Transformative Technologies in Transportation: A Gender-based Analysis of Attitudes and Perceptions

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Behavioral Processes: Qualitative and Quantitative Methods Subcommittee, AEP30(4)
Transportation Research Board
January 8th, 2021
Transportation Technologies

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

- Automation
- Mobility-on-Demand
- Connectivity
- Micro-mobility

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

Mobility for All and Sustainability
Study Purpose

Collect a rich set of data across multiple jurisdictions that includes people’s travel behavior, attitudes, socioeconomics, perceptions and potential adoption of, and response to, Mobility-on-demand, Shared, and Autonomous Vehicles.
TOMNET: Teaching Old Models New Tricks

MISSION: To bring attitudinal information into real-world transportation planning and forecasting

• A Tier 1 University Transportation Center
• Authorized November 2016
• 5-year funding
Survey Team

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Chandra Bhat
Giovanni Circella
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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
- Comprehensive attitudinal survey on MoD and AV
- Weighted to better represent Census distributions

<table>
<thead>
<tr>
<th></th>
<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>
<td>3,358</td>
</tr>
<tr>
<td>%</td>
<td>30.6%</td>
<td>28.1%</td>
<td>33.6%</td>
<td>7.8%</td>
<td>100%</td>
</tr>
</tbody>
</table>

Phoenix, AZ, Atlanta, GA, Austin, TX, Tampa, FL
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
Attitudinal Differences

A Gendered Perspective

Picture source: URBACT, 2020
### General Attitudes

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>I feel uncomfortable around people I do not know</td>
<td>6% (23%)</td>
<td>12% (24%)</td>
</tr>
<tr>
<td></td>
<td>5% (30%)</td>
<td>25% (25%)</td>
</tr>
<tr>
<td></td>
<td>4% (23%)</td>
<td>16% (22%)</td>
</tr>
<tr>
<td>Learning how to use new technologies is frustrating</td>
<td>6% (19%)</td>
<td>12% (16%)</td>
</tr>
<tr>
<td></td>
<td>12% (23%)</td>
<td>33% (33%)</td>
</tr>
<tr>
<td></td>
<td>5% (18%)</td>
<td>33% (33%)</td>
</tr>
</tbody>
</table>

- **Men N=1633, Women N=1714**

**Picture: Samsung**

- Women are more likely to feel uncomfortable around unfamiliar people.
- Men appear less likely to find technology frustrating.

**TOMNET Transportation Center**

**Teaching Old Models New Tricks**

**Men N=1633, Women N=1714**
Transportation Attitudes

- **Women are less likely to prefer being a driver**
- **Men are more likely to agree that car crashes are unavoidable**

When traveling in a vehicle, I prefer to be a **driver**

Car crash deaths are an unfortunate but **unavoidable** part of a modern, efficient transportation system.

**Men N=1619, Women N=1703**
Travel Behavior Differences

<table>
<thead>
<tr>
<th></th>
<th>Men</th>
<th>Women</th>
</tr>
</thead>
<tbody>
<tr>
<td>Miles Driven in a Week (median)</td>
<td>51-75 mi</td>
<td>26-50 mi</td>
</tr>
<tr>
<td>Main Commute Mode: Drive Alone</td>
<td>69%</td>
<td>74%</td>
</tr>
<tr>
<td>Main Commute Mode: Bus</td>
<td>10%</td>
<td>8%</td>
</tr>
<tr>
<td>Main Commute Mode: Walk or Bike</td>
<td>7%</td>
<td>4%</td>
</tr>
<tr>
<td>Commute Time (median)</td>
<td>22 min</td>
<td>20 min</td>
</tr>
<tr>
<td>Ridehailing User (at least monthly)</td>
<td>17%</td>
<td>14%</td>
</tr>
</tbody>
</table>
Transportation Transformations

A Gendered Perspective
Ridehailing Services Usage

Last actual ridehailing trips

- Women chose to **share** 1.5 times more than men
- No significant differences on ridehailing **trip purposes**
- While 7% of men said they would **not have made the trip** if ridehailing were not available, 11% of women would not have traveled
- Median **monthly ride-hailing expenditure** for men was $10 - $29 in the month prior to the survey, while women median expenditure was $1 - $9
Perceptions Towards Ridehailing Services

The lack of a child safety seat prevents me from using ridehailing services.

- **Men**
  - Strongly disagree: 16%
  - Somewhat disagree: 20%
  - Neutral: 30%
  - Somewhat agree: 24%
  - Strongly agree: 11%

- **Women**
  - Strongly disagree: 7%
  - Somewhat disagree: 13%
  - Neutral: 25%
  - Somewhat agree: 35%
  - Strongly agree: 20%

Traveling with unfamiliar passengers on shared RH makes me uncomfortable.

- **Men**
  - Strongly disagree: 10%
  - Somewhat disagree: 12%
  - Neutral: 33%
  - Somewhat agree: 28%
  - Strongly agree: 16%

- **Women**
  - Strongly disagree: 6%
  - Somewhat disagree: 9%
  - Neutral: 27%
  - Somewhat agree: 36%
  - Strongly agree: 21%

Traveling with a driver I don't know makes me feel uncomfortable.

