Mobility on Demand (MOD) Business Models Scenario Planning Template

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16. Abstract

The document is part of a larger effort to identify and analyze innovative business models that can be used to deliver better services to travelers. Previously completed efforts included the *Mobility on Demand Business Models Assessment*, which provided a definition of business models, identified various MOD business models and how they operate, and provided information on how MOD business models can help meet public goals. Also completed was the *Mobility on Demand Business Model Elements*, which further detailed MOD business models and provided an overview of the customer base, value proposition, capitalization and revenue, operational characteristics, and partnerships and regulations of various models. This report includes actions that agencies may undertake in advance of implementing MOD solutions. For instance, determining options to meet the needs of specific groups such as travelers with disabilities, evaluating risks, and assuring equitable access to services. This document is not intended to assist agencies with implementing MOD business models or associated elements.

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Chapter 1. Using This Template

This document was developed to assist agencies that are interested in using mobility services to address transportation needs. It outlines a process that agencies can use to identify MOD business models that are applicable to their community needs, organizational limitations, and goals. It also discusses how agencies can use scenario planning to identify potential risks associated with MOD business models and identify related mitigations. The focus of this document is on the identification of new mobility solutions versus the enhancement of existing services. However, a community with an underperforming mobility service could use this document to identify services that have potential to improve service quality.

The document is part of a larger effort to identify and analyze innovative business models that can be used to deliver better services to travelers. Previously completed efforts included the *Mobility on Demand Business Models Assessment*, which provided a definition of business models, identified various MOD business models and how they operate, and provided information on how MOD business models can help meet public goals. Also completed was the *Mobility on Demand Business Model Elements*, which further detailed MOD business models and provided an overview of the customer base, value proposition, capitalization and revenue, operational characteristics, and partnerships and regulations of various models. These documents, and this one, were integrated into a final synthesis report.

Readers of this document are expected to be familiar with the various MOD business models and their elements. In this regard, the *Mobility on Demand Business Models Assessment* and *Mobility on Demand Business Model Elements* reports are recommended reading.

This report includes actions that agencies may undertake in advance of implementing mobility solutions. For instance, determining options to meet the needs of specific groups such as travelers with disabilities, evaluating risks, and assuring equitable access to services. This document is not intended to assist agencies with implementing MOD business models or associated elements. For these needs, planners should refer to USDOT's *Mobility on Demand Planning and Implementation: Current Practices, Innovations, and Emerging Mobility Futures*.

This document is divided into four chapters:

- Chapter 2 discusses the importance of needs assessments and how they relate to mobility planning efforts.

- Chapter 3 provides an overview of MOD business models to assist planners with understanding and matching mobility needs to applicable business models.

- Chapter 4 discusses how scenario planning can be used to identify potential risks associated with MOD business models and to identify related mitigations.

- Chapter 5 describes how results from needs assessments and scenario planning can be combined to identify MOD business models to meet community needs, understand the potential risks associated with implementing models, and identify potential mitigations.

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- Chapter 6 exemplifies how the information within this document can be used. The example was designed to be relevant to many planning agencies and provide insights into the mobility planning process and the use of the various templates within this document.

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Chapter 2. Identifying Mobility Needs

The first step to implement a successful mobility solution is understanding the needs of the community the service is intended for. This assures that any implemented mobility solutions will be applicable to the need. In many cases, agencies have identified mobility services of interest and subsequently worked to identify a situation in which the service could be applied. This type of deployment can lead to services that may not operate in the best areas, along the best routes, or at the best times; may use technology that does not work for the community; or may not be marketed in an optimal way, among other issues. A needs assessment helps address this by assuring that mobility solutions are matched to community needs rather than vice versa.

The Importance of Needs Assessments

Needs assessments provide transportation agencies with a systematic process though which a community's mobility needs can be identified, and they can help prioritize where resources are needed to address specific challenges. In addition to identifying specific mobility needs, assessments can reveal important data about targeted communities that can assist implementation efforts; this includes information about language skills, accessibility of mobility services, access to and familiarity with technology, and how people receive information about transportation options, among other things.

Results from the assessment will provide communities with information that will help them identify which MOD business models are most able to meet their needs and help communities agree on the specific outcomes they hope to achieve by implementing a mobility service. A thorough needs assessment can also support the later evaluation of a mobility service. The process will define a clear goal, and collected data can be used as a baseline from which to determine whether the solution met the identified needs.

In many cases, communities have already conducted planning efforts to identify mobility needs. A needs assessment is not necessary if a community has identified current and near-term mobility needs that may be addressed with mobility services. Communities that do not have clearly defined mobility needs should conduct a needs-based planning effort prior to implementing a mobility service.

Conducting Needs Assessments

There is no single method for conducting a needs assessment. The information in this document is adapted from *Conducting Needs Assessments, A Multidisciplinary Approach* (Soriano, 2013) and modified to apply to needs assessments that are seeking mobility solutions. A five-step needs assessment process is outlined below.

1. Inventory existing conditions.

2. Determine the purpose of the needs assessment.

3. Assess available resources.

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4. Know the community.

5. Conduct the assessment.

Step 1: Inventory Existing Conditions

It is important to understand the environment in which any mobility service will be offered. This includes information such as land use, density, existing and planned transportation services and infrastructure, travel patterns, political concerns and preferences, employment and demographic data, and key stakeholders. The list of key stakeholders may be large and include the target population, the agency conducting the assessment, potential funders, potential operators, and others who may assist with evaluating and implementing any services.

This inventory of existing conditions will provide context and data for the needs assessment. Information can be used to assist with identifying unmet mobility needs, understanding historical concerns and preferences, identifying mobility solutions, and recruiting partners for the implementation of mobility solutions.

Step 2: Determine the Purpose of the Needs Assessment

Clearly understanding why a needs assessment is being undertaken will feed into overall data collection and analysis. Thinking through the problem that is to be addressed (e.g., to provide a mobility service to improve access to jobs) will flow through to the information requirements for the needs assessment. If a mobility solution is sought without identifying the purpose of the solution and those whom it is intended to serve, it will likely result in failed application.

Needs assessments should include goals and objectives. For example, a goal may be to conduct a needs assessment to determine the job access needs of low-income workers. Objectives of such a study could be: (1) assess current levels of job access for low-income workers, (2) identify current transportation resources available to low-income workers, (3) determine where mismatches exist between potential workers and jobs, and (4) determine reasons for job-housing mismatches. The goals and objectives will impact which stakeholders are included in the study and what data are needed to conduct the study.

