Innovation and Disruption in Urban Mobility: Change Is Coming Fast

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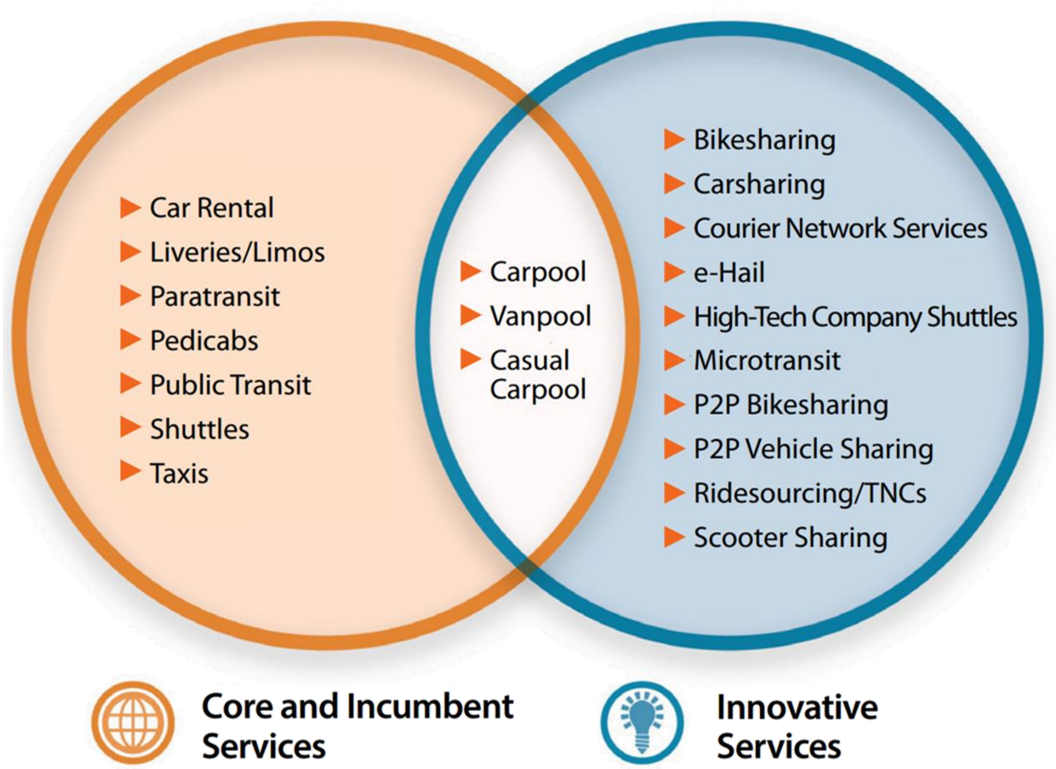
RESEARCH CENTER

Overview

- Defining shared mobility, impacts, and SAVs
- Declines in public transit use
- Key questions for public transit
- Importance of data and research in evaluating shared mobility
- SAV developments
- Upcoming studies and current reports
- Final thoughts

Defining Shared Mobility

Shared mobility—the shared use of a vehicle, bicycle, or other low-speed travel mode—is an innovative transportation strategy that enables users to have short-term access to a mode of transportation on an as-needed basis.



Shaheen et al., 2016

Shared Mobility Impacts

Environmental Effects

- Can yield lower GHG emissions via decreased VMT, low-emission vehicles, carbon offset programs
- Can reduce vehicle ownership

Social Effects

- Offers "pay-as-you-go" alternative to vehicle ownership
- Reasonable for college students and low-income households
- Can increases mobility of low-income residents, disabled, and college students
- Provides car use without bearing full ownership cost

Transportation Network Effects

- Takes cars off the road via reduced VMT, forgone/delayed vehicle purchases or sale of vehicle
- Reduced parking demand
- Can complement/complete with alternative transportation modes, e.g., public transit, walking, biking, etc. , and can help address first and last mile issue

(Shaheen, 2017)

