

# **Transit and New Shared-Use Modes - Key Questions from the Transit Agency's Perspective; a Discussion Paper**

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## Technical Report Documentation Page

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| <b>16. Abstract.</b><br><br><p>There is a need to review recent developments that are creating a range of new mobility options, and to identify and categorize the key questions that transit agencies should be asking themselves as they try to position themselves in the new arena of urban mobility. The new shared-use modes include carsharing (in various formats), bikesharing, ridesourcing Transportation Network Companies (TNCs), microtransit, etc.</p> <p>The perspective is from that of the transit agency. The key questions documented within emerged from several structured discussions at workshops and meetings co-organized by ITS America and/or APTA that took place in 2015-2016.</p> <p>The discussion paper concludes by recommending research and other initiatives that would enable transit agencies to address related challenges and pursue opportunities.</p> |                                             |                                              |                  |
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## **GLOSSARY**

|        |                                                               |
|--------|---------------------------------------------------------------|
| ADA    | Americans with Disabilities Act                               |
| APTA   | American Public Transportation Association                    |
| AVL    | Automatic Vehicle Location                                    |
| BRT    | Bus Rapid Transit                                             |
| CAD    | Computer-Assisted Dispatch                                    |
| DRT    | Demand Responsive Transit                                     |
| FHWA   | Federal Highway Administration                                |
| FTA    | USDOT Federal Transit Administration                          |
| GPS    | Global Positioning Systems                                    |
| ITS    | Intelligent Transportation Systems                            |
| ITSJPO | USDOT Intelligent Transportation Systems Joint Program Office |
| MOD    | Mobility on Demand                                            |
| MPO    | Metropolitan Planning Organization                            |
| PCB    | USDOT Professional Capacity Building Program                  |
| TDM    | Transportation Demand Management                              |
| TMA    | Transportation Management Association                         |
| TNC    | Transportation Network Company                                |
| TRB    | Transportation Research Board                                 |
| USDOT  | United States Department of Transportation                    |

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## 1. **INTRODUCTION:**

### 1.1. **BACKGROUND**

The Intelligent Transportation Society of America (ITS America) is the nation's largest organization dedicated to advancing the research, development and deployment of Intelligent Transportation Systems (ITS) to improve the nation's surface transportation system. Its Vision is to save lives, time and money and sustain the environment through the research, development and broad deployment of interoperable Intelligent Transportation Systems (ITS).

ITS America has been engaged for over fifteen years in tasks to support the U.S. Department of Transportation (USDOT), working with the Intelligent Transportation Systems Joint Program Office (ITSJPO) and the Federal Transit Administration (FTA) in a range of activities related to research, development, and dissemination of information on ITS and its application to public transportation modes. During the course of these activities, ITS America has been asked to develop strategic discussion papers on key topics that might help identify and understand challenges, barriers, and opportunities to ITS deployment as well as suggest recommendations for action to help achieve the full range of potential benefits that can be derived from the deployment of ITS by the public transportation industry.

These discussion papers build on the knowledge gained from a range of experts, including practitioners in the field, consultants, suppliers, and researchers, through workshops, listening sessions, and interviews, and supplemented by the review of pertinent literature.

### 1.2. **THE ISSUE**

There is a need to review recent developments that are creating a range of new mobility options, and to identify and categorize the key questions that *transit agencies should be asking themselves* as they try to position themselves in the new arena of urban mobility.

ITS and other emerging technologies such as mobile computing and digital communication have transformed the operations and quality of both fixed route and demand responsive transit (DRT) services in recent years. In particular, one has seen the growing availability of real-time traveler information and trip planning applications.

Some of these same technologies used by transit agencies, such as wireless communications and GPS location embedded in smartphones, have led to a simultaneous explosion of new shared-use mobility services. These include carsharing (in various formats), bikesharing, ridesourcing Transportation Network Companies (TNCs) such as Uber and Lyft, microtransit (e.g. Bridj), etc. These new modes are

providing a variety of new personalized flexible mobility options that can accommodate in many cases more "on demand" travel patterns without the use of single occupant vehicles. They also provide a range of cost options to the user, and more convenience with respect to electronic payment. They are thus particularly well suited to socially active connected younger travelers with less routine travel patterns. As a result, these new modes have captured much energy and profile associated with the emergence of the Millenium Generation, and are often backed by large venture capital investment firms. Likewise, traditional automobile manufacturers are also looking at how to engage the new transportation ecosystem. Their "coolness" factor has clearly captured the imagination of the media. At the same time, many of these new modes have been named "disruptive" in that they challenge existing practices and threaten existing modes such as taxis, and have shown the inadequacy of existing regulatory frameworks. This has led to much controversy, many court challenges, and difficult questions for politicians and regulators at all levels of government.

