

VEHICLE-TO-VEHICLE CRASH AVOIDANCE SAFETY TECHNOLOGY

Public Acceptance Final Report



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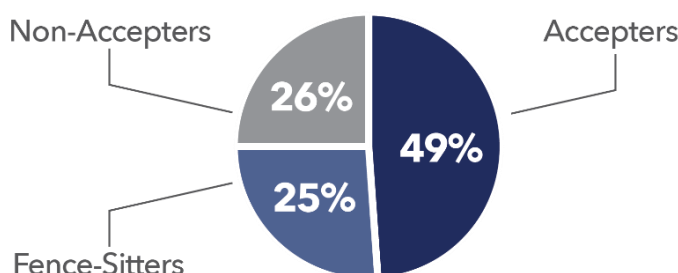
EXECUTIVE SUMMARY

The *Vehicle-to-Vehicle (V2V) Crash Avoidance Public Acceptance* report summarizes data from a survey of the current level of awareness and acceptance of V2V technology. The survey was guided by findings from prior studies and 12 focus groups. A total of 1,532 participants responded to the survey in September 2015. The report also provides information on benefits, barriers, and potential communications channels.

Study Highlights

Acceptance

As shown in Figure 1, approximately 49 percent of respondents were classified as “accepters” of V2V technology (proportion of accepters; margin of error = ± 2.5 percent). “Non-accepters” comprised 26 percent of the respondents, and “fence-sitters” (those who are undecided or neutral about V2V technology) comprised 25 percent. This confirms information gleaned during the focus groups.



Source: Ipsos, 2015

Figure 1: Respondent Categories

Acceptance was highest among the following population segments:

- Adults who are 25 years of age and over
- Urban and suburban area respondents
- Black or African Americans
- Those who have been in an accident
- Those with college degrees.

Acceptance was lowest among the following population segments:

- Adults who are 18 to 24 years of age
- Rural area respondents
- Respondents who have not been in an accident
- Respondents without a college degree.

Accepters differed from non-accepters primarily in how strongly they felt about the benefits of V2V technology, as opposed to their potential concerns about it. The most prevalent concerns about V2V technology were that it will result in inattention in other drivers, over-reliance on the technology in other drivers, and susceptibility to security breaches and hacking, and that too few drivers would participate in the system for it to be successful. Respondents rated most of these potential barriers as important. A barrier that was rated less important was potential misuse of V2V technology by law enforcement or the government to track drivers.

Women and respondents in the southern region of the United States were more likely to be undecided than men and respondents in the other regions of the United States.

In addition to measuring consumer interest in adopting V2V technology, the survey also explored consumer reaction to the mandate and inclusion of the technology as a default feature in vehicles. Most respondents (68.3 percent) reported that they would use the technology if it were included in a car they purchased. Note that this percentage, which reflects likely technology use, is higher than the percentage of accepters (49 percent). In other words, the percentage of respondents who would use the technology if included in their vehicle is higher than the percentage of respondents interested in adopting it. However, a non-trivial proportion of respondents (10.4 percent) said they would remove the technology from their vehicle, rather than ignore or disable it. This finding is consistent with the observation that, although most respondents reacted positively to V2V technology, a small group felt strongly negative about it.

Additionally, the majority of fence-sitters (64.9 percent) reported that they would use the technology if it were included in their vehicle, as opposed to 18.9 percent of non-accepters. In this way, fence-sitters are more closely aligned with accepters than with non-accepters.

Drivers of Acceptance

The primary differentiator between accepters and non-accepters was ratings of the benefits of V2V technology. Accepters and non-accepters gave similar ratings (i.e., agreement / disagreement) for potential barriers to V2V technology. However, the two groups gave very different responses regarding the technology's potential benefits—accepters were much more likely to agree with statements about the benefits of V2V technology.

Thus, the perception that there are potential difficulties with V2V technology does not necessarily preclude acceptance. Rather, it is the strength of the perceived benefits of V2V technology that leads to acceptance.

Barriers to Acceptance

The survey examined the reasons consumers may not accept V2V technology, which this report refers to as “barriers” to V2V acceptance. The survey queried respondents on barriers in two ways. First, respondents were asked to list potential challenges to V2V technology. Second, respondents were asked to rate their agreement with potential barriers derived from previous research stages. Respondents were also asked to rate the importance of the barriers. In this way, the survey measured both the **prevalence of agreement** with each perceived barrier (“How many people think distraction will be a problem with V2V?”) and the **magnitude of importance** of each barrier (“How problematic would distraction be?”). Ratings of the prevalence and magnitude of the barriers may not correlate. For instance, many respondents may agree that a barrier exists (high prevalence), but they may view it as a minor concern (low magnitude).

Barriers Generated by Respondents

When asked to list potential problems with V2V technology in an open-ended question, **over one-fourth of respondents expressed concerns about the reliability of the technology**, or whether the

technology would function properly (27.4 percent). Distraction (17.6 percent), over-dependence (14.3 percent), and privacy issues (10.2 percent) were other top-rated concerns.

Although most of the concerns raised with this question were covered in the prevalence and magnitude areas of the survey, three respondent concerns were not included elsewhere in the survey—concerns over costs (7.6 percent) and the difficulties of using the technology (1.5 percent), as well as reliability (27.4 percent), mentioned above.

Barriers that Respondents Were Asked to Rate

The survey assessed the prevalence (proportion of respondents that agree that the issue may be a problem) and magnitude (importance of the problem) of the following potential barriers associated with V2V use. **The most prevalent barriers were concerns over the impact of V2V technology on other drivers (as opposed to the impact on the respondent).**

Respondents expressed concerns about **distraction** due to V2V technology (prevalence of 69 percent) and **over-reliance** on V2V technology (prevalence is also 69 percent). Distraction refers to the attentional demands of the technology and its potential to reduce attention to driving. Over-reliance refers to drivers depending on the technology to ensure that they are driving safely, at the expense of driving carefully and attentively (the “zombie driver” concern expressed in the focus groups).

All barriers were rated as important (magnitude of importance = 3.4 to 4.3 on a 1-to-5 scale, where higher numbers indicated greater importance). The least important barriers were concerns that the respondent himself/herself would not drive as well when using the technology (“I may be less attentive...” magnitude of importance = 3.6) and “I may over-rely...” magnitude = 3.6) and concerns about the health risks of electromagnetic activity from the technology (magnitude = 3.5).

Perceptions of Barriers Due to “Me” Versus Barriers Due to “Other Driver”

Respondents were more concerned about inattention while driving and over-reliance on the technology among other drivers, compared to their own inattention and over-reliance. In other words, respondents were more likely to think that V2V technology presents a risk for other drivers than that they themselves will drive less safely.

Perceived Benefits of V2V Technology

Benefits Generated by Respondents

When asked to list potential benefits of V2V technology, **many respondents offered a general increase in safety (64.6 percent)**. Other responses included specific safety benefits—increased awareness (23.6 percent) and benefits from warnings/alerts (20.4 percent).

All of the benefits generated by respondents were queried elsewhere in the survey.

Benefits that Respondents Were Asked to Rate

Benefits were queried in a similar manner as the barriers. Separate survey sections assessed prevalence and importance.

The prevalence of benefits was lower than the prevalence of barriers; in other words, respondents were more likely to agree with the potential challenges of V2V technology than to agree with the benefits. The most prevalent benefits were reduced accidents among drivers in general (55 percent), increased safety and convenience among drivers in general (53 percent), and reduction in insurance rates (50 percent). The benefits varied little in prevalence—the least prevalent benefit was only 7 percent less than the most prevalent (48 percent versus 55 percent).

Perceptions of Benefits to “Me” Versus Benefits to “Other Driver”

There was little difference between perceived benefits to others drivers and benefits to respondents.

Items that Could Be Benefits or Barriers

Finally, respondents were queried about two issues that could be viewed as either barriers or benefits:

- I believe that law enforcement agencies would use V2V technology to identify illegal or illicit activity, such as speeding, running through stop signs, etc.
- I believe that the government would use V2V technology to track drivers' locations and activities.

The prevalence of agreement with these items was lower than the barriers and benefits listed above. Respondents were more likely to believe that law enforcement would use V2V data (31.1 percent) than to believe that the government would use V2V data to track drivers' activities (18.4 percent). Of those who believed that law enforcement or the government would use the data, approximately half believed that it is appropriate to do so (57.8 percent and 50.8 percent, respectively). Thus, among respondents who believed that these organizations will use the V2V data, they were more likely to view data use as a benefit than a barrier to acceptance.

Demographics

Demographics were not a strong predictor of most of the concerns measured. In other words, similar concerns were expressed across many demographics.

Implications for Communications and Outreach

The findings from the survey indicate the need for national and targeted communication and outreach efforts to ensure acceptance and wide use of the technology. Groups warranting targeted communication efforts include:

- **Fence-sitters** – Effective communications and outreach emphasizing the benefits of the technology can move fence-sitters to the acceptor category and build a clear majority of acceptance and use.
- **Individuals who have never been in an accident** – This group may respond to messaging designed to raise awareness of the prevalence of accidents.

Recommended content suggested by the survey responses and focus groups include the use of infographics to present statistics, testimonials, or third-party endorsements to emphasize benefits and correct misinformation. Preferred formats include video content with factual information, such as the one used for the survey and focus groups, and digital access to fact sheets, but also articles and reviews appearing in publications such as *Consumer Reports* and *Kelley Blue Book*.

Chapter 7 of this report provides further recommendations for communication and outreach.

CHAPTER 1. INTRODUCTION

The National Highway Traffic Safety Administration (NHTSA) is working on a rulemaking to require all new light vehicles to have vehicle-to-vehicle (V2V) communication technology. V2V technology uses dedicated short-range communications (DSRC) radios to send and receive information that can be used by on-board crash avoidance safety applications to warn drivers of imminent crash situations, so the driver can take action to avoid the crash.

An important part of assessing the feasibility of a V2V mandate is understanding how consumers will react to V2V technology in their vehicles. If consumers dislike or do not understand a new safety technology, they may not use it, or may not use it properly. In light of recent concerns expressed during previous research, media coverage, and invited comments, the U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA) contracted further market research to anticipate consumer beliefs and attitudes that may mitigate acceptance of the technology.

The objectives of the research included executing both qualitative and quantitative research to broaden the USDOT's understanding of consumer acceptance of V2V technology and to inform future outreach and communication efforts to the public. Specific objectives were:

1. Understand consumers' knowledge of V2V technology and "connected vehicle environments" and beliefs and attitudes toward the technology
2. Identify barriers to and drivers of V2V technology usage when it becomes available
3. Identify segments of consumers that may warrant tailored communication strategies
4. Assess reactions to informational materials about V2V technology to guide future communication strategies.

This document presents an overview of the market research and analysis results to provide the USDOT with information to gauge the extent of current consumer acceptance and resistance and to guide V2V technology communications.

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CHAPTER 2. APPROACH AND METHODOLOGY

The research effort used a four-phase approach. As shown in Figure 2, these phases included review and analysis; development of approach, plans, and materials; market research execution; and analysis.



Source: Booz Allen Hamilton, 2015

Figure 2: Research Approach

During the review and analysis phase, the research team conducted an environmental scan by reviewing currently available literature and news media over the past 12 months. Previously issued reports were reviewed including the *Driver Acceptance Clinics* (2011 to 2014) and *Safety Pilot Model Deployment* (2012 to 2014). In addition to reviewing the *Vehicle-to-Vehicle Communications: Readiness of V2V Technology for Application*, 2014 (Report No. DOT HS 812 014), which was published as part of the initiation of rulemaking to require V2V communication capability in cars and light trucks, more than 900-related public comments were analyzed using natural language processing (NLP) to identify major themes underlying the posting. This review suggested guiding questions using constructs such as perceived safety benefits and concerns; government overreach; concerns about possible distractions from the alerts; privacy and security concerns; health concerns from wireless technology; and implementation concerns, such as cost to consumers, drivers being distracted, or becoming inattentive.

During Phase 2, a formal approach was developed and included plans for focus groups, a survey, and cognitive interviews. In support of those activities, materials such as an informational video, screener documents, focus group moderator guides, and survey instruments were developed.

During Phase 3, the focus groups and interviews were conducted with topline reports for each activity. The survey was fielded in September, 2015.

This document completes Phase 4, delivering the final analysis and report.

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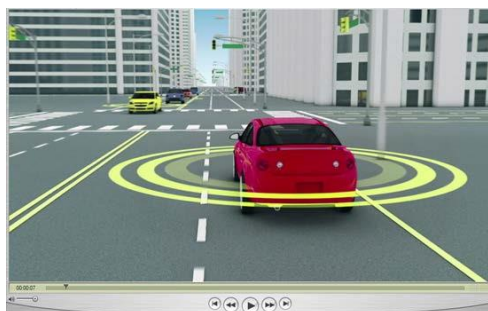
CHAPTER 3. FOCUS GROUPS

Twelve focus groups were conducted with a total of 63 car buyers (31 males, 32 females) in three geographically diverse cities to understand public perception of V2V communications. The cities were chosen based on census data and input from NHTSA. Participants were selected based on their intent to buy or lease a car in the near future, age, race, income level, education, and other demographics. Table 1 summarizes their characteristics.

Table 1. Characteristics of Focus Group Participants

City	Group 1	Group 2	Group 3	Group 4
Charlottesville, VA	Women 40 – 50 n = 6	Men 20 – 30 n = 7	Women 40 – 50 n = 5	Men 20 -30 n = 3
Omaha, NE	Men 40 – 50 n = 6	Women 60 – 70 n = 5	Men 60 – 70 n = 4	Women 20 – 30 n = 4
Seattle, WA	Men 60 – 70 n = 6	Women 60 – 70 n = 5	Women 20 – 30 n = 7	Men 40 - 50 n = 5

Small groups of three to seven people were conducted to provide qualitative information and inform development of a national survey that would assess public acceptance of V2V technology. The sessions also provided information helpful to future V2V outreach and communications. A trained focus group moderator elicited comments from participants on topics of concern and interest. Participants viewed a 2-minute animated video describing V2V technology, features of common applications such as the Do Not Pass Warning, and DSRC. The content and tone of the video were informational rather than persuasive.



Source: USDOT, 2015

Numerous themes were explored during the focus groups, including:

- Understanding of the terms vehicle to vehicle and connected vehicles
- Benefits and concerns of V2V technology (safety, driver attentiveness, distractions, privacy and security, regulation, costs, health concerns, and liability and legal issues)

- Alternate terminology
- Trusted sources of information
- Preferred information formats.

Key Findings of Focus Groups

Participants were asked to rate their interest, on a 10-point scale, in having V2V technology installed in their next car twice during the discussion: (1) immediately after watching a brief, informational video and (2) after discussion of potential benefits and concerns. The intent was to gauge needs for different communication messages before and after the technology becomes widely available. As seen in Table 2, the average rating decreased slightly after the discussion, but the median rating remained stable at 7 out of 10.

Table 2. How much would you want V2V technology in your next car?

Rating (10 is highest)	Immediately After Video	After Discussion
Average	6.4	6.0
Median	7	7

Participants were most likely to mention “safety” and “accident prevention” as key benefits of V2V technology for all groups, but especially for new drivers. Other benefits that were mentioned by some participants included the possibility of lower insurance rates and fewer traffic jams caused by accidents.

When asked about potential problems that may be associated with the technology, top concerns included:

- The need for universal installation/use for V2V technology to be effective
- The potential for over-reliance on V2V technology decreasing drivers’ attentiveness
- The potential for the V2V warnings to be annoying, distracting, and/or too sensitive
- Liability and related potential effects on insurance.

“Someone will hack it. But I also go back to the point of the NSA listening to my phone calls - I’m not doing anything wrong so it doesn’t hurt me so I don’t care.”

Omaha (M 40 – 50)

Privacy and security were raised as major concerns by some participants. Most participants believed incorrectly that V2V technology could be used to track people; however, the majority of participants also believed that cell phones and Internet use were greater threats to security.

“Someone will hack it. But I also go back to the point of the NSA listening to my phone calls - I’m not doing anything wrong so it doesn’t hurt me so I don’t care.”

Omaha (M 40 – 50)

Women, older participants, and those who had experienced a car accident were more willing to pay for the technology. Several participants suggested that the government should provide funds to upgrade older vehicles, similar to the upgrade from analog to digital television signals. Others suggested an opt-in subscription service similar to Sirius/XM radio, although this payment option would decrease the number of vehicles equipped with the technology.

Third-party endorsements were the most commonly trusted source of information, particularly if they knew the person. Some of the most preferred sources of information included family and friends, *Consumer Reports*, and insurance companies.

When asked to suggest an alternative name for the technology, participants frequently used “awareness,” “vehicle,” and “drive” or “driver.”

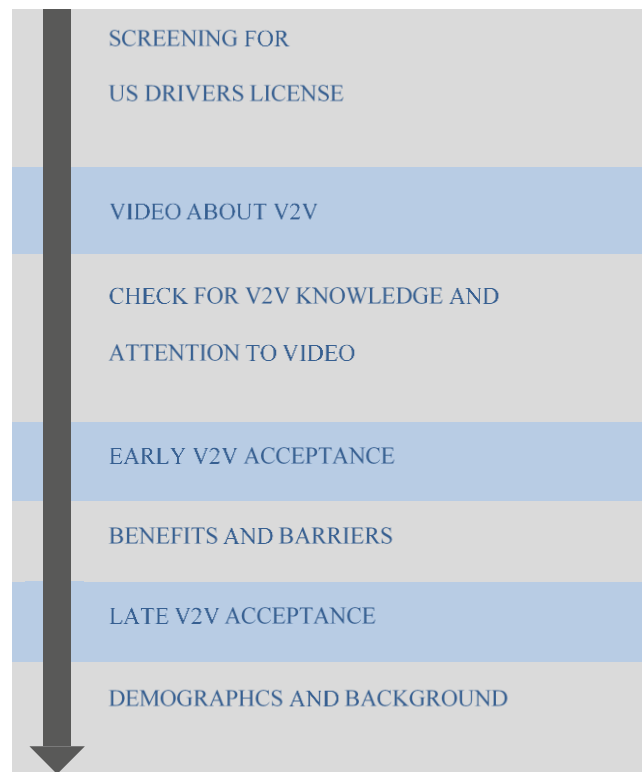
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CHAPTER 4. SURVEY

To complete the quantitative research, an opinion survey of 1,532 U.S. licensed drivers was conducted. The survey was administered online between September 2, 2015, and September 8, 2015. Respondents were recruited from the Ipsos i-Say panel (www.i-Say.com), an online opt-in panel. The respondent sample was chosen to be representative of U.S. adult licensed drivers in terms of age, gender, ethnicity, race, geographic region, and income. Sample weights were applied to further increase representation.

Chapter 5 describes the full methodological details, and Appendix A provides the survey instrument. The survey consisted of 35 questions, which required roughly 14 minutes to complete. Key survey measures included acceptance of V2V technology, perceptions regarding barriers to V2V technology, and perceptions regarding benefits of V2V technology. In addition, participants were queried on driving behaviors and technology use to identify differences on the variables as a function of these characteristics.

i-Say panel members received an invitation to participate in the survey. Upon entering the survey, respondents were asked a screening question to determine whether they held a U.S. driver's license. If they qualified (held a license), they continued the survey and were shown the same 2-minute educational video about V2V technology that was shown during the focus groups. The video was included to ensure that respondents knew enough about V2V technology to form attitudes and opinions. Immediately after the video, respondents were asked whether they had seen it and answered a simple question about V2V technology that could be easily answered if they had viewed the video. This helped exclude respondents who did not attend to the video.



Source: Booz Allen Hamilton, 2015

Figure 3. Sections of the Survey Instrument

Next, respondents were queried on acceptance of V2V technology. They answered a series of questions on perceptions of benefits and barriers related to V2V use. Because reading and responding to the survey items on benefits and barriers could affect V2V acceptance, we queried respondents a second time, after the benefits and barriers section. The first and second questions on V2V acceptance are referred to as “early acceptance” and “late acceptance,” respectively. Finally, respondents answered a series of demographic questions, as well as questions about driving, vehicle decision-making, and technology use.

CHAPTER 5. SURVEY METHODOLOGY

A survey instrument was created to measure public acceptance of V2V technology and issues surrounding acceptance. There were four stages of survey development:

1. **Thematic Outline:** An outline of survey themes and priorities was developed. The outline was informed by the final approach document, discussion with NHTSA, and findings from the focus groups. The outline identified key topics to explore and organized the topics into primary and secondary priorities. NHTSA provided feedback on the thematic outline.
2. **Initial Draft of Survey Instrument:** A draft survey was created. NHTSA and the Booz Allen team iteratively revised the draft.
3. **Cognitive Interviews:** Cognitive interviews were conducted to assess the clarity, flow, and duration of the draft survey. Nine in-person interviews were conducted. Participants were queried on their interpretation and perceptions of the survey. The survey was revised further based on the findings.
4. **Pretest:** An online pretest (N = 50) was conducted as a quality assurance test and to provide preliminary data for analysis. Final revisions were made after analyzing the pretest data.

Appendix A provides the final survey instrument.

Sample Plan and Weighting

The survey sample was designed to be representative of the population of U.S. adult licensed drivers. Respondent demographic quotas were created for age, gender, income, region, race, and ethnicity.

The team used age and gender statistics provided by the FHWA 2012 Highway Statistics Series (<http://www.fhwa.dot.gov/policyinformation/statistics/2012>).

Income, region, race, and ethnicity data were derived from the U.S. Census Bureau Current Population Survey (www.census.gov/cps).

Data Collection

Participants were recruited from the Ipsos i-Say panel, an online opt-in panel which consists of over 800,000 active panel members. Panelists were invited via email to complete the survey in exchange for 90 i-Say points. i-Say points are redeemable for vouchers on Amazon.com, iTunes, Starbucks, Target, Facebook electronic gift cards, PayPal payments, Visa choice cards, Visa prepaid cards, and donations to a variety of U.S. charities. In addition, after completing the survey, respondents were included in the monthly i-Say sweepstakes, which offers prizes worth up to \$5,000.

Sampling algorithms identified potential panelists for the survey based on target demographic characteristics. Panelists were sent an initial invitation as well as a reminder email.

The survey duration was approximately 14 minutes.

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CHAPTER 6. SURVEY RESULTS

This chapter provides descriptive statistics for the survey results. The full survey can be found in Appendix A. Some demographic questions are standard items on the i-Say survey platform and therefore do not appear in the survey instrument. The questionnaire item number and text are given for each variable (e.g., “Q3. If this technology was widely used and made available at low cost, how interested are you in having V2V technology in your next car?”).

Respondent Demographics

A sample of 1,532 adult licensed drivers in the United States participated in the study. Target quotas and weights were selected to match the total population of adult U.S. licensed drivers. This subsection describes the sample in terms of demographic composition and responses to questions about driving behavior, vehicle decision-making, and technology use. Variables include:

- Age
- Gender
- Race
- Ethnicity
- Education
- Urban/suburban/rural residency
- Recentness of last vehicle accident
- Severity of last vehicle accident
- Technology adoption preference
- Weekly driving mileage.