- **Men**
  - Strongly disagree: 36%
  - Somewhat disagree: 9%
  - Neutral: 42%
  - Somewhat agree: 9%
  - Strongly agree: 8%

- **Women**
  - Strongly disagree: 31%
  - Somewhat disagree: 11%
  - Neutral: 41%
  - Somewhat agree: 8%
  - Strongly agree: 5%

*Men N=1619, Women N=1703*
Willingness to Ride and Buy AVs

- **Never ride an AV**
  - Men: 29% (N=1597)
  - Women: 46% (N=1680)
- **Neutral**
  - Men: 64% (N=1597)
  - Women: 51% (N=1680)
- **Ride AV**
  - Men: 7% (N=1597)
  - Women: 3% (N=1680)

- **Men** (N=1619)
  - 15% Never ride an AV
  - 26% Neutral
  - 59% Ride AV

- **Women** (N=1712)
  - 24% Never ride an AV
  - 34% Neutral
  - 42% Ride AV

- **Men** (N=1597)
  - 29% Never buy
  - 64% Eventually buy
  - 7% One of the first to buy

- **Women** (N=1680)
  - 46% Never buy
  - 51% Eventually buy
  - 3% One of the first to buy
Autonomous Vehicles: Safety Perceptions

Men N=1639, Women N=1713

- Women are more concerned about autonomous vehicle failure
- Men view pedestrian/bicyclist safety improvement potential of AVs more favorably.

I am concerned about the potential failure of AV sensors, equipment, technology, or programs.

AVs would make me feel safer on the street as a pedestrian or as a cyclist.

Men: 28% Strongly agree, 36% Somewhat agree, 17% Neutral, 12% Somewhat disagree, 7% Strongly disagree

Women: 38% Strongly agree, 34% Somewhat agree, 18% Neutral, 12% Somewhat disagree, 6% Strongly disagree

Men: 12% Strongly agree, 16% Somewhat agree, 24% Neutral, 14% Somewhat disagree, 12% Strongly disagree

Women: 5% Strongly agree, 12% Somewhat agree, 28% Neutral, 21% Somewhat disagree, 6% Strongly disagree

Picture: Redshift Autodesk

Men N=1639, Women N=1713
Ridehailing Services and Autonomous Vehicles

I would use **shared AV** ridehailing with unfamiliar passengers

- **Women**: 33% Strongly disagree, 24% Somewhat disagree, 25% Neutral, 15% Somewhat agree, 3% Strongly agree
- **Men**: 26% Strongly disagree, 22% Somewhat disagree, 29% Neutral, 16% Somewhat agree, 7% Strongly agree

I would use **private AV** ridehailing alone with familiar passengers

- **Women**: 21% Strongly disagree, 11% Somewhat disagree, 26% Neutral, 31% Somewhat agree, 11% Strongly agree
- **Men**: 17% Strongly disagree, 9% Somewhat disagree, 23% Neutral, 33% Somewhat agree, 18% Strongly agree

Men N=1632, Women N=1711
Autonomous Vehicles: Changes in Commute

How much longer would respondents accept their ONE WAY COMMUTE to be once AVs become available?

Men (N=1155)
- Not accept longer commute: 28%
- Up to 5 minutes: 21%
- 5-15 minutes: 29%
- 15-30 minutes: 16%
- More than 30 minutes: 6%

Women (N=1060)
- Not accept longer commute: 33%
- Up to 5 minutes: 21%
- 5-15 minutes: 26%
- 15-30 minutes: 14%
- More than 30 minutes: 6%
Autonomous Vehicles: Travel Behavior Impacts

- **Likelihood of making additional trips once AVs become available**
  - Women (N=1708): 27% Very unlikely, 21% somewhat unlikely, 25% neutral, 21% somewhat likely, 7% very likely
  - Men (N=1626): 27% Very unlikely, 22% somewhat unlikely, 27% neutral, 17% somewhat likely, 8% very likely

- **Likelihood of making more trips after dark once AVs become available**
  - Women (N=1706): 23% Very unlikely, 16% somewhat unlikely, 22% neutral, 26% somewhat likely, 13% very likely
  - Men (N=1621): 21% Very unlikely, 18% somewhat unlikely, 26% neutral, 24% somewhat likely, 11% very likely
Autonomous Vehicles: Expected Use

I would feel comfortable having an AV pick-up/drop-off children without adult supervision.

<table>
<thead>
<tr>
<th></th>
<th>Strongly disagree</th>
<th>Somewhat disagree</th>
<th>Neutral</th>
<th>Somewhat agree</th>
<th>Strongly agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>Women (N=1711)</td>
<td>47%</td>
<td>22%</td>
<td>19%</td>
<td>9%</td>
<td>3%</td>
</tr>
<tr>
<td>Men (N=1629)</td>
<td>31%</td>
<td>24%</td>
<td>22%</td>
<td>17%</td>
<td>7%</td>
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</table>
We found:

- Women indicate they are less willing to share and more wary of unproven technology.
- But in reality, even though women’s usage of ride-hailing services is slightly less than men overall, their level of sharing is 1.5 times greater!
- Women express a lower level of willingness/interest to ride or buy autonomous vehicles and share rides in an AV ride-hailing setting. Is the presence of a human driver important/reassuring?

We recommend:

- Develop safety protocols and targeted campaigns for enhancing women’s experience with shared and automated transport services.
- Special services such as female-only services may enhance shared/automated mobility adoption among women.
- More research to untangle stated intentions versus actual behaviors.
Thank you!

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