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Emerging Mobility Services

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Overview

- In recent decades social and cultural trends have been rapidly and constantly changing and technological advancements such as smart phones, large-scale electronic devices, IoT, etc., have also experienced a more rapidly and accelerated growth.

- These rapid changes have also brought up some new innovative ideas on how to provide efficient and safe transportation services that can leverage emerging technologies.

- This research addresses questions around how academics, policy-makers, the private sector, and others can work together to shape new mobility solutions to benefit all users of our transportation systems.

Growing Mobility Demands

Aging Americans Require Mobility Choice:

- The proportion of American elderly population is rapidly growing, estimated to be 84 million Americans older than 65 years by 2045.
- Unique mobility options are needed for "Aging in Place."

All Travelers Need Mobility Choices:

- Including travelers with disabilities, low income individuals and minors need better mobility choices for their independent travel.
- Reliable and accessible point to point transportation is essential for all travelers.

Growing Mobility Demands

Millennial Americans Want Mobility Choice:

- Public transportation utilization is on the rise.
- Millennial Americans are growing and increasingly influencing the society as they participate in political, economical, and social activities
- More millennial households are in poverty than any other generation
- Younger generations want both convenience and cost savings and over 65% of Millennials consider transportation as an important factor in housing decisions.

On-Demand Services & Ride Sourcing

- On-demand systems such as bikesharing and carsharing combined with new ride sourcing application and transportation network companies are changing the people move about.

- Microtransit companies engaging the public sector through new partnerships are changing the way we think about integrating transit and solving first and last mile access issues.

- These new opportunities are changing the way we travel throughout our cities and provide real point-to-point mobility in real-time.

Inventory of Emerging Mobility Services

Bike sharing :

- Bike sharing is a system of bicycles that is available to users to access as needed for point-to-point or round-trip trips, traditionally to station kiosks in dense urban areas.

Inventory of Emerging Mobility Services (Cont.)

Car sharing :

- Car sharing services provide users access to short-term car rentals. There are multiple models of car share :

  1. Round-trip car share providers let users reserve a vehicle from the same pick-up spot they return the vehicle to.

  2. Peer-to-peer car share services, which are typically round-trip, enable car owners to rent their cars out as part of car share fleet.

  3. Point-to-point/One-way car share providers allow users to pickup and drop off cars anywhere within a defined geographic region.

Inventory of Emerging Mobility Services (cont.)

Ride sharing/Carpool Services:

- Ride sharing is the third-party service of matching of riders and drivers with similar shared destinations, enabling them to split the cost of the ride

Ride Hailing:

- Ride hailing services match riders with drivers, on-demand.
- While often referred to as "ride sharing", we use the term "ride hailing."
- Unlike ride share drivers, ride hail drivers are fare-motivated, providing transportation to another party to earn a profit, and typically do not share a destination with their passengers
- Lyft and Uber are examples of ride hailing services.

Inventory of Emerging Mobility Services (cont.)

Courier network services:

- Courier Network Services are companies that operate an application-based platform to provide immediate delivery to customers using couriers who may make deliveries by motor vehicle, bicycle, on foot, or by other mode.

- These couriers are on-demand local delivery contractors.

Microtransit/Private Transit Vehicles:

- Microtransit is a privately-operated transit service, enabled by technology, that usually operates along a dynamically generated route or a fixed route generated from crowd-sourced requests.
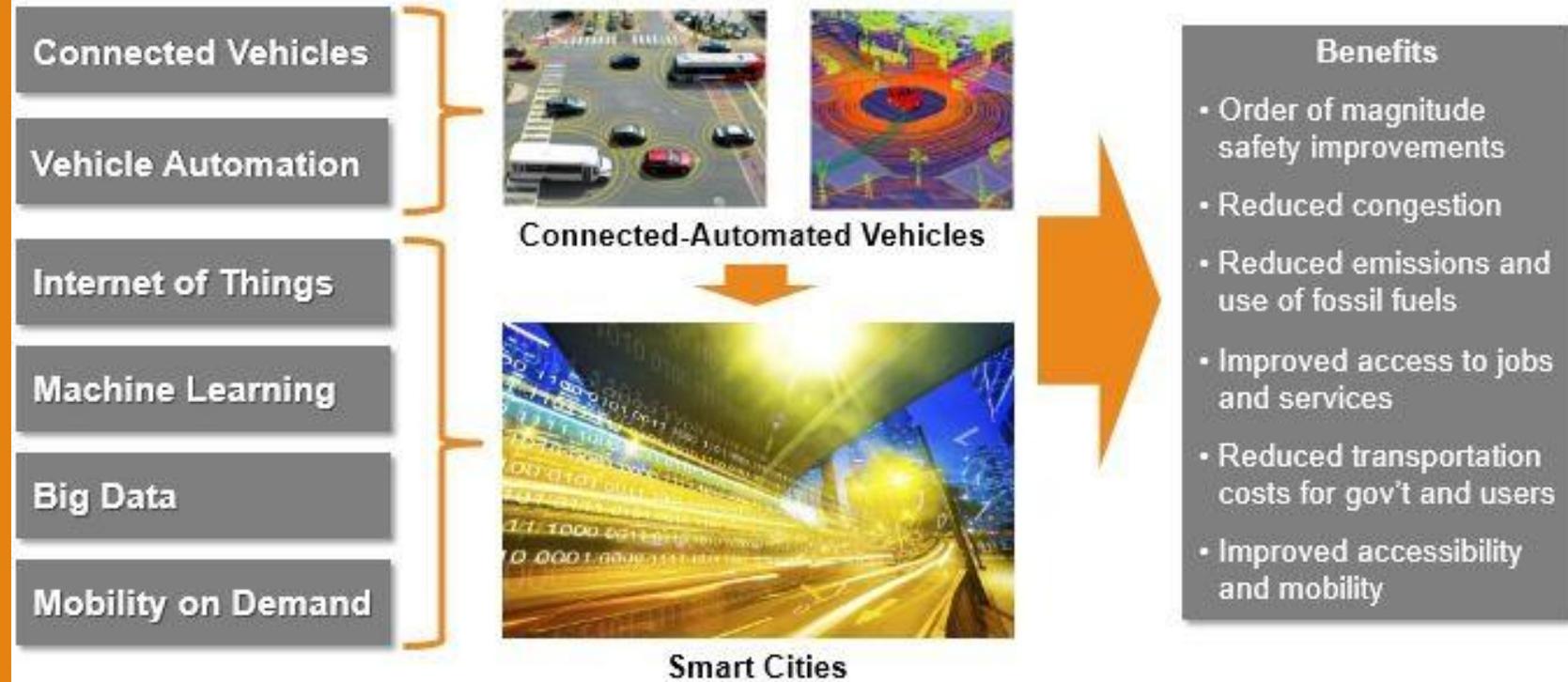
Mobility as a Service (MaaS)

- The concept of Mobility as a Service (MaaS) was developed in Finland and spread all over Europe.

- Across Europe, cities are deploying systems that integrate various forms of shared and public transport in a single payment network.

- These systems allow people to purchase mobility in real-time, straight from their smartphones.

- They furnish riders with an array of flexible and well-coordinated options so that alternative modes become more competitive with private car ownership.

Role of MaaS in the Concept of Smart Cities

- A smart city is defined as "a designation given to a city that incorporates information and communication technologies (ICT) to enhance the quality and performance of urban services such as energy, transportation and utilities in order to reduce resource consumption, wastage and overall costs."

- The concept of smart cities is expected to rely and work in coordination with other systems or concepts such as MaaS and Internet of Things (IoT) to link multiple different aspects of a city's infrastructure to react to real-time events such as traffic signals reacting to traffic patterns and adjusting accordingly.