Step 3: Assess Available Resources

Needed resources will be driven by objectives and will include data, analysis, and staffing. It may be necessary to scale the needs assessment depending on available resources. If resources are limited, any primary data collected through the needs assessment process should be augmented with secondary data to provide efficiencies in data collection. Secondary data (e.g., census data) are derived from a source other than the needs assessment analysis; whereas, primary data are collected specifically for the needs assessment analysis as part of the assessment process. Examples of primary data include survey and focus group results. Occasionally, a needs assessment can be conducted using only secondary data if recent and robust data exist.

Step 4: Know the Community

Often, simply collecting data or using secondary data will be inadequate for the needs assessment analysis. If resources are available, getting out into the community and interviewing key stakeholders who

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know the community best will result in additional insights that can be missed through simple data analysis. This can take the form of attending neighborhood meetings, developing focus groups, and conducting guided interviews with key influencers. Understanding the history of a targeted community can also help to provide additional insight to the travel habits and thought processes of members of a community. Potential key community stakeholders may include:

- Local transportation advocacy groups.

- Non-profit community groups.

- Neighborhood associations.

- Business owners.

Step 5: Conduct the Assessment

Generally, there are two types of assessments: qualitative and quantitative. More robust needs assessments will use a combination of the two types to support decision making and funding applications.

Quantitative methods can generate a more objective and generalized assessment; whereas, qualitative methods can provide poignant stories to discover needs that may not be apparent through quantitative data analysis. A mixed-method needs assessment may first use quantitative analysis to understand underlying trends and then use a qualitative method to understand if those underlying trends hold true and to get real-world examples.

The ultimate analysis should reveal specific information about the mobility need. Continuing the example of assessing the job access needs of low-income individuals, a needs assessment may determine that: (1) there is a need to move residents between a high-poverty neighborhood and a major suburban employment center; (2) weekday needs can be met with a first/last mile travel option between residents' homes and a nearby rail station while weekend needs require some kind of direct service between residents' homes and the employment center; (3) those most in need are primarily non-English speakers with limited access to smart phones; and (4) approximately 1,500 residents could benefit from the mobility service.

A final report should be developed that summarizes the study process, data collected, findings, and any stakeholder commitments that were made to assist with the funding and/or delivery of mobility service solutions.

Data Sources

Numerous data sources exist to assist with needs assessments. A quantitative needs assessment utilizes primary and secondary data sources. Applicable data sources that are universally available for quantitative needs assessment analysis include:

- **American community survey (ACS) data:** An annual survey that provides information on household income, demographics, and commuting to work by mode of transportation.

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- **Longitudinal employer-household dynamics (LEHD) data:** Available through an online resource, OnTheMap[1], which provides an interactive online tool to understand employment and commute patterns and flows and undertake origin/destination analysis.

Applicable secondary data sources that might be available to local agencies for a needs assessment include:

- Geographic Information System data to identify available transportation services, infrastructure, and services. Many regional planning agencies and local governments have online databases that allow users to download geospatial files with roadway, bike network, sidewalk, land use, and other data.

- Transit agencies may have available ridership and route data, which can provide a snapshot of routes with high ridership and gaps in the transit network where a new service maybe valuable.

- Data on available shared mobility providers and use rates may be available from cities that regulate the services or directly from service provider websites.

- Crowd-sourced data from services like Strava and Moves can support decision making for the location of new services.

- Data on traffic deaths and injuries are often available from city governments and departments of transportation. The information can indicate where safety concerns may exist.

Additional Resources

The following resources are available to provide additional recommendations for planning and implementing a needs assessment:

- The *Community Tool Box*, developed by the Center for Community Health and Development at the University of Kansas, is an in-depth online tool that includes further information and tools for assessing community needs and resources.[2]

- The Center for Disease Control created a *Community Needs Assessment* document in 2013 that provides additional information on how to undertake a needs assessment.[3]

There are many examples of mobility needs assessments conducted by communities, including the following:

- *Boulder County Mobility for All Needs Assessment and Action Plan*, which provides an example of a county-wide mobility needs assessment.[4]

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[1] Accessed here: https://onthemap.ces.census.gov.

[2] Accessed here: https://ctb.ku.edu/en/assessing-community-needs-and-resources.

[3] Accessed here: https://www.cdc.gov/globalhealth/healthprotection/fetp/training_modules/15/community-needs_pw_final_9252013.pdf.

[4] Accessed here: https://assets.bouldercounty.org/wp-content/uploads/2017/03/mobility-for-all-needs-assessment.pdf.

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- *Living Cully Plaza/Las Adelitas (Portland, OR) Community Mobility Needs Assessment*, which provides an example of a small area mobility needs assessment.[5]

- *Community-Based Assessment of Smart Transportation Needs in the City of Portland*, which provides an overview of developing needs assessments for smart transportation across a city.[6]

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[5] Accessed here:
https://static1.squarespace.com/static/57bf2cf2bebafb692dd3505c/t/5bd379377817f7ea5f6943ae/1540585788699/Verde+Mobility+Assessment.pdf.

[6] Available at:
https://forthmobility.org/storage/app/media/Documents/Community%20Assessment%20of%20Smart%20Mobility%20OPAL_PSU_Forth%20Final.pdf.

Chapter 3. Identifying Potential Mobility On Demand Business Models

Once a mobility need has been identified, MOD business models can be reviewed to determine which are likely to help the community meet its identified need. This chapter includes a discussion of MOD business models and their associated elements. It has been adapted from an internal FHWA report titled, *Mobility on Demand Business Model Assessment*. Information in the chapter is intended to increase the reader's awareness of MOD business models to make it easier to match identified needs to business models using the tools presented in chapters 4 and 5 of this report.

Identifying Types of Mobility on Demand Business Models in Existence

A company's business model is the outline of how it sustains its existence in the marketplace. Even in this fast-evolving space, knowledge of business models in the context of mobility companies allows public agencies to better understand where a company and an agency are similar and different in their strategies and goals. A definition of the broad categories of business models that define common relationships between mobility service providers and consumers (also referred to as MOD Business Models) is presented in table 1. An agency can benefit from learning broadly about the business models in existence and how they are evolving in other geographies before moving to the step of identifying the model that bests suits its needs.

