

Measuring Influences on Automated Vehicle Market Development: Consumer Acceptance and Adoption

Presentation by Johanna Zmud
Mobility and Transportation Systems of the Future
Experts' Group on R&D Priority-Setting and Evaluation
IEA Committee on Energy Research and Technology
U.S. Department of Energy



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



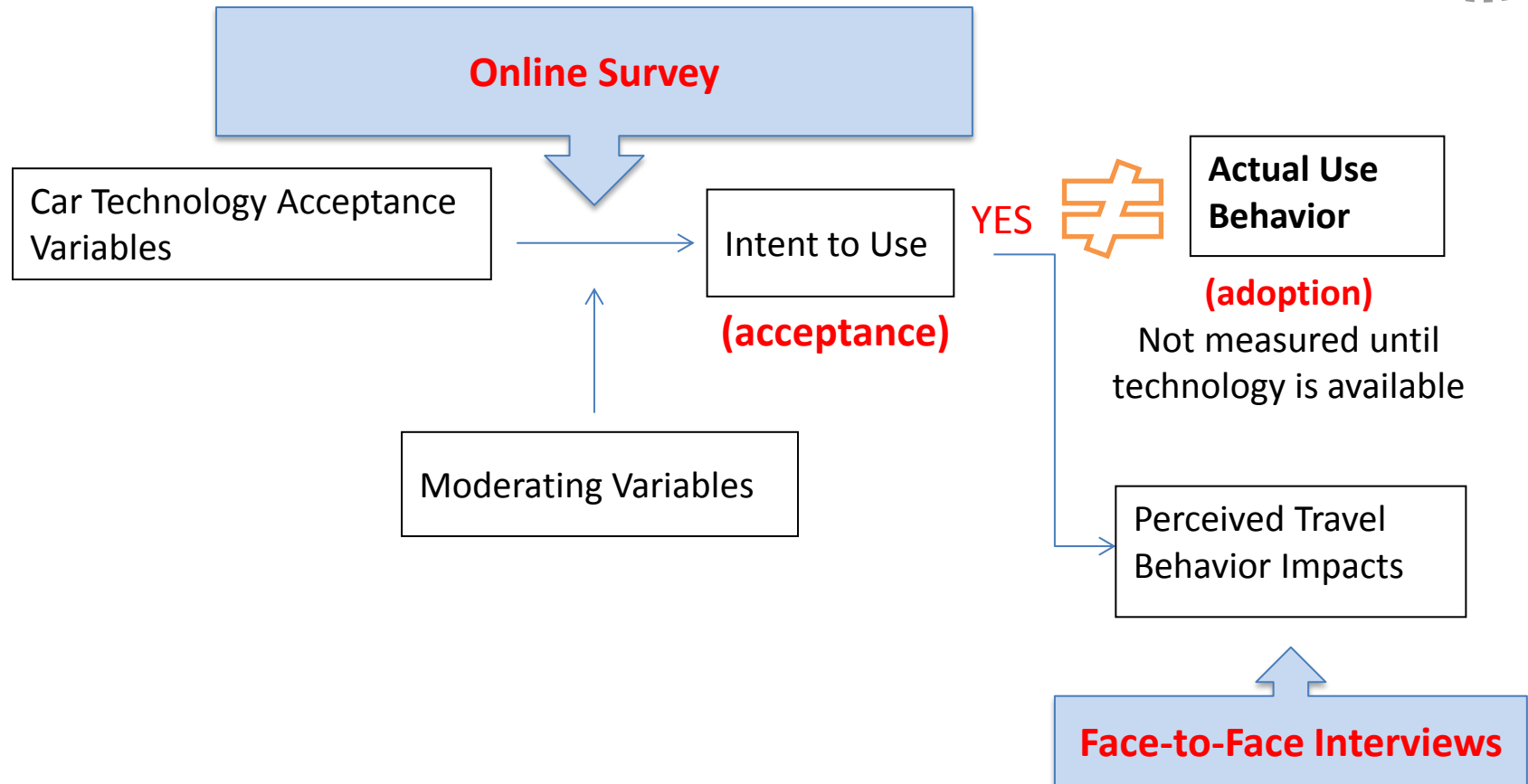
- How likely are people to use self-driving vehicles?
- What are the factors that influence acceptance and intent to use?
- What is the appeal of self-driving vehicles for people?
- In what ways would people change current travel behavior because of access to self-driving vehicles?
- How might self-driving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

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



Measuring Intent to Use

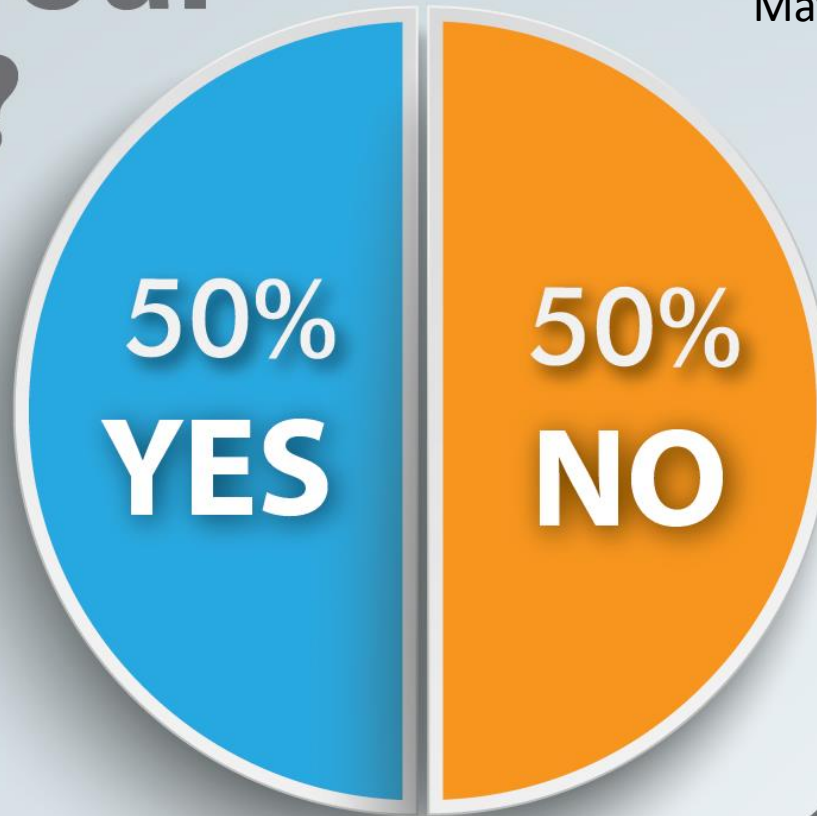


- Text Description of self-driving vehicles
- Video illustrating self-driving vehicles
- *Imagine that self-driving vehicles were on the market now either for purchase or rental. What is the likelihood that you would ride in a self-driving vehicle for everyday use?*

