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# Shared Mobility Definitions and Key Concepts

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# SHARED MOBILITY DEFINITIONS AND KEY CONCEPTS

Shared mobility - the shared use of a vehicle, motorcycle, scooter, bicycle, or other travel mode - provides users with short-term access to a transportation mode on an as-needed basis. Shared mobility includes various travel modes and service models that meet the diverse needs of users including: carsharing, bikesharing, transportation network companies (TNCs, also known as ridesourcing and ridehailing), and others. The following section, Travel Modes, provides U.S. Department of Transportation, American Planning Association, and SAE International definitions of the most common shared mobility models. Following these definitions, this tool defines two evolving mobility concepts: Mobility on Demand (MOD) and Mobility as a Service (MaaS). Next, the tool outlines four categories of smartphone applications impacting transportation. The tool concludes with descriptions of shared mobility service models and business models (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a; Shaheen et al., 2017).

## Travel Modes

**BIKESHARING** provides users with on-demand access to bicycles at a variety of pick-up and drop-off locations for one-way (point-to-point) or roundtrip travel. Bikesharing fleets are commonly deployed in a network within a metropolitan region, city, neighborhood, employment center, and/or university campus (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016). Bikesharing systems can be further categorized by their operational models: station-based, dockless, and hybrid. In a station-based bikesharing system, users access bicycles via unattended stations offering one-way service (i.e., bicycles can be returned to any station). In a dockless bikesharing system, users may access (unlock) a bicycle and park it at any location within a predefined geographic region. In a hybrid bikesharing system, users can check out a bicycle from a station and end their trip by either: 1) returning it to a station or a non-station location or 2) users can pick up any dockless bicycle and either return it to a station or a non-station location within a designated geographic (or geofenced) area.



**CARSHARING** offers members access to vehicles by joining an organization that provides and maintains a fleet of cars and/or light trucks. These vehicles may be located within neighborhoods or near public transit stations, employment centers, universities, etc. The carsharing organization typically provides insurance, gasoline, parking, and maintenance. Members who join a carsharing organization typically pay a fee each time they use a vehicle (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



**Courier Network Services (CNS)** (also referred to as flexible goods delivery) provides for-hire delivery services for monetary compensation via an online application or platform (such as a website or smartphone app) to connect couriers using their personal vehicles, bicycles, or scooters with freight (e.g. packages, food) (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



**MICROTRANSIT** is defined as a privately or publicly operated, technology-enabled transport service that typically uses multipassenger/pooled shuttles or vans to provide on-demand or fixed-schedule services with either dynamic or fixed routing (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



**PERSONAL VEHICLE SHARING** is defined as the sharing of privately owned vehicles, where companies broker transactions between vehicle hosts and guests by providing the organizational resources needed to make the exchange possible (e.g., technology, customer support, driver and motor vehicle safety certification, auto insurance, etc.). This model also includes peer-to-peer (P2P) carsharing, P2P marketplace, hybrid B2C and P2P models, and fractional ownership (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



**RIDESHARING** (also known as carpooling and vanpooling) is defined as the formal or informal sharing of rides between drivers and passengers with similar origin-destination pairings. Ridesharing includes vanpooling, which consists of 7 to 15 passengers who share the cost of a van and operating expenses and may share driving responsibility (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



**SCOOTER SHARING** allows individuals access to scooters by joining an organization that maintains a fleet of scooters at various locations. Scooter sharing models can include a variety of motorized and non-motorized scooter types. The scooter operator typically provides charge or gasoline (in the case of motorized scooters), maintenance, and may include parking as part of the service. Users typically pay a fee each time they use a scooter. Trips can be roundtrip or one-way (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



Scooter sharing includes two types of services:

- **Standing electric scooter sharing** employs shared scooters with a standing design with a handlebar, deck, and wheels that is propelled by an electric motor. The most common scooters today are made of aluminum, titanium and steel; and
- **Moped-style scooter sharing** employs shared scooters with a seated design. Moped-style scooters can be electric- or gas-powered, and they generally have a less stringent licensing requirement than motorcycles designed to travel on public roads.

**SHUTTLES** are shared vehicles (typically vans or buses) that connect passengers from a common origin or destination to public transit, retail, hospitality, or employment centers. Shuttles are typically operated by professional drivers and many provide complimentary services to the passengers (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



**TAXI SERVICES** provide prearranged and on-demand transportation services for compensation through a negotiated price, zone pricing, or taximeter (either traditional or GPS- based). Passengers can schedule trips in advance (booked through a phone dispatch, website, or smartphone app); street hail (by raising a hand on the street, standing at a taxi stand, or specified loading zone); or e-Hail (by dispatching a driver on-demand using a smartphone app) (SAE International, 2018).