Convergence

Electrification

Mobile Technologies

SECA

T. Papandreou, 2016

Shared Mobility

Automation

Declines in Public Transit Ridership

UZA Name	Sum of 2015	Sum of 2016	Change
Seattle, WA	178,640,154	185,913,534	4.1%
Houston, TX	83,285,295	85,180,489	2.3%
Milwaukee, WI	40,610,851	41,476,982	2.1%
Detroit, MI	36,734,180	37,079,598	0.9%
New York-Newark, NY-NJ-CT	4,222,700,561	4,241,214,495	0.4%
San Francisco-Oakland, CA	454,952,418	454,996,256	0.0%
Boston, MA-NH-RI	403,464,723	402,554,159	-0.2%
Pittsburgh, PA	63,990,430	63,570,697	-0.7%
Denver-Aurora, CO	101,021,365	99,777,407	-1.2%
Portland, OR-WA	112,440,100	110,985,034	-1.3%
San Antonio, TX	37,983,886	37,290,201	-1.8%
Salt Lake City-West Valley City, UT	44,909,741	43,776,825	-2.5%
Minneapolis-St. Paul, MN-WI	96,636,368	93,716,857	-3.0%
Chicago, IL-IN	623,466,948	603,747,357	-3.2%
Urban Honolulu, HI	68,587,549	66,361,162	-3.2%
Las Vegas-Henderson, NV	72,044,767	69,420,973	-3.6%
Dallas-Fort Worth-Arlington, TX	75,998,371	72,137,725	-5.1%
Baltimore, MD	111,070,976	105,214,371	-5.3%
Atlanta, GA	141,154,134	132,925,293	-5.8%
Philadelphia, PA-NJ-DE-MD	369,644,085	346,276,496	-6.3%
Phoenix-Mesa, AZ	69,525,177	64,898,486	-6.7%
San Diego, CA	94,921,830	88,507,937	-6.8%
St. Louis, MO-IL	47,250,866	44,020,031	-6.8%
Cleveland, OH	46,844,074	43,507,057	-7.1%
Los Angeles-Long Beach-Anaheim, CA	619,459,557	572,589,716	-7.6%
San Jose, CA	44,718,244	40,763,554	-8.8%
Miami, FL	156,449,301	141,556,090	-9.5%
Washington, DC-VA-MD	441,222,366	396,260,838	-10.2%
Austin, TX	32,795,531	28,893,986	-11.9%
San Juan, PR	38,853,326	32,289,221	-16.9%

Increase

No Change

Decrease

(NTD, 2017)

Public Transit Ridership Declines

- Numerous studies documenting shifts to ridesourcing/TNCs predominantly from taxi and transit
- National survey (Reuters, 2017)
  - 68% use taxi less often
  - 38% use public transit less often
  - 21% use personal auto less often
- San Francisco (Rayle et al., 2014)
  - .... If ridesourcing were unavailable .....
    - 33% would have used public transit; 4% first-last mile
    - 7% would have used personal vehicle instead of TNC
    - 10% would have walked or biked
- Denver (Henao, 2016)
  - “For this trip, how would you have traveled if Lyft/Uber wasn’t an option?
    - 22% Public transportation
    - 19% would have driven alone
    - 12% Would not have traveled

Shared Mobility and Public Transportation

More research and evaluations needed to study traveler behavior and elasticity of individual and combined variables

- Cost
- Fare type (e.g., pass, per trip, per mile) and stability (e.g., fixed vs. variable pricing)
- Temporal and spatial scale
- Convenience
- Travel time
- Wait time
- Number of modes
- Other factors

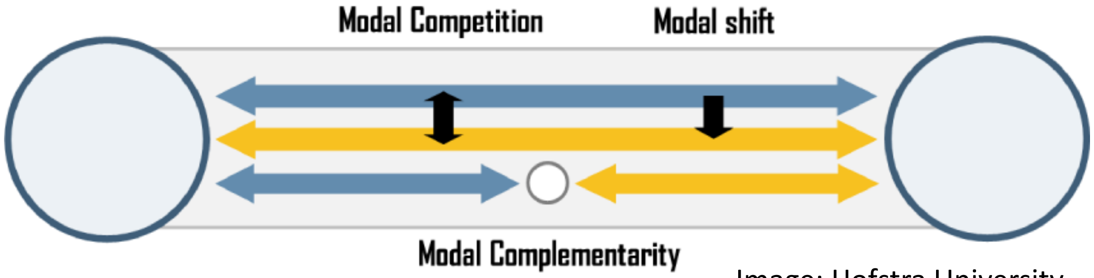


Image: Hofstra University

(Shaheen, 2017)

Key Questions for Public Transportation

- 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 public 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, 2017)

Additional Questions for Consideration

1) What types of outcomes and performance metrics are important to your agency and why?

