An Overview of Shared Mobility Growth, Trends, and Indicators to Watch

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University of California, Berkeley
Presentation Overview

• Shared Mobility, Trends, and Indicators to Watch
• Shared Mobility Growth and Industry Benchmarks
• Shared Mobility and Public Transportation
• Integrated Mobility and Emerging Technologies
• Concluding Thoughts
Shared Mobility, Trends, and Indicators to Watch
HYPE?
Uber Proposals Value Company at $120 Billion in a Possible IPO

Eye-popping offering, which could take place early next year, is nearly double the ride-hailing company’s valuation in a fundraising round two months ago.

Uber, Lyft could solve transportation problems

"We're heading towards hell": Expert shares concerns with self-driving cars

How Self-Driving Cars Could Shape Our Future

Once challenges are surmounted, the world (and world of business) may be altered forever.

Blockchain Becoming Integral To Leading Vehicle Brands With The Future In Mind

Five myths about autonomous vehicles
The Evolution of Mobility

Motorization
• Strong public sector involvement in policy and infrastructure
  • Proactive Government and Industry

Rise of Environmental and Safety Regulation
• Strong public sector involvement in regulation
  • Proactive Government

Transportation Demand Management
• Moderate public sector involvement in programs, such as carpooling/vanpooling
  • Proactive Government

The Rise of Sharing
• Private-sector driven innovations in mobility
  • Proactive Industry; Reactive Government

The Rise of Disruption
• New technologies and modes disrupt the marketplace (e.g., AVs, SAVs, EVs, UAM)
  • Proactive Industry; Reactive Government??

Cohen and Shaheen 2019
Three Digital Trends Impacting the Economy

• Disintermediation – Using digital marketplaces to cut out the middle man

• Disaggregation – Breaking up large purchase (e.g., vehicles, real estate, etc.) and repackaging as services

• Dematerialization – Turning the physical world into the virtual (virtual reality, 3D printing, etc.)
Public or Private?
The shared use of a motor vehicle, aircraft, drone, delivery vehicle, bicycle, scooter, or other mode - is an innovative transportation solution that enables users to gain short-term access to transportation or goods on an “as-needed” basis.

Shaheen and Cohen 2019
Shared Mobility Services
Changing Attitudes Toward Technology

- Millennials have embraced apps and other technologies
- More travelers are substituting physical trips with virtual trips
- Impact of telecommuting and e-commerce on vehicle ownership and use is less clear
- Emerging technologies are reducing need for brick-and-mortar retail consumption and workers to be physically present in an office
A Shifting Transportation Landscape

Innovative partnerships and emerging technologies are changing how consumers travel

• The public sector is leveraging shared mobility to address service gaps
• Integrated multimodal traveler information apps improving to include a variety of public and private options
• Auto manufacturers and technology companies are rebranding as mobility companies, acquiring start-ups, and pursuing self-driving vehicles
• Mobility on Demand (MOD) piloting in the U.S.
• Mobility as a Service (MaaS) piloting in Europe (e.g., Finland, Sweden, Netherlands)
Current Issues

Evolving Public Agencies

• Agencies are faced with a rapidly-evolving landscape for providing mobility choices to travelers

• How do we plan and adapt public rights-of-way? (both street and curb space management)

• How do we prepare for an electric and automated vehicle future?
Current Issues

Changing Consumer Expectations

• Shared mobility can provide a suite of strategies for providing travelers effective choices to enhance accessibility and improve travel reliability
• Travelers use more and different forms of transportation than ever before
• Travelers increasingly expect to have real-time, dynamic, actionable information before and during their tripmaking
Five Converging Mobility Innovations

- Shared Mobility, Shared Micromobility, and Last-Mile Delivery
- Electrification
- Automation
- Digital Information & Fare Payment Integration
- The Commodification of Transportation
Shared Mobility
Growth and Industry Benchmarks
Growth of Shared Micromobility

Station-based Bikesharing  
Dockless Bikesharing  
Standing Electric Scooter Sharing  
Moped-style Scooter Sharing
Key Global Shared Micromobility Benchmarks

As of May 2018 - 1,600 information technology-based public bikesharing systems worldwide with over 18.17 million bicycles

U.S.

- Between 2010 to 2018, 207 million shared micromobility trips have been completed in the U.S.

- In 2018, 36.5 million trips were completed using station-based bikesharing, 9 million trips on dockless bikesharing, and 38.5 million trips on shared e-scooters.

China

- As of May 2018, there were 6.1 million bicycles shared by more than 640 bikesharing programs in China
Shared Micromobility in the U.S.