Is a self-driving car in your future?



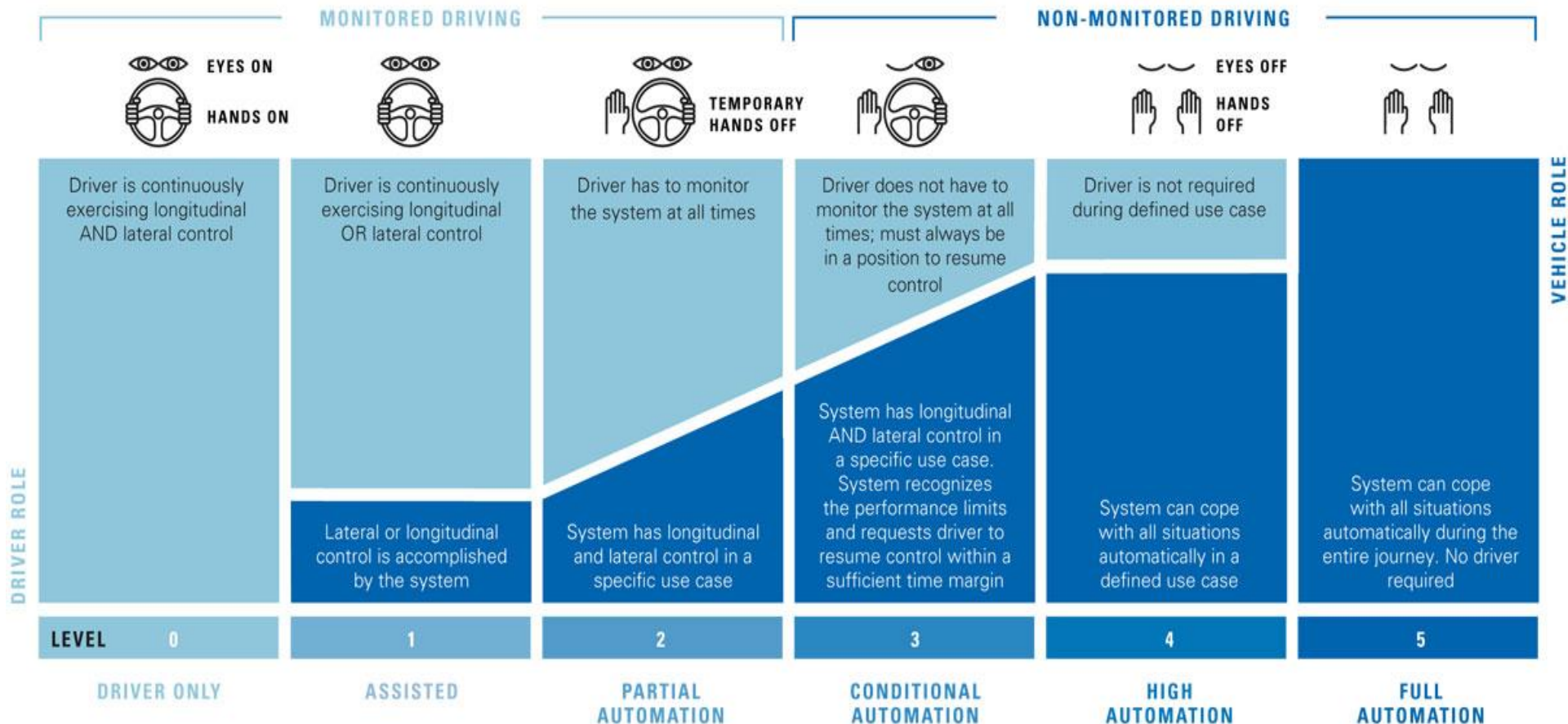
Austin
May 2015



Data from online survey
N=556



SAE Levels of Automation



VEHICLE ROLE

YES

Safer than human drivers



Relieve the stress of driving



Trust the technology



Expect to be more
productive while traveling



Can support mobility
needs for seniors



Just like public transit



NO



Don't trust the technology



Safety concerns