Transit agencies have been far from immune from these discussions, and have been doing much soul-searching to position themselves individually and as an industry, while trying to:

- understand the implications of this explosion of new modes on their own services and operations,
- determine whether these new mobility services are complementary or competitive to existing fixed route and DRT services,
- understand policy and regulatory implications, and
- develop frameworks for cooperation where feasible.

A variety of transit agencies have launched individual initiatives of their own to cooperate, coordinate, or integrate with the new shared-use mobility modes. A few examples of initiatives include:

- Operation of bike-sharing system (Dayton RTA)
- Use of transit smart card to access carsharing vehicles (Twin Cities Metro Transit)
- Discounts offered to transit customers to use bikesharing and carsharing services (Montreal STM)
- Joint promotional campaign with TNC on St Patrick's Day (Dallas DART)
- Sharing of transit agency mobile application platform with ridesourcing and carsharing companies (Dallas DART and Atlanta MARTA)
- Pilot projects to coordinate service and fare for suburban feeder services (St Petersburg PSTA and Tampa HART)

This growing interest in shared-use mobility has resulted in the recent publication of significant overview reports by the Transportation Research Board (TRB), and the American Public Transportation Association (APTA):

- TRB, December 2015: *Between Public and Private Mobility; Examining the Rise of Technology-Enabled Transportation Services*, Special Report 319  
<http://onlinepubs.trb.org/onlinepubs/sr/sr319.pdf>

- APTA, March 2016: *Shared-Use Mobility and the Transformation of Public Transit*, Prepared for APTA and TRB  
<http://www.apta.com/resources/hottopics/Pages/Shared-Use-Mobility.aspx>

At the same time, the USDOT has launched a major effort to understand and capture these various modes under the umbrella concept of "Mobility on Demand (MOD)", and have launched several projects to define the concept and to develop policy recommendations and guidance. These include the launch of the FTA MOD Sandbox Program<sup>1</sup>, and the recent publication of the report for the Federal Highway Administration (FHWA) entitled *Shared Mobility: Current Practices and Guiding Principles*<sup>2</sup>.

The objectives of the FTA MOD Sandbox Program are to:

- Enhance transit industry preparedness for MOD.
- Assist the transit industry to develop the ability to integrate MOD practices with existing transit service.
- Validate the technical and institutional feasibility of innovative MOD business models, and document MOD best practices that may emerge from the demonstrations.
- Measure the impacts of MOD on travelers and transportation systems.
- Examine relevant public sector and federal requirements, regulations and policies that may support or impede transit sector adoption of MOD.

These efforts and few studies are a valuable first step, but the environment is rapidly changing and characterized by much uncertainty and confusion. Technology in general, and ITS more specifically, are at the heart of enabling these developments, and transit agency technology staff are now being asked to look beyond the boundaries of their individual agencies in order to:

- Open real-time transit data to an ever-growing range of new stakeholders,
- Participate and/or build technological interfaces with the new partners,
- Participate in external shared-data platforms,
- Develop integrated trip planning tools or real-time information platforms,
- Participate in, or develop, integrated payment back-offices, with a variety of public and private organizations, many of which may be in competition with one another, etc.

However, given the lack of clear institutional frameworks and policy and corporate objectives, transit agencies lack direction on how to proceed. As a result, every discussion in recent Transit ITS workshops and meetings, organized by APTA and ITSA, have started with discussing technology issues, that rapidly branch out to wide-ranging discussion of institutional and organizational challenges related to transit and these new modes.

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<sup>1</sup> <https://www.transit.dot.gov/research-innovation/mobility-demand-mod-sandbox-program.html>

<sup>2</sup> <http://www.ops.fhwa.dot.gov/publications/fhwahop16022/fhwahop16022.pdf>

The above important efforts by TRB, APTA, and USDOT represent various efforts to try and make sense of the confusing reality in the realm of urban mobility, define what is being referred to as a new "ecosystem", and are in some cases, prescriptive in nature.

The objective of this discussion paper is more modest, and is to identify and categorize the key questions *transit agencies should be asking themselves* as they try to position themselves in the changing arena of urban mobility. *The perspective is from that of the transit agency.* The key questions documented within emerged from several structured discussions at workshops and meetings co-organized by ITS America and/or APTA that took place in 2014-2016, including:

- Workshop: From Demand Responsive Transportation to Mobility on Demand: The Impact of Technology on DRT in the era of Smart Cities (ITS America, May 2016),
- Symposium: Building a Smart, Diverse and Shared Travel Network (ITS America, July 2015),
- ITS Best Practices Workshop (APTA/ITS America, Atlanta, November 2015)
- ITS Best Practices Workshop (APTA/ITS America Orlando, November 2014)

The discussion paper concludes by recommending research and other initiatives that would enable transit agencies to address related challenges and pursue opportunities. It is hoped that this document will facilitate a framing of the reflection that needs to take place by transit agencies, and thereby help position themselves vis-a-vis the changing world of urban mobility. This in turn will help orient technological directions that will need to be pursued.