Table 1. Mobility on demand business models.[7]

Business Model	Definition
Business-to-Consumer (B2C) Services	Business-to-consumer services provide individual consumers with access to business-owned and -operated transportation services, such as a fleet of vehicles, bicycles, scooters, or other travel modes. These services are typically provided through memberships, subscriptions, user fees, or a combination of pricing models
Business-to-Government (B2G) Services	Business-to-government services offer business-owned and -operated transportation services to a public agency. Pricing may include a fee-for-service contract, a per-transaction option, or some other pricing model. Microtransit operators often use this business model in their public-private partnerships

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[7] Framework developed in the U.S. Department of Transportation's *MOD Operational Concept Report* (Shaheen et al., 2017), and subsequently expanded in SAE International J3163. (2018)

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Business Model	Definition
Business-to-Business (B2B) Services	Business-to-business services allow businesses to purchase access to business-owned or government-owned and -operated transportation services, either through usage fees or a fee-for-service. This type of service is typically offered to employees to complete work-related trips. First/last mile mobility service partnerships for suburban work destinations (reverse commutes) have employed this model
Peer-to-Peer Mobility Marketplace (P2P-MM)	Peer-to-peer mobility marketplace services offer a marketplace—usually as an online platform—to facilitate transactions among individual buyers and sellers of personally owned and operated mobility services in exchange for a transaction fee. Peer-to-peer carsharing services, such as Getaround and Turo, are the most prominent examples of this model
Fractional Ownership	Fractional ownership allows individuals to sub-lease or subscribe to access a motor vehicle or other travel mode owned by a third party. These individuals have "rights" to the shared service in exchange for taking on a portion of the ownership expense. Far less common than the other models, fractional ownership allows users to buy into a "library" of vehicles to be used for various purposes. Automobile manufacturers have experimented with the model

Identifying Business Model Elements

Although increasingly diverse, the actors in the mobility marketplace share an underlying logic of how their interdependent activities deliver value to customers and how those activities create a profit. The value includes identifying customers and creating a value proposition, while the profit considerations are primarily related to revenue, operations, and necessary partnerships or regulation.

A public agency can benefit from examining the elements of the potential business model independent of the decision of which business model to use. This would include examining elements such as:

- Customer base of the potential service(s).
- Value proposition of the potential services(s).
- Operational characteristics of the potential services(s).
- Types of partnerships and regulatory mechanisms that would help deliver the service(s).
- Potential sources for funding and/or financing the potential services(s).

The business model elements and examples are presented in table 2.

Mapping Identified Needs with Available Business Models

As agencies undertake the needs assessment described in chapter 2, several potential public goals may emerge within their jurisdictions. Chapter 5 of this report provides recommendations to help readers match mobility business models to identified needs. Specifically, table 4 provides a ranking of various business models and their ability to address common mobility needs.

Table 2. Mobility on demand business model elements.

Business Model Elements	Description	Illustrative Examples
Customer Base	For a business to succeed, it needs to identify the various segments of its customer base and attract and retain them	- Participants in a peer-to-peer marketplace - Transit agencies - Transit users
Value Proposition	For a service to gain customers and scale up, it needs a value proposition (i.e., what it is offering that is new, different, or better)	- Convenient rides at market rates - Affordable first/last mile connections - High-technology, on-time paratransit - One-stop, multimodal information in a no-cost application
Capitalization and Revenue	Mobility services are often funded with venture capital. In addition to venture capital, other revenue streams may also be involved	- Venture, start-up financing - State and federal grants, subsidies, and contracts - Sponsorships and vehicle advertising - Users, riders, and members - Innovative funding (e.g., public agency development of spin-off enterprises) that continues to provide funds to the agency for new projects - Revenue-sharing between partners
Operational Characteristics	Transportation modes can operate in the mobility space in several ways	- One mode - Multiple modes - Mobility-as-a-service
Partnership and Regulation	Whether from launch or after agencies begin to regulate them, agencies and operators should consider whether mobility on demand services and transit can complement each other to achieve modeshift away from single-occupancy vehicles	- Early comprehensive regulation - Ad hoc regulation - Contracts - Non-exclusive regulatory permits or franchises - Open call for unsolicited proposals - Traditional bid process - Grant-funded, community-led mobility networks

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Chapter 4. Scenario Planning

Agencies seeking to use mobility services to meet community needs must make decisions in an environment where technology, economic trends, regulation, and other factors are changing. In addition, business models are rapidly adjusting, and service providers are regularly moving into and out of the marketplace. Planners need a solution that allows them to consider how mobility on demand (MOD) business models may change in the near and long term and what risks those changes pose. Scenario planning enables them to make informed decisions that include applicable risk mitigations.

Scenario planning offers a typology to planners and community members so they can identify plausible alternative futures, consider the impact of those futures, and identify actions that can be taken to address potentially negative future outcomes.

Scenario planning originated with military planning during World War II and was subsequently adopted in the private sector by the late 1960s. (FHWA, 2015) Its adoption in the planning field is more recent and was aided, in part, by computer tools that simplify advanced land use and transportation system analyses. (Klosterman, 2014) Since 2004, the Federal Highway Administration has encouraged the use of scenario planning to enhance the traditional planning process. (FHWA, 2011) As part of that effort, the agency has developed numerous resources, including the following:

- The *FHWA Scenario Planning Guidebook* assists transportation agencies with carrying out a scenario planning process from start to finish.

- The *Next Generation Scenario Planning: A Transportation Practitioner's Guide* profiles the next generation of scenario planning for transportation practitioners and summarizes the history, key benefits, and driving issues that warrant a scenario-based approach.

- The *Supporting Performance-Based Planning and Programming through Scenario Planning* presents a framework for connecting established scenario planning processes with the four phases of performance-based planning and programming.

- The *FHWA/FTA Scenario Planning Technical Assistance Program* is an online toolkit with information for individuals seeking to integrate scenario planning into larger planning efforts.

Overview of Scenario Planning

Many planners are familiar with scenario planning within the context of regional planning. Large transportation planning agencies use scenario planning to identify how transportation networks, investments, and operations interact with land use patterns (FHWA, 2011) and often do so for time horizons of 30 years or more. (Chakraborty, Kaza, Knaap, and Deal, 2011) In many cases, agencies develop "normative" scenarios that represent preferred and achievable end states. (American Planning Association, 2019) However, there is no single methodology, or even specific outcome goal, associated with scenario planning. Beyond normative plans, many scenario-planning exercises are predictive or exploratory (i.e., they attempt to predict future conditions or explore various options of what could happen

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in the future). This inherent flexibility allows scenario planning to be adaptable to aiding in the selection of MOD business models to meet community needs.