Affordability concerns



Prefer to drive and control car



Insurance/liability concerns



Don't know about or see a
need for the cars

Intent to Use Self-Driving Vehicles



Texas Regions Surveyed



2015 population

Texas 25,146,105

Austin 2,000,860

Dallas 7,102,796

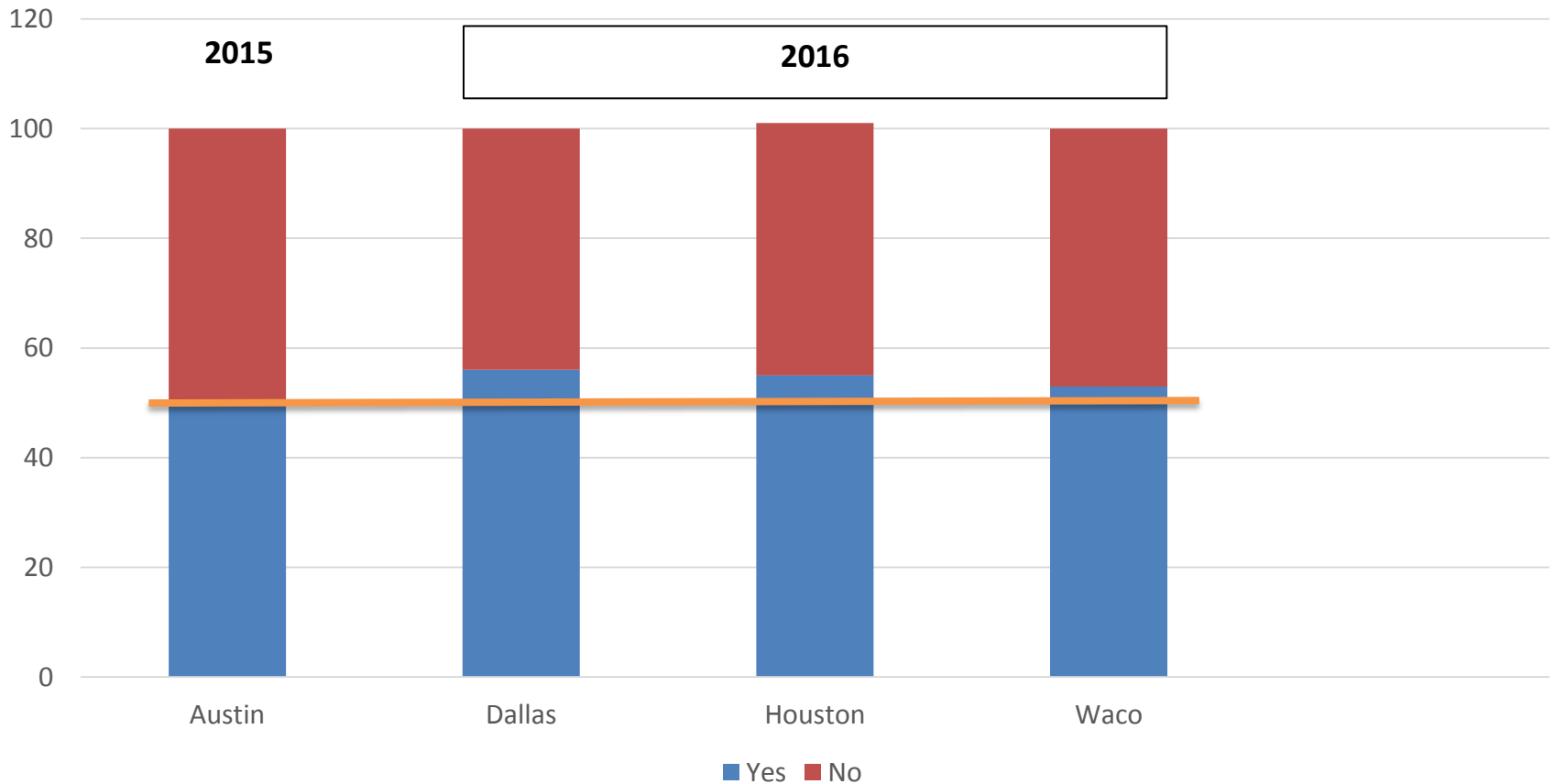
Houston 6,656,947

Waco 262,813

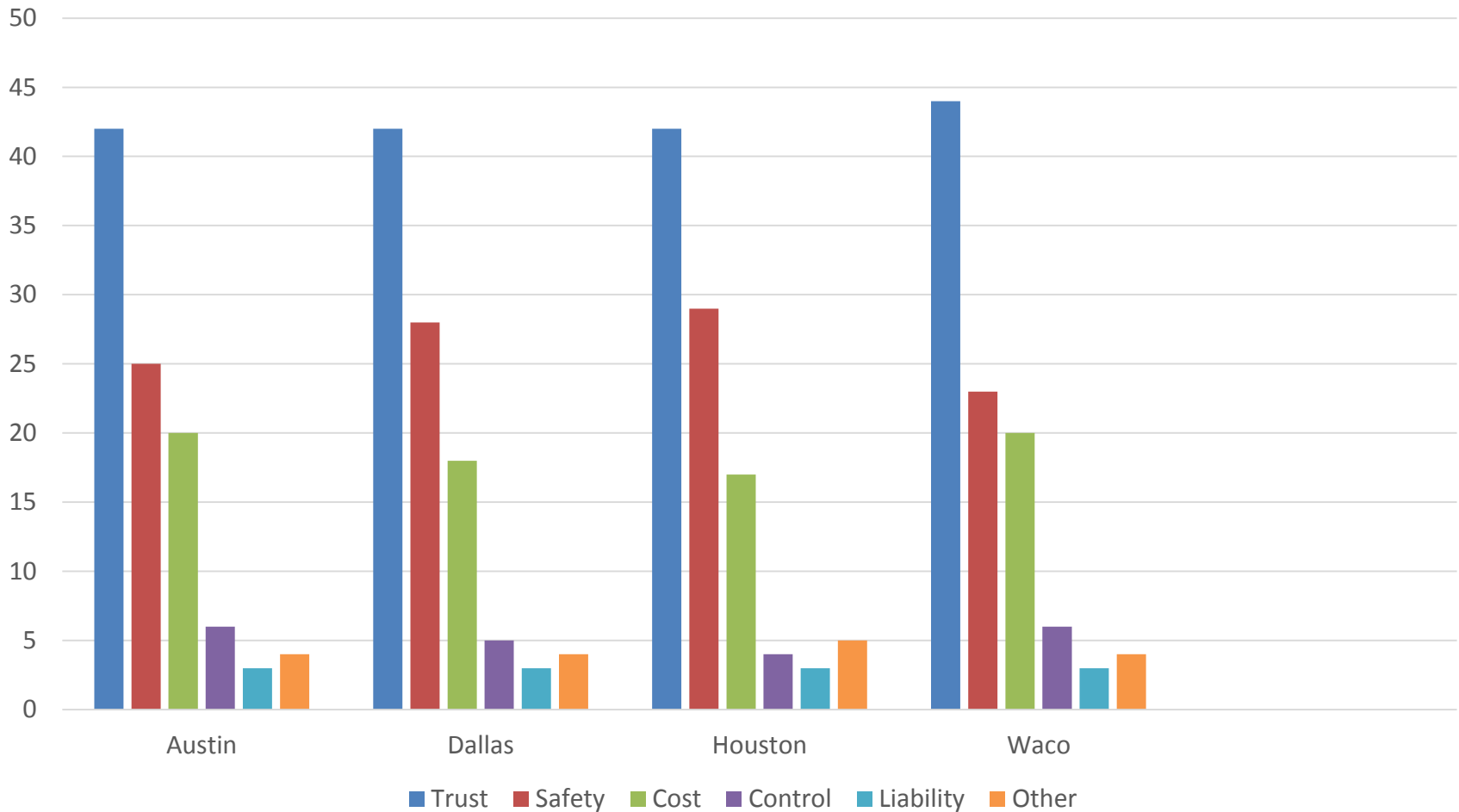
Is a self-driving car in your future?