## **2. EMERGING MOBILITY SERVICES**

Before discussing the key questions transit agencies should be asking, it is useful to provide a bit of background for those who have not been following the discussion in detail. This section will discuss the effects of emerging technologies on current transportation network, and then provide a taxonomy of the new mobility services.

### **2.1. THE EFFECTS OF TECHNOLOGY ON TRANSPORTATION**

The recent comprehensive TRB Special Report 319 entitled *Between Public And Private Mobility* summarized very well the role that technology has played in the explosion of new mobility services as well in the transformation of traditional modes [TRB, 2015]:

*Rapid changes now under way in transportation are due in part to the opportunities afforded to firms and individuals by new information and communication technologies. The rapid evolution of wireless communications, high-speed computing, enhanced sensors, and global positioning systems (GPS), among many other technologies, is helping to optimize logistics and freight delivery, facilitate planning for personal vehicle and public transportation trips, and simplify payments for tolls and transit fees. The new technologies, combined with new business and service models, are key elements of the next generation of transportation infrastructure and services. The sharing economy and on-demand business model are enabling a more nimble and cost-effective set of options for moving people and goods that require modest amounts of new infrastructure or capital spending. These changes in transportation also are opening up new industries and employment options, although not without negatively affecting some established interests, and potentially end-users, in the process.*

*Many technological innovations are affecting transportation and enabling shared mobility. In some cases, these innovations make using established modes easier, quicker, more reliable, and more predictable, attracting new customers and encouraging new types of trips by reducing uncertainty and increasing the convenience and efficiency of system use. Technological innovations also have enabled the coordination of services within larger networks and allowed system managers to optimize the use of employees and vehicles.*

*With the advent of open-source transit data, riders can easily know the details of transit service in real time, thereby avoiding the frequently voiced frustration of not knowing when the next transit vehicle will arrive. Public transit also has benefited in recent years from new payment options that reduce the burden of fare collection while giving riders more choices. Traffic and GPS data can be combined in navigation systems and apps, making it easier for drivers to reroute around congestion and travel through places with which they are unfamiliar. The*

*challenges of parking in urban areas are evolving as well with access to real-time data on parking availability; variable pricing to manage demand; and options to pay by cell phone, credit card, or online account. Collectively, highly accurate GPS data, online and application-based payment systems, remote locking and unlocking capabilities, and the ability to manage extremely large and dynamic data sets are enabling real-time rideshare matching, convenient shared-use and ownership opportunities, and bundling of multimodal travel options into packages analogous to health care or cable services. Both travelers and transportation providers can reduce costs through the new technologies. Real-time dynamic data make it possible for fleet owners and service brokers to optimize the number of vehicles needed to serve their customers, while the same data allow travelers to reduce their wait times and consider alternatives that were previously unknown or too uncertain. With more transportation options and better real-time information about them, travel by means other than personally owned vehicles is becoming a much more viable option in urban settings.*

*The Millennial generation that grew up with computers and mobile phones is at the forefront of the many changes described above. In the last 2 years, much has been made of the slower rate at which teens and young adults have been securing driver's licenses and the declining number of vehicle-miles they have been driving, although many questions remain about the causes of these declines and whether they represent a long-lasting trend. For now, it appears that many young adults depend on technology-enabled connections as much as, if not more than, those provided by personal vehicles.*

## **2.2. THE NEW MOBILITY SERVICES**

There are several sources of information on defining the new mobility services. Particularly noteworthy is the Reference Guide prepared by the Shared-Use Mobility Center [SUMC-2015] [http://sharedusemobilitycenter.org/wp-content/uploads/2015/09/SharedUseMobility\\_ReferenceGuide\\_09.25.2015.pdf](http://sharedusemobilitycenter.org/wp-content/uploads/2015/09/SharedUseMobility_ReferenceGuide_09.25.2015.pdf)

The TRB Special Report 319 also provides a useful taxonomy table of the new mobility services, and identifies the potential role of technology:

## Taxonomy of New Mobility Services from TRB Special Report 319

| Service                                                                            | Role of Technology                                                                                                                | Problems Technology May Solve                                                                                                                                          | Factors in Success                                                                                                                                                                     |
|------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Carsharing (examples: Zipcar, car2go)                                              | Reservations and tracking of vehicles; billing                                                                                    | Convenience in making/changing reservations and in locating/dropping off vehicles; national branding encourages use while traveling                                    | Critical mass of users to support availability of vehicles at a sufficient array of pickup/drop-off locations                                                                          |
| Bikesharing (examples: Citi Bike, Divvy, Capital Bikeshare)                        | Reservations and tracking of bikes; billing                                                                                       | Convenience in finding bikeshare stations and information on bike availability; management of rebalancing                                                              | Critical mass of users to support a sufficient array of bike stations; rebalancing of bikes to ensure availability                                                                     |
| Transportation network companies—sequential sharing (examples: Uber, Lyft)         | Reservations and tracking of vehicles; billing; quality control via online customer feedback                                      | Convenience of arranging ride just prior to travel; customer tracking of vehicles and wait times reduces uncertainty; national branding encourages use while traveling | Critical mass of users to support widespread vehicle availability                                                                                                                      |
| Transportation network companies—concurrent sharing (examples: UberPool, LyftLine) | Reservations and tracking of vehicles; billing; matching of riders for shared rides; quality control via online customer feedback | Convenience of arranging ride just prior to travel; customer tracking of vehicles and wait times reduces uncertainty; national branding encourages use while traveling | Critical mass of users to support widespread vehicle availability; comfort with riding with strangers; critical mass to match riders for shared rides                                  |
| Microtransit (examples: Bridj, Chariot)                                            | Reservations and tracking of vehicles; determining routes from public demand; billing                                             | On-board wi-fi and efficient routing to match customer demand; customer tracking of vehicles and wait times reduces uncertainty                                        | Critical mass of users to support a variety of routes; comfort with riding with strangers; price points that, while higher than those of standard transit, allow for regular commuting |
| Taxi apps (or e-hail) (Examples: Flywheel, Curb, myTaxi)                           | Easier reservations, both advance and just prior to travel                                                                        | Apps may cover multiple taxi companies and estimate wait time, reducing uncertainty; national branding could encourage use while traveling                             | Critical mass of participating taxi companies; integration with traditional taxi operations; app use by traditional customer base                                                      |

In some cases, distinctions are also made between different forms of ridesharing (i.e. round-trip, one-way, and peer-to-peer)

It should be noted that most of these reports focus on describing the new mobility services and current policy challenges, but provide little insight into longer-term challenges such as the planning of transportation infrastructure and services. In addition, the above taxonomy only addresses "new" mobility services so does not include more traditional mobility services (i.e. taxis, fixed-route transit, DRT, etc.).

The topic of DRT is worth highlighting, since the concept of using technology to facilitate the use of shared-ride DRT service is not a new concept. In the late 1980s, European projects demonstrated the application of technology for reservation of demand responsive or flex route service in low-density suburbs in Germany (Rufbus), Flanders, and various Italian cities. A Smart Traveler project was demonstrated in Bellevue, WA in the 1990s to provide advanced traveler information to encourage dynamic ridesharing. And the Denver Regional Transit District has successfully deployed a state-of-the-art DRT service for the general public, called Call-n-Ride, with over 40 small buses serving over 20 neighborhoods. The neighborhoods represent a variety of contexts (low density suburbs feeding CBD-oriented trips, reverse commute trips to office parks, rural towns, etc.), and Call-n-Riders use advanced technology (web and mobile applications) to reserve service with only two hours advance notice. It provides a quality service to customers, improved productivity, and has achieved much success. Nonetheless, ridership in all cases, including Call-n-Ride, has been modest. No studies to date have compared the new modes to more traditional DRT to assess commonalities, differences, challenges faced by the new modes, and opportunities for enhancing existing DRT services.

### **3. KEY QUESTIONS FROM A TRANSIT AGENCY'S PERSPECTIVE**

The following is the set of key questions that emerged from the workshop discussions, as participants sought to better understand the potential and/or desirable relationship between transit and shared-use mobility services and address areas of uncertainty.

#### **3.1. POLICY GOALS AND OBJECTIVES**

The new shared-use modes have generated extensive discussions in both professional journals and reports, as well as in the general media. In most cases, these discussions seem to be premised on the fact that "enabling an array of mobility options" is a worthwhile public policy goal in its own right, and merits the intervention of the public sector.

However, this assumption needs to be more carefully assessed. The public sector is characterized in most cases by extreme constraints on resources, staff, and energy, and must carefully justify their use. It is therefore worth stepping back in order to question the fundamental policy basis of public sector involvement in cooperating, coordinating, or even integrating with the new shared-use modes, and to determine what are the policy goals and objectives being pursued, and how they relate to the transit agency's corporate mission.

In some cases, this analysis may lead to review of the organization's fundamental mission. For example, one observes some transit agencies shifting their corporate mission from one that focuses on delivering transit service (with a primary focus on transit operations), towards a broader mission of managing mobility.

#### **Key Questions**

- Does the transit agency's overall corporate mission need to be reviewed in light of the new mobility ecosystem? Is the mission to deliver transit service or to manage mobility? Should the mission focus on ensuring mobility options for the disadvantaged, or for all in an effort to improve quality of life?
- Are there different goals and objectives being served by different components of the transit agency's family of services (e.g. rapid transit, regular bus, express bus, DRT, etc.)? Have they been made explicit?
- What is the policy objective being pursued by enabling / facilitating new mobility services? Why are we considering cooperation, coordination, or integration with the new shared-use modes?
- How does this effort relate to the transit agency's mission and goals? Which objectives justify transit agency involvement or partnership? Possible pertinent policy goals that might be served by shared-use modes include:
  - Reduce auto ownership
  - Reduce use such as vehicles miles traveled in order to reduce greenhouse gases
  - Mitigate congestion

- Reduce cost-ineffective services
- Expand coverage area and/or frequency of transit service to meet corporate service standards
- How can we measure whether the key objectives being pursued through partnerships are being achieved?