Arnab Chakraborty and Andrew McMillan reviewed and synthesized 63 articles and 25 projects from 2004 to 2014 that used or discussed scenario planning. (2015) The result of their synthesis was the creation of a scenario-planning typology with nine key components, each with three subcomponents that capture the important variations of scenario planning. Their typology can be used to consider how internal factors (items that a transportation agency can control) and external factors (items that a transportation agency cannot control) can come together to impact the success of agency policies and decisions.

Below is a general scenario-planning template based on the Chakraborty and McMillan typology. The elements should be considered as a framework only; unique community goals and needs may necessitate or encourage different considerations. The final outcomes of the scenario-planning process are: (1) the creation of future scenarios that identify how conditions that affect the delivery of MOD business models may change, and (2) an understanding of how present-day decisions and policies regarding MOD service deployment may impact future outcomes.

Organization structure – the relationship among the entities involved in the planning process. Organizational structures impact the control that an agency has on the success of mobility operators and are, therefore, important to scenario planning. For example, an agency with regulatory powers over mobility operators can control when and how regulations may impact mobility service delivery. An agency without such power could see its use of mobility services positively or negatively impacted by another agency's regulatory choices. Within mobility planning, the organizational structure of the planning process is generally *unitary*, which means that the process is led by a single agency. Alternatively, the organizational structure could be *strong leader,* meaning multiple agencies are involved in the planning process but there is a clear leader.

Scope – the breadth or focus of a planning effort. The scope of a typical MOD business model evaluation is typically *single issue*, where the focus of the effort is on the single topic of how conditions (e.g., population changes, technology innovation, regulatory changes, and economic trends) may impact the delivery of mobility services.

Scenario type – the primary motivation behind constructing and evaluating scenarios. Within mobility planning, the scenario type will typically be *explorative*, meaning planners seek to generate multiple scenarios that are realistic versions of what may happen in the future.

Outcome – the desired product or result of the scenario-planning process. Within mobility planning, the desired outcome is generally a *policy recommendation* that seeks to identify future outcomes of present-day decisions. Planners will typically seek to understand how the decision to implement a specific mobility service will be impacted by future events. For example, if the availability of venture capital suddenly decreases dramatically, what impact will that likely have on the selected mobility service? Understanding these potential outcomes will help with decisions about which business models, policies, or mitigations should be pursued.

Stakeholder engagement – highlights the nature of participants involved in the planning process. Within mobility planning, stakeholder engagement is typically focused on *interest groups*, which are stakeholders selected specifically from identifiable organized groups. They are typically interest groups that can help with developing scenarios and understanding outcomes and can include mobility providers, transportation agencies, project partners, futurists, and funders. Futurists can be useful to the process due to their

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emphasis on making predictions about the future based on current trends. Funders, which include any organization that may directly or indirectly fund the project or help secure grant funding, can help identify how scenarios may impact the availability of funding.

Participation extent – the nature of stakeholder involvement. Stakeholder engagement should focus on *seeking feedback*, which is knowledge sharing to guide the development of scenarios and understanding of outcomes.

Engagement medium(a) – the mechanisms used to draw inputs from planning participants. Mobility planning typically requires *face-to-face* engagement to collect information from stakeholders. Face-to-face engagement includes public forums and collaborative meetings.

Scenario construction and analysis tools – the tools and techniques used to craft planning scenarios. Within mobility planning, the focus is typically on *qualitative* tools that include interviews and opinion surveys that collect information from stakeholders regarding how MOD business models may react to various market and other events.

Resources – the funding, institutional capacity, intensity, and tenure of the project. Resources will often vary within mobility planning.

Figure 1 below illustrates the above-described typology.
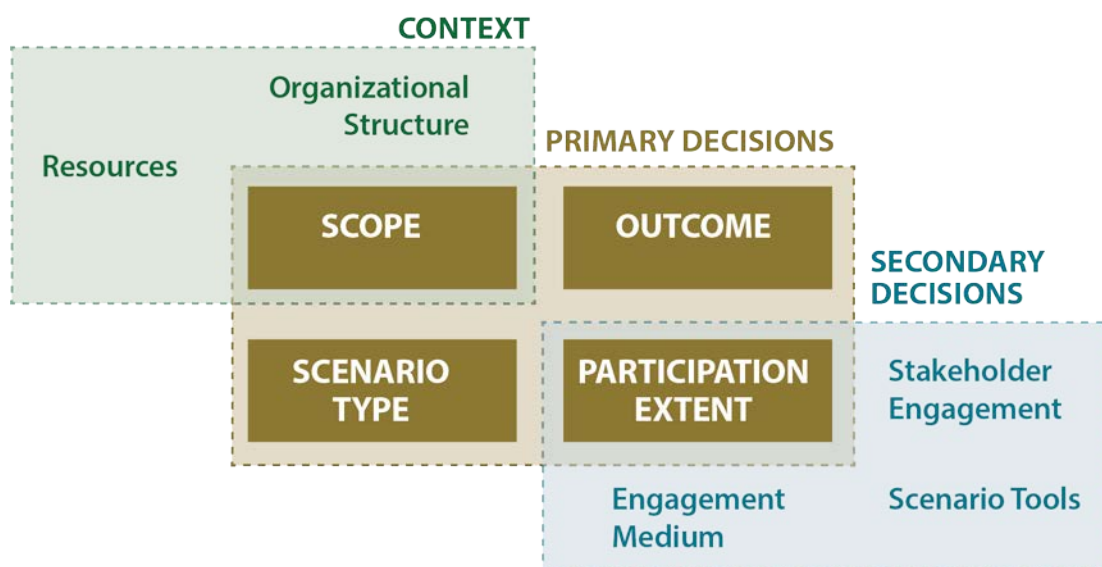
Source: Adapted from Chakraborty A. and McMillan A., 2015

Figure 1. Graphic. A Scenario Planning Typology

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Scenario Development

Scenarios should be created that allow for the evaluation of MOD business models based on multiple realistic futures. The goal is to identify potential future conditions and events in which a MOD business model will need to operate. While future conditions should be realistic, participants in the process are cautioned against being overly constrained; planners frequently confront unanticipated situations and scenario plans may exclude complex developments and trends because they are deemed logically impossible or inconsistent. (Lieble, 2002) This risk is likely greater with respect to MOD business models given the significant fluctuation occurring in the marketplace.

To create scenarios, planners should:

1. Establish an appropriate timeframe.

2. Identify internal and external factors.

3. Make predictions about external factors.

4. Determine the likelihood that a prediction will occur within the scenario timeframe and the likely impact of the prediction on mobility service delivery.