84 Million Trips on Shared Micromobility in 2018

Source: NACTO
As of October 2016, carsharing was operating in 46 countries and six continents, with an estimated 2,095 cities and approximately 15 million members sharing over 157,000 vehicles.

### Key Global Carsharing Benchmarks

<table>
<thead>
<tr>
<th>Region</th>
<th>Members</th>
<th>Vehicles</th>
<th>Member-to-Vehicle Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asia</td>
<td>8,722,138</td>
<td>67,239</td>
<td>129.5</td>
</tr>
<tr>
<td>Europe</td>
<td>4,371,151</td>
<td>57,857</td>
<td>75.6</td>
</tr>
<tr>
<td>North America</td>
<td>1,837,854</td>
<td>26,691</td>
<td>68.9</td>
</tr>
<tr>
<td>Other</td>
<td>119,049</td>
<td>5,629</td>
<td>21.1</td>
</tr>
<tr>
<td>Global</td>
<td>15,050,192</td>
<td>157,416</td>
<td>95.6</td>
</tr>
</tbody>
</table>
### Key Global TNC/VTC Benchmarks

<table>
<thead>
<tr>
<th></th>
<th>Uber</th>
<th>Lyft</th>
<th>Grab</th>
<th>DiDi</th>
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<tbody>
<tr>
<td><strong>Area of operation</strong></td>
<td>600 cities in 65 countries worldwide</td>
<td>300 US cities, 2 Canadian</td>
<td>Southeast Asia</td>
<td>400 Chinese cities, Brazil, Japan, Mexico, Australia, Hong Kong, Taiwan</td>
</tr>
<tr>
<td><strong>Launched</strong></td>
<td>March 2009</td>
<td>June 2012</td>
<td>June 2012</td>
<td>June 2012</td>
</tr>
<tr>
<td><strong>Headquarters</strong></td>
<td>San Francisco, US</td>
<td>San Francisco, US</td>
<td>Singapore</td>
<td>Beijing, China</td>
</tr>
<tr>
<td><strong>Users</strong></td>
<td>75 million</td>
<td>23 million</td>
<td>36 million</td>
<td>550 million</td>
</tr>
<tr>
<td><strong>Drivers</strong></td>
<td>3.9 million</td>
<td>1.4 million</td>
<td>2.6 million (all time)</td>
<td>21 million</td>
</tr>
<tr>
<td><strong>Rides per Day</strong></td>
<td>14 million</td>
<td>1 million</td>
<td>4 million</td>
<td>30 million</td>
</tr>
<tr>
<td><strong>Total Trips</strong></td>
<td>10 billion</td>
<td>1 billion</td>
<td>2.5 billion</td>
<td>7.4 billion in 2017</td>
</tr>
</tbody>
</table>
The Role of the Built Environment

- Context in the built environment matters
- One size does not fit all
- Solutions must be tailored to meet a diverse array of needs, use cases, and urban contexts
The Role of the Built Environment

A Tale of Two Cities

- Street layout and density may be the most important factors influencing the types of adoption of new transportation technologies
- Walkability, bikeability, and transit accessibility, are also key
The Relationship Between Shared Mobility & Public Transit

- First-and-Last Mile Connections
- Public Transit Replacement
- Low Density Service
- Late Night Transportation
- Paratransit
- Others ...
The Relationship Between Shared Mobility & Public Transit

High-Density Built Environment

Cities: Important to reduce congestion, emphasize HOVs (transit, pooled modes, active transport)

Peak/High Levels of Service (Headways)

Suburbs, Rural Areas: Replace underperforming routes, fill gaps, first and last mile

Low-Density Built Environment

Suburbs, Rural Areas: Replace underperforming routes, fill gaps, first and last mile

No Service/Limited Service (Headways)

CITIES: Provide more connections via shared mobility

Suburbs, Rural Areas: Replace underperforming routes, fill gaps, first and last mile

Shaheen and Cohen, 2018
The Relationship Between the Built Environment, Shared Mobility, and Motorized Vehicles

High-Density Built Environment

Edge Cities: Important to emphasize HOVs (transit, pooled modes), mixed land uses, shared parking

Cities: Important to emphasize HOVs (transit, pooled modes, active transport)

Auto-oriented Built Environment

Suburbs, Rural Areas: Important to emphasize walkability and mixed-use communities; telecommuting

Walkable Built Environment

Suburbs, Rural Areas: Important to emphasize improvements that support walking and shared micromobility

Low-Density Built Environment

Cohen and Shaheen 2019
## Summary of Shared Mobility Impacts on Public Transportation