2) Do particular hypotheses drive your pilot projects?

3) Does your agency conduct feasibility studies or market research in advance of piloting?

4) Does your agency adjust its pilot projects dynamically, either through a preliminary evaluation or response to real-time data?

UBER

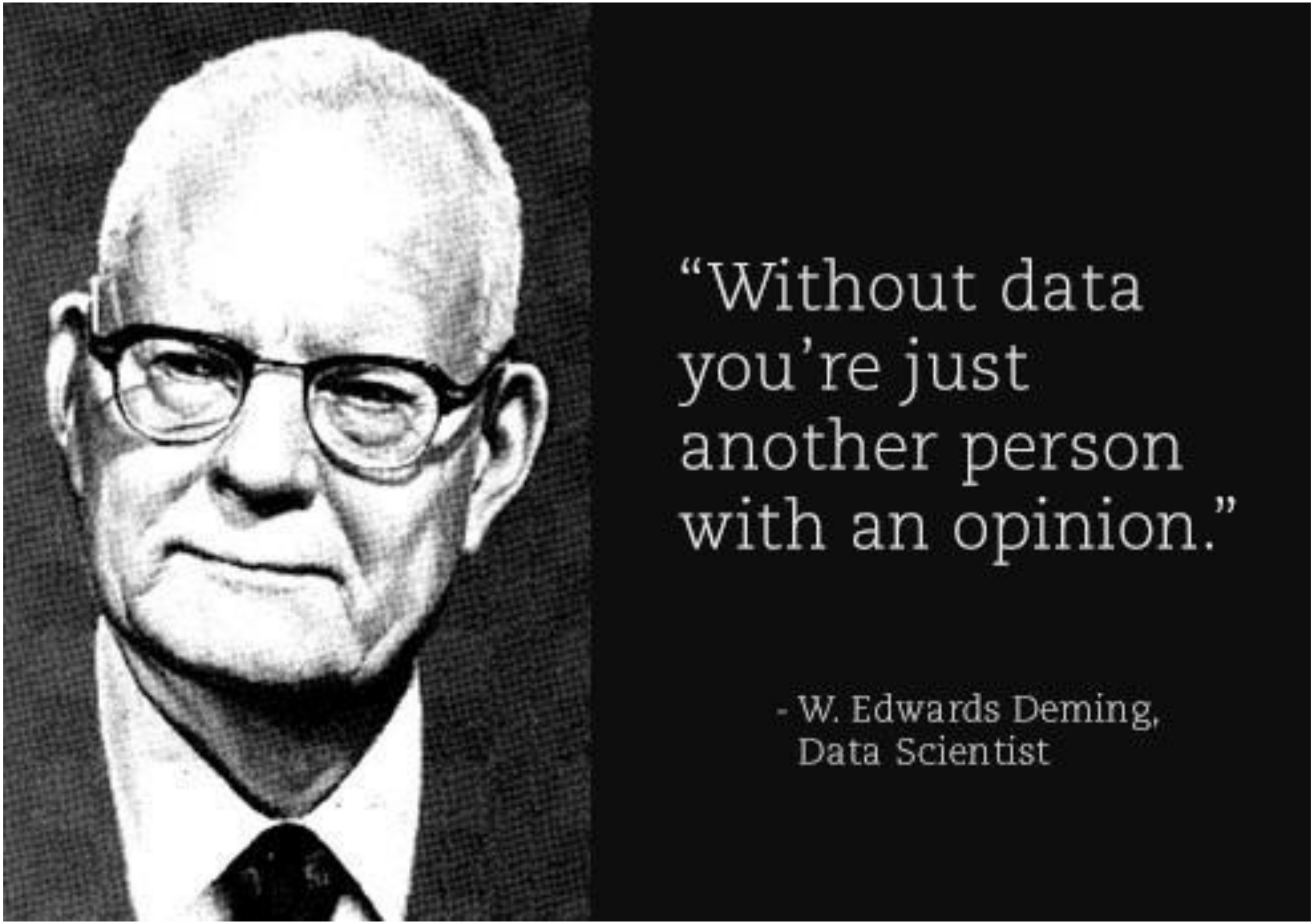
PSTA

(Shaheen, 2017)