**TRANSPORTATION NETWORK COMPANIES** (also known as TNCs, ridesourcing, and ridehailing) are prearranged and on-demand transportation services for compensation in which drivers and passengers connect via digital applications. Digital applications are typically used for booking, electronic payment, and ratings (Cohen & Shaheen, 2016; SAE International, 2018; Shaheen et al., 2016a).



## ***Micromobility***

Bikesharing, scooter sharing, and other low-speed modes (both shared and personally owned) are sometimes collectively referred to as micromobility. This can include bicycles, bikesharing, electric bicycles/e-bikes, scooter sharing, and an array of light electric-powered modes such as: segways, hoverboards, skateboards/electric skateboards, and electric unicycles).



*Figure 2.1. Examples of niche micromobility modes - Hoverboard (top left) (Smart Hoverboards, 2018), Unicycle (bottom left) (Best Electric Hoverboard, 2019; Segway, 2018), Segway (bottom right), Board (top right) (ZBoard Shop, 2018).*

# **Digital Information, Fare Integration, and the Commodification of Transportation**

## ***Mobility on Demand (MOD)***

In recent years, Mobility on Demand (MOD) has gained popularity among mobility consumers. MOD is an innovative concept based on the principle that transportation is a commodity where modes have economic values that are distinguishable in terms of cost, journey time, wait time, number of connections, convenience, and other attributes. MOD enables consumers to access mobility, goods, and services on demand by dispatching or using shared mobility, delivery services, and public transportation strategies through an integrated and connected multimodal network. MOD also includes the management of supply and demand across mobility services through an integrated transportation systems management and operations approach that is coordinated among the public and private sectors and the traveling public. As such, MOD encompasses decision support systems to: 1) aggregate real-time, historic, and predicted system condition information; 2) analyze alternative response strategies to address current or predicted problems; 3) assess the tradeoffs associated with strategies that support a number of operational objectives that

vary dynamically; and 4) produce recommended strategies for implementation by system operators to guide and influence consumer choice (Shaheen et al., 2017). Figure 2.2 below visually depicts MOD's role in integrating multimodal transportation operations and management to optimize the supply and demand of the transportation network.