5. Predict how mobility services will react to the most impactful and likely predictions.

These five steps, which are dependent and interact with one another, are discussed below.

Step 1: Establish a Timeframe

A timeframe for the scenario plan should be established, and it should be equal to the likely operational period of the mobility service. For example, if one is seeking to use a mobility service to address the mobility needs of low-income households during a major roadway construction project, scenarios that have a time horizon that extends through the period of roadway construction should be created. The timeframe of the scenarios should be lengthened if the project is considered a pilot that may be expanded after roadway construction ends.

Step 2: Identify Internal and External Factors

Scenarios are the result of the interaction of internal and external factors. Internal factors are things an agency can control. Within this process, internal factors are the MOD business models and services that an agency can choose to address community needs. Chapter 5 provides a process and associated matrix that agencies can use to identify MOD business models and services that may be applicable to their transportation needs. Potential MOD business models and services need to be identified before the scenario planning process can be completed.

External factors are things that an agency cannot control. It is important to note that factors that may be within the control of one agency may be outside the control of another. Clearly defining the organizational structure at the beginning of the scenario-planning process will help clarify what constitutes an external factor. Examples of external factors follow:

- Population change (e.g., increases in employment that may affect service demand).

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- Technology innovation (e.g., developments that may affect the features, delivery, or type of services available).

- Political change (e.g., electoral changes that impact support for service).

- Regulatory changes (e.g., policies enacted at any level of government that impact service availability, cost, or delivery).

- Economic trends (e.g., income or employment increases or decreases that affect how people travel and the number of people who may need to travel).

- Social trends (e.g., societal preferences for certain travel modes or safety concerns about specific modes).

- Environmental trends and events (e.g., increases in temperatures that affect travelers' willingness to use or wait for services or major storms that impact service delivery).

- Business model changes (e.g., decisions by service providers to cease service or focus service delivery on a new market).

- Energy/fuel costs (e.g., increases or decreases in fuel cost that impact demand for non-automobile travel).

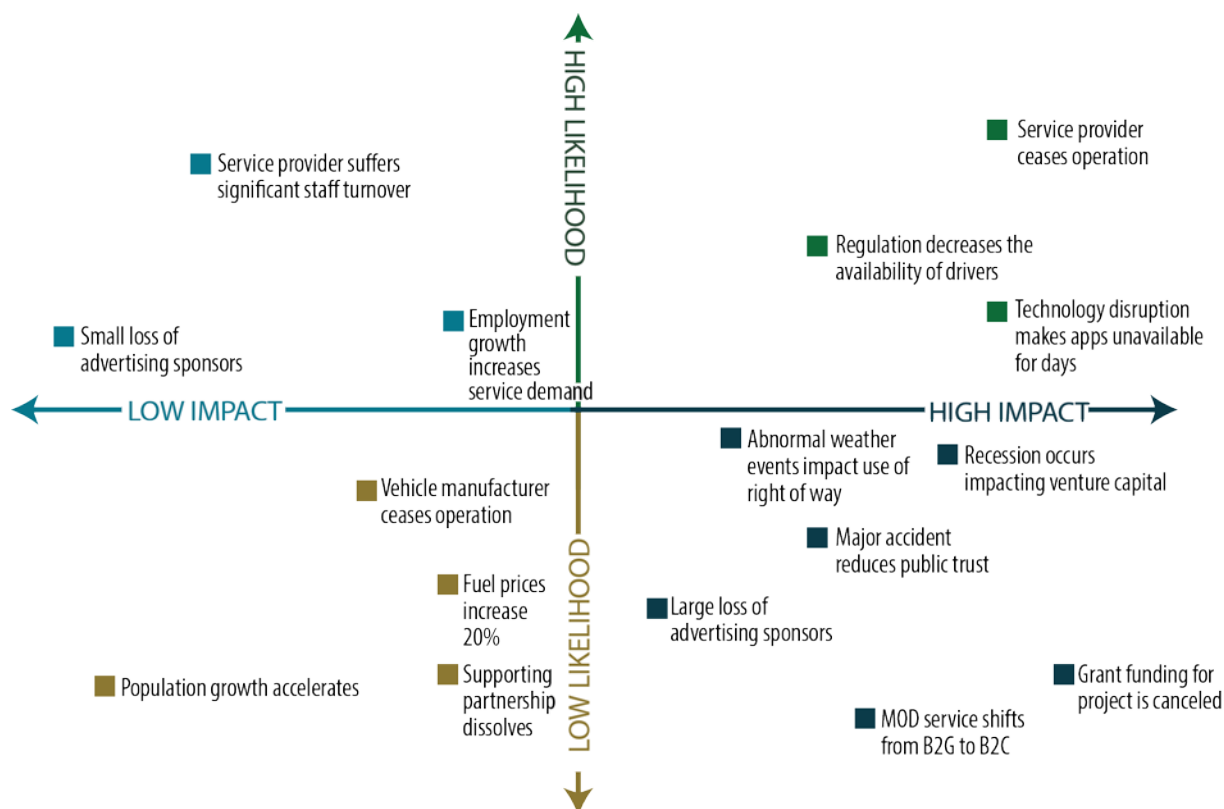- Funding (e.g., decreases in tax revenue or loss of grant funds).

Only factors that are likely to have an impact on mobility services within the scenario timeline should be considered. Environmental trends and events provide a good example of this issue. If the timeframe is 1 to 2 years, then environmental trends are unlikely to be a factor affecting mobility services; however, if the timeframe is 10 to 20 years, environmental trends may be an issue. Regardless of timeframe, environmental events such as major floods and snow storms could be an issue. Applicable factors can be identified based on stakeholder input and other data-gathering efforts.

Step 3: Make Predictions about External Factors

Predictions about the future state of external factors must be made. For example, if economic trends are identified as a factor that may impact mobility services within the established timeline, how will economic trends change, if at all? One prediction may be that employment within a planning area will increase 20 percent due to expansion by a major employer. Another prediction may be that business model changes will cause certain mobility providers to shift their business model from business to government to business to consumer.

Step 4: Determine the Likelihood and Impact of Predictions

A large number of predictions may be identified in the scenario-planning process. The number should be narrowed so that only predictions that are likely to occur *and* have a significant impact are further considered. Figure 2 exemplifies this process. The vertical axis depicts the general likelihood that a factor will occur during the scenario timeframe. The horizontal axis depicts the impact the factor would have if it did occur. All predictions should be graphed based on their relative impact and likelihood. Information gathered from stakeholder engagement can be used to decide the appropriate location of the predictions. Predictions that fall within the upper-right quadrant are of most concern and will be considered in Step 5.