Importance of Data and Research

- Need to develop data metrics, models, planning platforms, and methodologies to assess the economic and travel impacts of shared mobility
- Longitudinal tracking and forecasting of modal impacts (temporal/spatial scale)
- Develop ability for public agencies to forecast the economic and travel behavior impacts of shared modes/pilot projects and guide public policy development
- Developing policies that balance data sharing with privacy (user, private companies, and public agencies)
- Key for providing seamless multi-modal integration

(Shaheen, 2017)


"Without data
you're just
another person
with an opinion."
- W. Edwards Deming,
Data Scientist

Evaluating Impacts of Pilots/Shared Mobility

Evaluation Hypothesis

- Based on project specific goals/target impacts

Performance Metrics

- Metrics established in line with project targets/hypotheses

Data Sources

- Based on performance metrics based and data collection plan

Analysis & Evaluation

- Quantitative & qualitative methods, such as surveys, focus groups, stakeholder interviews, and statistical and data analysis, and GIS analysis

(Shaheen and Cohen, 2017)

SAV Developments – Conventional Vehicle SAVs

All SAV pilots with conventional vehicles to date have a steering wheel in the vehicle and an engineer in the driver's seat for safety

Waymo

Example Pilot:

Early Rider Program, Phoenix, AZ

Uber

Example Pilot:

Pittsburgh, PA

NuTonomy

Example Pilot:

One North, Singapore

(Shaheen, 2017)

SAV Developments – Conventional Vehicle SAVs

Waymo Early Rider Program, Phoenix, AZ

- Alphabet's Waymo launched its Early Rider program in April 2017, inviting residents of certain areas of Phoenix, Arizona to ride in their autonomous vehicles
- After a trial period in Phoenix, Waymo plans to expand its fleet from 100 to 600 autonomous Fiat-Chrysler Pacifica Hybrid minivans

(Shaheen, 2017)

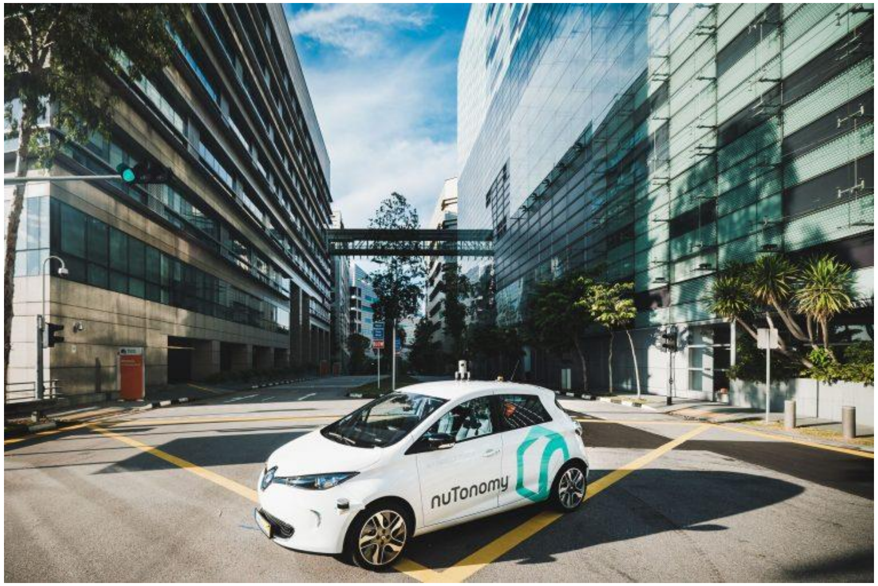
SAV Developments – Conventional Vehicle SAVs

Uber, Pittsburgh, PA

- In September 2016, Uber began a pilot in Pittsburgh, PA serving around 1,000 select Uber customers with four autonomous Ford Fusions
- There is a backup driver and engineer present in the front seats