Table 3. Demographics of Respondents

	Percent	Frequency
Age		
18-24	11%	169
25-34	18.0%	276
35-54	37.0%	567
55+	34.0%	521
Gender		
Male	49.6%	760
Female	50.4%	772
Race		
White	79.1%	1212

	Percent	Frequency
Black or African American	13.5%	207
Asian	5.3%	79
Other	5.9%	90
Prefer not to answer	0.8%	12
Ethnicity		
Hispanic	12.3%	190
Not Hispanic	86.8%	1329
Prefer not to answer	0.8%	12
Education		
High school graduate or below	37.5%	575
Some college/Associate's or trade degree	35.1%	536
College graduate	18.8%	289
Advanced degree	8.6%	133
Region		
Northeast	17.9%	274
Midwest	22.9%	350
South	37.7%	578
West	21.5%	330
Residency		
Rural	23.2%	356
Suburban	55.7%	854
Urban	21.0%	322

Most respondents were above 35 years of age, while the least represented group was those in the 18 to 24 year range. The percentages are whole numbers rather than decimal values because the data were weighted to match the U.S. population of licensed drivers. In other words, the proportion of respondents in each age category was set to fixed values (11 percent, 18 percent, 37 percent, and 34 percent). There was almost an equal distribution of male and female respondents, slightly in favor of females.

The vast majority of respondents identified as being White. The second-largest racial group represented was Black or African American. The sum of races do not equal to 100 percent because the categories do not differentiate between individuals identifying as more than one race. Only 12.3 percent of respondents identified as Hispanic, Latino, or of Spanish origin.

The most common education level was high school graduate. A little under a third of respondents had a college degree (including those with advanced degrees).

Respondents were largely concentrated in the south. The northeast had the smallest representation of respondents. Over half of respondents identified as living in suburban areas.

There was roughly an even split between respondents from urban areas and respondents from rural areas.

Table 4 summarizes the driving practices and attitudes toward technology among participants.

Table 4. Driving Characteristics of Respondents

	Percent	Frequency
Weekly Mileage		
0 to 49 miles	39.0%	598
50 to 90 miles	28.1%	430
100 to 199 miles	17.8%	273
200 to 499 miles	12.9%	198
500 miles or more	2.1%	33
Accident Recentness		
I have never been involved in an accident	25.0%	383
Accident less than 5 years ago	18.4%	282
Involved in accidents 5 or more years ago	56.6%	868
Accident Severity		
I have never been involved in an accident	12.1%	139
Accident with minor damage only	41.5%	477
Accident with injury or major damage	54.1%	622
Technology Adoption		
First to buy	11.9%	182
Buy when hype dies down	34.8%	533
Buy when thoroughly tested	45.3%	693
None of the above	8.0%	123

The majority of respondents reported being involved in accidents, but they occurred five or more years ago. One fourth of respondents reported having never been in an accident. Of those involved in recent accidents, slightly more respondents reported the incident caused minor damage, than reported major damage. Not many reported an accident that required medical attention. A little over two-thirds of respondents traveled less than 100 miles a week. The remaining respondents traveled between 100 to 499 miles a week. Only 2.1 percent of respondents indicated traveling 500 miles or more.

Most respondents indicated that they would rather wait until a product is thoroughly tested before purchasing (46.0 percent.) Only 11.1 percent of respondents indicated that they prefer to be the first to buy and try new technologies.

Acceptance of V2V Technology

A key goal of this survey is to understand the degree of public acceptance of V2V technology. Respondents were queried on their interest in V2V technology twice during the survey. One query (Q3)

occurred in the beginning of the survey, immediately after respondents viewed an educational video. The second (Q29) occurred near the end of the survey and helped determine whether completing the survey affected perceptions of V2V technology. In other words, by presenting potential barriers to and benefits of V2V technology, did the survey itself impact perceptions?

The first question (Q3) is referred to as “early acceptance,” and the second question (Q29) is referred to as “late acceptance.”

Q3. If this technology was widely used and made available at low cost, how interested are you in having V2V technology in your next car?

1	2	3	4	5
Not at all interested				Very interested

In the beginning of the survey, we asked about interest in having V2V technology. We would like to ask you the same question again.

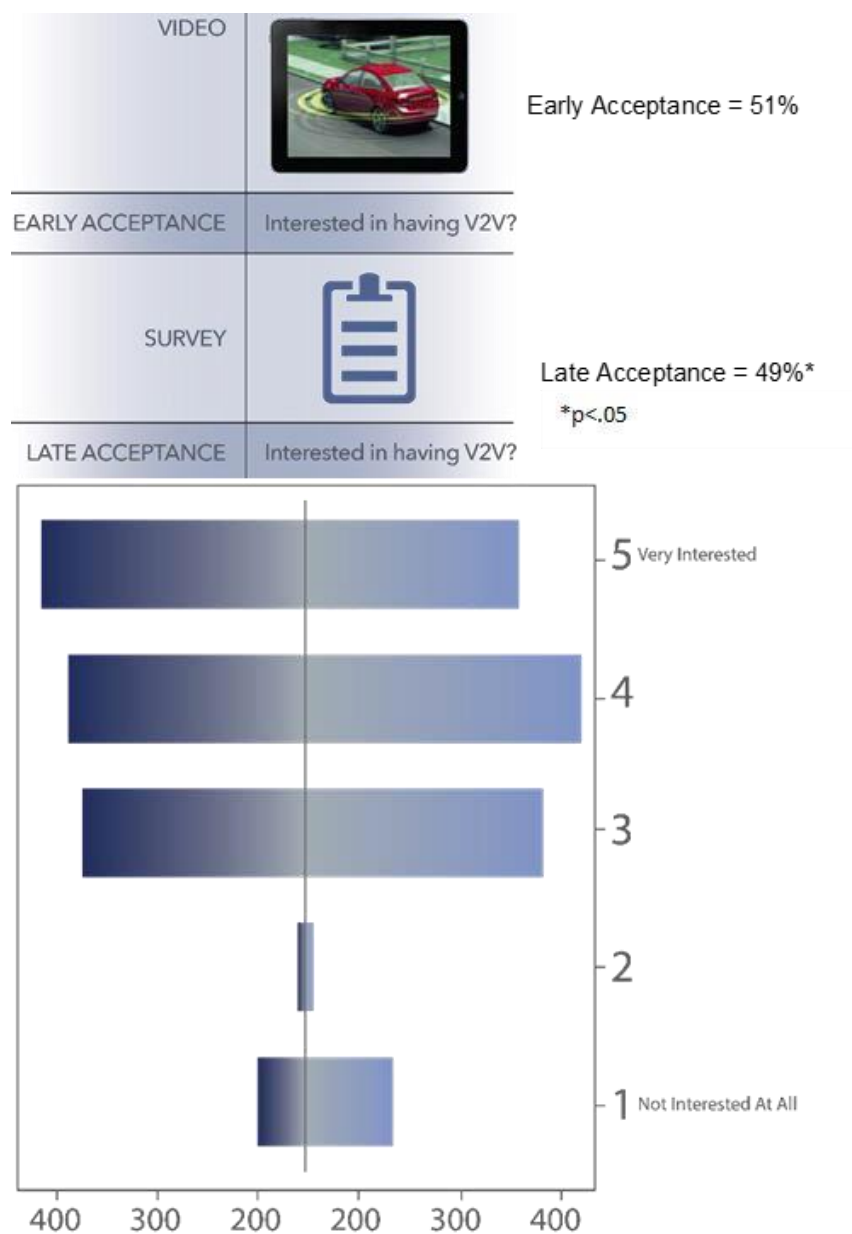
Q29. If this technology were widely used and made available at low cost, how interested are you in having V2V technology in your next car?

1	2	3	4	5
Not at all interested				Very interested

We defined acceptance as responses of 4 or 5 to these questions.

Early Acceptance versus Late Acceptance

Approximately half of respondents were interested in having V2V technology in their car. As was seen in the focus groups, there was a slight difference in the negative direction between respondent’s early acceptance and late acceptance of the technology. Because taking the survey had little effect on acceptance rates, late acceptance (Q29) of respondents was analyzed.



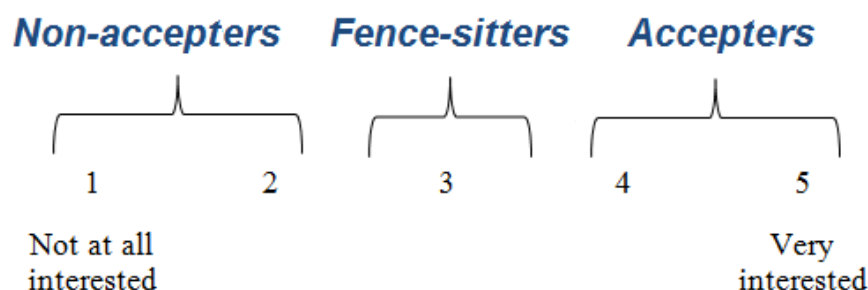
Source: Ipsos, 2015

Figure 4. Distribution of Early Acceptance vs. Late Acceptance

The graphs show the number of respondents that gave each response.

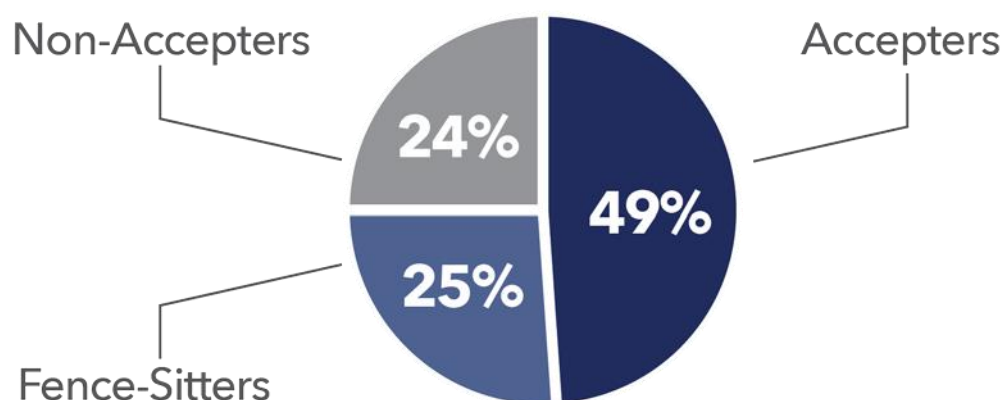
V2V Technology Acceptance Groups: Accepters, Fence-sitters, and Non-Accepters

Respondents were categorized as “non-accepters,” “fence-sitters,” and “accepters” based on their responses to the late acceptance question. As stated earlier, almost half of respondents were receptive to the technology (accepters), while the remaining respondents were split evenly as fence-sitters and non-accepters. Accepters were older and more likely to be male, fence-sitters were mostly female and located in the south, and non-accepters were less likely to be college graduates.



Source: Ipsos, 2015

Figure 5. Acceptance Categories



Source: Ipsos, 2015

Figure 6. Breakdown of Respondents by Acceptance Categories

Table 5. Demographic Summary of Accepters, Fence-Sitters, and Non-Acceptors

	Accepters	Fence-sitters	Non-accepters
Age (median)*	49.3 years	46.6 years	46.7 years
% Female*	49%	54%	50%
% College Graduates*	31%	26%	22%
% Southerners*	36.8%	40.1%	35.9%

Significant main effect, $p < .05$

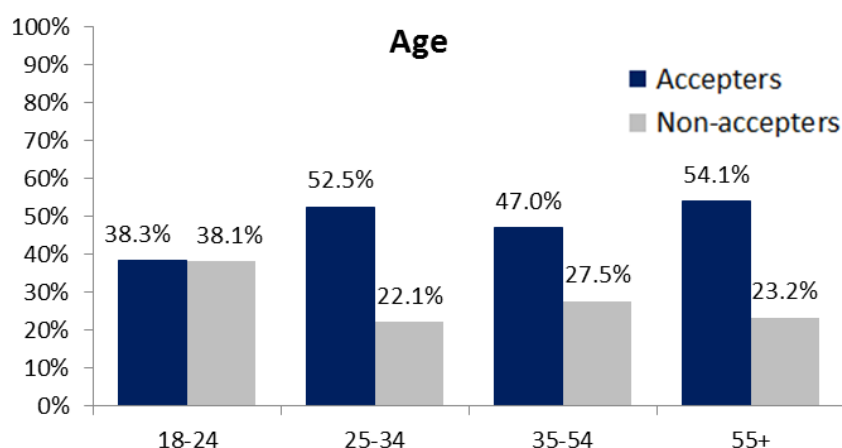
Demographic Differences between Accepters and Non-Accepters

The following figures show the percentages of each demographic sub-group that are accepters and non-accepters. For instance, 52.5 percent of persons aged 25 to 34 were categorized as being accepters, while 22.1 percent were categorized as non-accepters. The remaining 25.6 percent of persons aged 25 to 34 identified as being neutral (not graphed).

Acceptance of V2V technology was higher among adults aged 25 and older compared to young adults between the ages of 18 to 24. Black or African-American respondents were more accepting of the technology compared to the remaining racial categories, while Hispanic had slightly more accepters compared to non-Hispanics. Those with college degrees were more accepting of the technology.

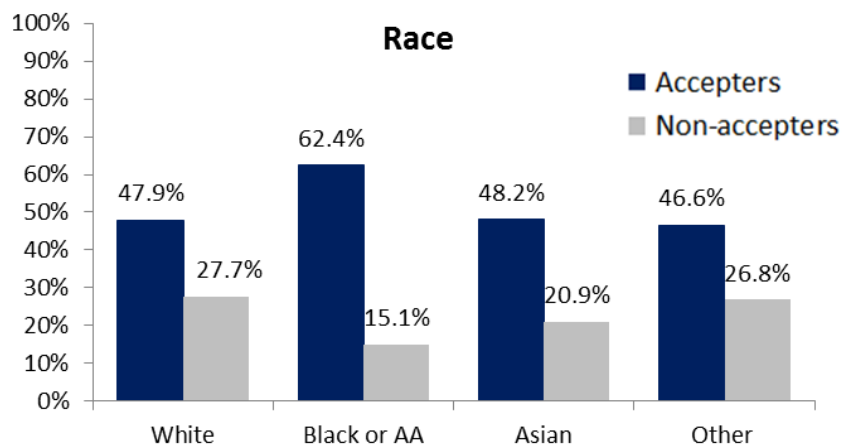
Regionally, there was no significant difference in acceptance among respondents in the north, south, east, or west. However, people living in urban and suburban areas had higher acceptance rates compared to those living in rural areas.

Those who have been in an accident had more accepters compared to those who have never been in an accident, and those driving less than 500 miles a week were more accepting of the technology compared to those driving more than 500 miles. In terms of technology adoption, those who indicated they were receptive to a new technology were more accepting of V2V technology.