### **3.2. TRANSPORTATION PLANNING**

The focus of attention has been primarily short-term in nature and there has been little thought given to longer-term planning implications of these new modes.

The new shared-use mobility services have erupted on the scene and the landscape is far from stable with new services appearing and disappearing as they test their feasibility and market acceptance in a highly competitive and fluid market, and confront regulatory challenges. As a result, most of the public discussion to date has focused on the short-term, and on regulatory conditions that permit operations, or not, in order to meet public safety standards.

There has been little discussion of the longer-term planning-related implications of these new modes, including in the TRB Special Report. This is not surprising given the fluidity and uncertainty of the situation. Nonetheless, this will become very important. Transit agencies receive federal subsidies because they are integrated into the long-established coordinated and comprehensive planning framework established by the USDOT, and meet the many technical, environmental, public engagement and other requirements that are part of the transportation planning process overseen by the Metropolitan Planning Organization (MPO) in each metropolitan region. These processes focus on developing a region's longer-term vision and capital infrastructure requirements in an effort to meet broad policy goals, and on shorter-term implementation priorities. To date, usage of these new modes remains modest, especially with respect to travel patterns that affect areas of primary concern (e.g. environmental impact, congestion, etc.). They are not modes that are typically monitored per se, and are not incorporated into existing planning models. There will need to be a comprehensive assessment of how these new modes relate to the metropolitan planning process.

#### **Key Questions**

- What is usage of shared-use modes? Who? When? Where?
- How can usage be measured or distinguished in order to compare them to transit services and other existing modes?
- Do these modes have an impact on planning / programming of major infrastructure?
- To what extent should privately operated mobility options be explicitly integrated into the MPO planning and implementation frameworks?

- To what extent should privately operated mobility options be explicitly integrated into municipal planning and zoning?
- How do these modes affect current planning models?

### 3.3. DATA

Control and access to data is one of the critical and most contentious issues underlying the challenges facing transit agencies positioning themselves vis-a-vis the new mobility services.

On the one hand, transit agencies are being asked and expected to provide their real-time data to a multitude of service providers, both non-profit, and for-profit, as well as to service brokers, who are providing a for-profit service. The cost of building and managing the necessary IT networks and portals to provide this data is a burden to the public transit agency.

On the other hand, the data created by each mobility service or service broker is a strategic and highly valuable asset that provides a competitive advantage in the highly competitive market. Many transit agency staff have complained in the workshops that this seems to represent a double standard.

However, access to usage data is essential to transportation planning, and to measurement of the effectiveness of public intervention in pursuit of societal goals. This represents a fundamental challenge in building public-private cooperation.

As stated in the recent SUMC/APTA study, there is a need to

*"ensure data reciprocity from the private sector, which benefits greatly from open public data. A "walled garden" model will not work for ridesourcing companies and other private operators if they expect to take part in a wider mobility ecosystem. Public transit operators, planners, researchers need this data to understand how people are moving and where intervention may be needed."*

There should be growing opportunities to negotiate access to data, as quid-pro-quo for transit agency cooperation or even subsidies. The challenge is to define what data is essential for public needs, and to develop the technical frameworks to obtain it while establishing the business rules to protect private sector interests. Some transit agencies have been doing this quietly.

An additional challenge is to define these data requirements *collectively for the interest of the entire transit industry*, so that best practices prevail, rather than emerge as a patchwork of costly and uneven arrangements negotiated on an ad-hoc basis, by individual transit agencies with each service provider or broker. Unfortunately, past practice related to the use of Transit ITS data in the transit industry suggests how challenging this will be (see Discussion Paper #15-2, *The Use of Transit ITS Data for Planning and Management, and Its Challenges*). For example, the discussion paper

found that some transit agencies have developed and been practicing sophisticated applications of ITS data for planning and management since the emergence of ITS twenty-five years ago. And yet, the majority of transit agencies are still struggling with how to manage and use ITS data. There seem to be few effective mechanisms for widely sharing the knowledge developed by industry leaders, and the industry, as a whole, is challenged to develop common approaches and methods.

And as with all data that tracks individuals and their movements, there are considerable privacy concerns in play.

### **Key Questions**

- What data is absolutely essential for the following purposes:
  - Monitoring of corporate goals?
  - Planning?
  - Coordinated operations with shared-use modes?
  - Financial accountability?
- What are the key private provider concerns that transit agencies must be sensitive to?
- What business rules are necessary to implement in order to protect the interests of private sector providers and/or brokers?
- How can a transit agency even access data of private providers? Will it require a neutral third party broker?
- What data should be shared with MPOs?
- What are the privacy concerns and how to address them?