Connected Vehicles
Vehicle Automation
Internet of Things
Machine Learning
Big Data
Mobility on Demand

Connected-Automated Vehicles

Smart Cities

Benefits
- Order of magnitude safety improvements
- Reduced congestion
- Reduced emissions and use of fossil fuels
- Improved access to jobs and services
- Reduced transportation costs for gov't and users
- Improved accessibility and mobility

Implementation Features of MaaS

- The advantage of MaaS is the ability to bring together different types of transportation options in one easy-to-use application.

- it can easily integrate various transportation modes from different service providers and make them accessible to users directly in a single mobility service on demand, such as unified mobile app, multimodal journey planning, service bundles, fixed monthly subscriptions, and pay-as-you go billing.

- Currently, there are various applications that provide options for multiple users to plan their trips, such as Google Maps, Whim, TripGo, etc.

- MaaS can provide users with door-to-door mobility services from various service providers.

Application of Technologies in MaaS

- The three core technologies, that is, mobile, big data, and the IoT are behind the successful deployment of MaaS.

- The smartphone, which is a mobile device, allows individuals to plan, book, and pay for a trip through a single app where the three technologies combine together to provide a visual result to the user.

- MaaS is taking advantage of recent rapid advances in wireless communications technology, which tremendously improved smartphones connectivity.

Potential Research Areas

- The concept of MaaS is relatively new and many public and private agencies, academic institutions, and organizations have taken part in developing concepts, procedures, and tools to implement MaaS systems.

- So, research is still needed in this area of study.

- Fears continue about the reliability and the availability of shared mobility modes and public transportation options, and their impact in traffic congestion, in addition to the urban demand-responsive transportation (DRT) that we do not yet know much about.

- More research on these topics is required.

Potential Research Areas (cont.)

Some of the specific areas of MaaS highlighted to be potential for research:

- **Examples of research studies to understand customers include:**

  ✓ mobility patterns (e.g., trip chains, round-tours, etc.);

  ✓ heterogeneous user groups (e.g., private vs corporate, income groups, etc.);

  ✓ constrains and needs for mobility (e.g., handicaps, elderlies, baggage, etc.);

  ✓ user as service provider (e.g., P2P ride-sharing, private car sharing, etc.).

Potential Research Areas (cont.)

- **Examples of research studies for business models may include:**

  - ✓ business plans for participating service providers and operators;

  - ✓ revenue allocation for participating service providers and operators;

  - ✓ legal framework that will make MaaS run smoothly and efficiently.

Potential Research Areas (cont.)

- **Examples of research needs for policy implications include:**

  - ✓ network design issues (e.g., service-level requirements, optimization of policy instruments, etc.);

