Automated Vehicle Market Development: Consumer Acceptance and Adoption
Presentation by Johanna Zmud
Alabama Transportation Conference
February 10, 2017

TTI by the Numbers
- 600+ annual projects
- 400+ researchers
- 200+ students
- 200+ public and private sponsors
- 50+ automated and connected vehicle studies

TTI Policy Research Center
- Established 2013 supported by Texas Legislature
  - Independent resource
  - Facilitator of evidence-based policy making
- Mobility impacts of autonomous vehicles (AVs)
  - Advent of AVs transformative
  - Potential benefits to safety, congestion, emissions, mobility
  - Acceptance and use highly uncertain
  - To nudge toward desirable social impacts, need to examine influences on behavior
  - Gathering evidence not basing policies on speculation

Research Questions
- How likely are people to use self-driving vehicles?
- What are the factors that influence acceptance and intent to use?
- What is the appeal of self-driving vehicles for people?
- In what ways would people change current travel behavior because of access to self-driving vehicles?
- How might self-driving vehicles on roadways impact traffic and congestion?

SAE Levels of Automation

Methodology Challenge
- AVs are new technology with which consumers have no experience
- People cannot base their responses to questions based on past or current experience
Methodology

Online Survey

Car Technology Acceptance Variables

Intended Use (behavior) Acceptance

Actual Use Behavior

Perceived Travel Behavior Impacts

Moderating Variables

Face-to-Face Interviews

Measuring Intent to Use

- Text Description of self-driving vehicles
- Video illustrating self-driving vehicles
- Imagine that self-driving vehicles were on the market now either for purchase or rental. What is the likelihood that you would ride in a self-driving vehicle for everyday use?

Is a self-driving car in your future?

Austin
May 2015

50% YES
50% NO

Intent to Use Self-Driving Vehicles

Texas Regions Surveyed

2015 population
Texas 25,146,105
Austin 2,000,860
Dallas 7,012,796
Houston 6,656,947
Waco 262,813

Data from online survey
N=556
Is a self-driving car in your future?

Reasons for Not Intending to Use

Trust in Technology
- Concerns surrounding added technology complexities, privacy, and the potential for systems to be hacked, hijacked, or crashed are prominent across all respondents.
- Gen Y and Z are nearly twice as likely as Gen X and five times as likely as Baby Boomers to trust fully automated, self-driving technology.
- There is a relationship between consumer interest in Full Self-Driving automation and their trust in the technology.

Influence of Experience with Automated Vehicle Features

Influence of Technology Adoption

Influence of Data Privacy Concerns

Source: J.D. Power 2016 U.S. Tech Choice

J.D. Power and Associates. All rights reserved. CONFIDENTIAL & PROPRIETARY – For internal use.
Influence of Having Mobility Impairment

Influence of Not Having Driver’s License

Influence of Age

Predictors of Intent to Use

Psychological and personality variables are better predictors than basic demographic

- Have any physical conditions that prohibit them from driving
- Think self-driving vehicles would decrease crash risk
- Use smartphones, text messaging, Facebook, transportation apps
- Are not concerned with data privacy about using online tech
- Think using a self-driving vehicle would be fun
- Think it would be easy to become skillful at using self-driving vehicles
- Believe people whose opinions they value would like using self-driving vehicles

Regression model results presented in TRB paper

Interest in Owning or Sharing Self-Driving Vehicles

Why Own?

Convenience
- Convenient to have it when I needed it
  - For having it there when I needed it and not having to call someone
  - Same negatives associated with shared vehicles as with public transit like convenience of access and egress
  - More freedom to do other things while on my trips
  - Would want it as my vehicle to use whenever I need it
  - If gets to the great majority of cars on the road were self-driving Ubers or car-shares then maybe, but now seems inconvenient
Why Share?

Gaining experience and cost

To start with, I would do the car share to try it out to see if I like it

Would first want to see how they work and if I liked them

I already have a vehicle, but it would be nice to have the option of not having to drive myself on long trips

The tradeoff of sharing compared to owning a car would be cheaper

Would rather pay for a vehicle when I need it than to worry about all the upkeep

It would be costly to own one, and it would take years to get an older model

More practical method. If you are not going to control the vehicle, why not use as a mass usage

Change in VMT

Current VMT

<table>
<thead>
<tr>
<th>Less than 5,000</th>
<th>5,000 to 10,000</th>
<th>10,000 to 15,000</th>
<th>More than 15,000</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stay the same</td>
<td>5</td>
<td>4</td>
<td>12</td>
<td>21 (64%)</td>
</tr>
<tr>
<td>Increase</td>
<td>1</td>
<td>6</td>
<td>1</td>
<td>8 (25%)</td>
</tr>
<tr>
<td>Decrease</td>
<td>0</td>
<td>2</td>
<td>1</td>
<td>4 (9%)</td>
</tr>
<tr>
<td>Total</td>
<td>6</td>
<td>12</td>
<td>14</td>
<td>44 (100%)</td>
</tr>
</tbody>
</table>

Change in Vehicles Owned

Current Number of Vehicle Owned

<table>
<thead>
<tr>
<th>Zero Vehicles</th>
<th>One Vehicle</th>
<th>Two Vehicles</th>
<th>Three or More Vehicles</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>No change</td>
<td>1</td>
<td>9</td>
<td>14</td>
<td>3</td>
</tr>
<tr>
<td>Reduce</td>
<td>0</td>
<td>2</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>Increase</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Total</td>
<td>2</td>
<td>15</td>
<td>18</td>
<td>8</td>
</tr>
</tbody>
</table>

Modeling Impact on Congestion

- CAMPO model – traditional trip-based model
- Assume travel time will be less onerous
- As sensitivity to time spent inside vehicle is reduced
  - Total daily VMT shows a slightly increasing trend
  - Individuals drive more – total auto trips increasing trend especially home-based work/education
  - Individuals use less transit – total transit trip decreasing trend especially local bus

Conclusions

- Measures of acceptance more reliable than measures of adoption at this point in time
- Qualitative interviews useful to learn about people’s misconceptions or uncertainties
- Understand vehicle usage to understand ownership
- Unknowns
  - Usage: Public acceptance, incentives and disincentives to usage (private vs. shared), value of time
  - Ownership: Willingness to pay for automation, ownership persistence, size and impact of “new” owners

Conclusions (cont)

- Educate respondents prior to actual data collection
- Find behavior analogs (simulate the experience)
- Leverage any pilot tests to carefully study user behavior
- Acceptance, use, impact moving targets; determinants may change as access to vehicles become available