Attitudes, Behaviors, and Choices around Emerging Transportation Technologies

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Transportation Technologies

- Automation
- Mobility-on-Demand
- Micro-mobility
- Electrification
- Connectivity
Transportation Future?

Automation

Mobility-on-Demand

Connectivity

Increase in VMT, Sprawl and Decrease in Walk, Bike, and Transit Use

Mobility for All and Sustainability

Increase in VMT, Sprawl and Decrease in Walk, Bike, and Transit Use
Study Purpose

Collect a rich set of data across multiple jurisdictions that collects people’s travel behavior, attitudes, socioeconomics, perceptions and potential behavior in response to Mobility-on-demand and Autonomous Vehicles.
Survey Team

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Ram Pendyala

Denise Capasso da Silva

Deborah Salon

Michael Maness

Nikhil Menon

Felipe Dias

Shuqing Kang

Chandra Bhat

Giovanni Circella

Yongsung Lee

Patricia Mokhtarian
TOMNET Transformative Transportation Technologies (T4) Survey

- Phoenix, Atlanta, Austin, and Tampa metro areas
- Summer and Fall 2019 (pre-pandemic)
- Random address-based sample with online instrument
- Inclusion of attitudes, stated preference questions, and perceptions and choices of Mobility-on-Demand and Autonomous Vehicles

<table>
<thead>
<tr>
<th>Phoenix, AZ</th>
<th>Atlanta, GA</th>
<th>Austin, TX</th>
<th>Tampa, FL</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sample Size</td>
<td>1,027</td>
<td>944</td>
<td>1,127</td>
<td>260</td>
</tr>
<tr>
<td>%</td>
<td>30.6%</td>
<td>28.1%</td>
<td>33.6%</td>
<td>7.8%</td>
</tr>
</tbody>
</table>
Survey Instrument

1. Attitudes and Preferences
2. Vehicles You Have and Where You Live
3. Current Travel Patterns
4. Mobility on Demand and Shared Mobility Services
5. Autonomous Vehicles
6. Background Information
Mobility on Demand

Ridehailing and Micromobility

Picture source: https://www.facebook.com/mobilityondemand/
MoD Familiarity and Usage (N=3,358)

- Private ridehailing (e.g., Uber, Lyft)
  - Use it weekly: 11%
  - Use it monthly: 5%
  - Use it rarely: 39%
  - Familiar but not an user: 34%
  - Not familiar: 11%

- Shared ridehailing (e.g., uberPOOL, Lyft Share)
  - Use it weekly: 54%
  - Use it monthly: 14%
  - Use it rarely: 55%
  - Familiar but not an user: 26%
  - Not familiar: 11%

- Carsharing (e.g., Zipcar, Share Now)
  - Use it weekly: 38%
  - Use it monthly: 4%
  - Use it rarely: 4%
  - Familiar but not an user: 8%
  - Not familiar: 11%

- Bikesharing (e.g., Jump, Grid)
  - Use it weekly: 52%
  - Use it monthly: 4%
  - Use it rarely: 4%
  - Familiar but not an user: 11%
  - Not familiar: 5%

- E-scooter sharing (e.g., Lime, Bird)
  - Use it weekly: 61%
  - Use it monthly: 5%
  - Use it rarely: 5%
  - Familiar but not an user: 5%
  - Not familiar: 28%
Last Ridehailing Trips Attributes (N=1,885)

- 54% waited less than 5 min
- Average travel time 21 min
- 47% weekday daytime
- 25% weekend nighttime
- Top trip purposes:
  - Social/recreational 25%
  - Main commute location 15%
  - To access airport 14%
  - Drive alone 18%
  - Drive with passengers 14%
  - Ride with others 12%
  - Bus 11%
  - Alternative mode (91%)
  - I would not have made the trip, 10%
  - Other, 6%
  - Walk, 4%
  - Light rail, 2%
  - Personal bicycle or scooter, 2%
Ridehailing: Willingness to Share

Last actual ridehailing trips* (N=1,219)
• 12% chose to share
• Low income chose to share twice more than high income
• Women chose to share 1.5 times more than men
• Frequent users chose to share 1.4 times more than infrequent users

*Shared ridehailing only for Austin and Atlanta
Ridehailing Use for Commute:
Where system is available and among familiar people