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Source: Leidos and UrbanTrans

Figure 2. Graph. Prediction likelihood and impact analysis.

Note that figure 2 is provided purely for conceptual purposes. The factors that each community identifies should vary based on the MOD business models being analyzed and unique community needs. In addition, the likelihood of various factors occurring and the impact they will have will vary by community.

Step 5: Predict Impacts and Reactions

This step is used to determine the specific impact that predictions will have on mobility services and to identify how an agency or community may respond to those impacts. This step is most easily guided by a matrix that shows internal options (e.g., mobility services) versus predictions. Table 3 provides an example of predictions and associated impacts. MOD business models/services that could potentially address community needs are shown on the vertical axis on the left. Across the top horizontal axis are the predictions that were determined to be both likely and impactful. Each paired MOD business model and prediction has information on the impact of the prediction on the service model and information on how a community could mitigate the effect. Table 3 is provided only as an example. Additional information on how to develop a similar matrix and integrate it into a full analysis of MOD business models is provided in chapter 5.

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Table 3. Internal options versus external factors.

Internal Options	External Factors/Predictions			
	Service Provider Ceases Operation	Regulation decreases the availability of TNC drivers	Technology disruption makes apps unavailable for multiple days	
On-demand shuttle service that uses mobile app to request rides	Service will cease.	No impact	Riders will be unable to request rides through the mobile app.	Impacts
	Go out to bid for new service provider. May take weeks to months. Provide temporary service through existing call-n-ride.	N/A	Service can temporarily operate using designated stops. Rides could be requested via phone using system designated for riders without smart phones.	Mitigations
TNC service such as Uber or Lyft	Service will cease.	Rider wait times increase	Riders will be unable to request rides through the mobile app.	Impacts
	Go out to bid for new service provider. Will likely take less time than on-demand shuttle service. Temporarily provide vouchers for another TNC service. Temporarily provide service using existing call-n-ride vehicles.	Minimal options	Rides could be requested via phone using system designated for riders without smart phones.	Mitigations

Planners should repeat this process for their own scenarios. The resulting information will help stakeholders understand the risks associated with pursuing mobility services to address community mobility needs. The mitigation portion of the process may also help communities identify policy, contractual, and operational actions they may want to take to minimize negative impacts or to maximize mobility service benefits.

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Chapter 5. Mobility Service Selection

This chapter describes how results from needs assessments and scenario planning can be combined to identify mobility on demand (MOD) business models to meet community needs, understand the potential risks associated with implementing models, and identify potential mitigations. The process consists of three steps and uses a matrix that summarizes information about MOD business models that includes business model elements and the ability of business models to address various community needs. The information is based on data and business characteristics that were widely available at the time this document was created. Changes may have occurred given the evolving nature of the mobility ecosystem. The matrix should be used as a guide but checked to assure its continued accuracy.

Step 1: Match the Value Proposition of Mobility Services with Identified Needs

The first step is to determine how well available mobility services can address identified community needs. Table 4, shown later in this chapter, includes information on the value proposition various MOD business models offer with regard to eight commonly identified community transportation needs—reducing congestion, improving first/last mile travel, enhancing mobility for services and goods, improving air quality, expanding mobility options, providing solutions in low-density areas, improving mobility for people with disabilities, and serving underserved areas or populations.

Each MOD business model is scored *limited*, *potential*, or *high*, referring to the model's ability to address the respective need. A score of *potential* does not mean that the service is not capable of addressing a respective need, but rather, that sufficient data were not available at the time this document was created. Sometimes, an identified need may not be listed in the matrix. In these cases, planners will need to review available research and possibly make educated inferences to determine the likely ability of the MOD business model to meet the community need.

Planners should compare their identified needs to scoring for each business model. Business models that are scored as most able to address the identified needs should be carried forward for further analysis in Step 2. A business model scored as *potential* or *limited* may still be worthy of further analysis. Unique local circumstances, available choices, and other factors should be considered when deciding which business models to carry forward.

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Table 4. Mobility services and business models planning template.

	Round-trip Carsharing	Free-floating Carsharing	Docked Bikesharing	Dockless Bikesharing	Dockless E-scooters	Ridesourcing	Microtransit	Apps
Step 1: Value Propositions/Identified Needs (1)								
Congestion	High	High	High	High	Potential	Limited	Potential	Potential
FLM Travel	Limited	Potential	High	High	High	High	High	High
Mobility for Services & Goods	High	High	Potential	Potential	Potential	High	Limited	Potential
Air Quality Improvement	Potential	Potential	Potential	Potential	Potential	Limited	Potential	Potential
More Mobility Options	High	High	High	High	High	High	High	Potential
Low Density Transportation Solutions	High	Limited	Limited	Potential	Limited	High	Limited	Limited
Mobility for People with Disabilities	High	High	Potential	Limited	Limited	High	High	Potential
Serving Underserved Areas or Populations	High	High	Potential	Potential	Potential	High	High	High
Step 2: Operational Models								
Customer Base	B2C/G	B2C	B2C/G	B2C	B2C	B2C	B2G	B2C/G
Operational Characteristics	One mode	One mode	One mode	One mode	One mode	One mode	One mode	Mobility as a Service
Capitalization and Revenue	- Riders, users and members - Brokerage (Peer-to-peer) - Venture capital - Grants and subsidies - Sponsorship and advertising	- Riders, users and members - Venture capital - Sponsorship and advertising	- Riders, users and members - Venture capital - Grants and subsidies - Sponsorship and advertising	- Riders, users and members - Venture capital - Grants and subsidies - Sponsorship and advertising	- Riders, users and members - Venture capital - Grants and subsidies - Sponsorship and advertising	- Users, riders and members - Venture capital	- Users, riders and members - Sponsorship and advertising - Venture capital - Grants and subsidies	- Users, riders and members - Sponsorship and advertising - Venture capital - Grants and subsidies - Brokerage - Revenue sharing
Partnerships and Regulation (2)	- Regulation - Contract	- Regulation - Contract - Traditional bid process - Grant-funded community-led mobility networks	- Regulation - Contract - Traditional bid process - Grant-funded community-led mobility networks	- Regulation - Contract - Traditional bid process - Grant-funded community-led mobility networks - Non-exclusive regulatory permits or franchises	- Regulation - Contract - Traditional bid process - Grant-funded community-led mobility networks - Non-exclusive regulatory permits or franchises	- Regulation - Contract - Traditional bid process - Grant-funded community-led mobility networks - Non-exclusive regulatory permits or franchises	- Regulation - Contract - Traditional bid process - Grant-funded community-led mobility networks - Non-exclusive regulatory permits or franchises	- Contract

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	Round-trip Carsharing	Free-floating Carsharing	Docked Bikesharing	Dockless Bikesharing	Dockless E-scooters	Ridesourcing	Microtransit	Apps
				Step 3: Scenario Planning Considerations				
Scenario 1 Impacts and Mitigations				Insert results from Figure 2 into this section				
Scenario 2 Impacts and Mitigations				Insert results from Figure 2 into this section				
Scenario 3 Impacts and Mitigations				Insert results from Figure 2 into this section				

(1) Strategies are scored by their ability to address the respective need: *limited*, *potential*, and *high*.
(2) Community-specific.
B2C = Business to consumer.
B2G = Business to government.
FLM = First/last mile.

