Preparing People and Communities Session

Who’s on First: Early Adopters of Self-Driving Vehicles

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Context

- Self-driving cars being tested on public roads
- Higher levels of vehicle automation; no human driver
- Future societal benefits and costs uncertain
- Impacts depend on when and how adopted and used
- Desired outcome is informed decision making by transportation agencies
TTI’s prior research

Early adopters of technology, in general, would be likely to use self-driving vehicles (Zmud et al. 2016, Sener et al. 2017)

- Austin 2015
- Dallas 2016
- Waco 2016
- Houston 2016

![Graph showing adoption levels for Early Adopters, Late Adopters, and Laggards with percentages for likely to use and not likely to use]
Relationship to mobility technologies?

• Shared mobility business model
  – Assets are accessed sequentially by multiple users on a pay-by-usage basis
  – Seamless transactions
  – Short-term usage
  – Alternative to ownership

• Multiple variations
  – Car-sharing, bike-sharing, scooter-sharing, ride-sharing
Tested two hypotheses

1. Current ride-sharing users are more likely to use self-driving vehicles than non-users

2. Among ride-sharing users, acceptance and likely usage increases with ride-hailing experience
“Intent to use” reflects technology acceptance, which is precursor to technology adoption.

Ride-hailing users were more likely to use self-driving vehicles than non-users by a margin of almost 2 to 1.
Intent to use self-driving vehicles by user type

The longer people have used ride-hailing services, the more likely they will use self-driving vehicles.
Intent to use self-driving vehicles by user type and adoption level

Relationship between technology adoption, intent to use, and user type is significant.
Methodology

• Online survey 3,275 persons in four cities
  – Boston, Las Vegas, Phoenix, San Francisco/Silicon Valley
• Key survey question:
  – Imagine that self-driving vehicles were on the market now for you to purchase and/or use today. Using a scale from 1 (not at all likely) to 4 (extremely likely), please indicate your likelihood to do the following:
    • Purchase a self-driving vehicle
    • Use self-driving vehicles in the form of car-sharing services like Zipcar or Car2go
    • Use self-driving vehicles in the form of ride-sharing services like Uber or Lyft.
Type of self-driving car preferred by user type

Generally, shared mobility services were preferred to privately owned vehicles.
Intent to use by various application types

59% use at least one type, 40% use none of the types.

52% use ride-sharing service, 41% use car-sharing service, 35% use privately owned vehicle, 20% use all types.

10% use only ride-sharing service, 5% use only privately owned vehicle, 2% use only car-sharing service.
Congestion effects: Intent to use by pooled or non-pooled versions

People generally preferred non-pooled rather than pooled autonomous fleets.
# Top ranked reasons for intending to use

<table>
<thead>
<tr>
<th>Rank</th>
<th>Privately Owned Vehicles</th>
<th>Car-Sharing Fleets</th>
<th>Ride-Hailing Fleets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Relieves stress of driving</td>
<td>Costs will be lower than owning</td>
<td>Ride-sharing convenient for me</td>
</tr>
<tr>
<td>2</td>
<td>Trust technology will be tested</td>
<td>Want to test before owning</td>
<td>Costs will be lower than owning</td>
</tr>
<tr>
<td>3</td>
<td>Will be productive while driving</td>
<td>Relieves stress of driving</td>
<td>Want to test before owning</td>
</tr>
<tr>
<td>4</td>
<td>Safer than human drivers</td>
<td>Trust technology will be tested</td>
<td>Will be productive while driving</td>
</tr>
<tr>
<td>5</td>
<td>Lower insurance costs</td>
<td>Will be productive while driving</td>
<td>Relieves stress of driving</td>
</tr>
</tbody>
</table>

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## Top ranked reasons for NOT intending to use

<table>
<thead>
<tr>
<th>Rank</th>
<th>Privately Owned Vehicles</th>
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<th>Ride-Hailing Fleets</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Vehicles’ ability to react safely</td>
<td>Lack of information</td>
<td>Privacy--my trips will be tracked</td>
</tr>
<tr>
<td>2</td>
<td>Cost (purchase)</td>
<td>Don’t trust technology</td>
<td>Vehicle may be hacked</td>
</tr>
<tr>
<td>3</td>
<td>No need to own car</td>
<td>Lack of control in crash situation</td>
<td>Vehicle’s ability to react safely</td>
</tr>
<tr>
<td>4</td>
<td>Like to drive</td>
<td>Vehicle’s ability to react safely</td>
<td>Don’t trust the technology</td>
</tr>
<tr>
<td>5</td>
<td>Cost (maintenance and repair)</td>
<td>Safety of vehicle I do not own</td>
<td>Lack of information</td>
</tr>
</tbody>
</table>
Summary of perceived benefits and concerns

- Safety concerns and lack of trust are key barriers.
- Owning a self-driving vehicle is perceived as more expensive.
- Testing before owning via car-sharing or ride-hailing is an incentive.
- Capability to be productive while driving is important to ownership.
- Privacy and cyber-security concerns are associated with self-driving ride-hailing fleets.
Three reasons findings are important

1. The size of the ride-hailing market in a city is a good estimate of the likely size of the early future self-driving market

2. Characteristics of ride-hailing users define characteristics of early users of self-driving vehicle

3. Travel patterns of ride-hailing users inform early application areas
Thank you. Questions?


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