<table>
<thead>
<tr>
<th></th>
<th>Available but I never use it</th>
<th>I use it less than one day a month</th>
<th>I use it 1-3 days a month</th>
<th>I use it 1-2 days a week</th>
<th>I use it 3 or more days a week</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-White</td>
<td>5%</td>
<td>2%</td>
<td>2%</td>
<td>6%</td>
<td>5%</td>
</tr>
<tr>
<td>Yes</td>
<td>11%</td>
<td>12%</td>
<td>12%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>4%</td>
<td>3%</td>
<td>2%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Yes</td>
<td>11%</td>
<td>12%</td>
<td>12%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Income&lt;50K</td>
<td>2%</td>
<td>5%</td>
<td>2%</td>
<td>8%</td>
<td>2%</td>
</tr>
<tr>
<td>Yes</td>
<td>11%</td>
<td>12%</td>
<td>12%</td>
<td>8%</td>
<td>10%</td>
</tr>
<tr>
<td>Limitation in Driving Day or Night</td>
<td>4%</td>
<td>6%</td>
<td>4%</td>
<td>13%</td>
<td>6%</td>
</tr>
<tr>
<td>Yes</td>
<td>6%</td>
<td>10%</td>
<td>10%</td>
<td>14%</td>
<td>10%</td>
</tr>
</tbody>
</table>
Micromobility Trips (N=380 users)

- 76% used e-scooter service
- 62% of trips were between 1 to 2 mi
- 38% weekday during daytime
- Top trip purposes:
  - 22% to commute location
  - 19% for shopping and errands
  - 7% just to enjoy the new service
Autonomous Vehicles (N=3,356)

**FAMILIARITY**
- Heard of AVs, but don't know much about 36%
- Somewhat familiar 35%
- Very familiar 13%
- Never heard before survey 15%
- Actually taken a ride in an AV 1%

**WILLINGNESS TO BUY**
- Eventually buy 57%
- Never buy 38%
- One of the first to buy 5%
Role of Age and Gender

<table>
<thead>
<tr>
<th>Age Group</th>
<th>Ride AV</th>
<th>Neutral</th>
<th>Never ride an AV</th>
</tr>
</thead>
<tbody>
<tr>
<td>18-30 years</td>
<td>55%</td>
<td>33%</td>
<td>12%</td>
</tr>
<tr>
<td>31-40 years</td>
<td>57%</td>
<td>23%</td>
<td>20%</td>
</tr>
<tr>
<td>41-50 years</td>
<td>56%</td>
<td>29%</td>
<td>15%</td>
</tr>
<tr>
<td>51-60 years</td>
<td>40%</td>
<td>33%</td>
<td>26%</td>
</tr>
<tr>
<td>61-70 years</td>
<td>40%</td>
<td>39%</td>
<td>21%</td>
</tr>
<tr>
<td>71+ years</td>
<td>42%</td>
<td>25%</td>
<td>33%</td>
</tr>
</tbody>
</table>

Male (N=1619) | Female (N=1712)

TOMNET Transportation Center
Teaching Old Models New Tricks
Role of Education in AV Familiarity

- Completed graduate degree(s): 36% Not Familiar, 64% Familiar
- Bachelor's degree(s) or some graduate school: 44% Not Familiar, 56% Familiar
- Some college or technical school: 49% Not Familiar, 51% Familiar
- Completed high school or GED: 61% Not Familiar, 39% Familiar
- Some grade/high school: 79% Not Familiar, 21% Familiar
Learning how to use new technologies is frustrating: Disagree = Tech-savvy, Neutral or agree= Not tech-savvy
AV Familiarity

Minorities are reflecting significantly lower familiarity toward AVs (N=3284).

They remained more neutral to other AV perception and choice questions.

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>I have actually taken a ride in an AV.</td>
<td>12%</td>
<td>13%</td>
</tr>
<tr>
<td>I am very familiar with AVs.</td>
<td>13%</td>
<td>13%</td>
</tr>
<tr>
<td>I am somewhat familiar with AVs.</td>
<td>9%</td>
<td>14%</td>
</tr>
<tr>
<td>I have heard of AVs, but don't know much about them.</td>
<td>2%</td>
<td>9%</td>
</tr>
<tr>
<td>I had never heard of AVs before taking this survey.</td>
<td>1%</td>
<td>1%</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>No</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-White Minority</td>
<td>37%</td>
<td>33%</td>
</tr>
<tr>
<td>Hispanic</td>
<td>35%</td>
<td>43%</td>
</tr>
<tr>
<td>Income &lt; $50K</td>
<td>34%</td>
<td>40%</td>
</tr>
<tr>
<td>Limitation in Driving Day or Night</td>
<td>37%</td>
<td>35%</td>
</tr>
</tbody>
</table>
## AV Adoption and Ridehailing Use

### Willingness to Buy Autonomous Vehicles

<table>
<thead>
<tr>
<th>Familiarity and Use of Private Ridehailing (e.g., Uber, Lyft)</th>
<th>Early adopter</th>
<th>Eventually buy</th>
<th>Never buy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not familiar (N=339)</td>
<td>3%</td>
<td>45%</td>
<td>53%</td>
</tr>
<tr>
<td>Familiar but not an user (N=1139)</td>
<td>3%</td>
<td>50%</td>
<td>47%</td>
</tr>
<tr>
<td>Infrequent user (N=1287)</td>
<td>6%</td>
<td>62%</td>
<td>32%</td>
</tr>
<tr>
<td>Frequent user (N=519)</td>
<td>8%</td>
<td>70%</td>
<td>21%</td>
</tr>
</tbody>
</table>

