Mobility on Demand
Concept, Enablers, and Challenges

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Current Trends

Societal Trends
- Over the next 30 years, the U.S. population is expected to grow by 70 million
- By 2045 the number of Americans over the age of 65 will increase by 77%
- Persons with disabilities comprise nearly 20% of the population
- There are 73 million Millennials aged 18-34

Technological Trends
- Data and analytics to drive decisions
- Mobile devices, with access to up-to-the minute information
- Connectivity - Helping operators understand, respond, communicate, and manage
- Automated transportation

Mobility Trends
- On average, Americans spend over 40 hours stuck in traffic each year, costing $160 billion
- There is growing popularity of shared mobility services
- Continued approaches for pricing and incentives
Rebranding as Mobility Companies

Interest in MOD by the automotive sector has taken a variety of forms including acquisitions, investments, partnerships, and internal development of technologies and services that were previously not on the radar of automotive OEMs.

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<th>Company</th>
<th>Activity</th>
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| Ford        | Acquisitions: Chariot (microtransit)  
Investments: Lyft (ridesourcing/TNC)  
Internal Developments: Ford Smart Mobility LLC; a Ford subsidiary working to design and invest in emerging mobility services |
| General Motors | Acquisitions: Sidecar (ridesourcing/TNC)  
Investments: Lyft (ridesourcing/TNC)  
Partnerships: Lyft; leases electric Bolt cars to Lyft drivers  
Internal Developments: Maven (carsharing) |
| Fiat Chrysler | Partnerships: Google/Waymo (shared automated vehicles); provides Chrysler vans to Waymo as test vehicles |
| Daimler    | Acquisitions: car2go (one-way carsharing), Moovel (multimodal trip payment), Hailo (e-Hail taxi app)  
Partnerships: Matternet (drones) |
| Volvo      | Partnerships: Uber (ridesourcing/TNC); joint venture to develop fully autonomous vehicles  
Partnership: Volvo with its new digital key app paired with Urb-it, a shopping and delivery startup, to deliver goods. |
Public or Private?
Public or Private?
Supply Chain/Goods Movement Sector

Whether it is a startup (e.g., Instacart, Uber Eats, Postmates, Doordash), an Internet-based retailer (e.g., Amazon), or a supply chain and logistics firm, advancements in courier services (both technologies and service models) are transforming how consumers access goods and services. FedEx, UPS, and DHL are all developing faster delivery services using automation and robotics for both ground-based and aerial vehicles.

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| **FedEx**            | Internal Developments: Developing AV delivery vans and robots  
Partnerships: Volvo, Freightliner, and Daimler; developing hybrid AV van and drone delivery system |
| **UPS**              | Internal Developments: Piloting a drone system that launches from the top of a truck |
| **DHL**              | Internal Developments: Pilot program testing automated parcel station and aerial delivery drones |
| **Amazon**           | Internal Developments: Amazon Prime Air drone delivery patent filed for the U.S. |
Mobility Shift

Traditional

I own and use my own transportation

Suburban
Rural

Trending

I own my transportation and/or access shared mobility options

Urban Core

Near Future

I access a menu of mobility options to meet my needs

Urban Core
Suburban
Rural
What is Mobility on Demand (MOD)?

An integrated and connected multi-modal network of safe, affordable, and reliable transportation options that are available to all

- User-focused options to improve personal mobility and access to more destinations
- Promotes choice in personal mobility & optimizes the transportation system through Intelligent Transportation Systems
- Advances connected vehicles & automation applications
- Uses emerging technologies & data exchange to enable personal mobility
- Encourages multimodal connectivity & system interoperability
On-demand; Better Options; More Choices
Multiple modes, little or no integration; multiple payments, multiple bookings, etc

Privately-Owned Vehicles

Public Transit, Rail, Bus, Ferry

Regional & Intercity Services: Rail, High-Speed Rail, Air

Shared Fleet Vehicles

Employer Shuttles, Jitneys
Commercial Deliveries

Taxi, Limousine & Transportation Network Companies

Source: Timothy Papandreou, former Director, Office of Innovation at San Francisco Municipal Transportation Agency (SFMTA), @tpap_
Customer Experience

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Mobility options - customized

[Image of three mobile phones displaying different mobility options]
Operational Perspective of MOD
Holistic View and Enablers

Economic and Societal Incentives

- Marketplace Supply
  - Goods Service Delivery
  - Public Transit
  - Peer-to-Peer Mobile Applications
  - Ridesharing

Economic and Societal Constraints

- User Needs/Preferences
  - Travelers
  - Delivery Request
  - Time of Ride Request
  - Origin - Destination Request
  - Goods
  - Occupancy & Vehicle Type

Real-Time Travel & Operations Data

Technologies, Strategies, Policies
Universal Accessibility

- 76% people with disabilities say adequate transportation is important to their job search
- 29% consider it a significant problem in accessing jobs [1]
- If one part of trip is not accessible then the complete trip is NOT accessible

Targeted Populations
- Persons with Disabilities
- Veterans with Disabilities
- Older Adults

Types of Disabilities
- Vision
- Mobility
- Hearing
- Cognitive

Enabling Technologies
- ITS, Wireless & Sensors
- Connected Vehicles
- Automated Vehicles/ Personal Mobility
- Robotics, Artificial Intelligence
- Accessible Data
MOD – Development contexts

**CITY CENTER**
High-density downtown/CBD employment centers and surrounding neighborhoods

**SUBURBAN**
Predominantly lower-density residential users with some segregated mixed uses

**EDGE CITY**
Medium-density employment centers outside of the urban core

**EXURBAN**
Very low-density residential uses on the urban fringe

**RURAL**
Typically unincorporated
MOD and Operations

Travel today…

- Transportation is multi-modal
- Travelers expect a seamless trip

By working together, TDM professionals and traffic managers…

- Create more traveler choices
- More effectively manage travel
Real-Time Multimodal DSS Informational Flow Diagram
2016 MOD Sandbox Program

- 11 projects demonstrating different approaches, technologies
- Each project leads to 12-month demonstration
- All projects include independent evaluation
- $8 Million in Section 5312 Research funds (projects range from 200K to $1.35M)
- Minimum 20-percent local cost-share
- Providers of public transportation with one or more partners
- Competitive process to select projects
- Projects ideas solicited in May 2016 and project portfolio announced October 2016
- All projects underway
2016 Sandbox Projects At a Glance