Intent to Use by Region



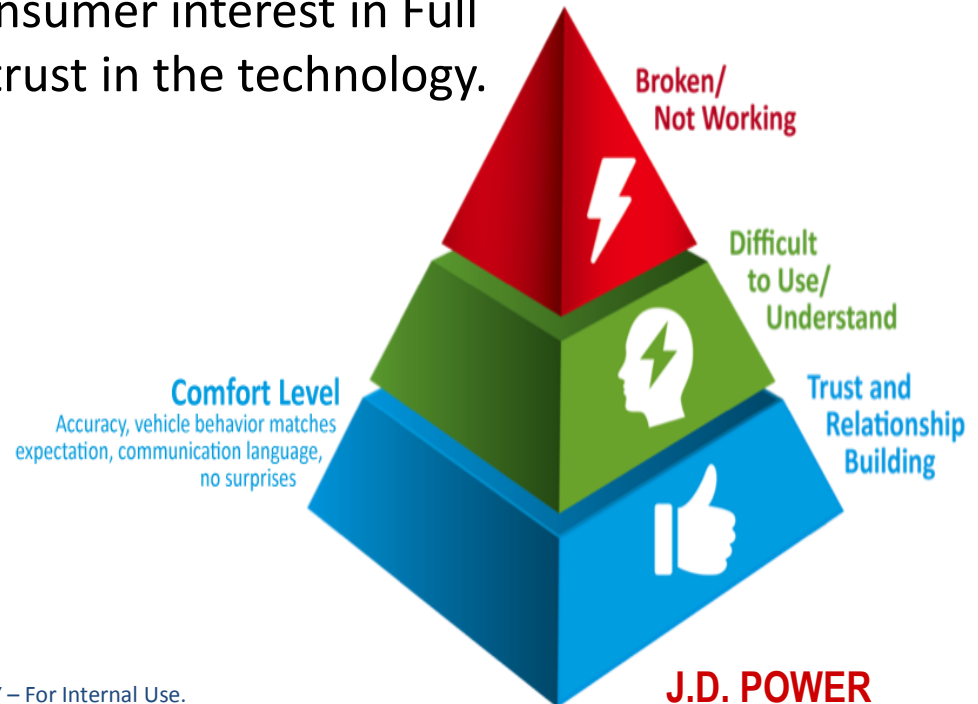
Reasons for Not Intending to Use



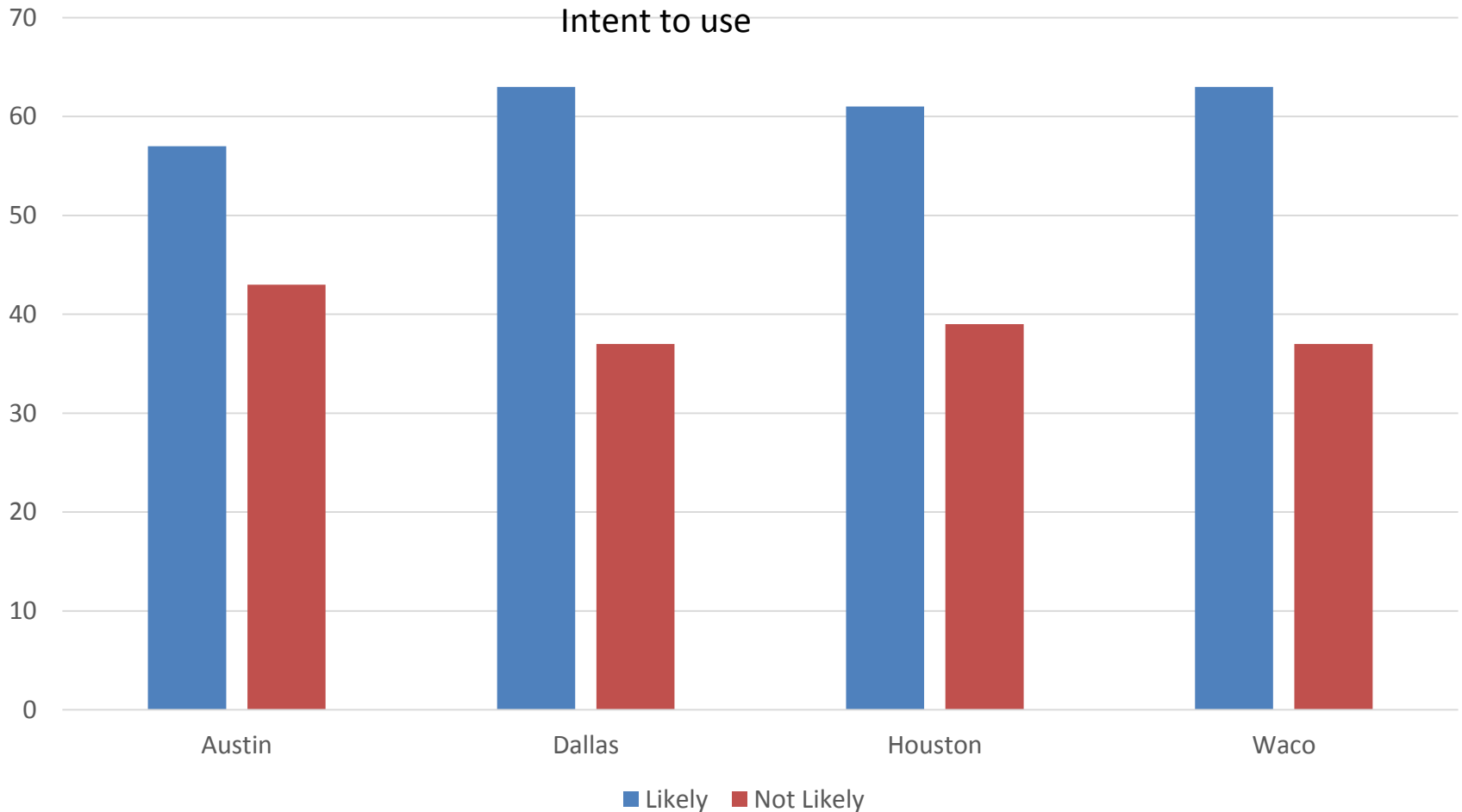
Trust in Technology