SAV Developments – Conventional Vehicle SAVs

NuTonomy, One North Business Park, Singapore



- In August 2016, NuTonomy launched a public trial of their autonomous vehicles in a 1.5 square-mile section of Singapore, called One North
- NuTonomy partnered with Grab, the Southeast Asia-based ridesourcing company, and vehicles can be hailed via smartphone through Grab's platform

SAV Developments – Planned SAV Pilots

Low-Speed SAV Shuttle Pilots

EasyMile, Treasure Island, San Francisco Bay Area, CA

- EasyMile and the San Francisco County Transportation Authority are planning a pilot to serve first and last mile public transit trips on Treasure Island by 2020

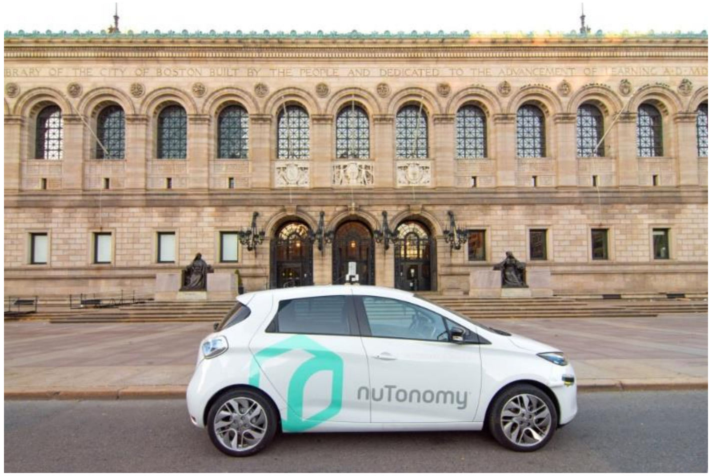
Local Motors Olli, Miami Dade County, FL and Las Vegas, NV

- Local Motors' Olli has been tested in National Harbor, MD and has expansion plans to serve passengers in Miami and Las Vegas

SAV Developments – Planned SAV Pilots

Conventional Vehicle SAV Pilots

NuTonomy and Lyft, Boston, MA



- NuTonomy has been testing its AVs in the Seaport and Fort Point areas of Boston since April 2017
- In June 2017, Lyft and NuTonomy formed a partnership with plans to deploy a SAV pilot serving passengers sometime in the coming months

Delphi and Transdev, Normandy and Paris, France

- In June 2017, Delphi and Transdev announced that they will test AVs in Normandy and outside Paris in advance of building a commercial service starting in 2019, which could be deployed in other markets, including North America

(Shaheen, 2017)

Future Shared Mobility Research

- North American and International Carsharing Market Outlooks (Summer/Fall 2017)
- Impacts Study of Lyft and Uber (Summer/Fall 2017)
  - Study will assess the impacts of travel behavior, vehicle ownership, VMT, modal shift, and GHG emissions
- P2P Carsharing Impact Study (Summer 2017)
- Bikesharing GHG Study (Fall 2017)

(Shaheen, 2017)

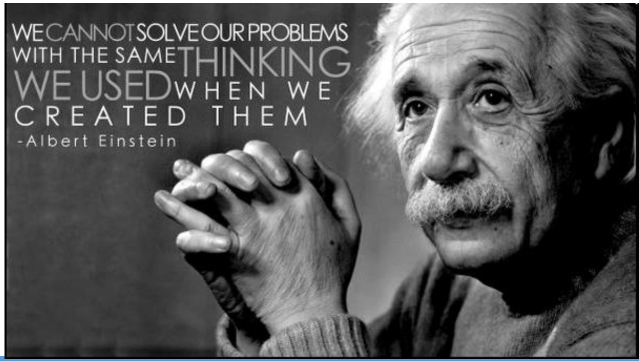
Future Shared Mobility Research (cont'd)

- U.S. Federal Highway Administration Studies of Mobility on Demand (Fall 2017)
- U.S. Federal Transit Administration Mobility on Demand Sandbox Independent Evaluation (2018-19)
  - $8 million funding for an array of mobility pilots with 11 partners (12 locations)
  - Booz Allen Hamilton and TSRC leading the independent evaluation for all sites
  - Measure project impacts and identify factors that may support or impede innovative transportation service models