### **3.4. TRANSIT PLANNING / SERVICE DESIGN AND DELIVERY**

Public transit agencies work under a large array of strict federal and state rules to ensure societal requirements related to accountability, transparency, protection of human rights, protection of individual privacy, accessibility and equal treatment for all, safety of operations, etc. Engaging in partnership with these new, predominantly private, shared-use mobility providers has therefore raised a large array of policy and administrative challenges, and USDOT has initiated various initiatives, under the Mobility on Demand Sandbox and other programs, to identify and explore these policy challenges, including listening sessions, policy advisory committee, and research projects. These will help document, address and clarify the regulatory framework that will enable cooperative partnerships in practice, demonstration and deployment. Leaving those challenges aside, the following questions address the various transit planning considerations that affect the design of a potential partnership. In other words, how should these services be considered, coordinated, or integrated in the design and delivery of transit services?

One particular aspect worth greater attention concerns the concept of "*first mile / last mile*". This refers to the means by which transit customers gain access to the transit

service from the origin of their trip, and the means of travel from the point where they exit the transit service to reach their final destination. The modes of travel for the "first mile" or "last mile" of a transit trip vary; walking is most common, but other means exist including biking, automobiles (park and ride), etc. The "first mile / last mile" challenge can represent a significant problem, in particular outside of dense urban environments where walking is a viable option and wait times are acceptable. It is a well-established fact in the professional literature that the ease of access from origin and/or to the final destination significantly affects the attractiveness of transit as a mode of choice.

There has been much hyperbole in both the popular and professional media, about the ability of shared-use modes "*to solve the first mile / last mile problem*", as if there were one single problem to be solved. There is of course no single unified concept of first mile / last mile, but a variety of land use and transportation contexts created by a variety of characteristics: residential density, employment density, auto ownership, pedestrian facilities and accessibility, road networks, etc., which in turn are subject to different travel behavior and patterns. The problems in outer low-density suburbs are unlikely to be amenable to the same solutions as are those of underserved but dense inner suburbs. In addition the different shared-use modes have different characteristics as well. First mile / last mile may be an attractive shorthand for describing complex situations, but it does a disservice to designing appropriate services.

The key questions below relate to a broad range of issues, from the strategic focus for potential partnerships, to the impact on existing partners and services, down to practical considerations on physical design of facilities.

### **Key Questions**

- Where do new modes complement transit service? (recognizing different potential roles for different modes)
- How do they relate to existing transit agency service standards? Do we have enough information to assess?
- Which "*first mile / last mile*" should be the focus for an agency's effort:
  - From home in low-density suburbs to high capacity trunk line?
  - From high capacity trunk line to work location in city center?
  - From high capacity trunk line to work location in suburban industrial / office park (reverse commute)?
- Where should be the focus of a transit agency efforts to cooperate or coordinate with shared-use modes:
  - Serving ill-served geographic markets (e.g. low-density suburbs)?
  - Serving ill served population segments (e.g. disadvantaged persons)?
  - Attracting choice riders (from higher income suburbs) for environmental objectives?
  - Replacing costly services that do not meet financial targets, etc?
- Is it possible to develop a relationship with private mobility providers without weighing down innovative providers with the full array of public sector requirements?

- What is the potential role of other stakeholders: Non-profits? Municipalities? MPO?
- How should one allocate highly constrained curbside real estate near transit station facilities? How should shared-use mobility services be incorporated into transit facility design guidelines?
- To what extent should shared-use modes be explicitly included in Transit-Oriented Development and other transit-supportive zoning requirements?

### **3.5. RELATIONSHIP OF SHARED-USE MODES TO DRT AND TRANSPORTATION DEMAND MANAGEMENT**

A follow-up to the above questions related to service planning concern DRT and Transportation Demand Management (TDM).

All transit agencies operate DRT service for their Americans with Disabilities (ADA) Paratransit-eligible customers, and in some cases coordinate with federally-funded Human Service Transportation (HST) or other community transportation providers. At the same time, many agencies also operate flexible services, such as DRT or deviation-based flexible routing, for the general public to provide coverage in harder to serve neighborhoods, such as lower density suburban residential or office parks. In some cases these services have similar characteristics as those offered by some of the new shared-use modes. This creates the potential for confusion and transit agencies will need to understand the nature of the markets being served, formal requirements when serving disadvantaged populations, and the respective roles of the existing DRT and HST services vs. the potential role that might be played by the new modes.

At the same time, many transit agencies have well-established TDM services to encourage alternatives to single-occupant vehicles, in particular for commuting trips. These include services such as: carpool matching, agency-sponsored vanpooling, Guaranteed Ride Home for transit customers, etc. In some communities, the transit agency also works closely with employer-sponsored Transportation Management Associations (TMAs) to encourage and support commuter choice programs. Transit agencies will need to carefully assess how partnerships with the new shared-use modes relate to and affect existing TDM programs, and to what extent they should be encouraged when working with TMAs.