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Step 2: Identify Potential Mobility on Demand Business Models

The second step is to determine which business models identified in Step 1 are most applicable given the organizational limitations and goals of the agency that is seeking to implement an associated mobility service. Step 2 of table 4 lists business model characteristics for mobility services that were operating widely at the time this report was developed. The characteristics include:

- **Customer base:** Who is able to secure the mobility service? Can a government agency or similar organization contract with a mobility provider, or is it better for travelers to pay for or purchase the mobility service directly from the provider? The answers to these questions indicate whether a business-to-consumer or business-to-government (B2G) business model is best or if a specific model is not important.

- **Operational characteristics:** Does meeting the mobility need require a single or multiple transportation services? Most MOD business models are predicated on the delivery of a single service, but multiple business models can be combined or a mobility-as-a-service solution can be sought.

- **Capitalization and revenue:** How is the service being funded? Available funding sources, which can include membership fees, grants and subsidies, venture capital, sponsorships, and advertising may affect which service is viable in a community.

- **Partnerships and regulations:** How will the service be secured? Services can be secured using both contractual and regulatory options. Regulations can be used to force service delivery to specific communities, increase competition to improve access to services and decrease costs, or force other changes that improve service options. Contracting allows services to be secured without regulation and through numerous options that include traditional bid processes; grant-funded, community-led mobility networks; and direct contracting.

Planners should use this section to narrow down the MOD business models to those that fit their operational, funding, and contractual needs.

Example

A transit agency may determine that it needs support providing first and last mile solutions in a low-income neighborhood and that it wants to directly purchase a service. It needs a business model with a customer base that is B2G and would consequently identify all the business models that are B2G. It may also be seeking a business model that can be supported with sponsorships and advertising. It will then identify all mobility services that are B2G *and* can be supported with sponsorships and advertising. This process can be repeated with the remaining business model elements to narrow the number of potential MOD business models that can support the transit agency's needs.

Business models identified in Steps 1 and 2 that are applicable to community needs within the confines of organizational limitations and goals should be carried forward to Step 3.

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Step 3: Use Scenario Planning to Understand Potential Risks

The third step is to understand how the applicable MOD business models may perform under uncertain future conditions. This involves use of the scenario-planning process that was outlined in Chapter 4. That process should be followed, and the impacts and mitigations identified in table 3 should be copied into Step 3 of table 4.

At this point, MOD business models have been identified based on their ability to meet community needs within the confines of organizational limitations and goals, and there is an understanding of potential operational risks and available mitigations. It is now up to a community to determine which MOD business model, if any, is best able to meet its needs. This decision should be made based on a combination of applicability and a community's ability to accept and/or mitigate potential risks. The community also will need to consider the following factors:

- Service availability.

- Cost to the implementing agency and travelers.

- Time to implementation.

- Ability to meet the mobility needs of disabled travelers.

The possibility exists that no currently available MOD business model fits the community's needs. However, it is important to note that the matrix only reflects business models that were widely available at the time this document was created. New services and business models continue to emerge that address a wide range of community needs, and the marketplace should be reviewed to determine if models not listed in this document may be available and able to meet community needs.

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Chapter 6. Example Scenario

This chapter provides an example that outlines how the information within this document can be used. While the example is fictitious, it was designed to be relevant to many planning agencies and to provide insights into the mobility planning process and the use of the various templates within this document.

Scenario Background

This example assumes that the planning geography is a mixed-use area that includes single family and multi-unit residential; a mid-sized university campus with approximately 10,000 students; and a mixture of retail, food, and entertainment businesses that primarily serve university students, faculty, and staff, and nearby residents.

The planning area is adjacent to a rail station with service that connects to other major employment, housing, entertainment, and shopping districts. The rail station's placement on the periphery of the planning area requires walking relatively long distances to access the campus. No services currently exist to move travelers between the rail station and the campus.

Area stakeholders include the city, university, an organized neighborhood group, and residents. The neighborhood group and residents have told the city and university that too many students, faculty, and staff drive and park on residential streets.

Approximately 2 years ago, the city developed a station area master plan. The document focused on how to encourage denser development around the station and how to better connect the station to surrounding land uses. The planning process included nearby residents, business owners, university representatives, and the transit agency. Three community meetings were conducted to seek input on the plan, and a survey was distributed that could be completed by anyone who worked, lived, attended school, or visited the area. The plan also included an inventory of existing transportation infrastructure and services.

Among the plan's recommendations was the provision of a mobility service to help travelers move between the rail station and the nearby university and businesses. No specific recommendation was made regarding the type of mobility service that should be provided.

While the city was working on the station area master plan, the university developed a campus mobility plan. The university's planning effort focused on how to increase the number of students, faculty, and staff who use non-drive-alone travel options to get to and from the campus. The university also desired to minimize its impact on nearby residential neighborhoods.

The university analyzed the home locations of students, faculty, and staff to determine what travel options they have to get to and from campus. The analysis showed that as many as 2,000 students, faculty, or staff members could be commuting by rail but only 500 were doing so. Focus groups revealed that many

people were not commuting by rail because they perceived the distance between the rail station and the campus as being too far to walk. A resulting recommendation was that the university invest in mobility options to make moving between the rail station and campus easier and quicker. A specific option was not identified, but the university set aside funds to implement a mobility pilot.

Numerous resources were identified during and after the planning efforts that are applicable to the design and implementation of a mobility pilot, including:

- The city is willing to make small infrastructure investments and develop or adjust regulations to support a mobility service solution.

- The city is willing to solicit mobility service providers and is capable of managing a mobility pilot. It is also willing to contribute a small amount of funding.

- The university set aside funds for a mobility pilot.