- 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.

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



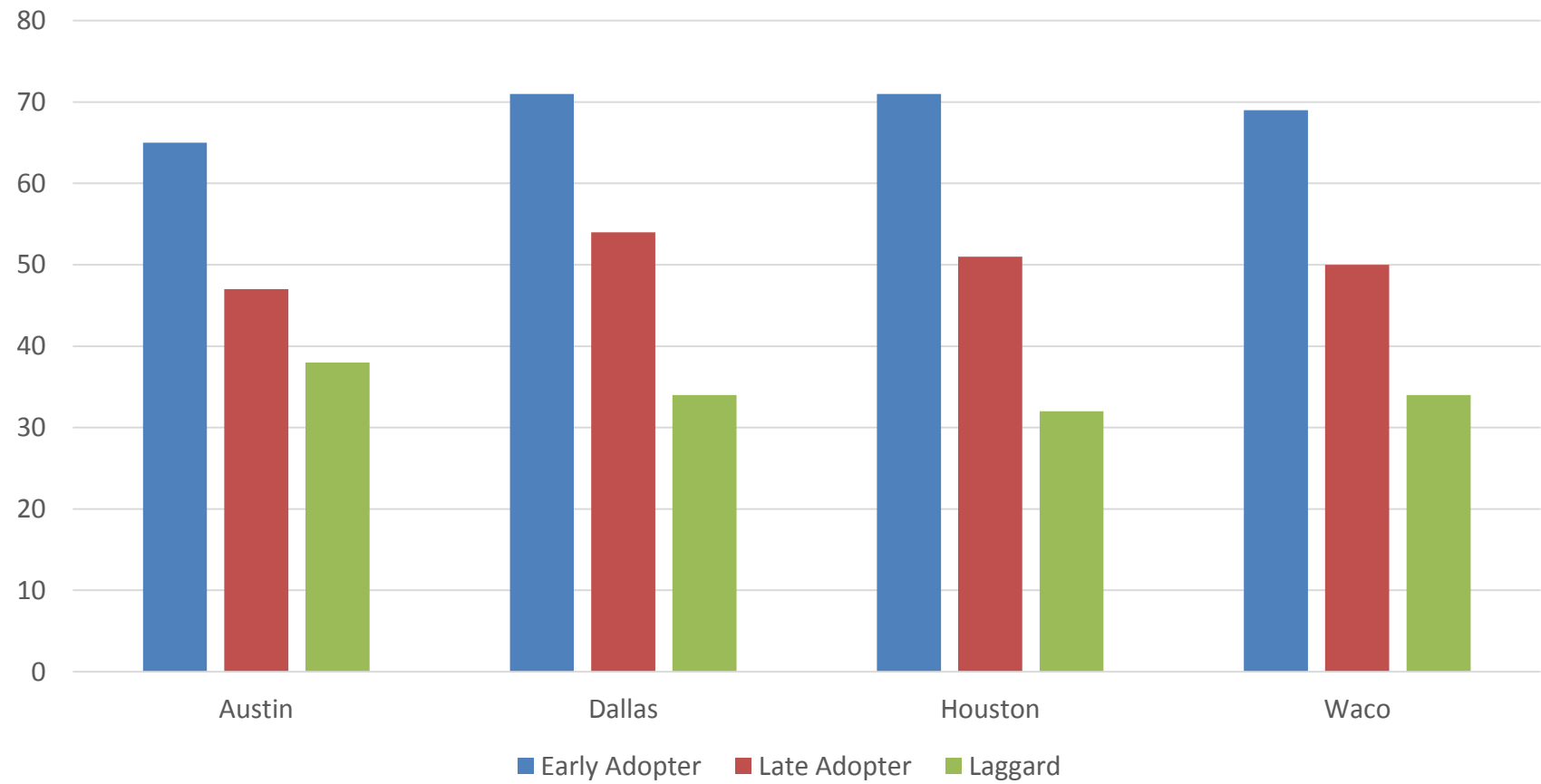
Influence of Experience with Automated Vehicle Features