#### **Key Questions**

- How will cooperation with shared-use modes affect existing relationships with non-profit HST or other community transportation providers?
- How does it affect any existing efforts to enhance coordination of federally-funded transit, paratransit, and HST providers?
- What will be the impact on existing agency-operated services such as DRT service for the general public (e.g. Denver Call-n-Ride)?

- What are the needs and formal requirements affecting markets of concerns, and what are the respective challenges and opportunities of agency-operated DRT services vs. shared-use modes?
- Does the transit agency have a sophisticated cost allocation model that allows analysis of the true cost of different internal DRT services in order to enable a proper comparison to alternative modes?
- What are the impacts of the new modes on transit-sponsored vanpool programs (e.g. King County Metro Vanpool), and other agency operated TDM services?
- How does one coordinate publicly-operated or sponsored TDM services, with private sector efforts?
- Should shared-use modes be included in Guaranteed-Ride Home Programs? What are the potential implications for existing contractual arrangements with private taxi companies?
- What is the more general relationship to the TDM framework such as Commuter Options requirements?
- How active a role should transit agencies play in promoting these services to Transportation Management Associations (TMAs)?

### **3.6. ROLE OF TECHNOLOGY – TRAVEL INFORMATION**

Technology has been the game changer that has enabled this explosion of new modes. Technical challenges exist related to development in technological portals, interfaces, data management, etc., but it is clear from the above discussion that the institutional questions and concerns are foremost of importance to transit agencies. It is however difficult to even pose the right questions without knowing the strategic direction a transit agency will take in positioning itself with respect to the new mobility services.

Much of the technology discussion has focused primarily on 1) real-time travel information, and trip planning, and 2) booking / payment systems. Many have suggested that the provision of travel information and integrated booking / payment for the array of possible mobility options, into a single application on mobile phones, will be the next revolution. It is hypothesized that this technological integration will greatly enhance the attractiveness of shared-use mobility services, by literally putting them at everyone's fingertips, and providing "situational mobility" to choose the right mode for the right situation on an individual basis in real-time. It is hypothesized that this in turn will entice large number of households to drastically reduce the use of their personal automobile, and lead many to dispose of their vehicle.

As mentioned before, the concept of using technology to facilitate the use of shared-ride DRT service is not a new concept. It would be valuable to understand what distinguishes new mobility services from the above examples, and how these distinctions are likely to affect ridership.

The concept of integrated information and payment, on an array of mobility services, has also created in addition much discussion of possible new business models, with a

potential role for new private-sector mobility brokers. Such a mobility broker model is already being pursued in some cities in Finland and Sweden under the *Mobility as a Service* concept, and some mobile application providers in North America are exploring a similar path. These intriguing new business models raise many complex institutional issues, not the least of which is how to ensure objectivity in presenting travel options offered by mobility providers who are in fierce competition with each other, and how to protect each company's data from competitors. The question of objectivity and trust is becoming even more complex since new companies are being created that integrate trip planning, payment, and operation of specific services, with the latter being in competition to other mobility providers.

The following are a few high level technology-related questions concerning travel information that transit agencies need to consider.

### **Key Questions**

- What should be the role of the public sector with respect to travel information?
- How open should transit agencies make real-time transit data?
- Should new modes be incorporated into trip planning applications? And how?
- Should transit agencies actively promote new mobility services?
- If so, should it promote only non-profit or also for-profit providers?
- How does one provide an objective and even-handed approach to providers with very different service characteristics (e.g. bikesharing vs. carsharing vs. ridesourcing vs. carpooling)
- Should transit agencies strive to actually incorporate data and information for all these providers into publicly-provided delivery mechanisms (e.g. internet, dynamic displays, mobile applications, etc.)?
- To what extent should information provision be left to third-party application developers and/or mobility brokers? This relates to the relationship the agency wishes to have with its customers, and to the likely evolution of business models for traveler information provision (e.g. referral fee, etc.)

### **3.7. ROLE OF TECHNOLOGY – PAYMENT**

There are significant challenges related to trust, in providing integrated travel information and trip planning tools. The challenge of creating trust is paramount with respect to integrating payment options. There is a need to consider the business rules that will build this trust and ensure operational efficiency. The Smart Card Alliance has initiated an effort to develop a framework by holding discussion sessions on Multi-modal Transit Payments Convergence held at the Payments Summit conference for the last two years.. In addition, the USDOT has funded a small multimodal payment demonstration project at the Utah Transit Authority to integrate UTA's account-based payment system with payment for use of the GREENbike non-profit bikesharing provider.

The issue of trust may lead some public agencies to take a more active role. For example, the cities of Vienna, Austria, and Arezzo, Italy have both initiated a public-sector integrated billing system involving monthly billing of customers for their consumption of transit, bike-sharing, carsharing, and other participating mobility services.

Again, the fundamental institutional choices will drive technological requirements. Here are nonetheless, some payment-related questions worth consideration.