  - ✓ regulation requirements (e.g., level playing field, open data policy, standards, harmonization, licenses, etc.).
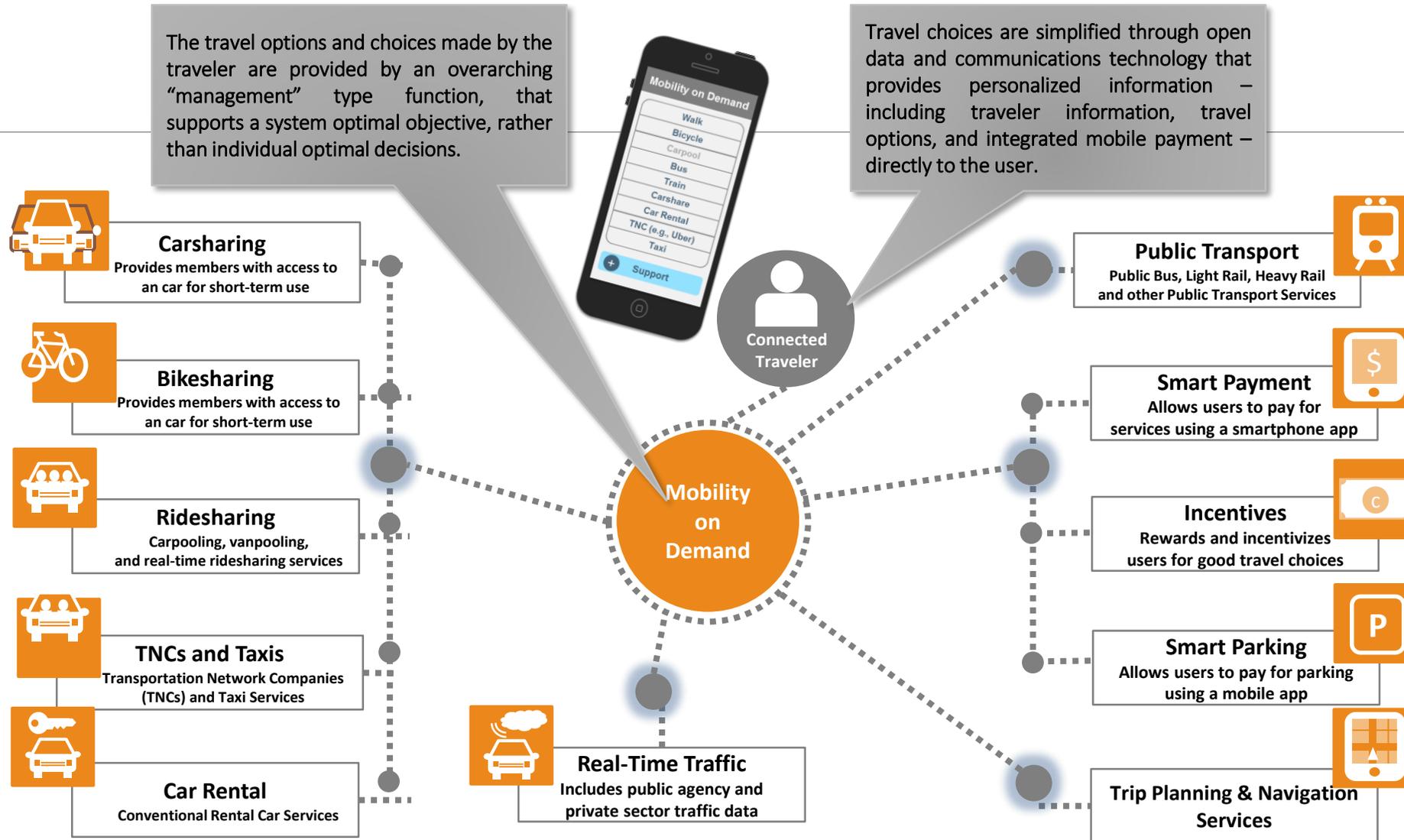
Mobility on Demand (MOD)

- The concept of Mobility on Demand (MOD) started by USDOT under the Federal Transit Administration (FTA).

- Promotes choice in personal mobility & optimizes the transportation system through Intelligent Transportation Systems (ITS)

- Advances connected vehicles & automation applications.

- Utilizes emerging technologies & data exchange to enable personal mobility.

- Encourages multimodal connectivity & system interoperability.

Optimizing Shared Use through MOD

The travel options and choices made by the traveler are provided by an overarching "management" type function, that supports a system optimal objective, rather than individual optimal decisions.

Travel choices are simplified through open data and communications technology that provides personalized information – including traveler information, travel options, and integrated mobile payment – directly to the user.

Mobility on Demand

Walk
Bicycle
Carpool
Bus
Train
Carshare
Car Rental
TNC (e.g., Uber)
Taxi

+ Support

Connected Traveler

Mobility on Demand

Carsharing
Provides members with access to an car for short-term use

Bikesharing
Provides members with access to an car for short-term use

Ridesharing
Carpooling, vanpooling, and real-time ridesharing services

TNCs and Taxis
Transportation Network Companies (TNCs) and Taxi Services

Car Rental
Conventional Rental Car Services

Real-Time Traffic
Includes public agency and private sector traffic data

Public Transport
Public Bus, Light Rail, Heavy Rail and other Public Transport Services

Smart Payment
Allows users to pay for services using a smartphone app

Incentives
Rewards and incentivizes users for good travel choices

Smart Parking
Allows users to pay for parking using a mobile app

Trip Planning & Navigation Services

Importance of MOD Services

Mobility needs:

• The emergency of MOD has provided individuals with the opportunity to get rid of private car ownership by providing flexible and attractive transportation and mobility options that include multimodal integration of many personal and public transportation alternatives.