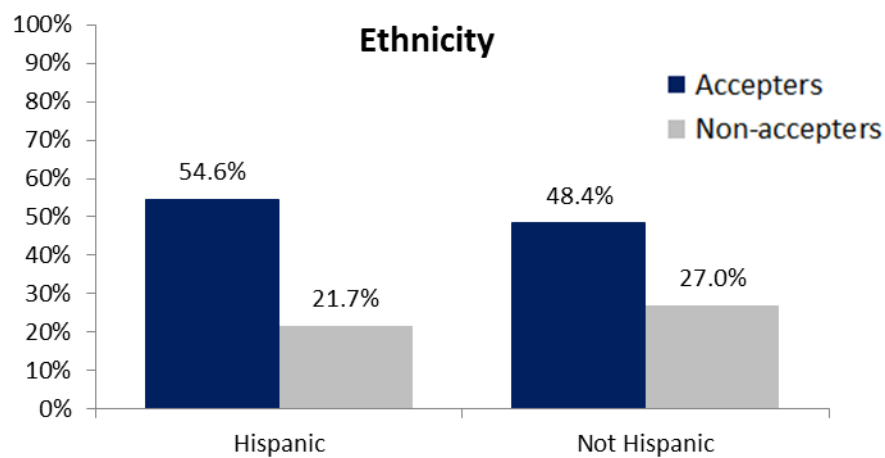
Source: Ipsos, 2015

Figure 7. Acceptance Category Breakdown by Age



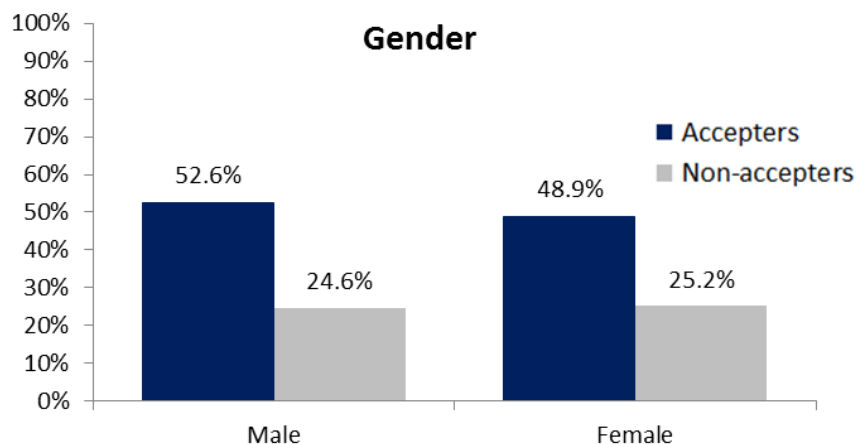
Source: Ipsos, 2015

Figure 8. Acceptance Category Breakdown by Race



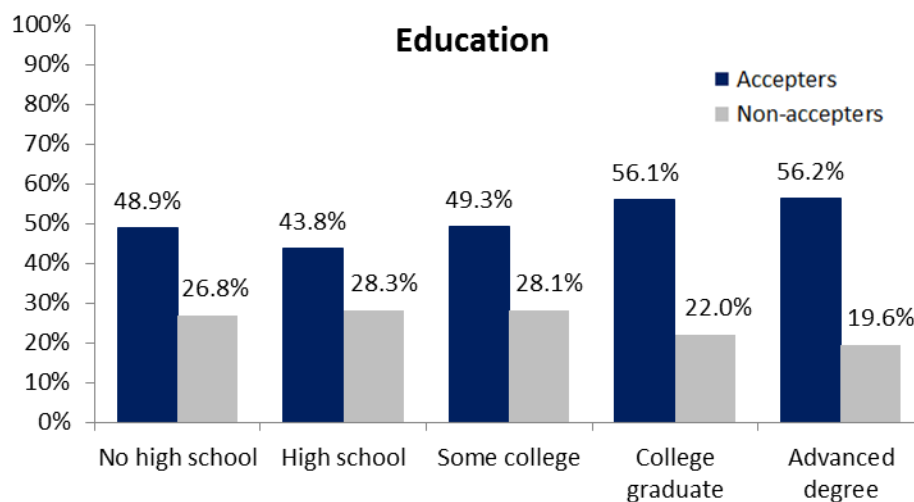
Source: Ipsos, 2015

Figure 9. Acceptance Category Breakdown by Ethnicity



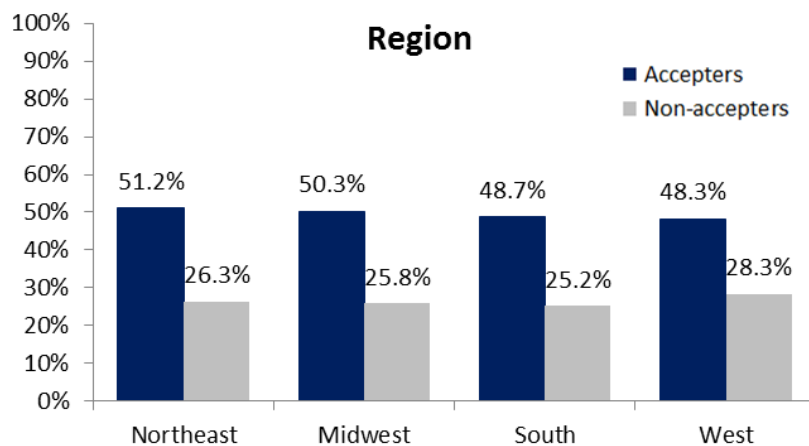
Source: Ipsos, 2015

Figure 10. Acceptance Category Breakdown by Gender



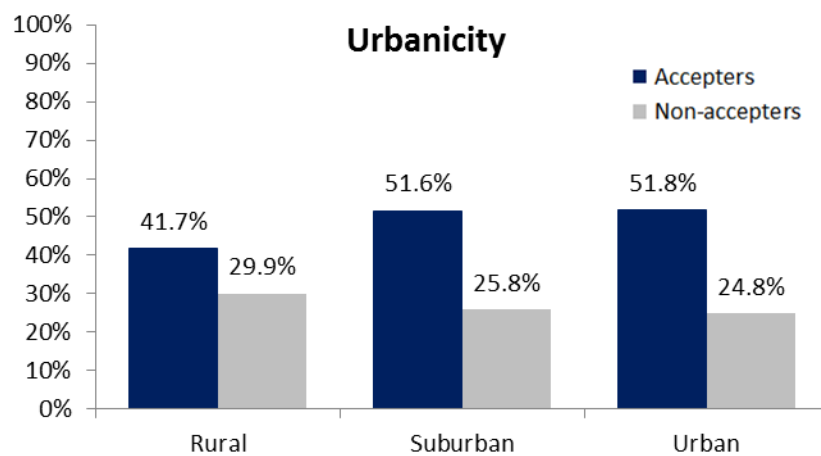
Source: Ipsos, 2015

Figure 11. Acceptance Category Breakdown by Education



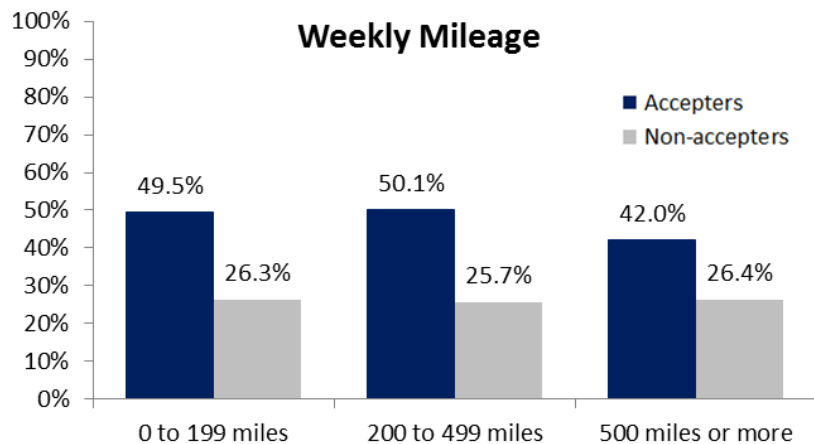
Source: Ipsos, 2015

Figure 12. Acceptance Category Breakdown by Region



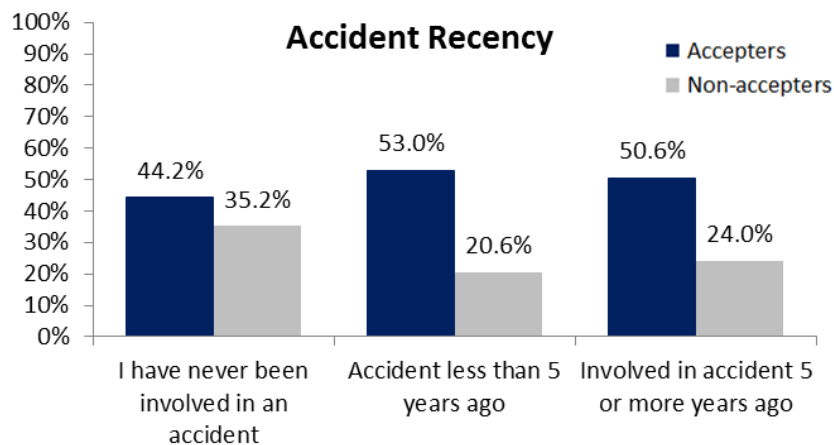
Source: Ipsos, 2015

Figure 13. Acceptance Category Breakdown by Urbanicity



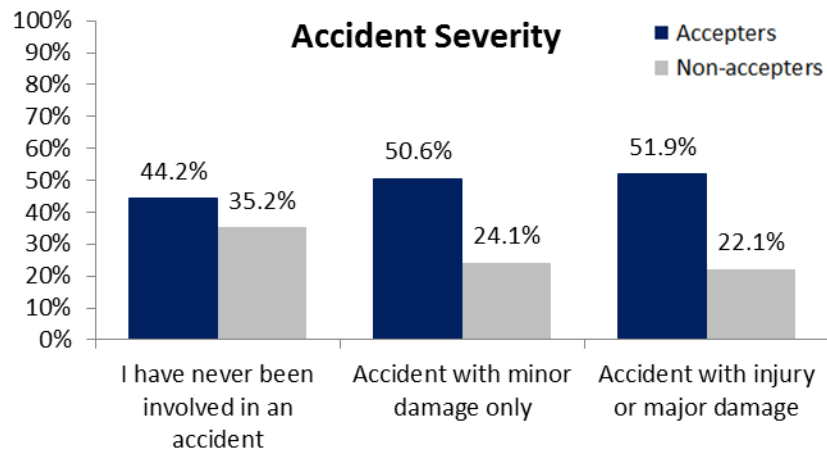
Source: Ipsos, 2015

Figure 14. Acceptance Category Breakdown by Weekly Mileage



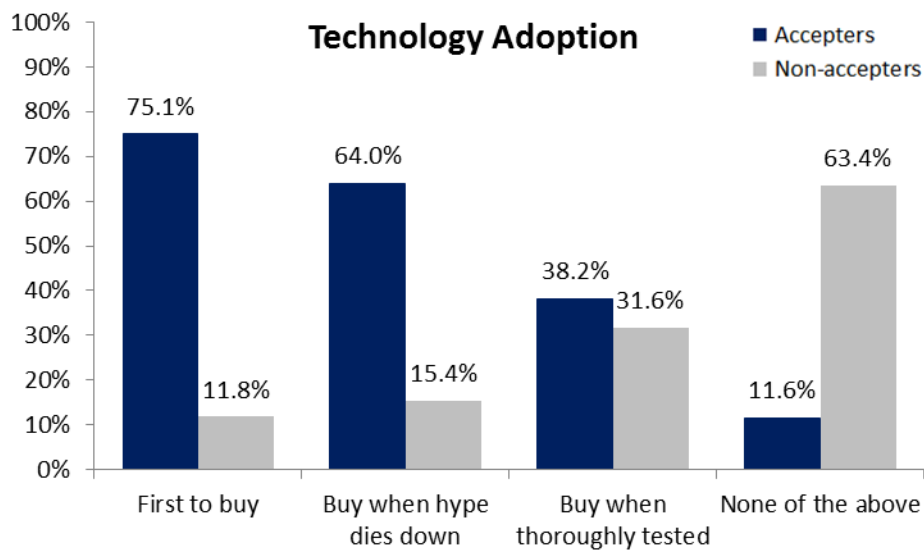
Source: Ipsos, 2015

Figure 15. Acceptance Category Breakdown by Accident Recency



Source: Ipsos, 2015

Figure 16. Acceptance Category Breakdown by Accident Severity



Source: Ipsos, 2015

Figure 17. Acceptance Category Breakdown by Technology Adoption

Barriers to Acceptance

Open-Ended Responses about Potential Barriers

Respondents were asked to provide open-ended responses about problems that may be presented by V2V technology. The most common problem offered was that the technology would be unreliable, followed by concerns that the technology would distract drivers, and finally that drivers would become over-dependent on the technology.

There were some concerns raised in open-ended responses that were not directly addressed elsewhere in the survey. Respondents expressed concern that the cost of V2V technology and the difficulty of using it would act as barriers. Very few respondents thought that there was no need for the technology.

The remaining concerns were directly raised in the survey.

Q5. In your opinion, what are some potential problems with using V2V technology?

Please use a separate line for each problem. Please write "No problems" if you do not think there are any potential problems.

Table 6. Responses to Open-Ended Questions on V2V Barriers

Barrier	Percentage	Frequency
System Unreliable	27.4%	420
Distraction	17.6%	270
Over-dependence	14.3%	220
Privacy Issues	10.2%	157
Insufficient Number of Users	10.2%	156
Hacking	9.2%	141
Costs	7.6%	116
Difficulty of Use	1.5%	23
More Information Needed	0.3%	5
No Need for System	0.3%	5
No barriers listed	31.5%	483
Misc. Other	11.7%	180
Indiscernible	3.1%	47

Prevalence of Barriers

The survey also evaluated the proportion of respondents that indicated concern about a series of potential barriers, as described below. This proportion is referred to as the **prevalence** of a concern regarding a potential barrier.

Please rate your agreement or disagreement with the following statements.

1	2	3	4	5
Not at all interested				Very interested

Q12. I believe that I may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.

Q13. I believe that I may rely too much on V2V technology for safety, and not apply safe driving practices as much as I should (e.g., maintain a safe distance from other vehicles).

Q14. I believe that other drivers may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.

Q15. I believe that other drivers may rely too much on V2V technology for safety, and not apply safe driving practices as much as they should (e.g., maintain a safe distance from other vehicles).

Q16. I believe that security breaches and “hacking” of V2V technology would occur.

Q17. I believe that electromagnetic activity from communication devices such as those used in V2V pose a health risk to drivers.

Q18. I believe that too few drivers would participate in the system for V2V to be useful (V2V technology depends on a network of drivers, so a minimum number of drivers must use it in order for the system to be useful).

We queried respondents on their agreement with nine potential barriers. The table and graph below give the frequencies of top box responses (responses of 4 or 5).

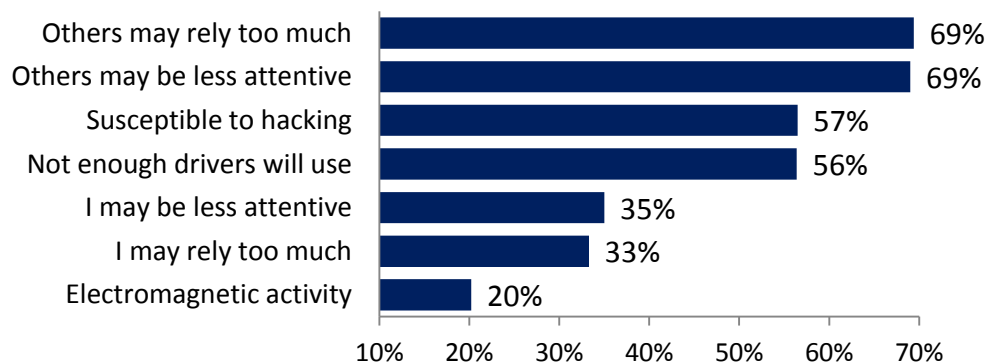
Respondents were more concerned about others driving poorly due to V2V technology, rather than themselves driving poorly. The most prevalent barriers were those involving other drivers, rather than the respondent. Respondents were most concerned that other drivers will rely too much on the technology (over-dependence) and be distracted.

Security concerns and a sufficient number of drivers using the technology were the next most prevalent concerns. Health concerns due to electromagnetic activity were the least prevalent. Concerns over one’s own driving (“I will be less attentive...,” “I will rely on the technology too much...”) were also among the least prevalent concerns.

Table 7: Prevalence of Barriers

Percent	Question
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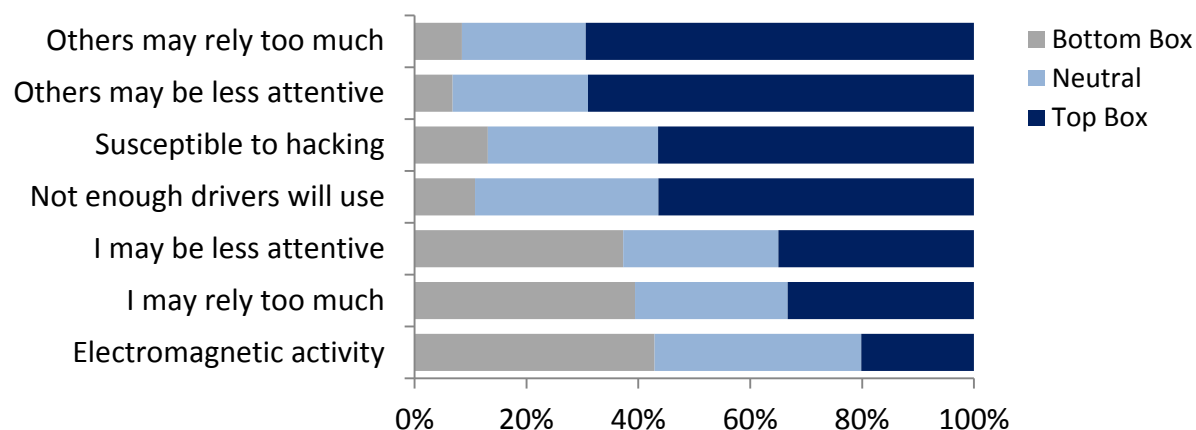
Percent	Question
69%	Q17. I believe that other drivers may rely too much on V2V technology for safety, and not apply safe driving practices as much as they should (e.g., maintain a safe distance from other vehicles).
69%	Q16. I believe that other drivers may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.
57%	Q20. I believe that security breaches and hacking of V2V technology would occur.
56%	Q22. I believe that too few drivers would participate in the system for V2V to be useful (V2V technology depends on a network of drivers, so a minimum number of drivers must use it in order for the system to be useful).
35%	Q14. I believe that I may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.
33%	Q15. I believe that I may rely too much on V2V technology for safety, and not apply safe driving practices as much as I should (e.g., maintain a safe distance from other vehicles).
20%	Q21. I believe that electromagnetic activity from communication devices such as those used in V2V pose a health risk to drivers.



Source: Ipsos, 2015

Figure 18. Prevalence of Barriers for Top Box Agreement

Figure 19 and Table 8 display the same data, with the addition of bottom box (response = 1 or and neutral (response = 3) responses. For all categories, at least 50 percent were neutral or agree that the presented barriers are of concern. For the four most prevalent barriers, less than 10 percent did not agree that the barriers are of concern.



Source: Ipsos, 2015

Figure 19. Prevalence of Barriers for All Levels of Agreement

In Figure 19 and Table 8, top box responses indicate that the respondents agreed with the statements/possible concerns. Bottom box responses indicate that the respondents disagreed with the statements.

Table 8. Prevalence of Barriers for All Levels of Agreement

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may rely too much	69.4%	1073	22.1%	334	8.4%	125
Others may be less attentive	69.0%	1056	24.2%	366	6.1%	110
Susceptible to hacking	56.5%	875	30.4%	448	13.1%	209
Not enough drivers will use	56.4%	879	32.8%	484	10.8%	169
I may be less attentive	35.0%	518	27.7%	428	37.3%	586
I may rely too much	33.3%	509	27.3%	416	39.4%	607
Electromagnetic Activity	20.2%	296	36.9%	568	42.9%	668

Importance of Barriers

The analysis not only evaluated the extent to which respondents expressed concern about a given barrier, but also the **importance** that is attached to each concern as it relates to a respondent's willingness to purchase V2V technology.

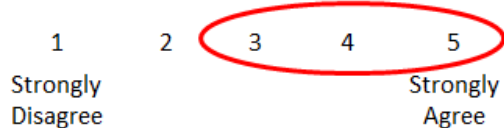
Q19. How important would these potential challenges of V2V be to you if you were to consider purchasing a vehicle that included V2V technology?

1	2	3	4	5
Not at all interested				Very interested

- a. I may be less attentive while driving due to over-reliance on V2V technology or distractions from the alerts.
- b. I may rely too much on V2V technology for safety and not apply safe driving practices as much as I should.
- c. **Other drivers** may be less attentive due to over-reliance on V2V technology or distractions from the alerts.
- d. **Other drivers** may rely too much on V2V technology for safety and not apply safe driving practices as much as they should.
- e. The technology is susceptible to security breaches and "hacking". Electromagnetic activity from the system poses a health risk.
- f. Not enough drivers will use the system for it to be useful.

For the importance placed on each barrier, the team first filtered respondents based on whether they gave a response of 3 or greater to the corresponding question regarding the prevalence of the barrier. Only those respondents that gave a response of 3 or greater were included in the analysis.

Q12-Q18: I believe that security breaches and hacking of V2V technology would occur.



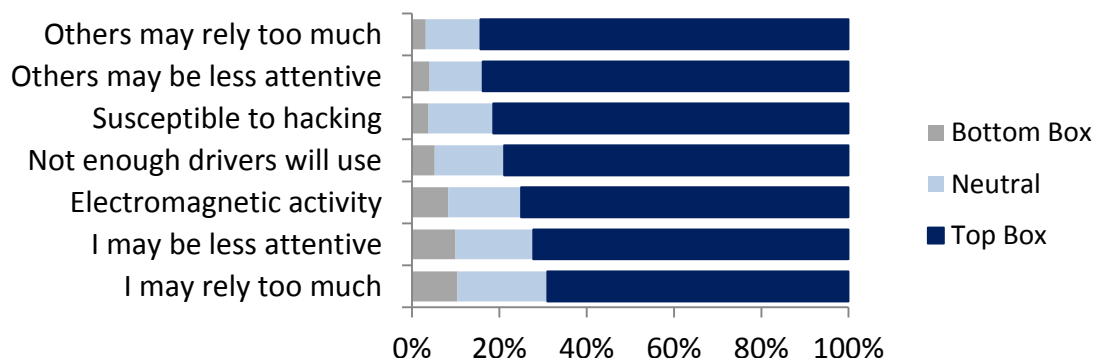
Q19a-Q19g. How important would these potential challenges of V2V be to you if you were to consider purchasing a vehicle that included V2V technology?

The technology is susceptible to security breaches and “hacking”.



All respondents included in this portion of the analysis agreed that the presented barriers were important to them in their decision to purchase V2V technology. Similar to the prevalence of barriers, those barriers that concerned other drivers had higher agreement compared to those barriers concerning themselves.

All the barriers were rated as important; ratings ranged from 3.5 to 4.1 on the 1-to-5 scale of importance (higher values reflect greater importance).



Source: Ipsos, 2015

Figure 20. Importance of Barriers by All Levels of Agreement

In Figure 20 and Table 9, top box responses indicate that the respondents believed the possible concerns were important. Bottom box responses indicate that the respondents did not believe the possible concerns were important.

Table 9. Importance of Barriers by All Levels of Agreement

	Summary Statistics		Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Mean	Standard Error	Percent	Frequency	Percent	Frequency	Percent	Frequency
Importance								

	Summary Statistics		Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
Importance	Mean	Standard Error	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may rely too much on it	4.1	0.03	84.3%	913	12.5%	127	3.1%	33
Others may be less attentive	4.0	0.03	83.8%	895	12.2%	123	4.0%	38
Susceptible to hacking	3.9	0.03	81.4%	709	15.0%	136	3.6%	30
Not enough drivers will use	3.9	0.03	78.9%	697	15.9%	141	5.2%	41
Electro-magnetic Activity	3.5	0.04	75.0%	225	16.7%	48	8.3%	23
I may be less attentive	3.6	0.04	72.2%	382	17.8%	92	9.9%	44
I may rely too much	3.6	0.04	69.0%	362	20.6%	94	10.4%	53

Perceived Barriers Regarding “Me” Versus “Other Drivers”

The analysis also measured the difference in respondents' level of prevalence placed on barriers that applied to “**other drivers**” and those that applied to the respondent (“**me**”). For questions related to driving attentiveness and reliance on V2V technology, the team calculated the difference between beliefs about other drivers and beliefs about the respondent. The difference score reflects the degree to which the respondent thinks V2V technology will affect him/herself and other drivers differently.

Positive values indicate that the respondent thinks other drivers will benefit more. Negative values indicate that the respondent thinks he/she will benefit more than other drivers.

$$[\text{Reliance difference}] = \text{Q14 response} - \text{Q12 response}$$

Q12. I believe that I may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.

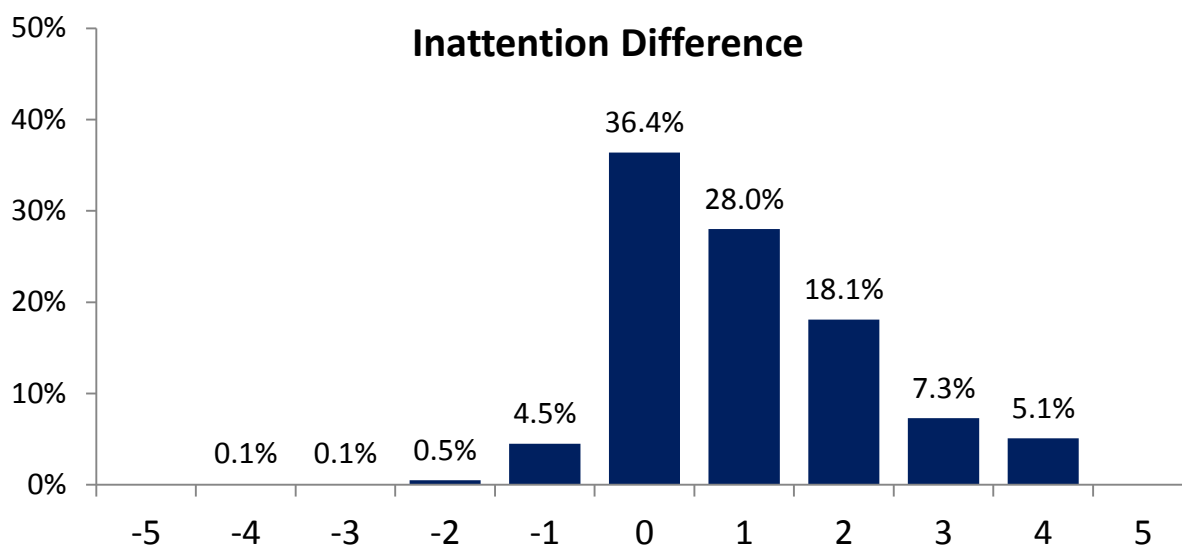
Q14. I believe that **other drivers** may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.

$$[\text{Attentiveness difference}] = \text{Q15 response} - \text{Q13 response}$$

Q13. I believe that **I** may rely too much on V2V technology for safety, and not apply safe driving practices as much as I should (e.g., maintain a safe distance from other vehicles).

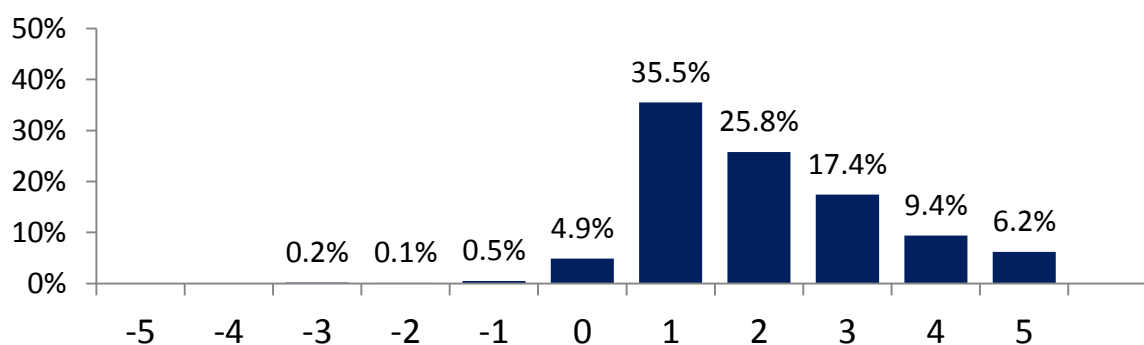
Q15. I believe that **other drivers** may rely too much on V2V technology for safety, and not apply safe driving practices as much as they should (e.g., maintain a safe distance from other vehicles).

Respondents were generally more concerned about awareness and over-reliance of other drivers than awareness and over-reliance of themselves. There was a statistically significant mean difference in both attentiveness and reliance of approximately 1.0 ($p < .05$ in t-tests comparing each mean to 0), indicating that respondents thought other drivers would be impacted by problems from V2V technology usage more than themselves. Few respondents judged the importance of barriers applied to them more highly than those applied to other drivers.



Source: Ipsos, 2015

Figure 21. Difference in Inattention Scores between "Others" and "Me"



Source: Ipsos, 2015

Figure 22. Difference in Over-Reliance Scores between "Others" and "Me"

Table 10. Mean Difference between Concerns Regarding "Me" versus "Other Drivers"

	Mean Difference	Standard Error	P value
Attentiveness Difference	1.0	0.04	<0.0001
Reliance Difference	1.1	0.04	<0.0001

Scores may range from -5 to +5. Positive numbers indicate that respondents are more concerned about inattention and over-reliance among other drivers than themselves.

Perceived Benefits of V2V Technology

Open-Ended Responses about Potential Benefits

Respondents were asked to provide open-ended responses about the potential benefits of using V2V technology. The benefits include variants of safety issues—increased safety, increased awareness, the presence of warning and alerts, better driving, and decreased distraction. The most common benefit offered was that that technology would increase safety, with more than two-thirds of respondents providing some variant of that type of response. This was followed by a belief that the technology would increase drivers' awareness of their surroundings.

Q4. In your opinion, what are some potential benefits of V2V technology? Please use a separate line for each benefit. Please write "No benefits" if you do not think there are any potential benefits.