<table>
<thead>
<tr>
<th>Mode</th>
<th>Decrease/Increase</th>
<th>Public Transit Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>Roundtrip Carsharing (N. America)</td>
<td>Net decrease (-)</td>
<td>For every 5 members that use rail less, 4 ride it more; For every 10 members that use the bus less, 9 ride it more.</td>
</tr>
<tr>
<td>One-Way Carsharing (N. America)</td>
<td>Net decrease, although an exception in Seattle (- / +)</td>
<td>In Seattle, where a small percentage of respondents increase their use exceeding the smaller percentage of respondents decreasing their rail use. Across the other four cities, more people report a decrease in their frequency of urban rail and bus use than an increase.</td>
</tr>
<tr>
<td>P2P Carsharing (N. America)</td>
<td>Net decrease (-)</td>
<td>Those increasing and decreasing their bus and rail use were closely balanced in number, with 9% increasing bus and 10% decreasing use. Similar effects were found with rail, as 7% reported increasing rail use, while 8% reported decreasing it.</td>
</tr>
</tbody>
</table>
| Station-Based (Docked) Bikesharing (N. America Multi-City Studies) | Net increases in bus/rail in small- and medium-sized cities Small net decreases in bus/rail in larger cities (+ / -) | -Small net increases in bus and rail use in small- and medium-size cities (e.g., Minneapolis)  
- Small net decreases in bus and rail use in larger cities (e.g., Mexico City) |
| Pooling (Casual Carpooling in Bay Area)    | Net decrease (-)                                        | Majority of casual carpoolers were public transit users. In the Bay Area, 75% were casual carpoolers. |
| Ridesourcing/TNCs (SF Bay Area)            | Net decrease (-)                                        | 33% competition with public transit, 4% first mile and last mile (destination or origin is public transit stop) |
Early Understanding of Shifts to Scooter Sharing from Other Modes

<table>
<thead>
<tr>
<th>Mode</th>
<th>Study Authors Location Survey Year</th>
<th>PBOT (Residents) Portland, OR 2018</th>
<th>PBOT (Visitors) Portland, OR 2018</th>
<th>6t Paris, FR 2019</th>
</tr>
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<tbody>
<tr>
<td>Drive (%)</td>
<td></td>
<td>19</td>
<td>16</td>
<td>3</td>
</tr>
<tr>
<td>Public Transit (%)</td>
<td></td>
<td>10</td>
<td>4</td>
<td>49</td>
</tr>
<tr>
<td>Taxi or TNC/VTC (%)</td>
<td></td>
<td>16</td>
<td>34</td>
<td>10</td>
</tr>
<tr>
<td>Bike (%)</td>
<td></td>
<td>9</td>
<td>4</td>
<td>14</td>
</tr>
<tr>
<td>Walk (%)</td>
<td></td>
<td>37</td>
<td>35</td>
<td>6</td>
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<tr>
<td>Would not have made trip (%)</td>
<td></td>
<td>8</td>
<td>5</td>
<td>0.5</td>
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<tr>
<td>Other / Other TNC (%)</td>
<td></td>
<td>1</td>
<td>1</td>
<td>1</td>
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Note: Mode replacement findings of these studies employ various methodologies, depending on survey instrument used and analysis methods chosen. Different methodologies can have a notable impact on findings.

A Few Notes About Portland
- Average trip length was 1.15 miles (1.85 km)
- 29% of respondents used scooters for recreational purposes
# Shifts to TNCs/VTCs Predominantly from Driving, Public Transit, and Taxis

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<tr>
<td>Mode</td>
<td>Drive (%)</td>
<td>Public Transit (%)</td>
<td>Taxi (%)</td>
<td>Bike or Walk (%)</td>
<td>Would not have made trip (%)</td>
<td>Carsharing / Car Rental (%)</td>
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<td>7</td>
<td>30</td>
<td>36</td>
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<td>34</td>
<td>14</td>
<td>8</td>
<td>17</td>
<td>1</td>
<td>42 (another TNC)</td>
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<td>45</td>
<td>3</td>
<td>2</td>
<td>2</td>
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<td>4 (other)</td>
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<tr>
<td>Mode</td>
<td>Other / Other TNC (%)</td>
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<td>10</td>
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<td>42 (another TNC)</td>
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<td>2 (other)</td>
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</table>

Note: Mode replacement findings of these studies employ various methodologies, depending on survey instrument used and analysis methods chosen. Different methodologies can have a notable impact on findings.
Barriers to Behavioral Change