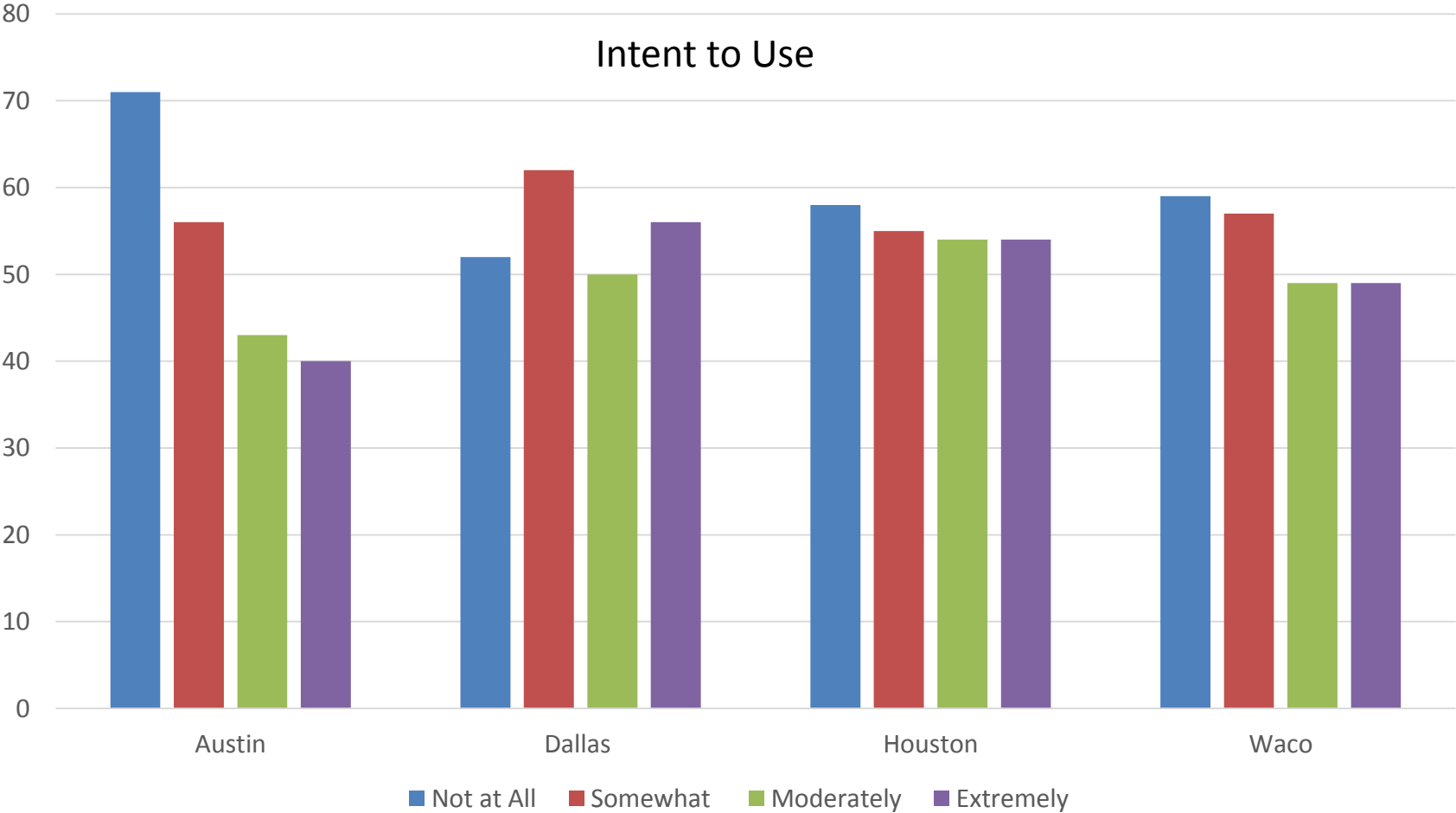


Influence of Technology Adoption

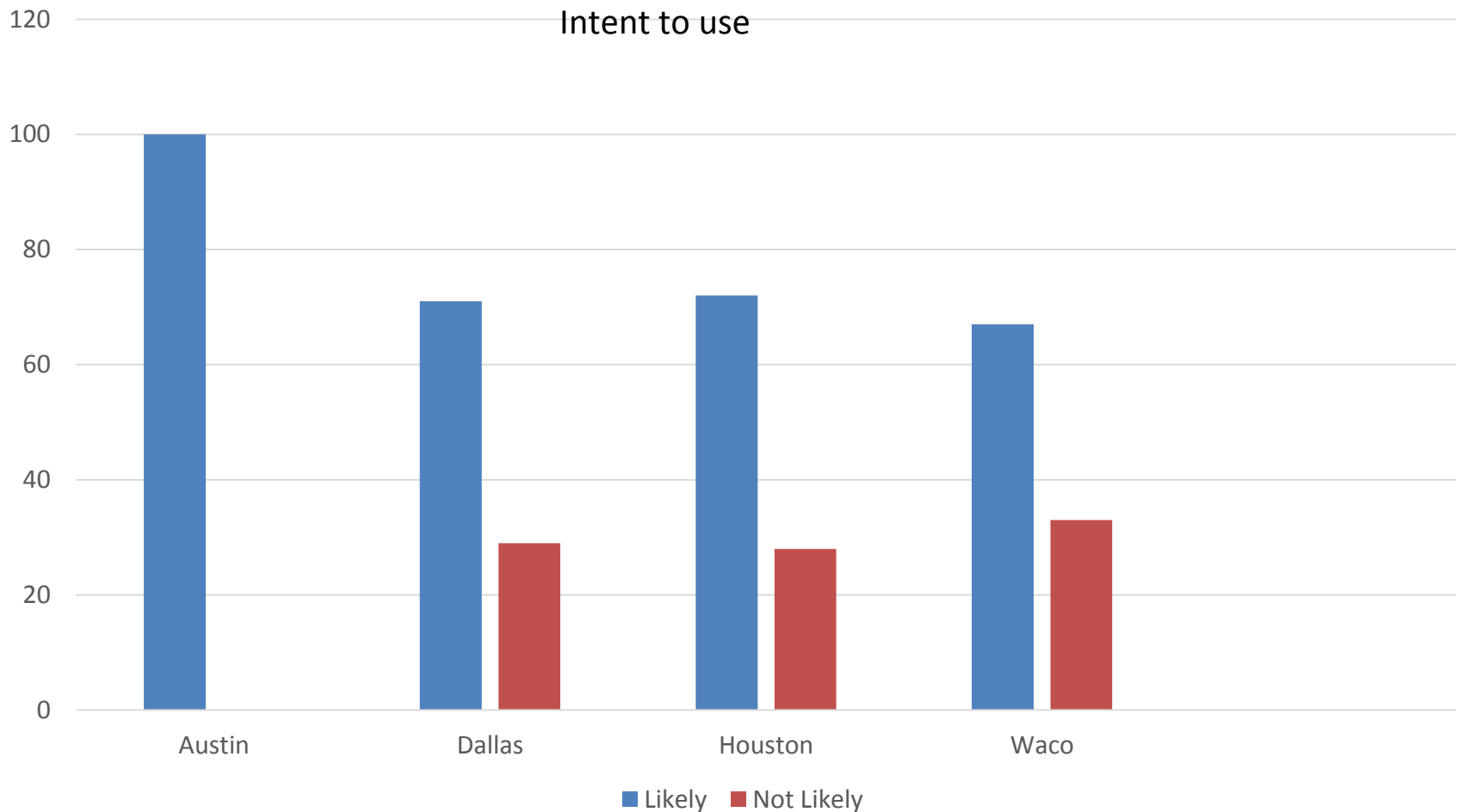
Intent to Use



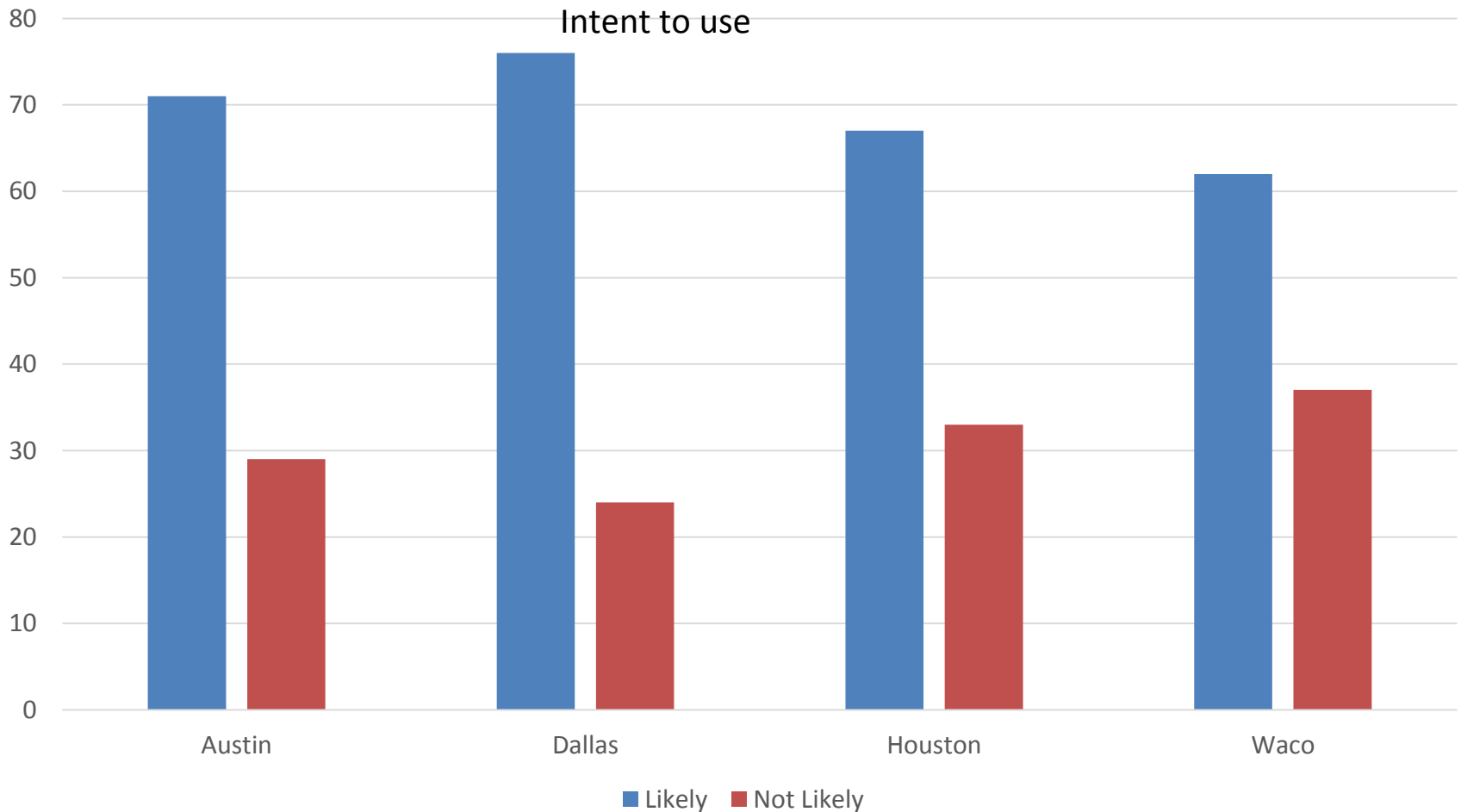
Influence of Data Privacy Concerns



Influence of Having Mobility Impairment



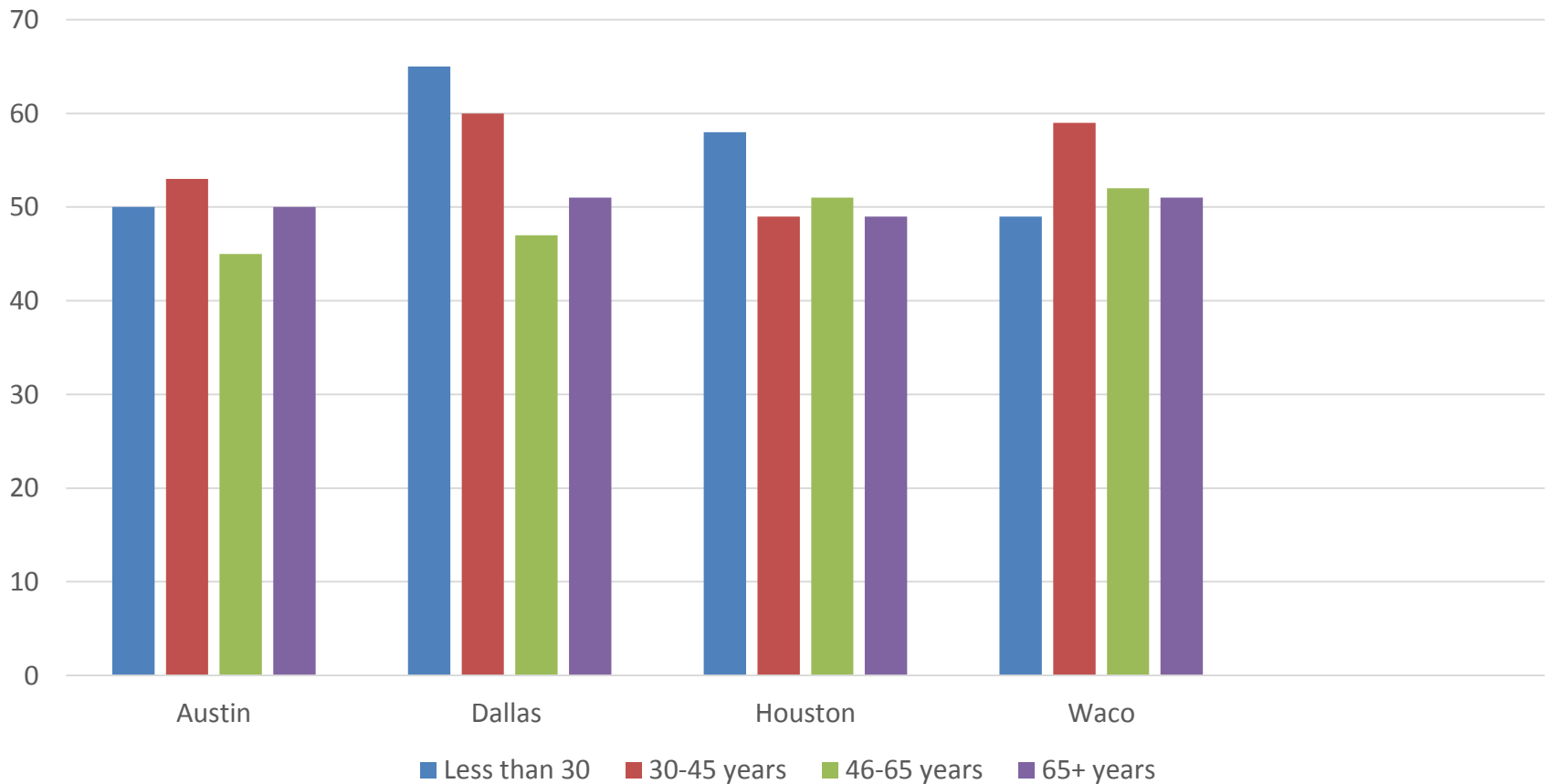
Influence of Not Having Driver's License



Influence of Age



Intent to Use



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

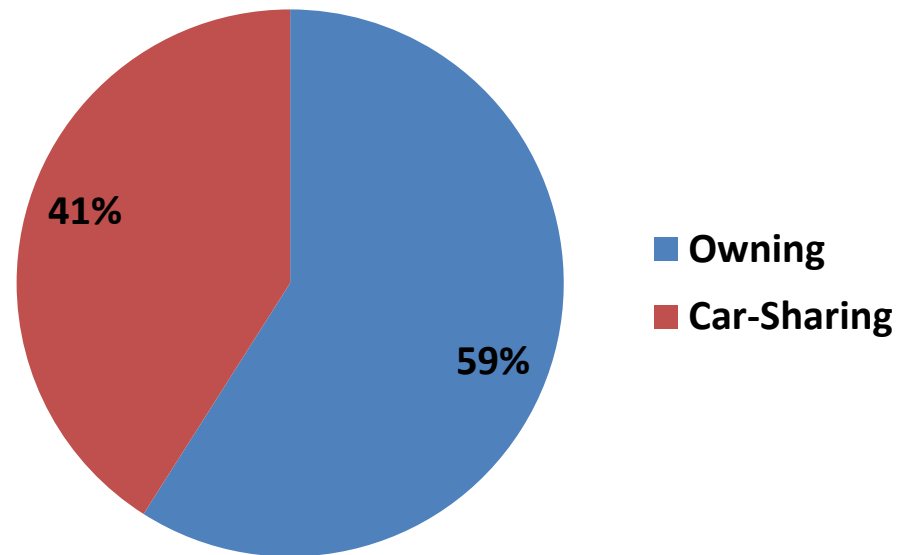
Believe people whose opinions they value would like using self-driving vehicles

Regression model results presented in TRB paper

Interest in Owning or Sharing Self-Driving Vehicles