Table 11. Responses to Open-Ended Questions on V2V Benefits

Benefit	Percentage	Frequency
Increased Safety	64.6%	989
Increased Awareness	23.6%	361
Warnings/Alerts	20.4%	313
Efficiency	3.7%	56

Benefit	Percentage	Frequency
Costs	3.1%	48
Better Driving	1.5%	23
Decreased Distraction	0.3%	4
No benefits listed	17.8%	273
Indiscernible	3.3%	50
Other	15.6%	239

Prevalence of Benefits

As with barriers, the analysis evaluated the proportion of respondents that agreed with a series of potential benefits, as described below. This proportion is referred to as the **prevalence** of agreement on a given benefit.

Please rate your agreement or disagreement with the following statements.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Q6. I believe that V2V technology would help make driving more convenient and efficient **for drivers in general**, by reducing the number of accidents.

Q7. I believe that V2V technology would help make driving more convenient and efficient **for me** by reducing the number of accidents.

Q8. I believe that V2V technology would lower the number of car accidents (and associated injuries and fatalities) **among drivers in general**.

Q9. I believe that V2V technology would make **me** safer.

Q10. I believe that insurance companies would lower rates for drivers using V2V technology

As opposed to the prevalence of barriers, there was little difference in prevalence among the various benefits. Prevalence of benefits ranged from 48 percent to 55 percent, as opposed to 20 percent to 68 percent for barriers.

Similar to barriers, the most prevalent benefits were those that applied to other drivers.

Table 12. Prevalence of Benefits

Percent	Question
55%	Q10. I believe that V2V technology would lower the number of car accidents (and associated injuries and fatalities) among drivers in general.
53%	Q8. I believe that V2V technology would help make driving more convenient and efficient for drivers in general, by reducing the number of accidents.
50%	Q12. I believe that insurance companies would lower rates for drivers using V2V technology.
49%	Q11. I believe that V2V technology would make me safer.
48%	Q9. I believe that V2V technology would help make driving more convenient and efficient for me by reducing the number of accidents.

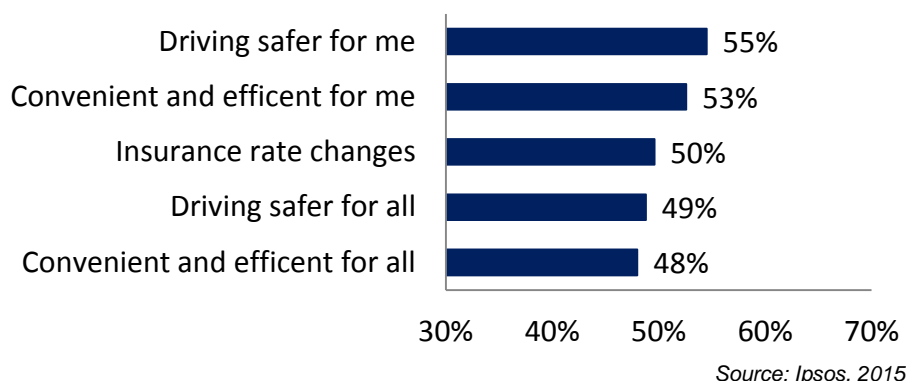
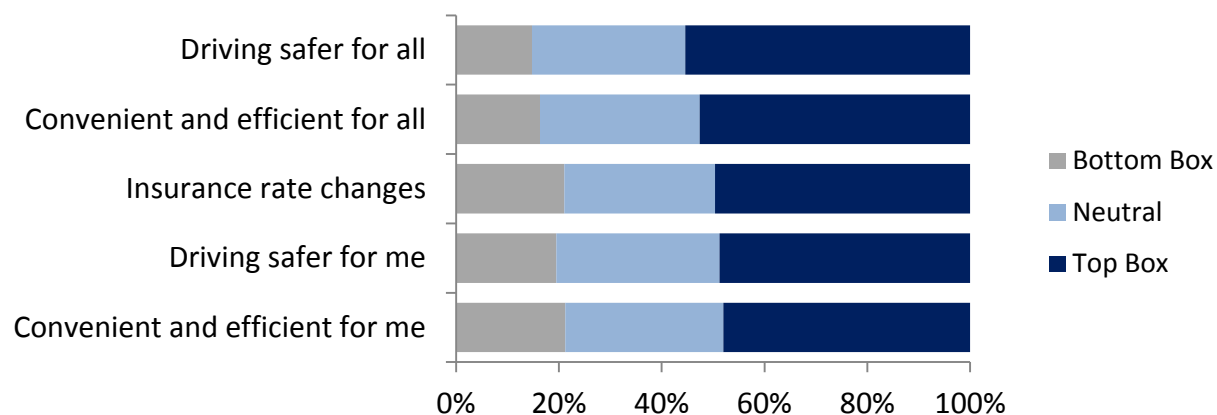
**Figure 23. Prevalence of Benefits for Top Box Agreement**

Figure 24 and Table 13 display the same data, with the addition of bottom box (response = 1 or and neutral (response = 3) responses. Those benefits that concerned other drivers had fewer bottom box responses than benefits concerning the respondent or insurance rates.

All benefits were rated as important. Importance ratings ranged from 3.8 to 4.0 on a scale of 1 to 5 (higher values reflect greater importance).



Source: Ipsos, 2015

Figure 24. Prevalence of Benefits for All Levels of Agreement**Table 13. Prevalence of Benefits for All Levels of Agreement**

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Driving safer for all	54.5%	866	29.3%	445	14.5%	221
Convenient and efficient for all	52.6%	830	31.1%	465	16.3%	237
Insurance rate changes	49.6%	780	29.3%	435	21.0%	317
Driving safer for me	48.8%	782	31.7%	464	19.5%	286
Convenient and efficient for me	48.0%	751	30.8%	467	21.2%	314

Importance of Benefits

The analysis not only evaluated the extent to which respondents expressed concern about a given barrier, but also the **importance** that is attached to each concern as it relates to a respondent's willingness to purchase V2V technology.

Q11. How *important* would these potential benefits of V2V be to you if you were to consider purchasing a vehicle that included V2V technology? Assume that the system is widely used.

1	2	3	4	5
Not at all important				Very important

- Participating in the system would make driving more convenient and efficient for drivers in general.
- Participating in the system would make driving more convenient and efficient for me.
- Participating in the system would make driving safer **for drivers in general**.
- Participating in the system would make driving safer for me.
- My insurance rates may be reduced if I use the system.

For the importance placed on each benefit, the team first filtered respondents based on whether they gave a response of 3 or greater to the corresponding question about the prevalence of the benefit. Only those respondents that gave a response of 3 or greater were included in the analysis.

Q6-Q10: I believe that V2V technology would help make driving more convenient and efficient for drivers in general, by reducing the number of accidents.

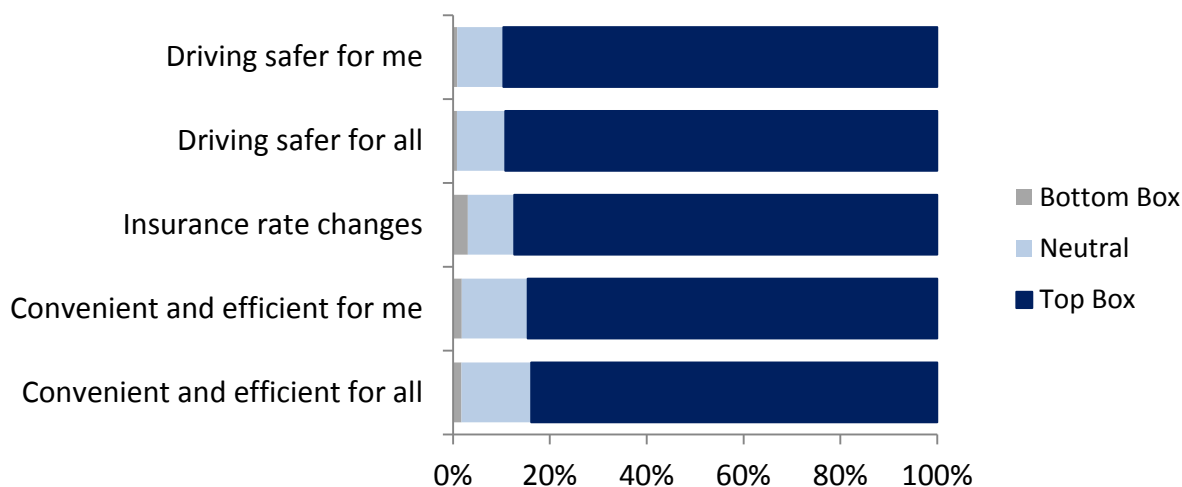
1 2 3 4 5
 Strongly Disagree Strongly Agree

Q11a-Q11e. How important would these potential challenges of V2V be to you if you were to consider purchasing a vehicle that included V2V technology?

Participating in the system would make driving more convenient and efficient for drivers in general.

1 2 3 4 5
 Not at all important Very important

All respondents included in this portion of the analysis were either neutral or agreed that the reported benefits were important in their decision to purchase V2V technology. The insurance rate response had the highest percentage of bottom box responses out of all the categories.



Source: Ipsos, 2015

Figure 25. Importance of Benefits for Levels of Agreement

In Figure 25 and Table 14, top box responses indicate that the respondents agreed that using the technology would have the possible benefits. Bottom box responses indicate that the respondents disagreed that using the technology would have the possible benefits.

Table 14. Importance of Benefits for All Levels of Agreement

Prevalence	Summary Statistics		Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Mean	Standard Error	Percent	Frequency	Percent	Frequency	Percent	Frequency
Driving safer for me	4.0	0.03	89.6%	702	9.5%	73	0.9%	7
Driving safer for all	3.9	0.03	89.2%	780	10.0%	435	0.8%	7
Insurance rate changes	4.0	0.03	87.4%	694	9.6%	70	3.1%	16
Convenient and efficient for me	3.9	0.03	84.6%	635	13.6%	102	1.8%	14
Convenient and efficient for all	3.8	0.03	83.8%	701	14.4%	118	1.7%	11

Perceived Benefits Regarding “Me” Versus “Other Drivers”

The analysis also measured the difference in respondents’ level of prevalence placed on benefits that applied to “**drivers in general**” and those that applied to the respondent (“**for me**”). For questions related to safety and convenience/efficiency, the team calculated the difference between beliefs about other drivers and beliefs about the respondent. The difference score reflects the degree to which the respondent thinks V2V technology will affect him/herself and other drivers differently.

Positive values indicate that the respondent thinks other drivers will benefit more. Negative values indicate that the respondent thinks he/she will benefit more than other drivers.

Difference safer = Q8 response – Q9 response

Q8. I believe that V2V technology would lower the number of car accidents (and associated injuries and fatalities) among drivers in general.

Q9. I believe that V2V technology would make me safer.

Difference convenience = Q6 response – Q7 response

Q6. I believe that V2V technology would help make driving more convenient and efficient for drivers in general, by reducing the number of accidents.

Q7. I believe that V2V technology would help make driving more convenient and efficient for me by reducing the number of accidents.

Compared to beliefs about barriers, fewer respondents viewed benefits to themselves versus other drivers differently. The difference score for both convenience and safety was zero for the majority of respondents (greater than 50 percent). The group means of convenience difference and safety difference (.17 and .14, respectively) each varied from zero, indicating a difference between perceptions of “others” and perceptions of “me.” Here, respondents rated the impact on “others” higher than the impact on “me.” However, the differences are so small that they are of little practical importance.

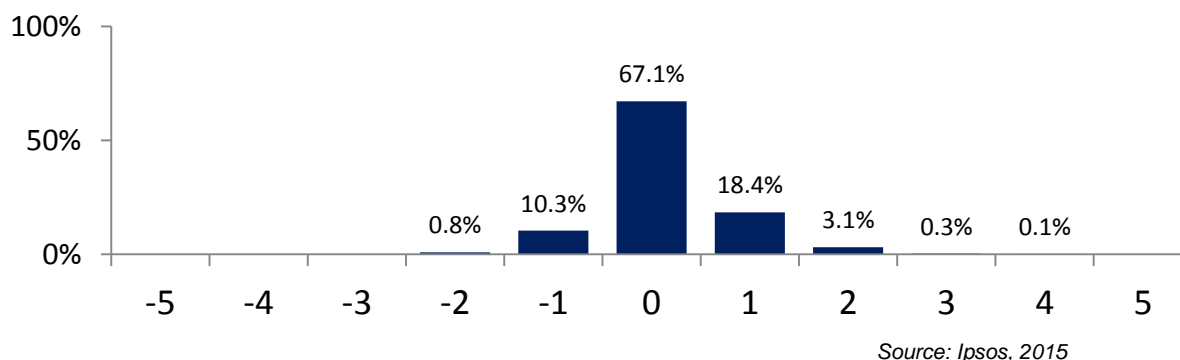
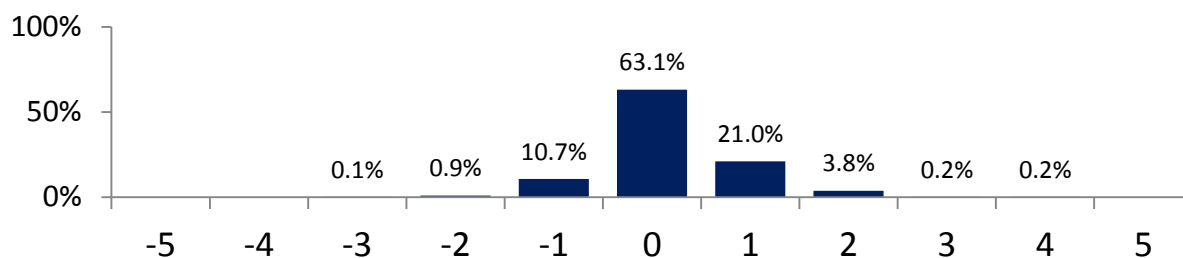


Figure 26. Difference in Convenience Scores between “Others” and “Me”



Source: Ipsos, 2015

Figure 27. Difference in Safety Scores between "Others" and "Me"

Table 15: Mean Difference Scores between Benefits to "Me" versus Benefits to "Other Drivers"

	Mean Difference	Standard Error	P value
Difference Convenience	0.17	0.02	<0.0001
Difference Safety	0.14	0.02	<0.0001

Scores may range from -5 to +5. Positive numbers indicate that respondents believe other drivers will benefit more than themselves in terms of convenience and safety, though the difference is small (less than one quarter of one point).

Items That Could Be Barriers or Benefits

The survey asked two questions that could be interpreted as either a benefit or barrier. These questions dealt with government and law enforcement's roles in V2V technology. The government's or law enforcement's use of V2V technology could be viewed as beneficial, as it would increase safety, or as a deterrent, as it violates privacy. The survey first asked respondents if they believed either entity would use V2V technology for other purposes, or the prevalence of such issues. Then, the survey asked respondents whether the government or law enforcement **should** use V2V technology in this way. This indicates whether the respondents viewed the issue as a benefit or barrier. Finally, as with the previous benefit and barrier items, the survey queried respondents on the importance of each issue in purchasing decisions.

Prevalence of Items That Could Be Barriers or Benefits

First, the survey asked participants whether they agreed that the government or law enforcement would use V2V technology for other purposes.

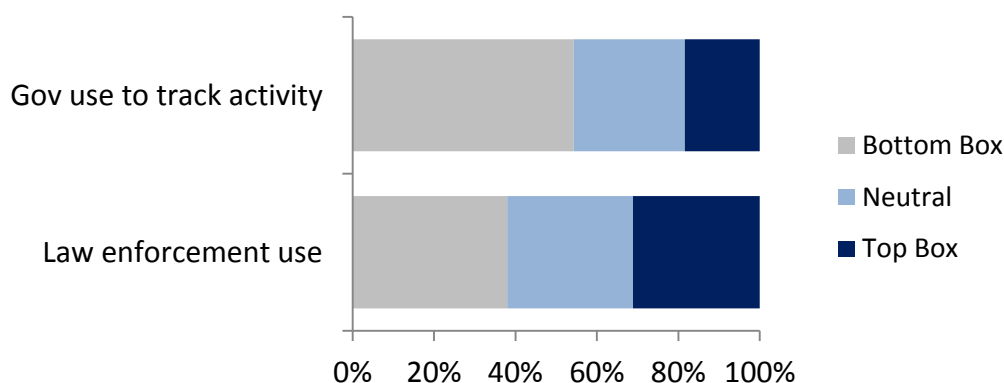
Please indicate whether you agree with the following statements:

1	2	3	4	5
Strongly Disagree				Strongly Agree

Q20. I believe that law enforcement agencies would use V2V technology to identify illegal or illicit activity, such as speeding, running through stop signs, etc.

Q21. I believe that the government would use V2V technology to track drivers' locations and activities.

Respondents generally disagreed that law enforcement and government agencies would use V2V technology to monitor activity or identify illegal behavior, as shown by "Bottom Box" responses. More respondents believed that law enforcement would use V2V technology to monitor illegal behavior (18.4 percent—"Top Box") than government would use the technology to monitor activity (31.1 percent).



Source: Ipsos, 2015

Figure 28. Prevalence of Beliefs that V2V Data Would Be Used By the Government to Track Drivers' Activities and By Law Enforcement to Identify Illegal and Illicit Behaviors

In Figure 28 and Table 16, top box responses indicate that the respondents agreed that the technology would be used by government and law enforcement. Bottom box responses indicate that the respondents disagreed that the technology would be used for these purposes.

Table 16. Prevalence of Beliefs that V2V Data Would Be Used By the Government to Track Drivers' Activities and By Law Enforcement to Identify Illegal and Illicit Behaviors

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Law enforcement use	31.1%	477	30.9%	474	38.0%	582
Government use to track activity	18.4%	22	27.3%	22	54.3%	581

Perceptions of Items as a Benefit or Barrier

The survey asked respondents if they believe that government and law enforcement **should** use V2V technology for such purposes (Q22a and Q22b). Responses to these items indicate whether the issue is seen as a benefit or a barrier. For instance, if a respondent believes that the government **should not** use V2V data to track drivers' locations, and they indicate that they agree that the government **would** do this, tracking is a barrier to acceptance for the respondent. If, on the other hand, he/she believes that the government **should** use this data to track locations, the respondent views tracking as a benefit of V2V technology.

Only respondents that gave a rating of 3 or above to the statements about whether government/law enforcement would use the technology in these ways (Q20 and Q21) were included in analyses of Q22a and Q22b.

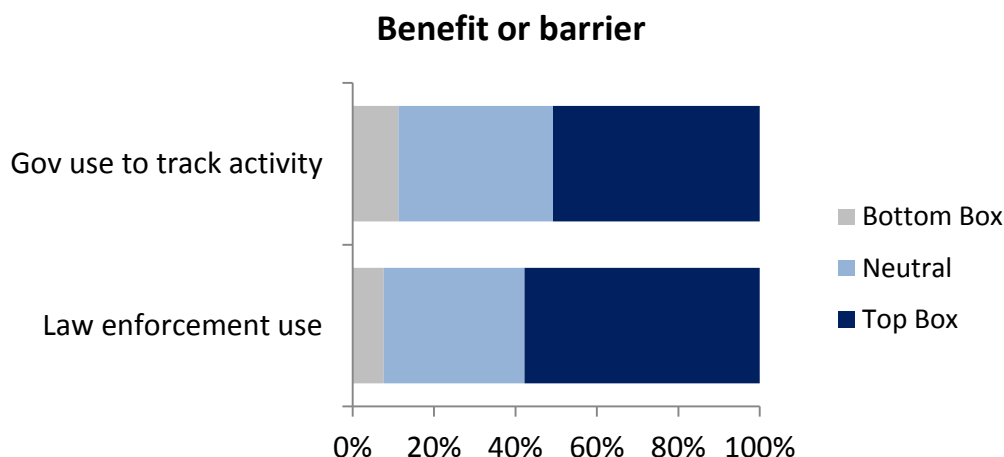
Q22. Please state whether you agree or disagree with the following statements.

- a. I believe that law enforcement agencies **should use** V2V technology to identify illegal activity in order make drivers safer.
- b. I believe that the government **should use** V2V technology to track drivers' locations and activities in order to make drivers safer.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Half of respondents (50.8 percent) believed the government should use the data to track drivers' activities ("Top Box" responses in Figure 29). More than half of respondents (57.8 percent) believed law enforcement officials should use the data ("Top Box" responses in Figure 29). Few participants disagreed with the government (11.2 percent) or law enforcement (7.6 percent) using the data.

In summary, more respondents viewed the items as benefits than as barriers.



Source: Ipsos, 2015

Figure 29. View of Items as Benefit or Barrier

In Figure 29 and Table 17, top box responses indicate that the respondents viewed the items as a benefit. Bottom box responses indicate that the respondents viewed the items as a barrier.

Table 17. View of Items as Benefit or Barrier

Prevalence	Top Box (Resp = 4-5) (Benefit)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2) (Barrier)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Law enforcement use	57.8%	549	34.6%	329	7.6%	72
Gov use to track activity	50.8%	356	38.0%	266	11.2%	79

In Table 17, top box responses indicate that the respondents viewed the items as a benefit. Bottom box responses indicate that the respondents viewed the items as a barrier.

Importance of Items That Could Be Barriers or Benefits

Finally, the survey queried respondents on the importance of the above issues in purchasing decisions.

Q23. How important would these factors be to you if you were to consider purchasing such a system? Assume that the system would be available at a low cost.

- a. The use of V2V technology by law enforcement agencies to identify illegal behavior.
- b. The use of V2V technology by the government to track drivers' locations and activities.

1	2	3	4	5
Not at all important				Very important

Respondents who perceived the items as barriers (gave a response of 4 or 5 on the question regarding whether the government or law enforcement should use the data) viewed the items as more important than those who perceived them as benefits ($p < .05$ for both items). Thus, for these items, negative items factor into the decision process more so than positive items.

Table 18. Importance of Dual Items

	Respondents Who Viewed Item as a Benefit		Neutral Respondents		Respondents Who Viewed Item as a Barrier	
Prevalence	Mean	Standard Error	Mean	Standard Error	Mean	Standard Error
Others may rely too much	2.46	0.11	3.04	0.05	3.52	0.05
Others may be less attentive	2.39	0.09	2.98	0.06	3.26	0.05

Differences in Perceptions of Barriers and Benefits among Accepters, Non-Accepters, Fence-Sitters

The analysis further explored the differences between accepters, fence-sitters, and non-accepters. The following figures display the proportion of each acceptance category (accepters, fence-sitters, and non-accepters) that agreed with each barrier or benefit. Note that the proportions of respondents that agreed within each category are independent; therefore, the total proportions of each item can be greater than 100 percent.