**Legend:**
- **Early adopter**
- **Eventually buy**
- **Never buy**
AV: Safety Concerns

I am concerned about the potential failure of AV sensors, equipment, technology, or programs. (N=3331)

- Strongly disagree: 6%
- Somewhat disagree: 8%
- Neutral: 17%
- Somewhat agree: 35%
- Strongly agree: 33%

I want the ability to take control of the AV at any time during the ride. (N=3331)

- Strongly disagree: 6%
- Somewhat disagree: 18%
- Neutral: 33%
- Somewhat agree: 40%
- Strongly agree: 40%
AV Technology:
Concern of Equipment Failure

Percent Concerned with AV Equipment Failure


50% (Bansal and Kockelmann, Texas)
61% (Bansal and Kockelmann, Texas)
67% (Nazari, Washington State)
71% (JD Power, US)
68% (T4 Survey, Southern US)
AV Future: Additional Commute Time
(N=2,221)

How much longer would you be willing to commute in an AV, compared to your current commute?

Average: ~ 9 min
AV Future: Zero-occupant VMTs (N=3,356)

<table>
<thead>
<tr>
<th>Statement</th>
<th>Disagree</th>
<th>Neutral</th>
<th>Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>I would feel comfortable having an AV pick-up/drop-off children without adult supervision.</td>
<td>62%</td>
<td>21%</td>
<td>18%</td>
</tr>
<tr>
<td>I would send an AV to pick-up groceries/laundry/food orders by itself.</td>
<td>28%</td>
<td>23%</td>
<td>49%</td>
</tr>
<tr>
<td>AVs would save me time and money for parking by dropping me off and parking themselves.</td>
<td>16%</td>
<td>31%</td>
<td>53%</td>
</tr>
</tbody>
</table>

Photo: Brian Tietz for Transdev
Photo: Ross D. Franklin, STF / Associated Press
AV: Travel Impacts
(N=3,358)

- Making additional trips that are not made now
  - Very likely: 8%
  - Somewhat likely: 19%
  - Neutral: 26%
  - Somewhat unlikely: 21%
  - Very unlikely: 27%

- Moving to a better location or home
  - Very likely: 7%
  - Somewhat likely: 12%
  - Neutral: 30%
  - Somewhat unlikely: 18%
  - Very unlikely: 33%

- Making more long-distance road trips
  - Very likely: 14%
  - Somewhat likely: 25%
  - Neutral: 22%
  - Somewhat unlikely: 16%
  - Very unlikely: 21%

- Traveling more in peak hours (due to multitasking)
  - Very likely: 13%
  - Somewhat likely: 25%
  - Neutral: 25%
  - Somewhat unlikely: 17%
  - Very unlikely: 20%
**AV Future: Willingness to Share**

I will use AV ridehailing services alone or with coworkers, friends, or family. (N=3358)

- Strongly disagree: 19%
- Somewhat disagree: 10%
- Neutral: 25%
- Somewhat agree: 32%
- Strongly agree: 14%

I will use AV ridehailing services with other passengers I don't know. (N=3358)

- Strongly disagree: 29%
- Somewhat disagree: 23%
- Neutral: 27%
- Somewhat agree: 15%
- Strongly agree: 5%
POST-COVID Behaviors (N= 8723 across US)
www.covidfuture.org

Work-from-home
25% of workers expect to increase their WFH frequency

Personal Air Travel
13% expect to increase*
36% expect to decrease*

Business Air Travel
12% expect to increase**
40% expect to decrease**

Online Shopping
21% expect to increase online non-grocery shopping
16% expect to increase online groceries for delivery

*who used to travel at least once a year
**workers who used to travel for business at least once a year
Concluding Thoughts

T4 Survey paints a challenging picture around adoption of Autonomous Vehicles:

- Low adoption/trust
- No (very low) true sharing
- More non-commute VMT
- Replacing some active modes, carpool, and transit trips
- Low familiarity and willingness to use among minority groups

Attitudes have a key role in shaping adoption pathways. We must proactively work to influence and shape attitudes and perceptions. More work in public education and awareness domains to enhance public trust in AV technology as well as sustainable and equitable use of the technology is highly recommended.

In addition, we recommend:

- Complex interrelationship between technology and pandemic impacts should be studied more
- Investment in integrated mobility platforms
- Implementing regulations toward environment
- Cost competitiveness of sharing vs private modes
- Need more pilots especially among minority groups!
Thank you!
Sara Khoeini, sara.khoeini@asu.edu

For more information:
https://tomnet-utc.engineering.asu.edu/t4-survey/