- **Density and Built environment**
  - Walkability, bikeability, public transit accessibility

- **Habitual Experience**
  - Change is difficult

- **Convenience**

- **Cost**
  - Sunk cost of driving (high up-front costs)
  - Inexpensive driving costs (free parking, low-cost fuel)

- **Lifecycle Factors**
  - Younger drivers (a new feeling of freedom)
  - Families (vehicle ownership is convenient and/or necessary with children)
  - Older adults (don’t want to give up freedom)

- **Equity/Access Factors**
  - No smartphone and/or debit/credit card access
  - Accessibility for people with disabilities
Current Impacts: Understanding and Challenges

- Positive and negative impacts of shared mobility
- Impacts vary depending on mode, metrics measured, and methodology
- Impacts differ based on time of day, location, built environment, transit accessibility, and urban context
- Data challenges (privacy, competition, duopoly)
- Challenging to show and confirm causality
- Our research indicates land-use/built environment and socio-demographics differ by city
- Hard data to obtain including: % at peak/% at off-peak, driver VMT impacts when using two or more apps, occupancy rates, impacts of pricing and AVs
Integrated Mobility and Emerging Technologies
MOD & MaaS
Similarities and Differences

Mobility on Demand
- Passenger Movement & Goods Delivery
- Transportation systems management (i.e., managing supply & demand through feedback control)

Mobility as a Service
- Mobility aggregation
- Bundled & subscription services

Shaheen and Cohen 2018
Vertical vs. Horizontal Integration

<table>
<thead>
<tr>
<th>Vertical Integration (One Service Provider with Multiple Modes)</th>
<th>Uber</th>
<th>Free2Move</th>
<th>Lime</th>
<th>Your-Now</th>
<th>Lyft</th>
<th>Zipcar</th>
<th>Transit App</th>
<th>Via</th>
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<tr>
<td>Shared Automated Vehicles (SAVs) &amp; Transportation Network Companies (TNCs)</td>
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<td>Shared Micromobility (Bikesharing and Scooter Sharing)</td>
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<td>Microtransit</td>
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<tr>
<td>Carsharing</td>
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<td>Last Mile Delivery &amp; Courier Network Services</td>
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<tr>
<td>Mobility Aggregators &amp; Smartphone Apps</td>
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<td>Public Transportation</td>
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Horizontal Integration
One Platform Aggregating Multiple Service Providers and Modes
Shared Automated Vehicles (SAVs)

- Automation could change public transit by altering the built environment, costs, commute patterns, and modal choice.
- SAVs could reduce parking needs, creating opportunities for infill development to non-vehicular modes.
- AVs could reduce the operating costs for transit that could be passed onto riders in lower fares, more routes, and/or more frequent service.
- AVs and telecommuting could also make longer commutes more practical and contribute to sprawl.

Source: Adapted from Deloitte Small and Rural Communities Auto-Oriented Megaregions Transit-Oriented Megaregions Shaheen and Cohen 2019
Urban Air Mobility

Passenger Mobility and Goods Delivery

• The safe and efficient system for air passenger and cargo transportation within an urban area, inclusive of small package delivery and other urban Unmanned Aerial Systems (UAS) services, which supports a mix of onboard/ground-piloted and increasingly autonomous operations

• Notable investments are being made around the globe in electric and autonomous urban aviation
Concluding Thoughts
Key Questions Asked by Public Agencies

• How do public agencies prepare and plan for mobility innovations?
• When does shared mobility complement public transit and when does it compete?
  • How does it vary by mode & context?
• What factors influence complementarity vs. competition?
• How can shared mobility be used to enhance accessibility to areas without transit service?
• How can shared mobility be used to improve efficiency and/or reduce service inefficiencies?
• How should public transportation respond to short, mid, and long-term changes? (e.g., shared mobility, AVs, SAVs, and other innovations)

Shaheen and Cohen 2019
Policy Implications and Recommendations

- What policies make sense not just for shared mobility providers but all transportation modes moving forward (level playing field)
- Emphasis needed for mobility hub planning that includes public transit, shared mobility, last mile delivery, and aviation services (where available)
- Stakeholders are beginning to discuss usage-based pricing mechanisms in some cities, which could possible include:
  - Trip-based fees;
  - Mileage-based pricing;
  - Spatio-temporal pricing (cordon pricing, express lanes, curb pricing);
  - Mode or occupancy-based fees;
  - Access to high occupancy vehicle lanes or express lanes;
  - Others...?
Additional Resources

• Shared mobility resource library available on http://innovativemobility.org/?page_id=2762