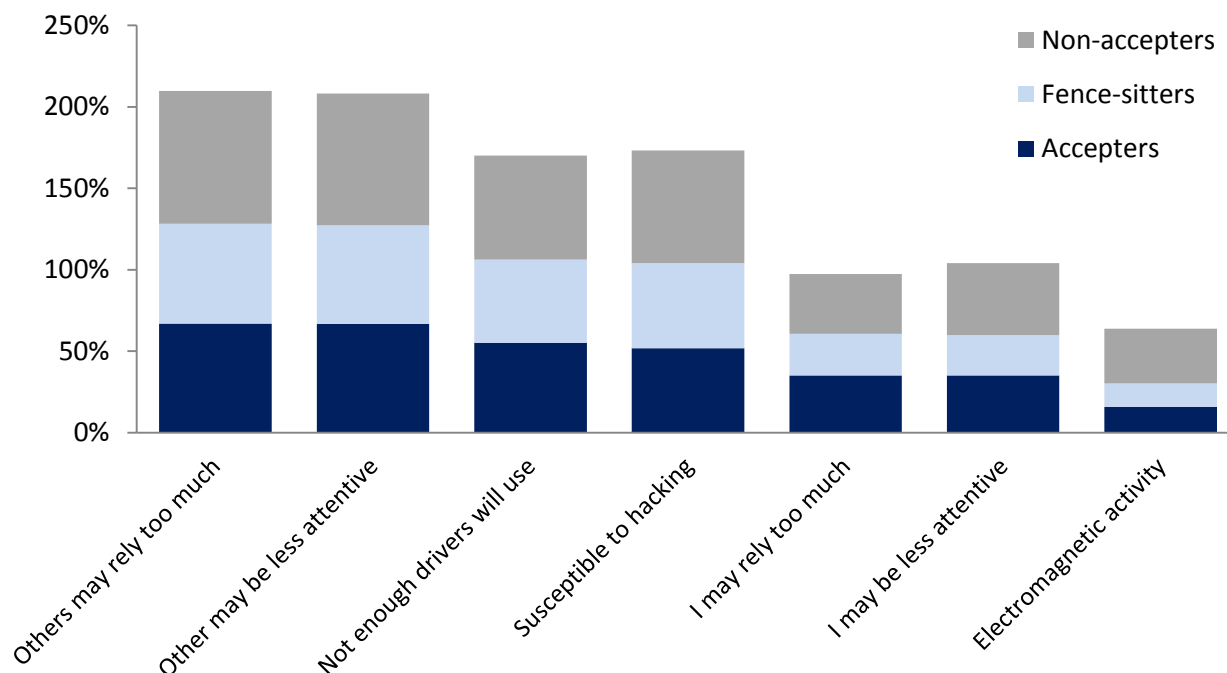
Non-accepters agreed with the barriers more than accepters, and accepters agreed with benefits more than non-accepters, as would be expected.

A noteworthy finding is that **accepters and non-accepters largely differed in their perceptions of the benefits**. Accepters did not vary substantially from non-accepters in their perceptions of the possible challenges of V2V technology (barriers), but accepters were more confident about the benefits of V2V technology. This finding implies that benefits, not barriers, are drivers of acceptance. Extending this finding to communication strategies, NHTSA may be better served by convincing the public of the benefits of V2V technology than by dissuading the public of the barriers.

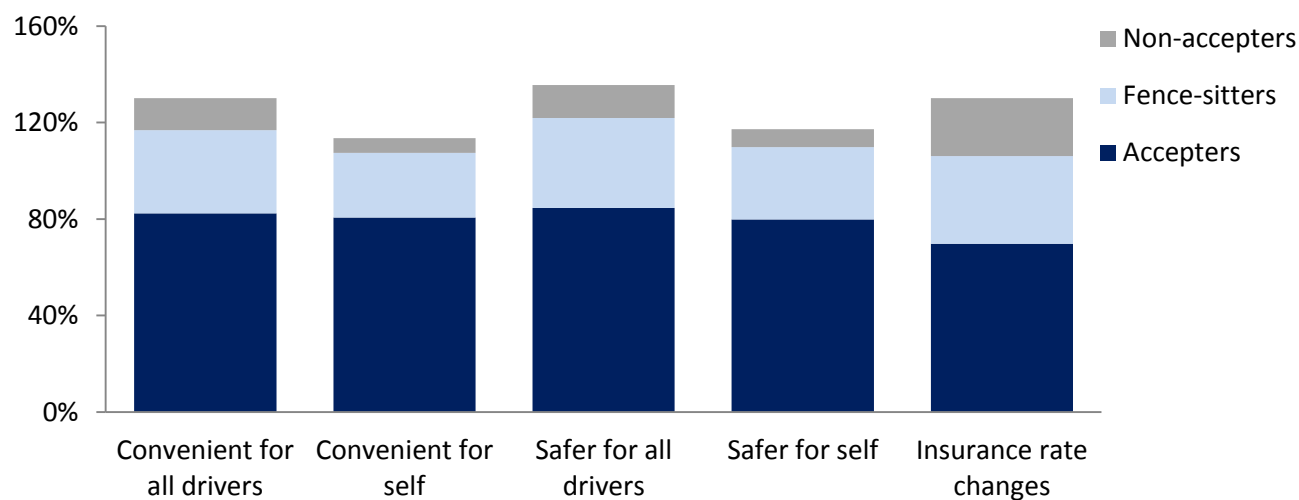
Figure 30 and Figure 31 summarize agreements with barriers and benefits by acceptance category. The proportion of agreement for accepters and non-accepters (the dark blue and grey portions of the bar graphs) was quite similar for barriers but quite different for benefits.

Specifically, agreement with benefits was considerably lower for non-accepters than accepters.

Subsequent sections provide detailed summaries of the prevalence and importance ratings for each acceptance group for benefits and barriers.



Source: Ipsos, 2015

Figure 30. Agreement with Barriers by Acceptance Category (Top Box Responses)

Source: Ipsos, 2015

Figure 31. Agreement with Benefits by Acceptance Category (Top Box Responses)

Accepters – Barriers

The prevalence of agreement with barriers varied greatly among the barriers (prevalence = 15.9 – 67.0 percent), but those who did view the items as barriers considered them important in their decision-

making. Barriers that dealt with the technology's impact on other drivers were the most prevalent and among the most important.

Table 19. Prevalence of Barriers for Acceptors

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may rely too much on it	67.0%	514	21.6%	178	11.3%	87
Others may be less attentive	66.8%	505	23.2%	190	10.0%	84
Not enough drivers will use	55.1%	429	30.7%	234	14.2%	116
Susceptible to hacking	51.9%	400	29.2%	227	19.0%	152
I may rely too much	35.2%	163	23.2%	180	41.5%	336
I may be less attentive	35.1%	252	21.5%	175	43.4%	352
Electromagnetic Activity	15.9%	122	32.9%	249	51.2%	408

Table 20. Importance of Barriers for Acceptors

Importance	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may rely too much on it	82.9%	428	13.9%	67	3.3%	19
Not enough drivers will use	81.3%	343	14.9%	68	3.8%	18
Others may be less attentive	80.6%	415	14.7%	68	4.7%	22
Susceptible to hacking	80.5%	320	16.4%	66	3.2%	14
Electromagnetic Activity	76.6%	95	16.0%	17	7.5%	10
I may be less attentive	73.9%	194	19.7%	44	6.4%	14
I may rely too much	67.1%	188	23.3%	47	9.7%	28

Accepters – Benefits

The prevalence of benefits was higher among accepters than the prevalence of barriers, as would be expected (prevalence = 69.8 percent to 84.6 percent).

The great majority also viewed the benefits as important (top box = 88.9 percent to 94.4 percent).

Table 21. Prevalence of Benefits for Accepters

Prevalence	Top Box (Resp = 3-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Driving safer for all	84.6%	668	13.7%	96	1.8%	15
Convenient and efficient for all	82.4%	655	15.7%	108	1.9%	16
Convenient and efficient for me	80.7%	631	16.9%	127	2.5%	21
Driving safer for me	79.9%	635	18.5%	130	1.6%	14
Insurance rate changes	69.8%	560	20.5%	145	9.7%	74

Table 22. Importance of Benefits for Accepters

Importance	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Driving safer for all	94.4%	634	5.3%	32	0.3%	2
Driving safer for me	93.8%	598	5.8%	34	0.5%	3
Insurance rate changes	92.3%	524	6.9%	31	0.9%	5
Convenient and efficient for all	89.3%	586	9.9%	63	0.9%	6
Convenient and efficient for me	88.9%	556	10.0%	68	1.1%	7

Fence-Sitters – Barriers

Fence-sitters generally were neutral or agreed that the listed barriers were of concern. Among those who viewed the items as barriers, the items were considered important. Again, barriers pertaining to other drivers were more highly rated than those pertaining to the respondents.

Table 23. Prevalence of Barriers for Fence-Sitters

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may rely too much on it	61.2%	237	35.8%	123	3.0%	12
Others may be less attentive	60.4%	235	37.1%	127	2.4%	10
Susceptible to hacking	52.2%	207	41.4%	138	6.4%	27
Not enough drivers will use	51.1%	204	42.5%	145	6.8%	23
I may rely too much	25.5%	104	44.6%	154	29.9%	114
I may be less attentive	24.7%	97	48.2%	169	27.2%	106
Electromagnetic Activity	14.4%	59	52.4%	191	33.2%	122

Table 24. Importance of Barriers for Fence-Sitters

Importance	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may be less attentive	81.2%	197	15.6%	34	3.2%	4
Not enough drivers will use	78.9%	160	19.7%	41	1.4%	3
Others may rely too much on it	78.7%	197	18.1%	36	3.3%	4
Susceptible to hacking	77.2%	164	18.7%	39	4.1%	4
I may be less attentive	71.5%	68	25.6%	26	2.9%	3
I may rely too much	67.7%	71	27.2%	28	5.1%	5
Electromagnetic Activity	62.3%	37	32.3%	19	5.4%	3

Fence-Sitters – Benefits

Fence-sitters were largely neutral on the benefits of V2V technology. The *lower insurance rate* category had the highest proportion of fence-sitters *disagreeing* with the benefit, but it was viewed as important among those who considered it a benefit. Most fence-sitters were neutral or agreed with the importance of the remaining benefits on their purchase decision. In this way, fence-sitters are more similar to accepters than to non-accepters.

Table 25. Prevalence of Benefits for Fence-Sitters

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Driving safer for all	37.3%	150	55.2%	191	7.5%	31
Insurance rate changes	36.3%	133	46.2%	170	17.6%	69
Convenient and efficient for all	34.5%	129	60.2%	221	5.2%	22
Driving safer for me	30.0%	118	60.3%	219	9.7%	35
Convenient and efficient for me	26.9%	97	62.6%	232	10.5%	43

Table 26. Importance of Benefits for Fence-Sitters

Importance	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Insurance rate changes	83.2%	113	11.7%	17	5.2%	3
Convenient and efficient for all	74.2%	93	25.1%	35	0.7%	1
Driving safer for me	73.8%	86	23.7%	29	2.6%	3
Driving safer for all	72.1%	107	27.2%	42	0.7%	1
Convenient and efficient for me	65.2%	68	31.9%	26	2.9%	3

Non-Accepters – Barriers

Of the three respondent groups (accepters, fence-sitters, non-accepters), non-accepters exhibited the highest prevalence of agreement with barriers, as would be expected. Barriers that concerned hacking, technology use, electromagnetic activity, and the respondent's driving were least prevalent. Many

expressed that these potential barriers would impact their purchasing decisions (70.2 percent to 90.7 percent reported that the barriers are important).

Table 27. Prevalence of Barriers for Non-Accepters

Prevalence	Top Box (Resp = 4-)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may rely too much on it	81.6%	322	10.3%	33	8.1%	26
Others may be less attentive	81.0%	316	14.1%	49	4.8%	16
Susceptible to hacking	69.2%	268	22.7%	83	8.1%	30
Not enough drivers will use	63.8%	381	28.1%	105	8.1%	30
I may be less attentive	44.3%	169	20.4%	84	35.3%	128
I may rely too much	36.8%	142	18.9%	82	44.3%	157
Electromagnetic Activity	33.6%	115	30.2%	128	36.3%	138

Table 28. Importance of Barriers for Non-Accepters

Importance	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Others may be less attentive	90.7%	316	5.8%	21	3.4%	12
Others may rely too much on it	90.5%	288	6.7%	24	2.9%	10
Susceptible to hacking	85.6%	225	10.4%	31	4.0%	12
Electromagnetic Activity	78.6%	93	11.2%	12	10.2%	10
Not enough drivers will use	75.1%	194	14.7%	32	10.2%	20
I may rely too much	73.3%	103	11.6%	19	15.1%	20
I may be less attentive	70.2%	120	11.0%	22	18.8%	27

Non-Acceptors – Benefits

Non-accepters were neutral or disagreed that the listed benefits would result from V2V use. In all cases, the proportion of those that disagreed outnumbered the proportion of those that were neutral. The prevalence of benefits was not as high among non-accepters (prevalence = 45.1 percent to 66.0 percent) as among accepters (prevalence = 69.8 percent to 84.6 percent). The proportion of non-accepters who rated the benefits as important (top box = 43.5 percent to 72 percent) was less than the proportion who rated the barriers as important (top box = 70.2 percent to 90.7 percent). Thus, as would be expected, accepters saw more benefits of V2V technology than non-accepters. Among non-accepters, barriers were viewed as more important than the benefits.

Table 29. Prevalence of Benefits for Non-Acceptors

Prevalence	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Convenient and efficient for me	66.6%	250	17.3%	108	6.1%	23
Driving safer for me	62.4%	237	30.3%	115	7.4%	29
Convenient and efficient for all	53.7%	199	33.1%	136	13.2%	46
Insurance rate changes	45.7%	174	30.2%	120	24.0%	87
Driving safer for all	45.1%	175	41.3%	158	13.7%	48

Table 30. Importance of Benefits by Non-Acceptors

Importance	Top Box (Resp = 4-5)		Neutral (Resp = 3)		Bottom Box (Resp = 1-2)	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
Driving safer for me	72.3%	31	20.9%	13	6.8%	4
Insurance rate changes	66.5%	57	21.1%	22	12.3%	8
Driving safer for all	65.1%	78	31.7%	10	3.2%	1
Convenient and efficient for me	57.2%	11	28.8%	8	14.0%	4
Convenient and efficient for all	43.5%	22	42.0%	20	14.5%	4

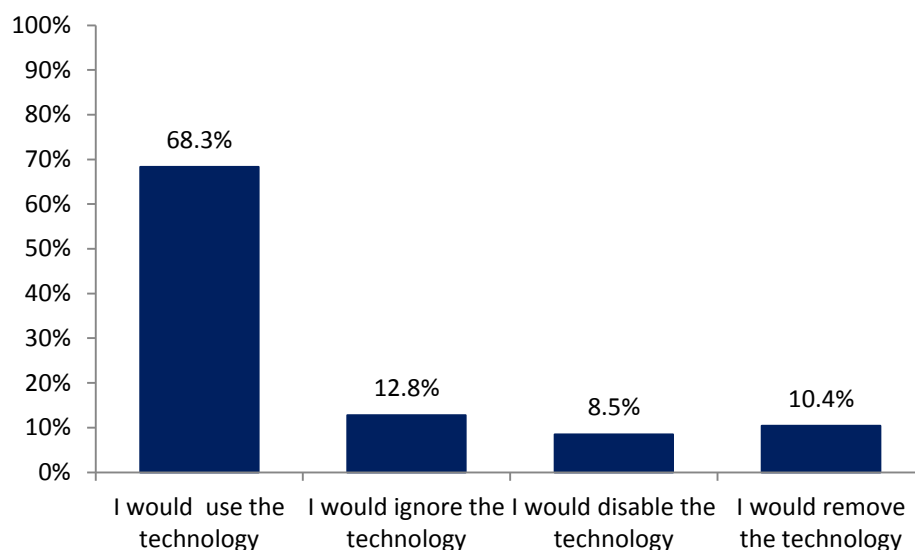
Behavior If V2V Technology Were Implemented

The survey queried respondents on their likely behavior if V2V technology were included in their vehicles in the future. This question allowed us to differentiate between consumers' interest in obtaining V2V technology and consumers' likelihood to use or reject the technology (e.g., disable or remove it) if it were a default vehicle feature.

Q26. Which of the following actions best describes what you would do if V2V were included in a car you purchased? Please select only one option.

- a) I would use the technology.
- b) I would ignore the technology, but leave it on.
- c) I would disable the technology.
- d) I would remove the technology from the vehicle.

The majority of respondents (68.3 percent) indicated that they would use the technology if it were included in a vehicle they purchased (Figure 32). Almost 13 percent of respondents reported that they would ignore the technology, and 18.9 percent reported that they would disable (8.5 percent) or remove (10.4 percent) the technology.



Source: Ipsos, 2015

Figure 32. Response Distribution for Behavior If V2V Technology Were Implemented

Not surprisingly, almost all of the respondents categorized as accepters reported that they would use the technology (96.2 percent; Table 31). Approximately 19 percent of non-accepters reported that they would use the technology, indicating that even among respondents who are not interested in the technology, a non-trivial proportion would nevertheless use it if it were in their vehicles. However, a majority of non-accepters (60.5 percent) would either disable the technology (24.6 percent) or remove the technology

from the vehicle (35.9 percent). Thus, many non-accepters report that they would actively reject the technology rather than simply ignore it, possibly due to health or about privacy and security concerns.

More than half of fence-sitters reported that they would use the technology (64.9 percent) and

11.6 percent reported that they would disable (3.8 percent) or remove it (7.8 percent). In terms of using the technology if it were a default, fence-sitters were more closely aligned with accepters than with non-accepters: the percentage of fence-sitters that would use the technology (64.9 percent) was closer to the accepter group (96.2 percent) than the non-accepter group (18.9 percent). The same was true of disabling or removing the technology. On the other hand, a similar proportion of respondents reported that they would ignore the technology among fence-sitters (23.5 percent) and *non*-accepters (20.7 percent, versus only

3.3 percent of accepters). On the whole, however, fence-sitters would most likely use the technology or, at worst, ignore it rather than disable or remove it.

Table 31. Behavior If V2V Technology Were Implemented, by Acceptance

Prevalence	Accepters		Fence-Sitters		Non-Accepters	
	Percent	Frequency	Percent	Frequency	Percent	Frequency
I would use the technology	96.2%	729	64.9%	242	18.9%	76
I would ignore the technology, but leave it on	3.3%	25	23.5%	88	20.7%	83
I would disable the technology	0.4%	3	7.8%	29	24.6%	99
I would remove the technology from the vehicle	0.1%	1	3.8%	14	35.9%	144

Table 32 and Table 33 show responses to the likely behavior question by age and urbanicity. More respondents over 25 years of age reported that they would use the technology than respondents under 25, consistent with patterns of technology acceptance by age group reported above. Interestingly, over one-fourth of respondents under 25 (26.5 percent) reported that they would remove the technology if it were included in the vehicle. This finding may be due to a combination of factors—V2V acceptance is lowest among young adults, and young adults may be more confident in their technology skills, including their ability to remove the V2V equipment from the vehicle. In contrast, some respondents in other age groups may feel that they wouldn't know how to remove the equipment, although they may feel similarly negative toward the technology. However, we cannot determine why so many young adults reported that they would remove the technology from the current dataset.

Finally, more urban and suburban respondents reported that they would use the technology (72 and 67.4 percent, respectively) than rural respondents (60.3 percent). This trend is also in agreement with acceptance rates among rural, urban, and suburban respondents, as reported above.

Table 32. Behavior If V2V Technology Were Implemented, by Age

	18-24	25-34	35-54	55+
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Prevalence	Percent	Frequency	Percent	Frequency	Percent	Frequency	Percent	Frequency
I would use the technology	58.9%	99	66.6%	184	65.1%	369	75.7%	394
I would ignore the technology, but leave it on	5.8%	10	17.0%	47	14.9%	84	10.6%	55
I would disable the technology	8.7%	15	7.7%	21	9.4%	53	7.9%	41
I would remove the technology from the vehicle	26.5%	45	8.7%	24	10.6%	60	5.8%	30

Table 33. Behavior If V2V Technology Were Implemented, by Urbanicity

	Rural		Urban		Suburban	
Prevalence	Percent	Frequency	Percent	Frequency	Percent	Frequency
I would use the technology	60.3%	215	72.0%	614	67.4%	217
I would ignore the technology, but leave it on	14.2%	51	11.9%	101	13.6%	44
I would disable the technology	12.0%	43	7.4%	63	7.5%	24
I would remove the technology from the vehicle	13.4%	48	8.7%	75	11.4%	37

Influences on Vehicle and Vehicle Option Purchasing

The survey queried respondents on the influences on their purchasing decisions. The most common sources were expert and consumer reviews (e.g., Consumer Reports and autotrader.com reviews) and friends and family. Commercial sources (e.g., sales staff, advertisements, and auto magazines) were less prevalent.

Q28. Which of the following sources inform your decisions when selecting a vehicle and vehicle options? Please check all that apply.

Table 34. Influence on Vehicle Purchasing Decisions

Source	Percentage	Frequency
Professional reviews, such as from Consumer Reports	44.1%	676
Family members	36.5%	559

Source	Percentage	Frequency
User/consumer reviews, such as from cars.com or autotrader.com	31.4%	480
Friends	31.3%	480
Kelly Blue Book	25.3%	388
National Highway Traffic Safety Administration, which issues the 5-Star Safety Ratings	23.9%	366
Manufacturer websites	22.2%	340
Insurance Institute for Highway Safety (IIHS), which issues the \Top Safety Pick\	19.8%	303
None of these sources	17.9%	275
Sales staff	11.6%	178
Advertisements	10.1%	155
Autotrader	6.5%	99
Other source	0.9%	14
Internet/website	0.3%	5
Auto Magazines	0.2%	2

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CHAPTER 7. IMPLICATIONS AND RECOMMENDATIONS

The findings from the survey suggest that approximately half of the drivers will have a positive attitude toward V2V safety technology when it becomes available, and those either opposing or ambiguous about V2V technology are split almost equally. Acceptance changed slightly, but significantly, from first impressions to judgements made after considering barriers to adoption as well as perceived benefits. This finding suggests that some consumers initially accepting of the technology may later become less accepting upon seeing or hearing messages of possible problems, regardless of the accuracy of these messages.

A realistic goal for NHTSA is to gain a clear majority of drivers accepting the technology, which would promote sufficient use of V2V to make the technology effective in preventing accidents. This majority could be gained by developing national and targeted communication and outreach activities to change attitudes. Two groups recommended to target are fence-sitters and drivers who have not been in accidents.

Analysis of the ambiguous fence-sitters indicates that their attitudes and beliefs are closely aligned with those predisposed to accept the technology, differing only in the intensity of beliefs about benefits. This group will likely respond to messages emphasizing the benefits of the safety technology backed by research-based statistics, expert opinion, and testimonials of accident victims or, if possible, participants in one of the pilot tests. Since fence-sitters are more likely to reside in southern states, more intensive outreach efforts in this region may be warranted.

Drivers who have never been in an accident (27 percent of survey participants, mostly 18 to 24 years of age) are another possible target audience. Acceptance of the technology is lower in this group, and they place less value on safety benefits of V2V technology. To engage these individuals, communications should emphasize the prevalence of accidents to increase their perceived self-risk and the value of the safety technology. Messages about the costs of even small accidents could resonate with this group, who tend to have lower income.