(Shaheen, 2017)

Final Thoughts

- Change is now very fast, although may feel incremental; is disruption now a constant?
- Ultimately, will people care less about driving and more about connecting with media in vehicles?
- Future something we are creating now. We have ability to forecast what is coming and create preferred outcomes.
- Need more emphasis on social engineering (e.g., machine learning)
- Need more data and research understanding (e.g., pilots)



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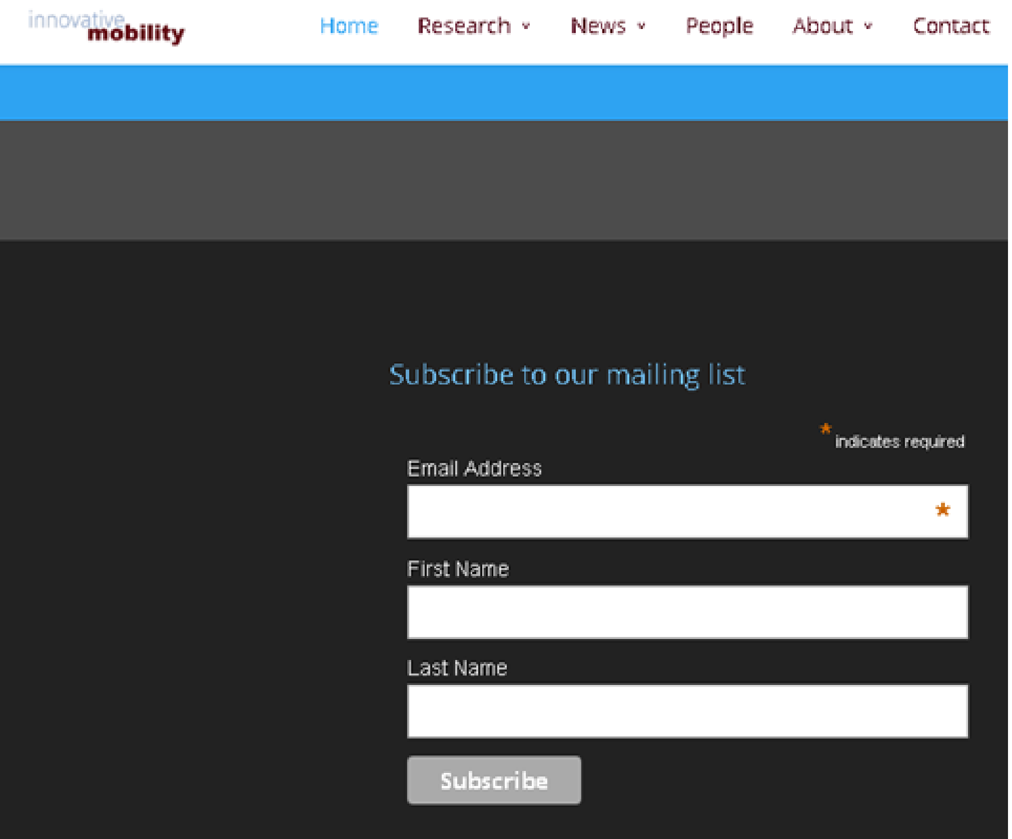

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TECHNOLOGY

NVIDIA and VW collaborate to apply artificial intelligence technology to broader transportation challenges. The organizations had previously partnered to develop driverless vehicles and will continue to use machine learning applications for urban traffic flow optimization.

RIDESOURCING

Uber and Yandex combine their Russian ridesourcing business. Both companies stated they would join forces in Russia, Armenia, Azerbaijan, Belarus, Georgia, and Kazakhstan to create a company that will operate in 127 cities. Russia's federal anti-monopoly regulatory body states the action would need approval as it potentially poses risk to competition.

APPS

TransLoc and Google announce partnership to ensure accurate public transportation data are integrated into Google Maps. This partnership will allow TransLoc to manage larger volumes of real-time transit information for agencies and vastly improve access to public transit information for riders.