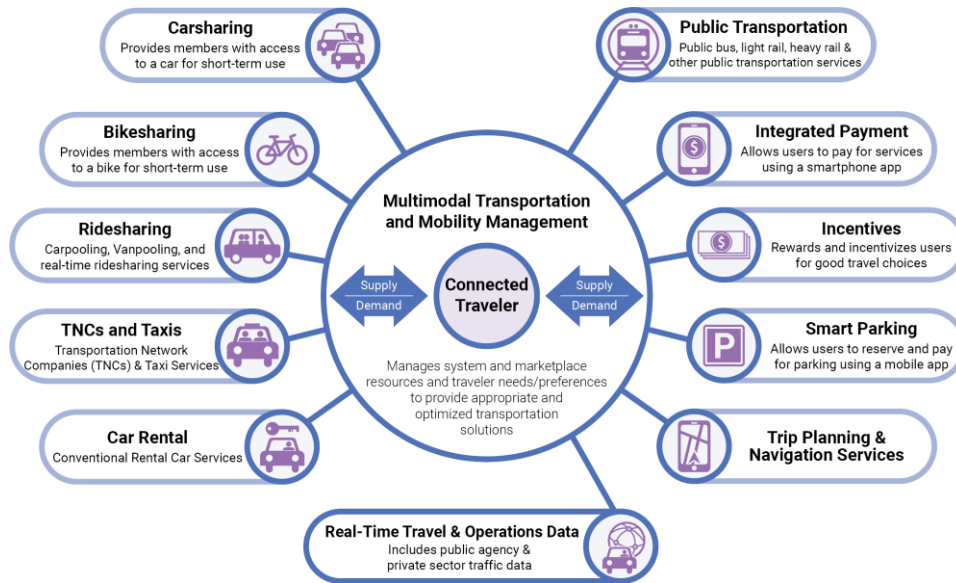


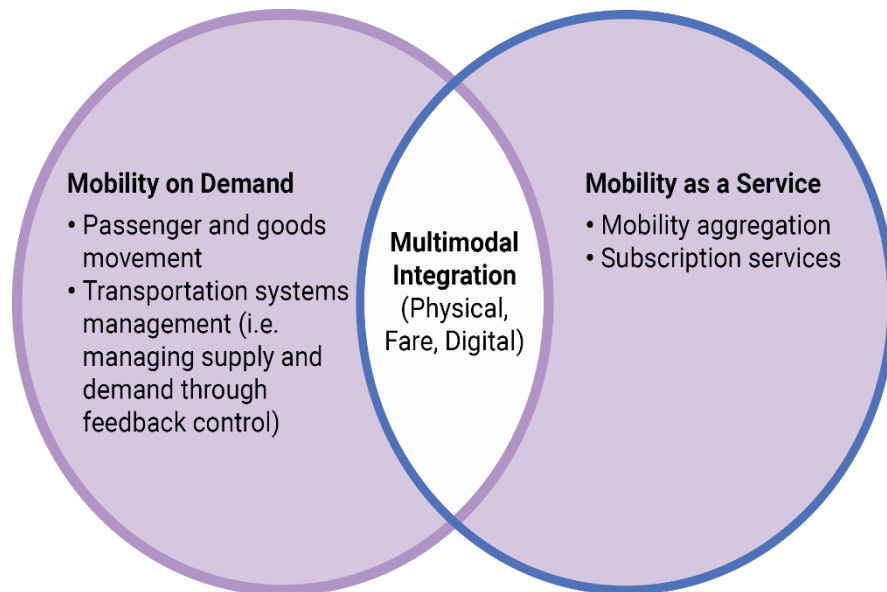
Figure 2.2. Mobility on Demand and Multimodal Transportation and Mobility Management (U.S. Department of Transportation)

## Mobility as a Service (MaaS)

In Europe, an evolving concept known as Mobility as a Service (MaaS) is gaining popularity. Fundamentally, MaaS restructures the mobility distribution chain by integrating the products and services of mobility providers and supplying them to users as a single service. Typically, a digital platform creates and manages trips that users can pay for via a single account. A distinguishing feature of MaaS is giving users the option to purchase MaaS products, such as a monthly subscription plan that includes a bundle of transportation services that best fit a user's or household's travel needs. These subscriptions can include a certain amount of each transportation service (e.g. public transportation, bikesharing, carsharing, taxis, etc.) and are similar to other service bundles, such as mobile phone plans, where the user pays one price for the combination of multiple service elements (e.g., talk, text, data, roaming, long distance, etc.) (Durand et al., 2018; Matyas & Kamargianni, 2018).

## Differences between MOD and MaaS

MOD differs from MaaS in that MOD focuses on the commodification of passenger mobility, goods delivery, and transportation systems management, whereas MaaS primarily focuses on passenger mobility aggregation and bundling services. Figure 2.3 illustrates the similarities and differences of MOD and MaaS. Specifically, MaaS is about integrating existing and innovative mobility services into one single digital platform where customers purchase mobility service packages tailored to their individual needs. In contrast, MOD leverages an integrated multimodal network to enhance access to services and improve system operations. Transportation network managers balance supply and demand to match changing conditions across the transportation system.



*Figure 2.3. Similarities and Differences of MOD and MaaS. Shaheen and Cohen, 2019*

## Smartphone Applications

Increasingly, smartphone applications are assisting users in planning or understanding their transportation choices and may increase their access to alternative modes (SAE International, 2018; Shaheen et al., 2016b). There are four broad categories of apps impacting transportation. These categories are delineated by the apps' primary function. The categories are: 1) mobility apps, 2) vehicle connectivity apps, 3) smart parking apps, and 4) courier network services (CNS) apps (Shaheen et al., 2016b).



## ***Mobility Apps***

Mobility Apps are apps that assist users in planning or understanding their transportation choices and may enhance access to alternative modes. The eight sub-categories are:

### **Business to Consumer (B2C)**

Business-to-Consumer (B2C) Sharing apps sell shared transportation services from a business to an individual consumer including: carsharing, bikesharing, and scooter sharing among other modes (Shaheen et al., 2016b).

### **Mobility Tracker Apps**

Mobility Tracker apps track the speed, direction, and elapsed travel time of a traveler. These apps often include both wayfinding and fitness functions that are colored by metrics, such as caloric consumption while walking (e.g., GPS Tracker Pro) (Shaheen et al., 2016b).

### **Peer to Peer (P2P) Apps**

Peer-to-Peer (P2P) Sharing apps enable private owners of vehicles to share them peer-to-peer, generally for a fee (e.g., Turo) (Shaheen et al., 2016b).

### **Public Transit Apps**

Public Transit apps enable the user to search public transit routes, schedules, near-term arrival predictions, and connections. These apps may also include a ticketing feature, thereby providing the traveler with easier booking and payment for public transit services (e.g., Washington, DC's Metrorail and Metrobus) (Shaheen et al., 2016b).

### **Real-Time Information Apps**

Real-Time Information apps display real-time travel information across multiple modes including: current traffic data, public transit wait times, and bikesharing and parking availability (e.g., Snarl) (Shaheen et al., 2016b).