• The concept of MOD is a novel idea centered on offering transportation modes to individuals as a service available on demand,

• But as a commodity in a society where the value of services is competitive in terms of cost, flexibility, travel time, delay and waiting time, number of connections, and other aspects.

Importance of MOD Services (cont.)

Travel behaviors:

- Constant changes in social and cultural trends as well as rapid technological advancements in wireless networks, cloud technologies, smartphones, information technologies, etc., have collectively contributed in developing a phenomenon called sharing economy.

- The sharing economy uses the Internet and mobile apps to allow individuals to monetize underutilized space, assets, and skills.

- Connected travelers are an important piece of the MOD progression since improved and advanced data network has enabled connectivity among travelers and has made possible for people, vehicles, and transportation infrastructure exchange data among each other.

Importance of MOD Services (cont.)

Existing transportation services:

- The growth in MOD and its accompanied changes in travel behavior are impacting the transportation network.

- population's demographic makeups affect the demand as they may make different mobility choices that are different compared to the rest of the population .

- residential types where an individual lives may influence the level and usage of MOD systems.

Supply Side of the MOD Ecosystem

- **The supply side of the MOD ecosystem involves all the players, operators, and devices that provide transportation services for passengers or goods delivery .**
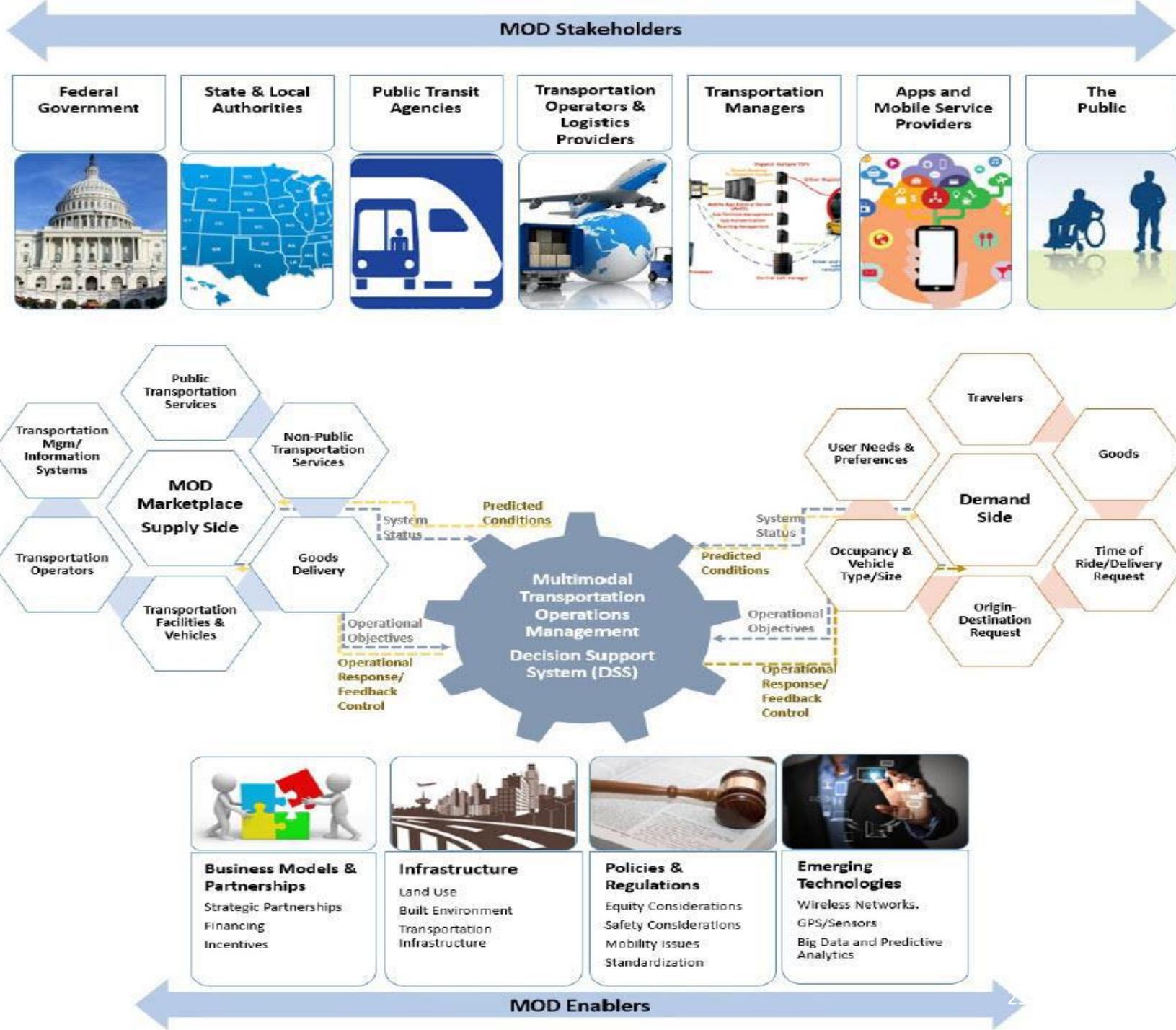
Demand Side of the MOD Ecosystem