PUBLIC TRANSIT

Paris launches autonomous EV shuttle service pilot program. Two companies, Navya and Keolis, are partnering with the Parisian government to offer the service free of charge. The shuttles carry up to 15 people each and will operate three different daily routes. The pilot will run until at least December of this year.

BIKESHARING

Seattle allows private bikesharing on city streets, with as many as 10 companies planning to launch under the new program. Interested companies must roll out a minimum of 500 bikes and pay an operations fee to the city. This may lead to hundreds of thousands of dollars in public revenue. Helmet laws will still be enforced for users of the systems, but companies are not required to provide such helmets.

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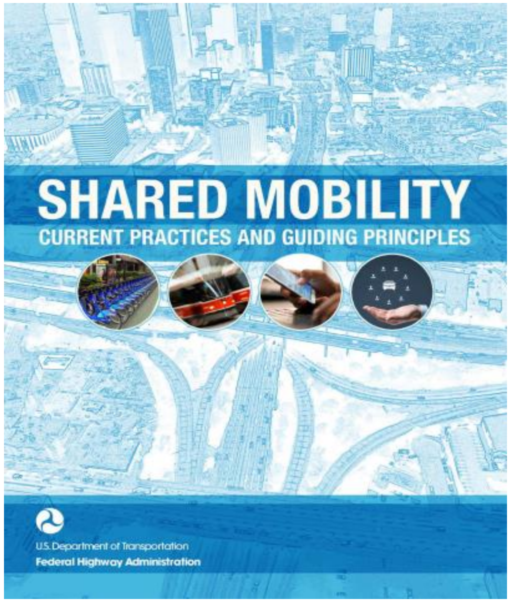
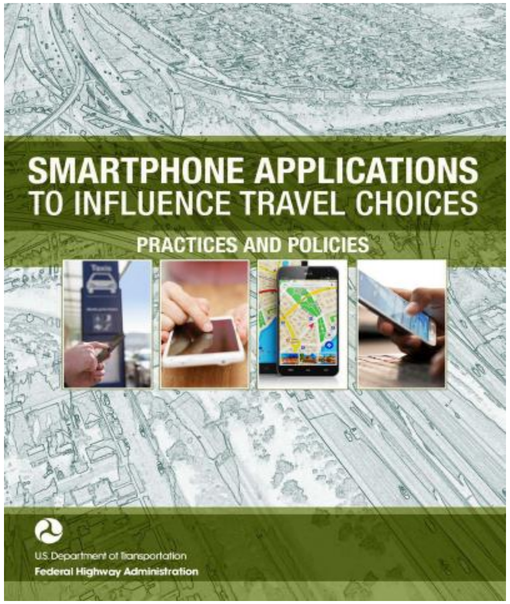


https://ops.fhwa.dot.gov/publications/fhwahop16022/fhwahop16022.pdf



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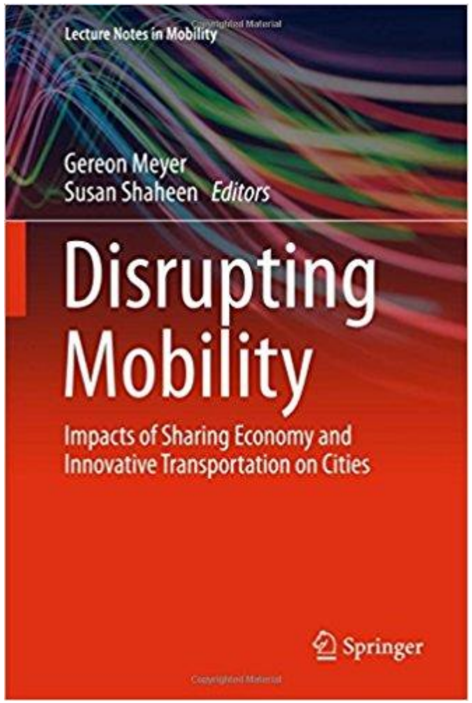
https://www.planning.org/publications/report/9107556/

Recent Book: Disrupting Mobility



Available at:

https://www.amazon.com/Disrupting-Mobility-Impacts-Innovative-Transportation/dp/3319516019

Acknowledgements

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