- The university is willing to solicit mobility service providers and is capable of managing a mobility pilot.

- The university has internal resources to market mobility solutions to students, faculty, and staff.

After discussion, the university and city decide to pursue a joint mobility pilot in which the city will conduct activities associated with securing and managing the service. It will also provide a small amount of funding to support the service. The university will provide the bulk of funding in exchange for its students, faculty, and staff being able to ride the service for free. The university will market the selected service to potential riders. Both entities have agreed to fund a service for up to 2 years. The university and city must now determine if a MOD business model exists that will meet their identified needs.

Step 1: Match the Value Proposition of Mobility Services with Identified Needs

As is the case in many communities, significant planning has already occurred, and the city and its stakeholder groups have a defined and agreed-upon need. Both the city and university have identified the need for a first/last mile solution to make travel between the rail station and the nearby university and businesses easier and more convenient. As many as 500 existing transit riders who work or attend classes at the university may use the service. Additional demand may exist from nearby businesses and the 1,500 university workers and students who could use transit based on their home locations.

Planners can use Section 1 of table 4 to match MOD business models to the desired value proposition. In this case, the stakeholders are seeking a MOD business model that can address first/last mile travel needs. Docked bikeshare, dockless bikeshare, scooters, ridesourcing, microtransit, and applications all have a high potential to address first/last mile travel needs.

Step 2: Identify Potential Mobility on Demand Business Models

Numerous MOD business models are able to meet the identified transportation need. Planners must now analyze the identified business models to determine which include business elements that most meet their operational, funding, and contractual needs. This is done by comparing the business model elements summarized in Section 2 of table 4 to the stakeholders' needs.

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Customer base: The city plans to directly oversee the selected mobility solution. As such, it would prefer a business model that focuses its customer base on business-to-government.

Operational characteristics: The city has no preference with respect to the operational characteristics of the business model. It simply needs a solution.

Capitalization and revenue: The university has agreed to fund the service with minimal assistance from the city. The city and university do not require advertising, sponsorships, or grants to offset the cost of the service. As such, this category has no impact on the decision process.

Partnerships and regulation: The city wants to procure the service and desires to do so through a traditional bid/contracting process.

Of the business models able to address first/last mile travel, only docked bikesharing and microtransit have business model elements that meet the needs of the stakeholders.

Step 3: Use Scenario Planning to Understand Potential Risks

The stakeholders have determined that bikesharing and microtransit are most able to meet their needs. They must now consider how external factors (those beyond their control) could impact the successful delivery of a mobility solution. The city and university have committed to funding the pilot for up to 2 years. As a result, they should consider external factors that could impact the pilot within the 2-year timeframe.

Planners, after working with key stakeholders, determine that the following factors listed in table 5 could impact the pilot. Each factor includes a prediction that can be used to develop scenarios.

Table 5. Factors that could impact mobility service delivery.

Factor	Prediction
Population Change	Enrollment drops significantly at the university
Political Change	Elections at the city cause loss of support for the pilot service
Economic Trends	A recession impacts the city and/or university's ability to fund the pilot
	A tight labor market makes it difficult for mobility services to recruit and retain employees
Social Trends	A major vehicle crash and/or information on social media or in the news creates significant concerns about the safety of riding bikes
Environmental Events	Winter snowfall significantly exceeds historical averages
Mobility on Demand Business Model Changes	The service provider ceases operation
Fuel Costs	Gasoline costs increase by 25 percent or more
Other	Technology disruption prevents travelers from using the service provider's application for multiple days

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After considering the likelihood and potential impacts of the various predictions, planners determine that those most likely to impact the pilot are: (1) a tight labor market makes it difficult for mobility services to recruit and retain employees, (2) winter snowfall significantly exceeds historical averages, and (3) the service provider ceases operation. Table 6 summarizes the likely impacts the predictions would have on the identified business models and the mitigations available to the city and university.

The city considers the potential impacts and available mitigations and decides that it is most comfortable pursuing a microtransit solution.

Next Steps

Within this example, the stakeholders have identified a preferred MOD business model solution. They understand some of the likely scenarios that may impact the delivery of the solution and have identified potential mitigations. At this point, the stakeholder can begin considering implementation, which requires addressing numerous additional questions, some of which follow:

- What should the level of service availability be?

- What is the likely cost to implement the service?

- How long will it take to implement the service?

- What service providers are available and willing to provide the service?

- How many vehicles and what frequency are needed to meet likely ridership levels?

- How will the service meet the needs of travelers with disabilities?

- If the service is on-demand, will travelers have the skills and devices needed to effectively interact with the service? If not, what solutions exist?

- How will data sharing occur between the city and service provider?

- How will the success of the program be measured?

The Federal Highway Administration has developed a report, Mobility on Demand Planning and Implementation: Current Practices, Innovations, and Emerging Mobility Futures that provides information on implementation practices and tools to support communities that seek to use mobility services to address transportation needs. That document can assist planners with answering some of the above questions and others.

It is possible that, while working to implement a mobility service, the initially preferred business model will be determined to be inadequate or otherwise not implementable. If this occurs, stakeholders can use this toolkit to identify other business models that may be applicable. In addition, a community may find that, after implementing a mobility service, it did not meet community needs as expected. In this case, stakeholders can also use this toolkit to identify other business models that may be applicable.

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Table 6. Example: internal options versus external factors.

Internal Options	External Factors/Predictions			
	Tight labor market makes it difficult to recruit and retain employees	Winter snowfall significantly exceeds historical averages	Service provider ceases operation	
Microtransit	Rider wait times increase due to a reduction in the number of vehicles in operation.	Service may operate behind schedule due to roadway congestion associated with snow.	Service will cease.	**Impacts**
	Minimal options	Increase snow plow service along the route.	Go out to bid for new service provider. May take weeks to months. Secure agreement with the local transit agency to provide interim call and ride service.	**Mitigations**
Docked Bikeshare	Bicycles may not be rebalanced regularly leading to empty stations during periods of high demand. Bicycle maintenance backlog may occur reducing the number of available bicycles.	Bike paths and lanes may be covered in snow forcing cyclist onto unsafe roadways and/or bicycles will not be safe to use due to ice.	Service will cease.	**Impacts**
	University maintenance staff could be reassigned to support the bikeshare system.	Purchase additional snow removal equipment to service bicycle routes and paths.	Go out to bid for new service provider. Attempt to secure a contractual agreement that will allow the city or another party to operate the service using existing infrastructure through the end of the contract period.	**Mitigations**

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Washington, DC 20590

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