### **Key Questions**

- Is an open payment account-based system a requirement to enable integrated multimodal payment?
- Should the transit agency consider implementation of joint accounts (transit - bike sharing – car sharing)?
- Should the transit agency participate in third party brokerage of mobility payments (e.g. the Finnish Mobility as a Service model)? If so, under what conditions?
- What are the practical considerations with respect to ADA Paratransit customers in pursuing integrated mobile payment options?
- How does integrated payment relate to customer relations management objectives?

## **4. RECOMMENDATIONS**

It is clear that federal policy will need to be clarified before any extensive partnerships between transit agencies and shared-use mobility services can be pursued, and the new FTA MOD Sandbox Program should help considerably in this regard. The previous sections nonetheless outline a number of key questions that transit agencies should reflect on as they work to position their organizations and services with respect to the new shared-use mobility services.

### **4.1. GENERAL RECOMMENDATION: NEED FOR SHARING OF INFORMATION**

The most important recommendation emerging from the previous discussion is a desperate need for more effective means for sharing information between transit agencies on their discussions, reflections, and initiatives. The current situation is characterized by rapid development and deployment of new services by the new mobility providers, uncertainty, confusion, and a flurry of ad-hoc initiatives. The professional and popular media are filled with examples of transit agencies trying to develop relationships with individual shared-use mobility services, each in their own way. There are however, few TNCs and carsharing organizations, and they operate on a national scale, and thus have the ability to share information internally between operations in different cities. Transit agencies on the other hand operate in relative isolation. There is therefore a great need for USDOT and APTA to structure comprehensive mechanisms for sharing of information among transit agencies, in order to avoid a patchwork of ad-hoc deployments, and in order to encourage the sharing of best practices.

The FTA MOD Sandbox Program is intended to encourage experimentation, as well as to enable the sharing of lessons learned and best practices. It will be particularly important to ensure effective dissemination of findings from the Program given the challenges within the industry on sharing information.

Suggestions for expanding dissemination include the following:

- Develop workshops that would bring together transit agencies and new mobility providers to discuss initiatives, challenges, opportunities, lessons learned and best practices.
- Find mechanisms to reach those that do not typically attend APTA conferences and workshops.
- Use the USDOT Professional Capacity Building (PCB) Program to have a series of webinars to share information on relevant topics.
- Encourage the development of transit agency committees that will develop industry recommended practices on common challenges such as data collection and reporting requirements.

## 4.2. RESEARCH NEEDS

Finally, this discussion paper has identified five topics for research.

### *Transit agency / MPO reporting data requirements*

There is a need to define the data reporting requirements that will serve for monitoring the effectiveness of initiatives against identified policy goals and objectives. Negotiations are already under way in several transit agencies. It would be valuable to have an industry-wide research effort to ensure best practices are shared, and data requirements are standardized.

### *Best Practices in Managing Partnerships with these New Mobility Providers*

Some agencies have already invested considerable effort in developing partnerships with the new mobility providers. It would be useful to document and share lessons learned. For example, how does one manage internal inter-departmental coordination in a relationship with different types of potential external partners, where the consequences affect different transit agency departments?

### *Assessment of Previous and Current Public-Sector Technology-Based DRT Services*

As mentioned, there are several cities in Europe and North America that operate demand-responsive transit for the general public using advanced technology. It would be useful to assess lessons learned from these projects, compare their characteristics to those of the new mobility services, and identify challenges and opportunities for both transit agencies and shared-use mobility providers. It is hypothesized that their three key game-changing attributes are: immediacy, peer review, and trust. This research might provide insight into the relative importance of these new attributes, which in turn would suggest ways to improve existing DRT services, and assess where the new mobility services might offer a better option than publicly-operated DRT.

### *From Transit Service Provision to Integrated Mobility Management: Alternative Institutional / Business Models for Public Transportation Agencies*

The explosion of new technology-enabled shared-use modes is causing much change and reflection, leading some to refer to a new "ecosystem" of mobility on demand. The many questions raised by this new ecosystem may lead some transit agencies to reflect on their corporate mission. Some agencies had already moved to embrace a mission of mobility management based on a vision of integrated mobility systems. This is more common in Europe, but some agencies in North America had also moved in this direction, including agencies such as King County Metro and the STM in Montreal that had already developed partnerships with bikesharing and/or carsharing services. The SFMTA in San Francisco has probably developed the broadest vision of integration of modes in North America. In light of this, it would be useful to conduct research to identify alternative (or potential) institutional / business models, in North America and Europe, which might provide a better understanding of alternative options for transit agencies with corresponding different degrees of involvement and/or partnerships with other modes.

*Multimodal Payment Business and Technical Requirements*

As stated, the Smart Card Alliance is already undertaking an initiative on multimodal transit payments convergence, and USDOT is conducting a small demonstration at the Utah Transit Authority. There is a need to share the information from these discussions more widely within the transit industry.

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