- The demand side of the MOD ecosystem is made up of all the MOD system users (i.e., travelers and couriers) including their choices and preferences, which in turn affect the supply side as well.
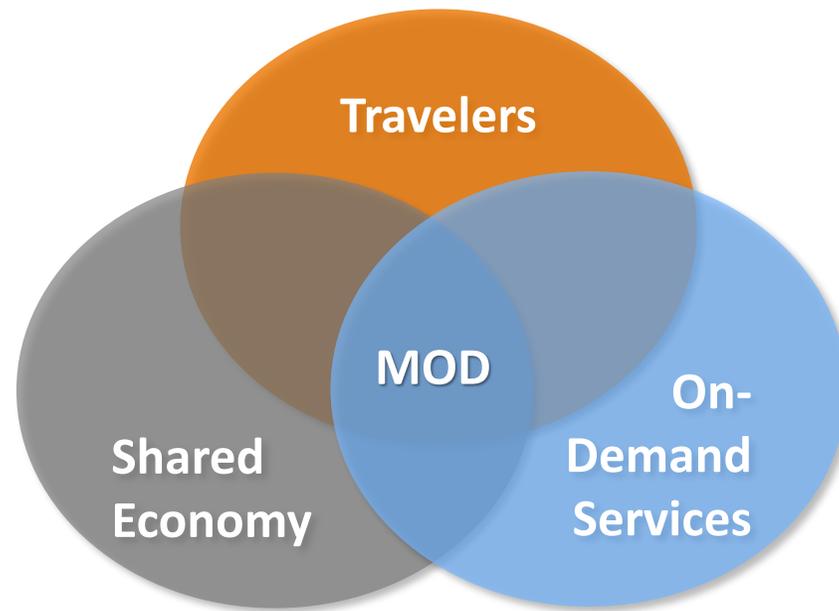
Technologies Enabling MOD Services

1) Information and communications technology (ICT).

2) Smart infrastructure.

3) Connected vehicles (CVs).

4) Location-based technologies.

5) Mobile devices and apps.

Contribution of MOD in Shared Mobility Ecosystem

- Shared mobility provides users with short-term access to transportation services.

- Alternative transit services e.g., paratransit, shuttles, microtransit, etc., are also forms of shared mobility.

- Shared mobility provides users with goods delivery services that help connect couriers with goods, e.g., CNS.

