³³ [Shared Use Mobility Center, 2015](#)

³⁴ [Uber.com/cities](#)

³⁵ Levinson, D. et al. "The Transportation Futures Project: Planning for Technology Change." , Minnesota Department of Transportation Research Services & Library, 2015.

³⁶ [Chokkattu, 2014](#)

³⁷ [Rodriguez, 2016](#)

³⁸ [Hawkins, 2016](#)

³⁹ [Newcomer & Stone, 2016](#)

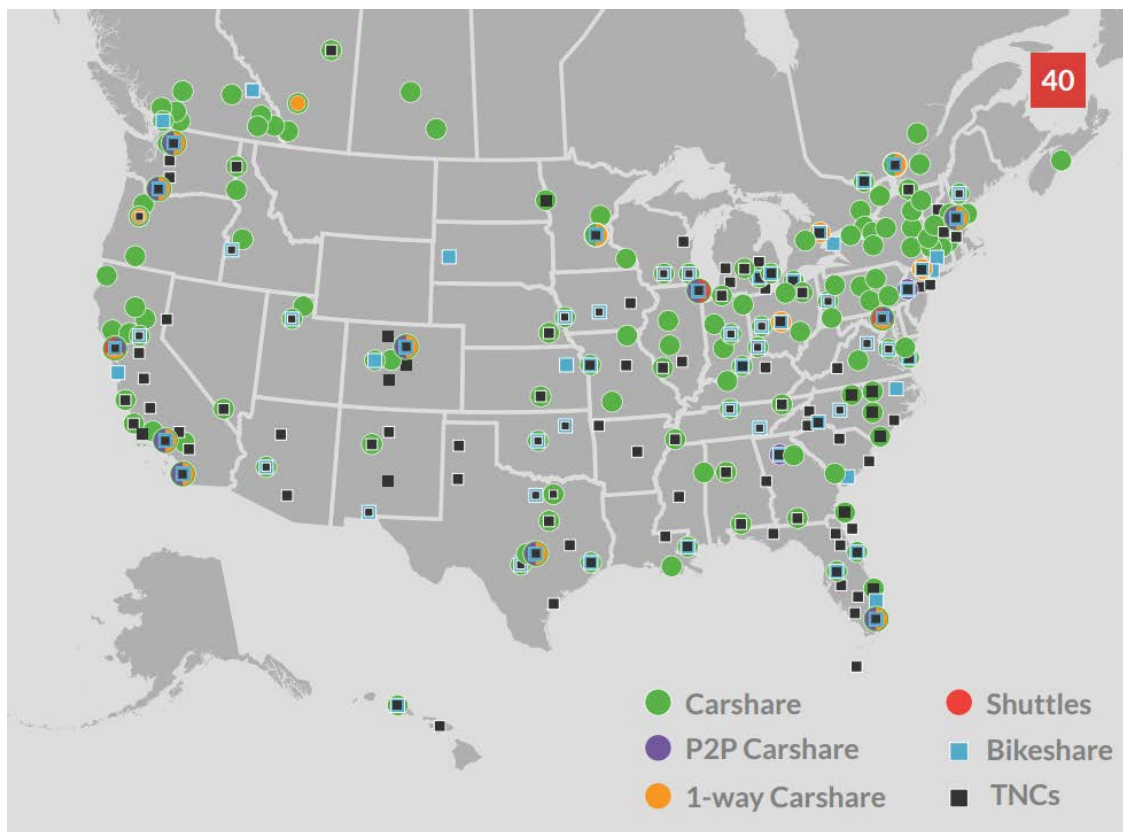
⁴⁰ [Jeffries, 2013](#)

competition between rideshare companies and a subsequent reduction in fares, these services could match the cost of other services and “steal” trips from other modes, such as transit, or even attracting people away from walking, if the price is right.

THE FUTURE OF MOBILITY AS A SERVICE

For communities where residential and commercial densities are relatively low, incomes high, the most reliable strategy for timely point-to-point transport is for people to maintain personal transport close at hand⁴¹. However, as the services described above continue to improve, urban environments become more populated, and behaviors change, so too will the services and modes upon which users rely. See Figure 5 for an overview of shared mobility services across the country. Sharing of cars, bikes, rides, and even scooters⁴² will likely continue to grow as people choose to share instead of own. Current online platforms are being developed to show users of the network their transportation options from any origin to destination, and the cost and time related to each—leaving the user to decide which to use.⁴³ More formally, this range of options can be termed Mobility-as-a-Service. While still nascent today, clearly big players are placing big bets that this will be a big change in how people travel.⁴⁴

Figure 5: Shared mobility across the country⁴⁵ (Transportation Network Companies (TNCs) like Uber and Lyft are shown as black squares.)



⁴¹ Levinson, D. et al. “The Transportation Futures Project: Planning for Technology Change.”, Minnesota Department of Transportation Research Services & Library, 2015.

⁴² <http://www.scootnetworks.com/>

⁴³ <http://transitscreen.com/>

⁴⁴ Levinson, D. et al. “The Transportation Futures Project: Planning for Technology Change.”, Minnesota Department of Transportation Research Services & Library, 2015.

⁴⁵ [Shared Use Mobility Center, 2015](#)