### **Transportation Network Company Apps**

TNC apps provide a platform for sourcing rides. This category includes "ridesplitting" services in which fares and rides are split among multiple strangers who are traveling in the same direction (e.g., UberPOOL and Lyft Shared rides) (Shaheen et al., 2016b).

### **Taxi e-Hail Apps**

Taxi e-Hail apps supplement street hails by allowing location-aware, on-demand hailing of regulated city taxicabs (e.g., Flywheel) (Shaheen et al., 2016b).

### **Trip Aggregator Apps**

Trip Aggregator apps provide users with trip planning and routing information incorporating multiple transportation modes and provide the user with travel times, connection information, distance, and trip cost (e.g., Transit App) (Shaheen et al., 2016b).

### **Vehicle Connectivity Apps**

Vehicle connectivity apps allow remote access to a vehicle through an integrated electronic system that can be used in times of emergencies (e.g., locked out of a car, asking for help when in an accident, etc.). Vehicle connectivity apps are generally developed by auto manufacturers (e.g., General Motor's OnStar) (Shaheen et al., 2016b).

### **Smart Parking Apps**

Smart parking apps provide information on parking cost, availability, and payment channels. These apps are often paired with smart parking systems. These apps can be grouped as follows (Shaheen et al., 2016b):

1. **e-Parking** describes the integration of technologies to streamline the parking process—from real-time information on space availability to simplified payment methods. e-Parking apps provide important information regarding real-time parking cost and availability (e.g., Park Whiz) and accessible payment channels for parking (e.g., Parkmobile).
2. **e-Valet** describes a for-hire parking service where drivers use an app to dispatch valet drivers to pick-up, park, and return vehicles. In addition to parking, some of these apps offer fueling, cleaning, and other vehicle services. e-Valet provides the ease of on-demand valet parking with flexible drop off and return locations (e.g., Luxe and Zirx, both now defunct).

### **Courier Network Service Apps**

Courier Network Service (CNS) Apps provide for-hire delivery services for monetary compensation using an online application or platform (such as a website or smartphone app) to connect couriers using their personal vehicles, bicycles, or scooters with packages

(Shaheen et al., 2016b).

## Service Models

These service model definitions describe how each mobility service is delivered to the traveler. Shared mobility service providers may offer more than one service type (SAE International, 2018; Shaheen et al. 2016a). Similar service models may evolve in a driverless vehicle future.

### ***Membership-Based Service Models***

Membership-based service models require that an individual or group of users sign up for membership to use a service. Examples include carsharing and membership-based bikesharing access.

### ***Non-Membership-Based Service Models***

Non-membership service models do not require a membership to use a service. Examples include: casual bikesharing access, car rental, and casual carpooling.

### ***Peer-to-Peer (P2P) Service Models***

In P2P service models, private companies manage transactions (for a fee) between hosts and guests of an asset (e.g., a vehicle, bicycle, or other mode) by providing the organizational resources needed to make the exchange possible (i.e., customer support, driver and motor vehicle safety certification, auto insurance, and technology, etc.). One way that P2P services differ from membership-based services is that an individual owns the private asset being shared rather than a business or organization.

### ***For-Hire Service Models***

For-hire service models transport passengers for a fare, which either is predetermined by distance or time traveled or is dynamically priced based on a meter or similar technology. For-hire services include TNCs, taxis, limousines, liveries, or pedicabs. The fundamental basis of for-hire services involves a passenger hiring a person operating an asset (e.g., a driver or cyclist) for a ride. For-hire services can be prearranged through a reservation or they can be booked on-demand through phone dispatch, street hail, or e-Hail using a website or smartphone app.

### ***Public Transit Services***

Public transit services include a variety of public transportation modes such as: buses,

subways, ferries, light and heavy rail, high speed rail, and alternative transportation services.

## Business Models

Shared mobility includes a variety of business models that are characterized by the different methods of commercial transactions used (SAE International, 2018; Shaheen et al., 2017).

### **BUSINESS TO CONSUMER SERVICES (B2C)**

B2C 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 (SAE International, 2018; Shaheen et al. 2016a).

### **GOVERNMENT TO CONSUMER (B2G)**

B2G 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 (SAE International, 2018; Shaheen et al. 2016a).

### **BUSINESS TO BUSINESS SERVICES (B2B)**

B2B services allow businesses to purchase access to business-owned 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 (SAE International, 2018; Shaheen et al. 2016a).

### **PEER TO PEER (P2P)**

P2P services offer a marketplace, usually an online platform, that facilitates transactions among buyer and sellers of personally owned and operated mobility services in exchange for a transaction fee. These can also include courier network services (SAE International, 2018; Shaheen et al. 2016a).

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