- Shared mobility is having a transformative impact on many major cities around the world by providing MOD services for peoples' mobility and goods delivery options.

Future Research Direction
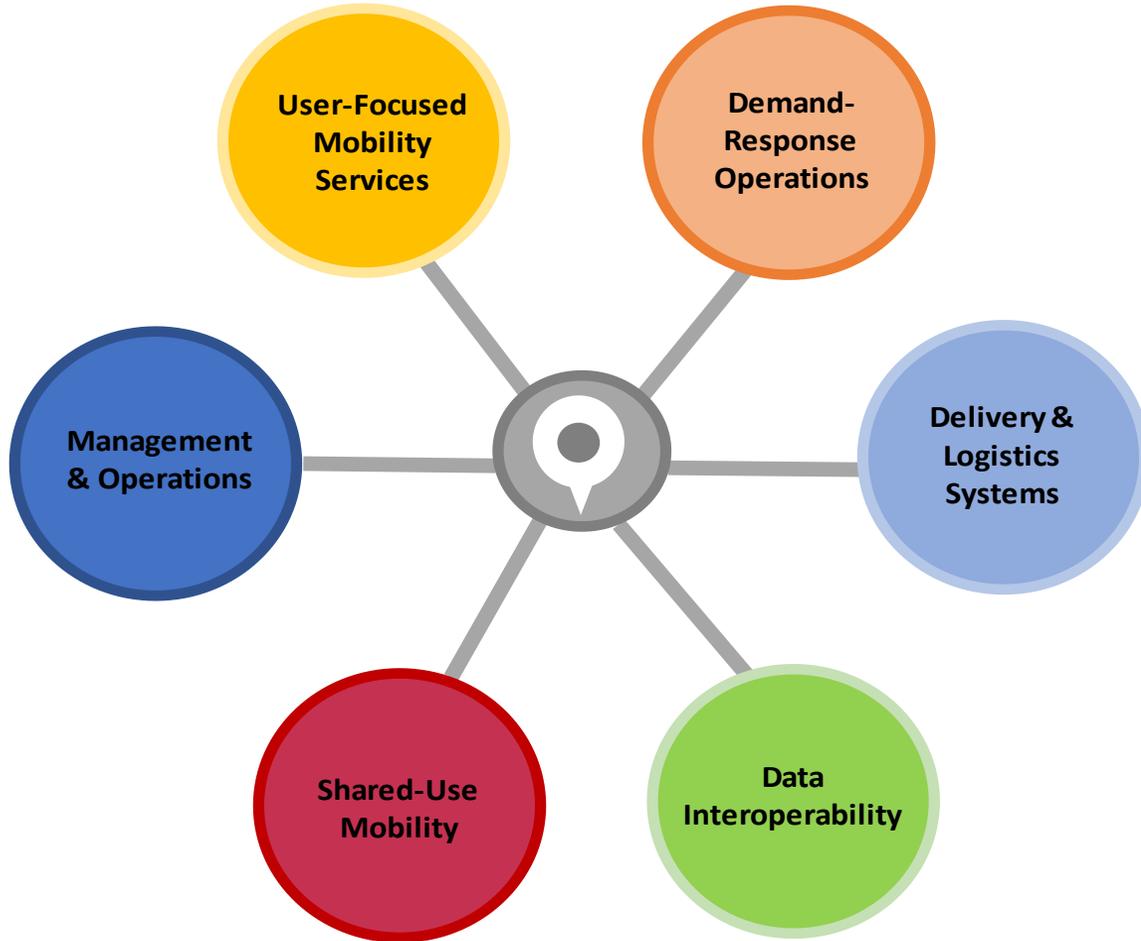
USDOT identified six interrelated focus areas for future MOD research activities that will generate the knowledge expected to make mobility within multimodal ecosystem smarter, more efficient, and safer.

User-Focused Mobility Services

Demand-Response Operations

Management & Operations

Delivery & Logistics Systems

Shared-Use Mobility

Data Interoperability