Ideally, the communication campaign would have national and regional components. The national campaign could target publications and websites that were frequently mentioned in the survey and focus groups—*Consumer Reports*, cars.com, autotrader.com, *Kelley Blue Book*—possibly purchasing advertising to link to a NHTSA micro-website dedicated to V2V technology. Search engine optimization is also recommended to direct vehicle buyers to NHTSA's website.

Recommended content should stress the benefits of using the safety technology overall, including the bottom line that it saves lives and prevents serious injury. It is interesting to note that these outcomes were not frequently mentioned in focus groups or in open-ended survey questions, perhaps because they are implicit. Nonetheless, this is a powerful message that can contribute emotional appeal to content.

The communication strategies should also address perceived or observed barriers. For example, concerns over privacy and security were mentioned by only 10 percent of participants in open-ended questions, but were registered as very important by the majority. These findings suggest that the public responds to a mere mention of the possibility that the DSRC could be hacked, and NHTSA should prepare to counter misinformation with fact sheets, matte articles for popular outlets, and media tours.

Focus group participants recommended using informational videos like the one used for the study, expert opinions, and data/infographics showing preliminary findings from pilot tests and anticipated accident avoidance. In regional campaigns, these projected rates could be adjusted to local cities. Testimonials and anecdotes from accident victims or early users of the technology, such as those in pilot test regions, are also likely to be effective, especially if spokespeople are representative of fence-sitters, younger drivers involved in their first accident, and accepters.

The majority of survey participants said they would use the safety alert system if it was available in a vehicle that was purchased or leased. Presumably, most would also use the technology if it were installed in fleets—including taxis, driving schools, and rental cars—which would provide another opportunity to win consumer acceptance. For this reason, it is recommended that NHTSA also target fleets through trade shows, conferences, and trade publications. Vehicle driver associations such as the American Automobile Association and AARP should be similarly targeted.

APPENDIX A. RESEARCH APPROACH

Source for All Images and Figures: Booz Allen Hamilton, 2015

US Department of Transportation Federal Highway Administration (FHWA)

VEHICLE-TO-VEHICLE CRASH AVOIDANCE SAFETY TECHNOLOGY PUBLIC ACCEPTANCE REVIEW APPROACH

Version 3.0

February 20, 2015

Prepared by:

Booz Allen Hamilton

VERSION HISTORY

Version			
#	Author	Date	Changes
1.0	E. Levine	12/17/2014	Initial Draft
2.0	E. Levine	1/8/2015	Language to reflect research priorities, recommended locations, revised topic modeling for public comments
3.0	E. Levine	2/20/2015	Final locations and changed time line

1. INTRODUCTION

Vehicle-to-Vehicle (V2V) technology will continue to grow in the public consciousness. In light of concerns that have been expressed in previous research, media coverage, and invited comments, the

U.S. Department of Transportation (USDOT) Federal Highway Administration (FHWA) contracted further market research to anticipate consumer beliefs and attitudes that may mitigate acceptance of the technology.

This document presents an overview of the market research approach to provide the USDOT FHWA with information that will gauge the extent of current consumer resistance and guide Vehicle-to-Vehicle (V2V) technology communications.

1.1 TASK ORDER OBJECTIVES

The objective of this task order is to conduct both qualitative and quantitative research to broaden USDOT's understanding of consumers' acceptance of V2V technology and to inform future outreach and communication efforts to the public. Through this task order, the Booz Allen Team will help the USDOT:

- (1) Understand consumers' knowledge of V2V and "connected vehicle environments," and beliefs and attitudes toward the technology
- (2) Identify barriers to and drivers of using V2V technology when it becomes available
- (3) Identify segments of consumers that may warrant tailored communication strategies
- (4) Assess reactions to informational materials about V2V technology to guide future communication strategies

1.2 DOCUMENT OVERVIEW

This Research Approach provides an overview for the Vehicle-to-Vehicle Crash Avoidance Safety Technology Public Acceptance Review Task Order (TO). The Approach describes:

- Prior research and information from an environmental scan;
- The rationale for recommended research methods; and
- An overview of the recommended research implementation.

2. PRIOR RESEARCH AND ENVIRONMENTAL SCAN

This section summarizes information from USDOT, other reports, and an environmental scan that were useful for designing the proposed approach to consumer acceptance. For the sake of

brevity, comprehensive findings are not presented in this document; instead, a brief description is provided to underscore the key findings that were considered to develop the approach.

2.1 USDOT STUDIES

Between 2011 and 2014, USDOT/NHTSA sponsored two studies focusing on driver acceptance of V2V technology. The Driver Acceptance Clinics were held in six locations across the country and featured demonstrations of V2V features while riding with professional drivers on controlled tracks. The 688 consumer participants in the clinics also viewed materials informing them of the benefits of the technology. Participants completed pre- and post-demonstration surveys, and 96 people also took part in focus groups (Lukuc, 2012). Responses to both survey questions and focus group discussions indicated that participants generally had favorable views of the benefits of the technology and desired the V2V devices for their personal cars (more specific findings were detailed in Lukuc, 2012 and Harding et al., 2014).

In contrast, the first wave of participants in the Safety Pilot Model Deployment in Ann Arbor, Mich. were less enthusiastic about the benefits of V2V compared to the clinic passengers after driving specially equipped vehicles for six months. While complete findings are not yet available, early results indicated that only about 30 percent of the Safety Pilot participants would be inclined to install V2V technology on their personal vehicle, compared to 91 percent of the participants in the Driver Clinics (Harding et al., 2014). False alerts were a problem with the devices tested; over 40 percent of participants reported problems with alerts being distracting, not always clear, or too short in duration. Some of these problems were to be addressed in the second wave of driver-tested vehicles.

Key findings of the studies that are useful for the current research approach include differences in reactions to the technology by age, gender, and location

2.2 GAO REPORT

A report to Congress (U.S. Government Accountability Office, 2013) noted public acceptance as one of the challenges that may deter the use of V2V technology (other challenges addressed engineering and liability issues). This review included USDOT's two studies, plus interviews with experts in data privacy and security, legal and policy issues, and human factors. The main challenges to public acceptance that were identified were privacy concerns, perceptions of limited functionality, and costs. One of the recommendations from the report was to conduct further research focusing on consumers' privacy concerns.

2.3 PUBLIC COMMENTS

The USDOT initiated rulemaking to require V2V communication capability for passenger cars and light truck vehicles with the publication of a report in August, 2014 (Harding et al., 2014) and an invitation for comments on Regulations.gov. Over 900 comments were submitted.

Booz Allen collected 920 comments and used natural language processing (NLP) to identify major themes underlying the postings. The NLP algorithms look through the data and find

groups of words that appear to co-occur with each other more often than you would expect from random chance. Four major themes emerged from this exercise—concerns over perceived government overreach if installation of V2V technology were mandated; health concerns from wireless technology; implementation concerns, such as cost to consumers, drivers being distracted, or becoming inattentive; and comments that were general in nature, touching on an assortment of concerns. This breakdown is summarized in the table below.

Table 1. Topics and Sample Posts Derived from Comments Using Natural Language Processing

Topic (Number of Posts)	Example
Government Overreach Concerns (165)	"I am extremely disappointed and enraged with NHTSA's plan to install the so-called V2V technology in every new car in US. Yes this system might save some lives. But give me liberty or give me death! My car should be my private domain as an individual I should have the RIGHT not to install a communication device on my own car. Given how essential cars are to most US citizens a mandate to install this system on every new car in US is effectively the same as implanting a communication chip inside every newborn baby in US..."
Health Concerns (166)	"WHAT IS WRONG WITH YOU FOLKS? Wireless MICROWAVE radiation is a Class 2B Possible Carcinogen as is Lead DDT and Chloroform. It hurts my head makes my eyes blurr and can even give me strange heart palpitations. ALSO< Electromagnetic Radiation interferes with red blood cells rouleaux formation (see Dark Field microscope video here at http://www.emfanalysis.com/blog/archives/11-2013). EMR interferes with the electric fields of the heart..."
Implementation Concerns (163)	"Currently newer vehicles with built-in monitors for viewing music channels / playlists weather channels phone text and email notices creates an additional distraction that is unsafe. Additionally some are equipped with flashing lights in side and rear view mirrors warning of nearby vehicles which has prompted our household to NEVER BUY A VEHICLE LOADED WITH ALL THOSE DISTRACTIONS. We want our family members to pay attention to the road not all the gadgets that distract them from driving safely. AND we would like other drivers to do the same. NO MORE DISTRACTED DRIVING."
General Concerns (199)	"This proposal while superficially well-intentioned if enacted will turn out to have been paving the road to hell with good intentions. This because earlier advice on necessary requirements has been ignored and/or misunderstood. Therefore I must dissent. The stated goals cannot be met and the projections are wishful thinking no more. It's either that or you are deliberately misleading in your proposal"

Note that the research approach also used insights from an earlier model that produced ten themes or topics; the revised model with four topics simplifies and draws sharper distinctions. Although most comments were negative, positive comments were also found in each category. Capturing the precise language used in the comments as well as the overall concepts expressed is useful for developing focus group and survey instruments.

The Appendix provides more details of this topic modeling exercise.

2.4 ENVIRONMENTAL SCAN

A Google search of the phrase, “vehicle-to-vehicle communications” or V2V limited to just 12 months of coverage from October 2013 to 2014 produced over 1,000 results. Among these were five recent studies and reports: Telefonica’s “Connected Car Industry Report 2014”; HNTB’s America THINKS transportation technology study; the *2014 Harris Poll AutoTECHCASTSM* study; Accenture Connected Vehicle Solutions; and “What’s Driving the Connected Car” Report by McKinsey and Company.

These studies confirmed that consumers are willing to engage in conversation about “connected vehicle” technology and showed general understanding about safety benefits such as those provided by V2V. Specific findings that inform the approach include:

- In a 12-country survey, nine percent reported using “car-to-car” communication, and the desire for these services ranged greatly for different functions
- 37 percent of respondents in a multi-country survey said they would not even consider owning a connected car, largely due to fears about vehicles being hacked
- Age was an important determinant of acceptance: younger respondents reported heavier use of technology in cars, and were more likely than older participants to favor paying for infrastructures to facilitate using connected vehicles

Findings from previous studies, reports, and public comments were used to guide the research approach, which is described in the following section.

3. RESEARCH APPROACH

This section describes the broad proposed approach to research methods. This approach was first described in the technical response to the Statement of Work, and has been revised based on information gained from the environmental scan and meetings to discuss a preliminary draft. Specifically, we propose characteristics to use for screening focus group participants and survey respondents; locations for focus groups; and content emphasizing concerns of privacy and security, which were not addressed in previous DOT studies. We will also explore whether framing the description of dedicated short-range communications (DSRC) as different from other mobile devices can ease concerns.

3.1 THEORIES AND CONSTRUCTS RELEVANT TO THE ADOPTION OF TECHNOLOGY

One challenge for the research task is that we need to elicit beliefs, attitudes, and intentions toward technology that few people have heard of and no one will have used. Theories are useful for predicting outcomes, and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, 2003) offers relevant constructs to guide the research.

As the name suggests, UTAUT combines constructs from a number of theories of behavior change including Theory of Reasoned Action (Fishbein and Ajzen, 1975), Theory of Planned Behavior (Ajzen, 1991), and Innovation Diffusion Theory (Rogers, 1995) with the Technology Acceptance Model (Davis, 1989). Constructs from the model which are useful for guiding instrument development and data analysis include:

- Attitude toward using technology
- Subjective norms
- Perceived usefulness
- Complexity
- Relative advantage over non-use of technology
- Compatibility with existing values, needs, and past experiences
- Voluntariness of use

3.2 DEVELOPMENT OF INFORMATIONAL MATERIALS

Since the technology is unknown to the research participants, focus groups and surveys will include a brief video that explains the different features of V2V technology and how DSRC works. We recommend using a video format since this method is well-liked across generations, and also because a similar video for connected vehicle technology can be used as a model (or possibly adopted).

3.3 QUALITATIVE RESEARCH

Mini-focus groups (four-to-six people per group) and triads will be conducted to maximize opportunities for gathering information from different regions of the country. This section describes our approach for recruiting, instrument development, implementation, and analysis.

3.3.1 Objectives for focus groups and triads

The overall objective of the focus groups is to provide information that will enhance the survey findings. The group discussions will also verify that the survey instrument captures important factors relevant to acceptance of V2V technology before the survey is launched. Specific objectives include:

Objectives

1. To understand beliefs and perceptions of V2V technology
 - Do consumers liken V2V to “Connected Vehicles” or “Internet of Everything”?
2. To assess consumers’ value placed on V2V technology
 - Will consumers raise issues or concerns with cost, privacy, or security?
 - To what extent will consumers be willing to maintain/certify V2V?
3. To explore the extent to which consumers perceive issues with privacy and security
 - To what extent will consumers be influenced by rhetoric about V2V invading privacy?
 - What language, tone, and messengers are effective to combat inaccurate information?

3.3.2 Participant characteristics

Based on findings from the environmental scan, previous research, and comments from USDOT leadership, the following characteristics and demographics for focus groups have been identified:

- Participants must be actively car-shopping or purchased a car within the last year (2009 make or newer) and must have been a decision maker on car purchase
- Age – This research will replicate the age groupings from the Driver Clinic study: 20-30, 40-50, 60-70.
- Gender—Groups will consist of men or women
- Familiarity and use of high technology in cars for safety, communication, or navigation.
- Mix of income, education, race/ethnicity

3.3.3 The recruitment screener will be adopted from one used in recent USDOT research to facilitate comparison with previous studies. Recruitment of participants

The research team will use a professional recruitment vendor to locate suitable participants in each location. The vendor will be provided with a screener to select for characteristics in each group. The screener used for this research will also use or adopt items from the screener used for focus groups on fuel efficiency, which were effective for recruiting participants providing valid input.

The vendor will also prepare and distribute incentive payments; in this way the researchers limit exposure to personally identifiable information of the participants. Participants will be offered \$75 as a token of appreciation for their time. This amount is lower than the average

market rate, and may increase the difficulty of recruiting higher-income participants. If necessary, we will discuss raising the honorarium slightly to ensure a suitable mix among respondents. .

3.3.4 Description of interview guide

A semi-structured interview guide will be prepared to ensure that key topics are addressed, but also allow for exploration of unexpected themes that emerge from the discussion.

Questions for the sessions will focus on the following topics:

Topic	Potential Questions
Knowledge/understanding of technology before and after viewing a brief video	<p>If you were to describe this to a friend, how would you say it worked?</p> <ul style="list-style-type: none"> How is it the same or different from other technology in cars that you may be using now?
Perceived value of the safety benefits, traffic control, environmental effects	<p>What do you see as the main benefits of V2V technology? How likely would you be to purchase this technology for a current car? For a new car?</p> <ul style="list-style-type: none"> What factors would you take into consideration? <p>When you bought your last car, how important was safety technology features compared to, say, navigation systems?</p>
Perceived barriers, including privacy, security, costs, and what would be required to overcome the barriers	<p>Is there anything that would stop you from using this technology?</p> <ul style="list-style-type: none"> What would you want changed to overcome this obstacle?
	<p>[If privacy or security are mentioned as barriers to using V2V] What would you need to hear or read to feel that your privacy is protected? [If privacy or security issues are not mentioned] Here are some remarks that were received by the USDOT when they invited the public to comment on a report about V2V technology.</p> <ul style="list-style-type: none"> What do you think of these comments? Do you think a lot of people agree with this?

Topic	Potential Questions
Information needs and preferences	<p>Who would you trust this information coming from?</p> <ul style="list-style-type: none"> Is there an organization, like AAA that you trust for this type of information? (prompt for or the U.S. government if not mentioned) Would you trust it coming from a car salesperson? <p>Where do you think you would be likely to read or hear information about safety technology for cars? (prompt for when buying a car if not mentioned)</p> <ul style="list-style-type: none"> Do you prefer getting information like this in video, written word (fact sheets/articles), or a combination of formats?

3.3.5 Recommended locations and groupings

The recommendations listed below are based on the availability of focus group resources in different regions.

Recommended locations:

- East Coast - Charlottesville, VA. In this university town, 87 percent drive to work.¹ Although a small town of about 150,000, the population is highly diverse and a large proportion have higher-income jobs in medical services or education.
- Midwest – Omaha, NE. This mid-sized, demographically diverse city of approximately 450,000 is characterized by households with multiple cars (63% have two cars, and 28% have 3 or more vehicles). Ninety-two percent of the labor force commutes to work by car.
- West Coast – Seattle, WA. Seattle has a diverse and technically savvy population. Seattle residents are highly educated (nearly 60% have a Bachelor's degree or beyond) and have proximity to businesses that lead in technology like Microsoft, Boeing, and Amazon.

The proposed groupings for the sessions are presented in Table 2 below. In this design, there are two sessions with each gender/age group. Both the triads and groups consisting of up to six people will be used to check for trends and outliers within and across age and gender. Because fewer individuals are involved in each triad session, these discussions offer an opportunity to hear each participant's views in more depth, and will be a good way to test more complex ideas. Another advantage of triads compared to larger groups is that these

¹ Data is from the U.S. Census for each location
<http://factfinder.census.gov/faces/tableservices/jsf/pages/productview.xhtml?src=CF>

discussions may better mirror the dynamics of a conversation among peers, which can provide insights into word-of-mouth communication.

Table 2. Design for Focus Groups (4-6 participants per group) and Triads

Location, Dates	Mini-Group 1	Mini-Group 2	Triad 1	Triad 2
Charlottesville	Men 20-30	Women 40-50	Men 20-30	Women 40-50
Omaha	Men 40-50	Women 60-70	Men 60-70	Women 20-30
Seattle	Men 60-70	Women 20-30	Men 40-50	Women 60-70

3.3.6 Implementation of focus groups

The focus groups and triads will be conducted in conference rooms at Booz Allen Hamilton offices in each city. Participants will read and sign informed consent letters after they arrive and before the sessions begin. The moderator will lead the discussion, and will be assisted by a trained research assistant who will take notes. The sessions will also be recorded. At the conclusion of each session, participants will receive checks for the amount of \$75.

3.3.7 Analysis

Thematic analysis will be used to assess transcriptions of the group recordings along with notes from the sessions for patterns and trends that emerge from the discussions. Differences will be noted within homogenous groups and across other sub-groups.

3.4 QUANTITATIVE RESEARCH

3.4.1 Objectives for survey

The survey component of the project is designed to quantify public knowledge, attitudes, beliefs, and behaviors surrounding V2V technology. In addition, the survey will identify any differences among segments of the general population on these measures. The quantitative (survey) research builds on findings of the qualitative (focus group) research, in that key themes derived from the focus groups may be measured and formally analyzed.

3.4.2 Sampling frame

The sampling frame will be derived from a population of approximately 210 million adult licensed drivers in the United States. We propose a sample size of 1,000 respondents, yielding a margin of error of $\pm 3.1\%$. Screening questions would be implemented to identify drivers among respondents. We anticipate a high response rate, given the percentage of the U.S. population that drive ($> 85\%$). The sample will be matched to the U.S. population as closely as possible on gender, age, and race/ethnicity.

The FHWA may wish to further limit the sample to current vehicle owners, as these individuals more closely reflect the population segment that would consider adopting V2V technology in the near term. Findings from focus groups may inform the final decision of inclusion and exclusion criteria.

3.4.3 Description of instrument

The survey instrument will be developed to tap factors affecting acceptance of V2V technology from the findings of previous studies discussed above, and will incorporate new findings from the focus groups. We recommend limiting the survey experience to 15 minutes or less, as longer sessions are associated with increased attrition and reduced response quality. We further recommend that materials used to provide general information to survey respondents, such as a brief video, require only two-to-three minutes to review. Given these recommendations, we anticipate that a 12-minute survey consisting of no more than 30 close-ended and three open-ended questions is appropriate. We propose several topics for the survey below. To balance the comprehensiveness of the survey with the time constraint, it may be useful to discuss the priority of the different topic areas to FHWA.

Potential survey questions:

- Confirmation that the respondents viewed/read the educational materials and understood the content
 - Brief questions on the content of the materials. Respondents who do not answer the questions correctly may be excluded from analyses.
- Liking and desirability of V2V technology. These items would appear early in the survey so that respondents are not biased by questions that raise potential barriers.
 - Rating of the usefulness of V2V technology, both to the respondent and to drivers at large.
 - Rating of likelihood to use such technology if it were offered
- Potential benefits of V2V technology
 - Belief that V2V technology would decrease the number of crashes
 - Belief that V2V technology would improve traffic conditions
- Potential barriers to V2V acceptance
 - Belief that V2V technology would result in government entities tracking driver location
 - Belief that V2V data would be used for law enforcement

- Belief that V2V technology could be hacked
- Strength of beliefs in other barriers raised in focus groups
- The degree to which these barriers might prevent the respondent from using V2V technology
- Knowledge, beliefs, behaviors associated with digital technology and connectivity
 - Use of connected technology devices and applications, such as in-vehicle navigators, social networking
 - Knowledge of location tracking and digital connectivity features in existing devices. For instance, is the respondent aware of location tracking on many cell phones?
- Decision-making factors
 - Sources of vehicle and technology information (car dealerships, friends/family, consumer reports, news, etc.)
 - Influencers for vehicle-related decisions (parents, professionals, news, reviews, etc.)

In addition, demographic variables such as urbanicity, driving behavior, political affiliation, and others may be collected.

In a survey such as this, in which general attitudes as well as specific barriers are queried, the order of questions in the survey instrument is particularly important. Raising potential barriers (or benefits) to V2V technology in a question could bias opinion on other questions. Thus, the survey should begin with broad questions about V2V technology (general questions on knowledge and perceptions). Questions should narrow in scope as the survey progresses, so that questions on specific barriers or benefits are asked later in the survey.

3.4.4 Analysis

A top-line descriptive analysis will be conducted to provide a “snapshot” view of survey results. Analyses will include a summary of all demographic measures to provide a description of the sample population. Survey response outputs may include top-box results of items, means of scaled items, and percentages of agreement/disagreement with opinion statements. In addition, behavioral statistics such as t-test, ANOVAs, and correlations will be applied. For instance, ANOVAs may indicate what demographic segments differ from one another on key questions. Correlations may indicate the relationship among responses to items. T-tests may indicate whether responses differ from some benchmark value (i.e., 0 or 50%), or whether two groups differ from one another on an item.