Austin



Now I'd like you to assume that self-driving vehicles were available for use today. Would you be more interested in owning one or just using one, like a Car2go or Uber taxi?

Why Own?

Austin



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?

Austin



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 have 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 Vehicles Owned

Austin



	Current Number of Vehicle Owned				
	Zero Vehicles	One Vehicle	Two Vehicles	Three or More Vehicles	Total
No change	1	9	14	3	27 (61%)
Reduce	0	2	5	3	10 (23%)
Increase	1	4	0	2	7 (16%)
Total	2	15	19	8	44 (100%)

You currently own X number of cars. How would that change if self-driving vehicles were available today?

Change in VMT

Austin



	Current VMT				
	Less than 5,000	5,000 to 10,000	10,000 to 15,000	More than 15,000	Total
Stay the same	3	4	10	12	29 (66%)
Increase	1	6	3	1	11 (25%)
Decrease	0	2	1	1	4 (9%)
Total	4	12	14	14	44 (100%)

You now drive X miles in an average week. How would that change if self-driving vehicles were available today?

Modeling Impact on Congestion

Austin



- 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



Report available online

<http://tti.tamu.edu/policy/technology/>

Research Team

Dr. Johanna Zmud

j-zmud@tti.tamu.edu

Dr. Ipek Sener

i-sener@tti.tamu.edu