4. REFERENCES

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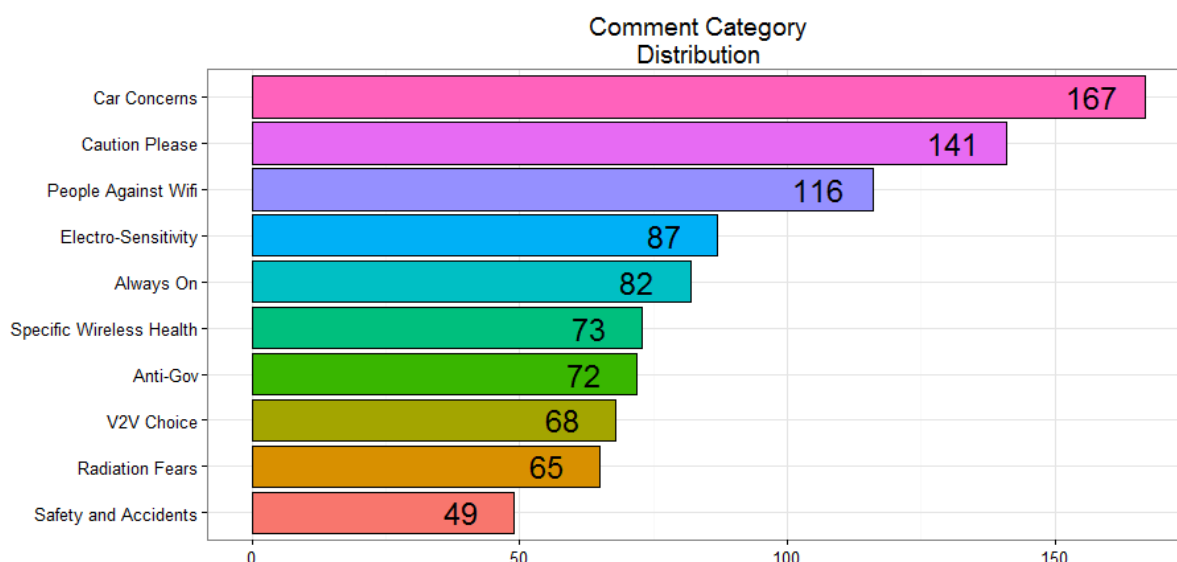
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5. APPENDIX: PUBLIC COMMENT ANALYSIS

OVERVIEW AND METHODS

We extracted 920 publicly available comments from Regulations.gov using their public-facing API. API access was freely available through a self-service website. We used several mathematical measures to determine the best fit for the overall number of categories in the text. Our original attempt to classify topics resulted in ten comment categories that expressed a variety of health, safety, and regulatory concerns.

Figure A-1. Model 1 with 10 Categories

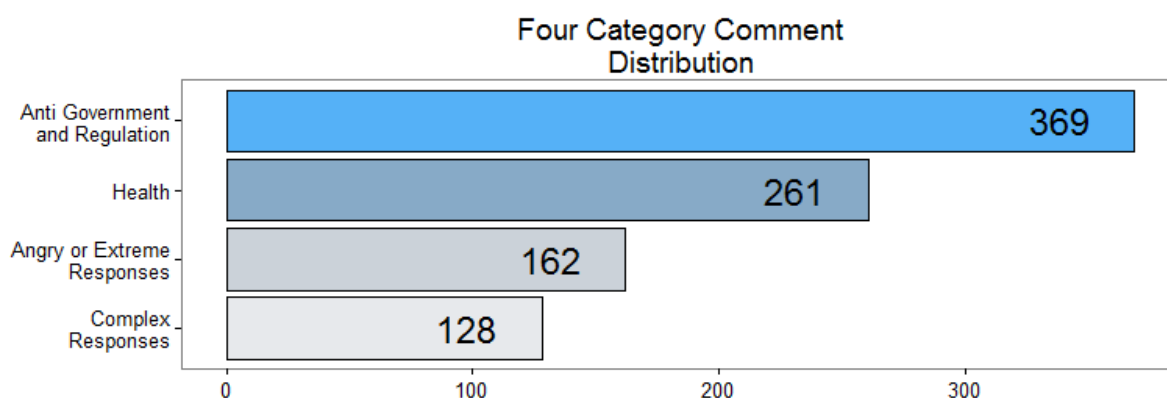


Although the number of original categories was in part chosen for how well the model identified distinct topics, some distinctions were too obscure and categories appeared to overlap. In response to the request to make categories that are more obviously distinct from each other, we used multiple steps.

We first tested the creation of a smaller number of categories using the same techniques. The four topic model actually provides less distinct categories than the original ten topic model. When we bring down the number of total possible topics, more broad word choice begins to dominate the model. Large groups of angry responses get grouped

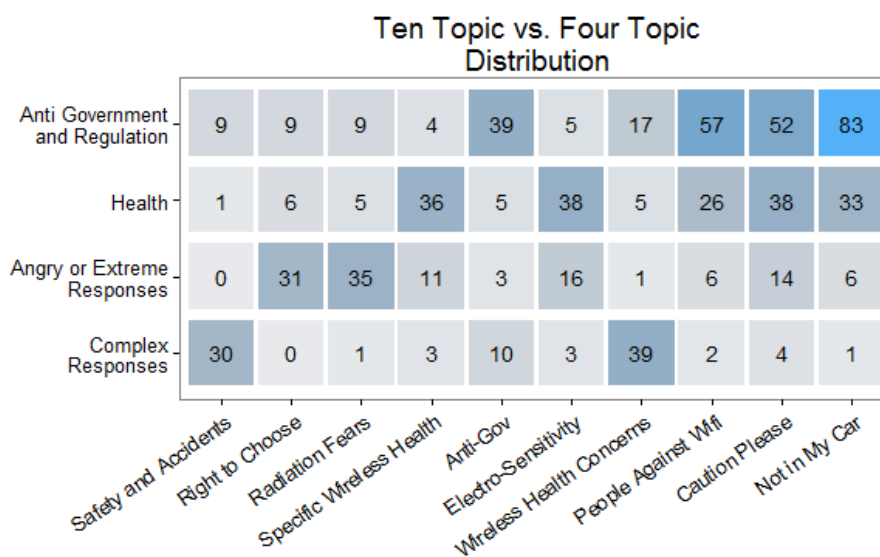
together because commenters used very similar language. Similarly, well thought out sophisticated responses are grouped together because of the similarity of word choice.

Figure A-2. Model 2 with Four Categories



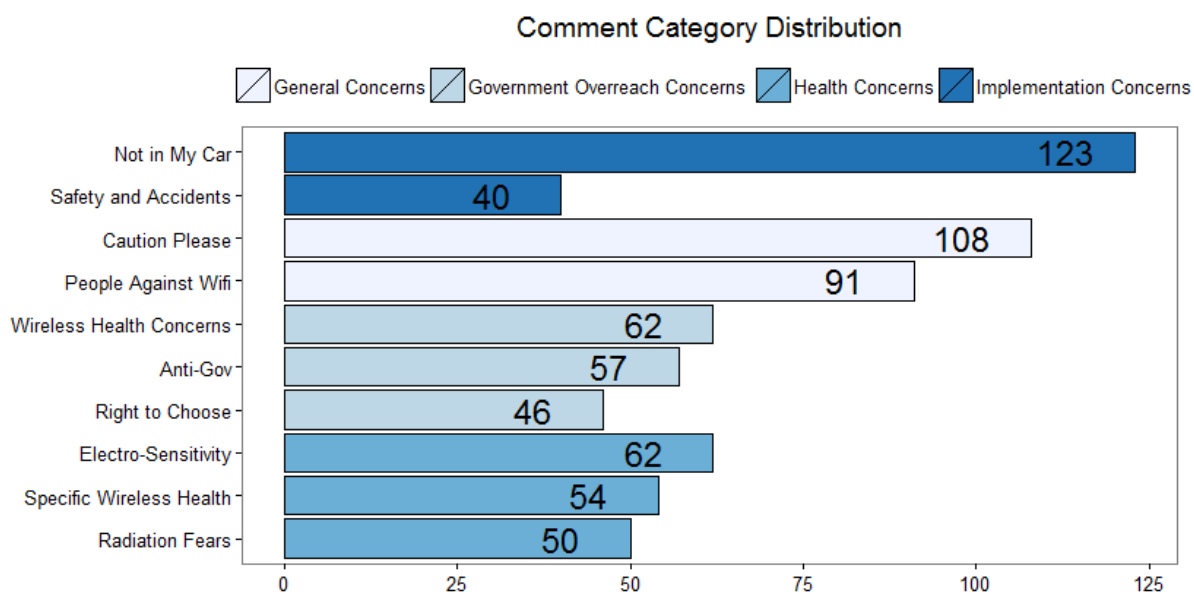
We can see in Figure A-3 that comments from the four-category model do not neatly contain the topics from the ten topic model. If anything, generating fewer categories makes the distinction between the topics less clear.

Figure A-3. Comparison of Content in Ten Topic vs. Four Topic Models



We secondly used an analytic clustering approach to combine the original ten categories into hierarchical groups that offer more separation. This resulted in four categories, each comprised of between 160 and 200 comments: Government Overreach Concerns, Health Concerns, Implementation Concerns, and General Concerns.

Figure A-4. Crossover Between Ten-Category Model and Final Four-Category Model



These final four categories are described below.

Commenters in this group focus on the fact that they feel the federal government is acting outside its purview if it mandates vehicle-to-vehicle communications. Different factors such as health or privacy are used as warrants for this mostly negative topic group.



“This V2V requirement is completely outside the authority of the Federal Government. Nowhere in the Constitution does it give the Federal Government the right to tell us what features our vehicles must have...”

“Although I understand the need for safety I do not feel that this is an issue that the government needs to be involved in. Being safe on the road should be a matter of personal responsibility. If the incentive isn't there to develop V2V technology that might indicate that it's not that great of an idea. Free markets are a pretty good way of determining what is and isn't a great idea...”

Health Concerns (n=166)

Commenters in this group feel that health is the primary reason to object to the proposed policy. These comments are focused on the impact on the human body. Some comments focus on specific health outcomes such as cancer while others focus on broadly stated dangers such as radiation.



“WHAT IS WRONG WITH YOU FOLKS?

Wireless MICROWAVE radiation is a Class

2B Possible Carcinogen as is Lead DDT and Chloroform. It hurts my head makes my eyes blurr and can even give me strange heart palpitations. ALSO< Electrom agnetic Radiation interferes with red blood cells rouleaux formation (see Dark Field microscope video here at <http://www.emfanalysis.com/blog/archives/11-2013>). EMR interferes with the electric fields of the heart...”

“We are already conducting a huge experiment on consumers with cell phones and ubiquitous wi-fi. This is a terrible idea! We need to step back and conduct some truly comprehensive studies on the effects all this EMR/EMF soup has at the cellular level. Please don't choose the path of expediency ... corporate America doesn't need another tobacco-like debacle.”

“I highly object to wireless technology in motor vehicles. There are more and more of us who suffer from electro-sensitivity and it is already hard to find safe places to be. Where are the laws to prevent individuals from being bombarded with these invisible frequencies that do affect the human body on a physical level??”

General Concerns (n=199)

Commenters in this group tend to write summary opinions about the proposed rule citing a variety of concerns. They may share some types of evidence with the other major categories but tend to be better written and are focused on reasoned argument. This category also includes all individuals who simply submitted supplementary documents as evidence.



"I have several concerns about this proposed regulation. The first is the same I have with most all proposed regulations. Namely it is the agency that proposes the regulation that determines if something is "reasonable." Be it an increase in cost privacy protection or whatnot. That's kinda biased don't you think? Why not ask consumers the people who have to live with it if it is reasonable - if you have adequately addressed the public's concerns?"

“This proposal while superficially well-intentioned if enacted will turn out to have been paving the road to hell with good intentions. This because earlier advice on necessary requirements has been ignored and/or misunderstood. Therefore I must dissent. The stated goals cannot be met and the projections are wishful thinking no more. It's either that or you are deliberately misleading in your proposal...”

“It would appear to me-that the V2V mandate is very costly-what about every time you come to a stop light-every car in line would be buzzing-every time you want to pass a car the V2V would be going off. My problem is the word MANDATE. For something new like this it should be an alternative add on if it is wanted by anyone as an extra to the price of the car. Would it automatically put on the brakes everytime you came up close to a car. Getting drunks off the road would save thousands more than any mandated V2V.I strongly oppose the mandated V2v become a regulation”

APPENDIX B. FOCUS GROUP SCREENER

Topic: Vehicle-to-Vehicle Crash Avoidance Safety Technology

Please use this language to terminate:

Thank you for your willingness to participate; however, based on our criteria, we will not need your help in this set of focus groups. Again, thank you, and have a good day.

INTRODUCTION

Good day. I hope you are doing well. My name is _____ and I am calling today from XXX to see if you are interested in participating in a focus group we are conducting for the

U.S. Department of Transportation. Participants will be talking about thoughts, feelings, and experiences using safety technology in cars. You do not need to have a car with safety technology to participate. However, we are looking for individuals who plan to buy or lease a car in the near future and meet a few other specific criteria. Would you mind answering a few questions to determine if you meet our criteria? All of the information you provide will remain private.

1. Are you a licensed driver?

- 01 Yes
- 02 No [TERMINATE]
- 03 REFUSED [TERMINATE]

2. Do you currently own or lease a passenger vehicle?

- 1 Yes – OWN
- 2 Yes – LEASE
- 3 No [TERMINATE]
- 4 REFUSED [TERMINATE]

3. Which of the following statements best represents your plans for purchasing or leasing your next vehicle for you or your family?

- 1 I plan to purchase or lease a new vehicle within the next 12 months. By new vehicle, I mean new model year vehicle, not used or previously owned.
- 2 I plan to purchase or lease a used vehicle within the next 12 months that is at least a 2010 model or newer.
- 3 I have no plans to purchase or lease a new vehicle or late-model used vehicle. [TERMINATE]

4. How soon do you plan to purchase or lease your next vehicle? [RECRUIT MIX]
- 1 I plan to purchase or lease a vehicle in the next 1 to 3 months
 - 2 I plan to purchase or lease a vehicle in the next 4 to 6 months
 - 3 I plan to purchase or lease a vehicle in the next 7 to 12 months
 - 4 I plan to purchase or lease a vehicle longer than 12 months from now.
[TERMINATE]
5. Thinking about your next vehicle purchase or lease, would you say you are the primary decision maker, have shared responsibility, or will someone else make the decision?
- 01 I am the primary decision maker
 - 02 I have shared responsibility with someone else
 - 03 I do not have any responsibility for vehicle purchasing decisions [TERMINATE]
6. Approximately how many miles do you drive your primary vehicle per week? [ENSURE BROAD MIX OF DRIVING DISTANCES IN EACH GROUP]
- 1 0 to 49 miles [LIMIT: MAX 2 PER GROUP]
 - 2 50 to 99 miles
 - 3 100 to 199 miles
 - 4 200 to 299 miles
 - 5 300 to 499 miles
 - 6 500 miles or more
7. Do you or a family member currently, or have you or a family member previously worked for any of the following?
- 01 The automotive industry [TERMINATE]
 - 02 A market research company or department [TERMINATE]
 - 03 A marketing company or department [TERMINATE]
 - 04 None of the above
 - 05 DON'T KNOW [TERMINATE]
8. What is your age? _____

[Recruit to the grid at top. Classify to closest category]

- 01 Under 20 [TERMINATE]
 - 02 20 to 24
 - 03 25 to 30
 - 04 40 to 44
 - 05 45 to 50
 - 06 60 to 64
 - 07 65 to 70
 - 08 REFUSED [TERMINATE]
9. [RECORD]
- 1 Male
 - 2 Female
10. Select one or more of the following that best describes your race? [ACCEPT MULTIPLE RESPONSES]
- 1 American Indian or Alaska Native
 - 2 Asian
 - 3 Black or African-American
 - 4 Native Hawaiian or other Pacific Islander
 - 5 White
11. Are you of Hispanic or Latino descent?
- 1 Yes
 - 2 No
12. Which ONE of the following best describes your total household income?
- 03 Under \$25,000
 - 04 \$25,000 to less than \$50,000
 - 05 \$50,000 to less than \$75,000
 - 06 \$75,000 to less than \$100,000
 - 07 \$100,000 to less than \$150,000
 - 08 \$150,000 to less than \$200,000
 - 09 \$200,000 or more

10 Unsure or Refused

13. What is the last grade you completed in school?

- 1 Some grade school (1-8)
- 2 Some high school (9-11)
- 3 High school graduate (12)
- 4 Technical or vocational school
- 5 Some College
- 6 College Graduate
- 7 Graduate or Professional School
- 8 Other

14. What are the makes and models of the vehicles you own?
[OPEN END]

15. Do any of your vehicles have the following features? [RECORD FOR EACH CAR]

- 1 On-board navigation or GPS
- 2 Wi-Fi
- 3 Integrated hands-free phone
- 4 Back-up camera/Rear-view cam
- 5 Connected roadside assistance (e.g. OnStar or Verizon Vehicle)
- 6 Self-parking
- 7 Front/rear end collision alarm warning
- 8 Lane changing warning system/blind spot warning system
- 9 Intersection movement assist (warnings about running a red light, running a stop sign, making unsafe left- or right-hand turns)

16. Which of the following statements best describes you? [RECRUIT A MIX]

- 1 I prefer to be the first to buy and try new technologies
- 2 I prefer to wait until new product hype has calmed before I purchase and try new technologies

- 3 I prefer to wait until new technologies have been thoroughly tested and reviewed, and others I know have purchased and used new technologies before I purchase
- 4 None of the above

INVITATION

Thank you very much for your time. You are a perfect candidate for this focus group. Each focus group will be approximately 90 minutes long, and will be held on <date/time> at <location>. You will be compensated \$75 for your time plus parking, and light refreshments will also be available. Also, so you are aware, the focus group session will be audio recorded to ensure accuracy. However, your participation and everything you say during the discussion will be kept private.

Would you be willing to participate in our focus group? *If yes, continue to Reminder Email/Phone Call. If no, go to End of Call.*

REMINDER EMAIL/PHONE CALL

We will provide you a reminder two to three days in advance of the focus group, which will include the address of the facility, directions, and the day and time. Would you prefer we call you or send you an email with this information? *Email:* Would you please provide me your email address so I can send you the information? *Phone:* Is this the best number to reach you at or would you prefer we call a different number? What is that number?

END OF CALL

Thank you very much for your time. Have a great day.

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APPENDIX C. FOCUS GROUP MODERATOR'S GUIDE

V2V Crash Avoidance Safety Technology Review Focus Groups

Introduction: Hello. My name is _____ and I am the moderator for today's group discussion. The purpose of this discussion is to gain insight into your opinions and perceptions of a safety technology in cars, vans, and pickup trucks. This session should take approximately 90 minutes.

Moderator Info: I work for Booz Allen Hamilton, a consulting firm located in McLean, VA. I am working on this project as a representative for the Department of Transportation, National Highway Traffic Safety Administration. I am here with my colleague name, etc.

Disclosure: This session is being audio recorded so that we capture your opinions and reactions as best as possible. Also, our colleagues from the Department of Transportation are watching this live feed through the Video Camera (everyone give a little wave). The video feed is for the sole use of the Department of Transportation so that they can see and hear your reactions to the technology we will be reviewing and will not be shared with anyone outside of the research team. Additionally, nothing will be sold and you will not be contacted later without your permission. Your responses are anonymous and private; we will not be using your name in any report.

For more information, please see the Informed Consent form that we distributed earlier, and if you agree, please sign it to indicate your willingness to participate. Remember, your participation is voluntary—if you do not feel comfortable at any point in the study, you are free to leave.

Acknowledgement: I want to thank all of you for taking the time today to participate in this discussion and I look forward to hearing all of your feedback.

Agenda: First, let me tell you a little about what we will be doing today. We will ask some questions on your current awareness and familiarity with vehicle safety technology. We will then watch a short video that will provide a quick overview of new technology we would like to discuss today.

Logistics (point out bathrooms): At any time, please feel free to excuse yourself to go to the restroom. I just ask that only one person be up or out of the room at one time.

Guidelines: In order to make this research session as effective as possible there are a few guidelines:

1. Please talk one at a time.
2. Talk in a voice as loud as mine.
3. Avoid side conversations with your neighbors.
4. Work for equal "air time" so that no one talks too little or too much.

5. Allow for different points of view. There are no right or wrong answers.
6. Say what you believe, whether or not anyone else agrees with you.
7. Only one person up or out of the room at one time.
8. At times, in order to make the conversation move along, I may have to interrupt you.

Time Check: 5 minutes

[Moderator turns on video feed and audio recorder]

Ice breaker: So that we can get to know each other a little, I'd like to go around and have everyone say their name, the type of car they are looking to buy or lease, and the main reason for your decision.

A. Current Awareness/Perceptions/Knowledge of V2V [20 minutes]

1. What type of safety technology do you currently have in your car? Do you use it?

[Moderator shows "Connected Vehicles" on a flip chart]

2. What comes to mind when you think of "Connected Vehicles"?

Probes:

- What are some examples of "Connected Vehicle" technology?
- Have you used or heard of any applications for increasing safety?

[Moderator flips page to "Vehicle-to-Vehicle"]

3. What comes to mind when you think about Vehicle to Vehicle or V2V technology?

Prompt:

- a. What do you think that technology would entail from just hearing the name?

Probe:

- b. Do you think it's the same as "Connected Vehicles"? If not, how is it different?

B. Review of Materials [10 minutes] (allow for replay if needed by participants)

[Moderator plays video]

Time Check: 30-35 minutes

C. Feedback Collection (Questions) [60 minutes]

Understanding of V2V after viewing video:

1. After watching the video, what do you think is the main function of V2V technology?

Probe:

- a. What will it not do?

2. If you were to describe the technology to a friend, how would you say it worked?

Probe:

- b. Do you see the technology behind V2V communication as being the same or different as the technology for other Connected Vehicle technology? How so?

3. What would be a good name for this technology if you think V2V didn't do a good job describing it?

[Moderator uses flipchart for instructions]

I want you to write down on the paper in front of you a number from 1 to 10, where 10 would mean that you would absolutely want this technology in your car and 1 means that you absolutely would not want it in your car.

Then write down 1 or 2 things to explain why you rated it as you did.

Next write down any questions you have that were not answered on that video.

[Moderator asks each person for rank, factors and questions, and proceeds with questions as they are brought up or if they are not covered in the conversation]

4. What benefits do you think V2V technology will provide?

[Prompt if not mentioned]

- a. Safety
- b. Reduced costs related to collisions
- c. Reduced congestion related to accidents

Probes:

- a. Are these important to you?

5. Do you think there would be any downsides or problems from V2V technology?

[Prompt if not mentioned]

- a. Increased driver inattentiveness
- b. Distractions
- c. Costs
 - i. What type of costs do you imagine would be associated with this technology? How do you feel about that?
 - ii. What would be an acceptable cost to you to pay for this technology installed in a new car?
 - iii. What would you be willing to pay for a plug-in device for an existing car so that it can have V2V features?
- d. Health concerns
- e. Privacy concerns or security concerns
 - i. Have you ever been concerned about privacy/security and technology?
 - i. Do you have concerns about the vulnerability of technology to be infiltrated by others?
 - ii. If so, what measures do you take to avoid this?
 - iii. What kind of security features in a car would give you peace of mind to avoid those potential situations?
 - ii. How much of a concern is V2V technology for privacy compared to cell phones, social media, online purchases, etc.?
 - i. Do you view the technology as similar or different from these types of interactions?

Probes:

- a. How important is this to you? Would it prevent you from getting a car with V2V technology?
- b. What would have to change so that this isn't a problem? Or what would you need to hear or see to be convinced this is not a problem?

[If not mentioned] Here's something to consider: the benefits of this technology can only be used if all or at least most of the cars on the road are equipped with V2V so that they can signal to each other.

6. If we know that V2V will save lives, should it be made standard, like seat belts and smoke detectors? Why or why not?

Prompt:

- a. Studies estimate that if we just left it up to people to decide for themselves to purchase and install the V2V technology, each year thousands of crashes and hundreds of deaths will have occurred that could have been avoided if V2V was in most of the cars.
7. Now that we have talked more about V2V and answered some of your questions, I'm going to ask you to rank again on the bottom of your page how likely you are to want V2V technology in your next car. Write down the top three reasons for your ranking.

Probes:

- a. Why do think the rank for V2V did/did not change? Was there any one factor, or was there a combination of things we talked about that led to this rank?
8. Channels of Information: If you had questions about V2V technology, where would you go looking for information?

Prompts:

- a. If you were to Google this, how do you decide if it's a reliable source?
 - b. What other sites would you visit on the Internet? (Blue Book, Edmunds, etc.)
 - c. Do you trust the car dealership for providing reliable information?
 - d. Do you trust the US Government? Have you heard about the National Highway Traffic Safety Administration? (responsible recalls, 5-Star Safety Ratings)
 - e. If information were to come from AAA, do you consider this a reliable source?
9. How do you prefer to get information on technology? For example, would you prefer to read a fact sheet or article? Or do you prefer learning about technology like this through videos, or both?

Time Check: 1 hr. 50 minutes

False Close: I am going to check with my colleagues to see if they have any further questions. While I do this, I want you to think about this question:

What is the most important thing the Department of Transportation should do about V2V technology?

Closure:

As our session draws to a close, I want to thank you for your comments and for taking the time out of your day to participate. I have learned some valuable information. As I said at the beginning, all of your responses will remain private with the Department of Transportation.

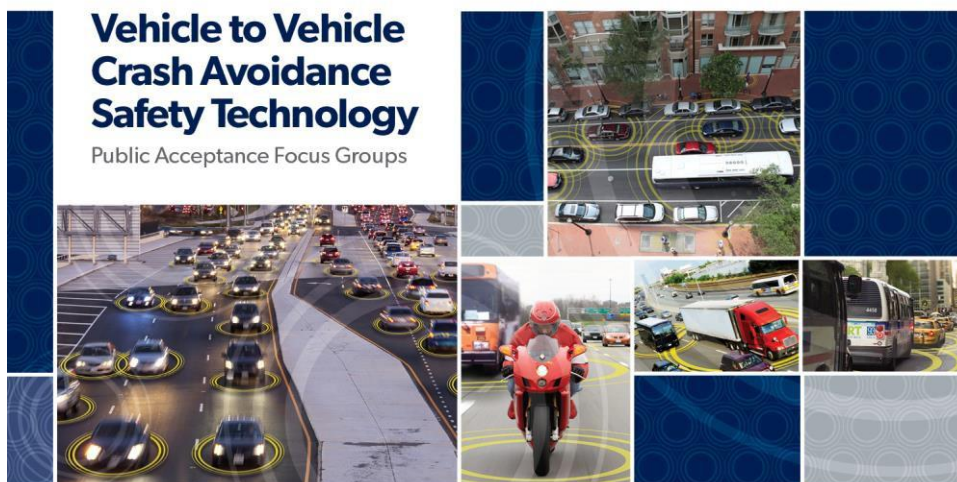
I hope you all have a wonderful rest of your day. Thank you again.

APPENDIX D. FOCUS GROUP TOPLINE PRESENTATION DECK

Source for All Vehicle Images: USDOT

Source for All Focus Group Related Images: Booz Allen Hamilton, 2015

Source for All Survey-Related Images: Ipsos, 2015



April 29, 2015

This document is confidential and is intended



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Our proposed agenda includes:



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Background

- Booz Allen conducted 12 focus groups in three cities to understand public perception of Vehicle to Vehicle (V2V) communication
- Small-sized focus groups and triads were conducted to provide qualitative information and inform development of a national survey which will assess public acceptance of V2V technology; the sessions also provided information helpful to future V2V outreach and communications
- A brief informational video was developed for viewing by focus group participants; the video explained features of common V2V applications and Dedicated Short-Range Communication
- A semi-structured focus group moderator guide was used in the sessions to elicit comments from participants on topics of concern
- The following report outlines key findings from the focus groups and provides additional recommendations for consideration



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METHODOLOGY



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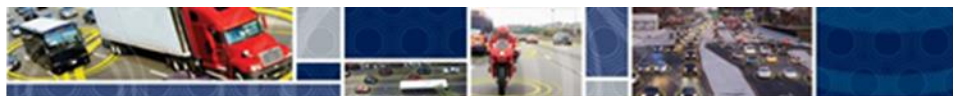


12 focus groups were held in 3 regions of the country.



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Our 63 participants came from a variety of backgrounds.

City	Group 1	Group 2	Group 3	Group 4
Charlottesville, VA	Women 40 – 50 Total = 6	Men 20 – 30 Total = 7	Women 40 – 50 Total = 5	Men 20 – 30 Total = 3
Omaha, NE	Men 40 – 50 Total = 6	Women 60 – 70 Total = 5	Men 60 – 70 Total = 4	Women 20 – 30 Total = 4
Seattle, WA	Men 60 – 70 Total = 6	Women 60 – 70 Total = 5	Women 20 – 30 Total = 7	Men 40 – 50 Total = 5

- Total number of participants = 63 (Male: 31; Female: 32)
- Participants were selected based on screening questions including intent on buying a car, age, race, income level, education, and additional demographics.




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The following themes were explored during the focus groups.

- Understanding of Terms – Connected Vehicles and Vehicle-to-Vehicle (before and following informational video)
- Benefits / Concerns of V2V technology
- Deeper probing of issues both prompted and unprompted:
 - Driver Attentiveness
 - Distractions
 - Health Concerns
 - Privacy / Security
 - Regulation
 - Costs
 - Liability / Legal Issues
- Alternative Names to V2V
- Trusted Sources of Information
- Preferred Information Formats

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OBSERVATIONS



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**The majority of participants had not heard the terms
“Connected Vehicles” or “Vehicle-to-Vehicle / V2V.”**

Initial thoughts

Connected Vehicles

- Cars connected to the Internet
- Cars sharing traffic information
- People communicating with each other in a “family or friends” network
- Cars physically connected to each other

Vehicle-to-Vehicle

- Cars “talking” to cars to share information:
 - Road conditions
 - Traffic
 - Socializing
- Cars equipped with sensors



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Understanding of Terms - Notable Quotes

• Connected Vehicles

- “See I am kind of suspicious. It’s like Big Brother, kind of...if they, not for any nefarious reasons, but if it’s being **tracked** or something like an **OnStar** where you are connected in that way, to the dealership or whomever.” Charlottesville (VW 40 -50)
- “I thought I heard about technology where they are going to have basically cars like in a sense **talking to other cars, as a way to how close they are getting** or if there is a technology between them.” Omaha (M 40 – 50)
- “Maybe that **communicates with other vehicles that have the same technology** or something like that.” Seattle (VW 20 -30)

• Vehicle-to-Vehicle

- “Almost sounds like the old **walkie-talkie** things where **one vehicle can talk to the other**” Omaha (VW 60 – 70)
- “It just sounds **too vague**, there is nothing descriptive about that, vehicle to vehicle, what, I just don’t know.” Seattle (M 40 – 50)
- “Well one can be more of a **central control**, like the connected vehicles, and the vehicle-to-vehicle would be **distributed control**, like there is no central box.” Seattle (VW 60 – 70)



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A brief video (2 ½ minutes) provided an overview of V2V technology, some common applications, and a description of DSRC.

- ▶ The content and tone were informational, not persuasive
- ▶ All participants demonstrated a better understanding of V2V functions after watching the video and were able to recall specific information
- ▶ Two commonly asked questions: would this technology apply to bicycles and stationary cars (as seen in the video)?
- ▶ The same video will be required viewing for survey participants before they answer questions



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After watching the informational video the majority cited “safety” and “accident prevention” as the main benefits.

Benefits mentioned after viewing the video:

- Reduction in accidents, especially small fender benders
- Blind spot warning
- Forward collision warning
- Weather/road condition notifications
- Beneficial for motorcycles, trucks, bicycles and pedestrians to be similarly equipped



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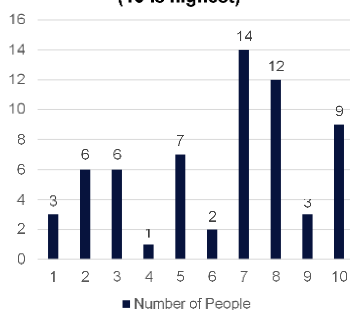
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Participants ranked their interest in having V2V. Response was mostly positive, but rankings often trended downwards following discussion.

- On a scale of 1 to 10, the majority of participants rated it five (5) or higher
- Following more in-depth discussion, some participants changed their desire to adopt this technology:
 - Those who decreased their rating claimed to do so because of the lack of current evidence and research that this is effective and/or because other health/safety/privacy concerns they had not considered were addressed during the focus group
 - Very few (~ 7) people increased their rating after the focus group conversation

How much would you want V2V technology in your next car? (10 is highest)



■ Number of People

Average = 6.26

Median = 7

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The need for universal installation / use in order for V2V to be effective was a major concern among all groups.

Other concerns that were mentioned without prompting:

- The potential for over-reliance on V2V decreasing drivers' attentiveness
- The potential for the V2V warnings to be annoying, distracting, and/or too sensitive
- An interest in wanting to control (or manage) the alert system
- Liability and related potential effects on insurance



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Participants recognized that optimum safety benefits were contingent upon the technology being universally installed and used.

- The need for all vehicles to be equipped with V2V in order for the technology to be effective was mentioned without prompting in all groups
 - Participants were concerned that if every car was not equipped with this technology, more accidents could potentially occur due to over-reliance on the alerts
- "It only works if there is another car with the same technology so if you're driving around and no one else had it, it would be worthless... in a sense it would be great if everyone had it" Omaha (W 20 – 30)



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With more discussion, participants cited the themes below as reasons their safety may be *compromised* with the use of V2V.

- **Potential for Over-reliance/Inattentiveness:** “For me sometimes if I rely on my technology too much then I don’t pay enough attention to the things I should. I need to be focused on the road.” Omaha (W 20-30)”
- **Alert Frequency/Sensitivity:** “I’d want to test drive because I’d want to check the annoying factor – how many times does it beep... I would start to ignore it” Seattle (M 40 – 50)
- **Distractions:** “It’s distracting and I think that...processing the warning is going to take longer.” Charlottesville (W 40– 50)



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Safety – Notable Quotes

- Discussion around safety as a priority for next vehicle purchase:
 - “I mean the structural construct of the car should already be good”
 - Yeah I’m also making the assumption that many cars now would all have that safety” Charlottesville (M 20 – 30)
- “But the benefit of this also, in a way it keeps the driver, even though he has this product, I think more aware of his surroundings and also his driving skills that wow, this is telling me this, I need to react or do something.” Seattle (W 60 – 70)
- “It would almost encourage a different way to learn to drive. I mean if kids, and let’s face it they’re the ones that embrace every new thing that comes down the pipe, they will be loving this. But it’s almost like you are going to have to learn to drive with all this technology in mind ...” Omaha (W 60 – 70)



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The majority of participants ultimately believed that privacy was not of much concern compared to cell phone and internet use.

- Most people believed that V2V technology could track people and be used by government, criminals, and law enforcement (to issue traffic and speed violations)
 - “I had noted data privacy. Data that’s collected is stored somewhere, government or not, I would just have the question, ‘How’s it stored? Is it stored? How long is it stored?’” Charlottesville (W 40 – 50)
- Many accepted lack of privacy and felt they would not be affected if V2V were used for tracking
 - “Someone will hack it. But I also go back to the point of the NSA listening to my phone calls - I’m not doing anything wrong so it doesn’t hurt me so I don’t care.” Omaha (M 40 – 50)
 - “I mean you are tracking millions of people, I wouldn’t be too concerned about it for myself.” Omaha (M 40 – 50)



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Security concerns were voiced in some groups, but not by the majority.

- “If somebody were to hack it, it could make it appear like the 50 cars around you were all going coo coo crazy, which would make you think oh my gosh everyone’s driving off the road and what’s going on?” Charlottesville (V 40 – 50)
- “What are they going to do if somehow I am being hacked in the vehicle and somehow it turns off and they have full control of the vehicle. Could vehicles be driven who knows where into what?” Omaha (M 40 – 50)
- “I don’t know if they [terrorists] would get very far with that as opposed to getting an airplane loaded with dynamite and fly it into someplace”. Omaha (M 60 – 70)



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There were mixed opinions on the government mandating the technology for vehicles.

- Regulation was more acceptable among:
 - 20 to 30 year olds
 - Participants living farther from the Beltway
 - Those who discussed V2V as becoming "standard" rather than "regulated"
- "I'm sorry I'm one of these kind of people that think the government is just trying to take over our lives too much" Omaha (W 60 – 70)
- "My biggest problem was that it's government installed. I really don't trust the government to really do well." Charlottesville (W 40 – 50)
- "I honestly, I wouldn't have a problem with that [government regulating V2V installation]" Charlottesville (M 20 – 30)
- "The government has a right to improve safety, has a duty to improve safety conditions for its citizens and if this technology improves it they should mandate it and have no concern about privacy." Seattle (M 60-70)



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The amount for which participants would be willing to pay for this technology varied from \$0 to \$2,000.

- The most common range was \$100 - \$1,000
- Those most willing to pay for the technology were:
 - Women
 - Older participants
 - Those who had experienced a car accident
- Several participants stated they would be less willing to pay for this if all cars do not have it or if it did not come standard in all cars
- Most participants assumed that, in a new car, this would be part of a package of features (e.g. including Bluetooth)
- Several participants suggested that the government provide funds to upgrade older vehicles, similar to the upgrade from standard definition to high definition television
- Several people also suggested that this might be a subscription service similar to Sirius/XM radio



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Cost - Notable Quotes

- "It really depends on how much it costs. If someone was like, you need to have this in your car and by the way it costs \$5,000, *I'd be pretty upset with that.*" Seattle (M 40 – 50)
- "I think *benefits outweigh costs* here... in comparison to even minor accident costs" Charlottesville (M 20 – 30)
- "If this was an 'upgrade' I would not choose this – I *would want leather seats before this*" Charlottesville (W 40 – 50)
- "I would think it would be a lot less - I mean *a computer isn't even \$1,000* and this shouldn't take much more technology than that " Omaha (W 60 – 70)



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Liability and the support (or non-support) of insurance companies were raised as key concerns.

- Most participants assumed that their insurance rates might go down if they have this technology in their vehicle and that the support of insurance companies would be important as they "have skin in the game."

Comments included:

- "If you *got in an accident* and you were relying on or using that technology to prevent an accident and it happened, *whose fault is that?* Is it *your fault or the companies fault?*" Seattle (M 40 – 50)
- "It would only take one instance of a kink like that to where the *lawsuits could be huge...* and bye bye company, I mean *no more of these things on the road.*" Charlottesville (W 40 – 50)
- "I am just *very concerned about the issues of liability* and how that might dramatically change things" Seattle (W 20 – 30)



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With few exceptions, health concerns were only addressed after prompting by the moderator.

- Many said they did not consider health an issue with V2V technology
 - “I hear people say that stuff all the time and half the time it’s unfounded. I think people try to connect other things and try to find the bad in things.” Omaha (M 40-50)
 - “Aren’t those people [“electro-sensitive”] called hypochondriacs”? Seattle (W 20 – 30)
- Some acknowledged that there may be a very small “electro-sensitive” population, but their sensitivity should not prevent use of V2V if the majority would benefit
 - “For that small number of people...I guess if they can get a note from their doctor [to disable the technology]” Seattle (W 60 – 70)
- A common sentiment was that extensive research should be conducted prior to release of this technology to assure drivers health would not be at risk
 - “Well I’m assuming the technology is going to be health tested and that it’s safe before it’s actually installed. They aren’t going to run amuck and install something that’s not been proven healthy.” Seattle (M 50 60 – 70)



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Suggested alternate names were provided by the participants.

- | | |
|---------------------|------------------------------------|
| • 360 Awareness | • Total Awareness |
| • Aura | • Vehicle Awareness Safety System |
| • Auto Alert | • Vehicle Awareness System |
| • Certified Driving | • Vehicle Perimeter Safety |
| • Insight | • Vehicle Positioning System (VPS) |
| • Secured Driving | • V2V Communications |
| • Safe Drive | |
- Some people recommended keeping V2V
 - Two women (20 – 30) specifically mentioned that “V2V” sounds better than “Vehicle-to-Vehicle”
 - Participants agreed that “Connected Vehicles” sounded as though it would encompass more than what V2V offers (e.g., wifi connection, etc.)



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Third-party endorsements were the most commonly trusted source of information, particularly if they knew the person.

Sources of Information

- Family and friends
- Consumer Reports
- Insurance companies
- Internet user ratings
- DMV (physical locations & mailers w/tag renewals)
- CNET
- You Tube
- Motor Trends magazine
- Auto Week magazine
- Hot Rod magazine
- Manufacturer blogs
- Car shows
- News sites
- Popular Science Magazine

Preferred Formats

- Online
- Short Videos
- Demonstrations
- Articles w/Statistics
- Visuals w/Text
- TV Ads

Blue = Multiple Mentions



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RECOMMENDATIONS



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To address some of the concerns participants made the following recommendations:

- **On/Off Control:** Participants felt this would address their concerns about the technology not being installed in all vehicles or unnecessary alerts when in congested areas
- **Alert Customization:** Many participants (particularly women) wanted the ability to customize the format of alert (e.g., select from voice/vibration/visual alert)
- **Research Findings:** The majority of participants said their concerns could be lessened with quantifiable evidence of the effectiveness of having technology installed in vehicles
- **Trial Period:** They would prefer to have a 30-day trial before investing in the technology



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The USDOT will need to carefully consider its communications strategy.

- A key takeaway from focus group research was given the opportunity to discuss, in-depth, the benefits and concerns of V2V participants wanted more information before making an investment decision
- NHTSA may want to carefully consider who is the source of information
 - NHTSA was not a widely recognized organization
 - Government distrust differed by region and age group
- A variety of formats should be considered
 - Video was the most popular one suggested
 - Outreach should ideally include proven statistics
 - Take advantage of the upcoming Connected Vehicle Pilots



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NEXT STEPS



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Our next step is to move from qualitative Research to quantitative research.

QUALITATIVE

- Concerns over privacy
- Concerns about driver distraction

Follow up on questions and concerns:

- Liability if there's an accident
- Impact on insurance rates
- Concern over "zombie drivers"

QUANTITATIVE

- X% of respondents are concerned about privacy.
- Driver distraction was rated as a [major/moderate/minor] concern, on average




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The following is an overview of the survey phase.




Target Sample

- N = 1,000 US licensed drivers
- Matched to U.S. driver population
- Gender
- Age
- Race/Ethnicity

Ipsos i-Say panel


- Over 800,000 panelists
- Panelists are identifiable by

Age
Urbanicity
Location




Static
(Desktop PC & laptops)

Education
Other demographics



Mobile
(smartphones, tablets)



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The following themes have been identified for quantitative research.

PRIMARY THEMES

- Confirmation that the respondents viewed/read the educational materials and understood the content
- Benefits and desirability of V2V technology
- Potential benefits of V2V technology
- Potential barriers to V2V acceptance
- Demographic information

SECONDARY THEMES

- Knowledge, beliefs, behaviors associated with digital technology and connectivity
- Decision-making factors
- Preferences regarding V2V technology offerings
- Communications preferences



The final report will provide a comprehensive review of findings both qualitative and quantitative.

- Major sections to include background, methods, findings, and limitations

Findings to address:

- Consumers' impressions of V2V after viewing informational materials
- Barriers (perceived or actual) that may affect consumers' use of V2V
- Drivers or motivators to using V2V
- Messaging and outreach strategies
- Subgroups of drivers that may require different messages/ communication channels to speed adoption of V2V



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APPENDIX E. SURVEY INSTRUMENT

V2V Safety Technology Survey

Version 5, Revised August 28, 2015

[PLACE NEXT STATEMENT BEFORE ANY DEMO QUESTIONS]

Please DO NOT continue with the survey if you are operating a vehicle. You may return to the survey at a later time.

INTRODUCTION

Thank you for participating in this survey! Your input is extremely valuable to us. We are conducting a research study on behalf of the U.S. National Highway Traffic Safety Administration to gain a better understanding of consumers' opinions about transportation issues.

The survey involves watching and answering questions about a brief video as well as general questions about transportation safety technology.

Your answers are private and confidential. No one will ever be able to connect your name with these answers.

This study will take about 20 minutes to complete and we ask that you complete the survey in one sitting (without taking any breaks) to avoid distractions.

[PROG: TERMINATION LANGUAGE: THANK YOU FOR YOUR INTEREST IN PARTICIPATING IN THIS SURVEY. EITHER WE RECEIVED ALL THE RESPONSES NEEDED OR YOU DO NOT MEET THE ELIGIBILITY REQUIREMENTS OF THE SURVEY.]

SECTION A. SCREENING

QS1. Which of the following statements best describes you:

- a. I currently have a U.S. driver license and I use public transportation at least once a month.
- b. I currently have a U.S. driver license and I **do not** use public transportation at least once a month.
- c. I **do not** have a U.S. driver license and I use public transportation at least once a month. [TERMINATE]
- d. I **do not** have a U.S. driver license and I **do not** use public transportation at least once a month. [TERMINATE]

SECTION B. INSTRUCTIONAL VIDEO AND VALIDATION

Please watch this video, which is less than three minutes in length. Please make sure that sound is enabled on your device. There will be questions related to the video after you have finished viewing.

[PLAY VIDEO. ALLOW REPLAY. Note that the following message will appear as the video is loading "Please be patient while the video is loading, it will take only a minute."]

Q1. Were you able to see and hear the video?

Yes

No [TERMINATE]

Q2. What technology was discussed in the video you just watched?

[RANDOMIZE RESPONSE OPTIONS]

- a. A communication system among vehicles
- b. A voice control system for in-vehicle features such as radio, temperature control, etc. [TERMINATE]
- c. A new braking technology [TERMINATE]
- d. A fuel-saving engine design [TERMINATE]

The next series of questions are about your opinions on Vehicle-to-Vehicle technology, or "V2V". Please base your responses on the information presented in the video.

SECTION C. DESIRABILITY OF V2V TECHNOLOGY

1	2	3	4	5
Not at all interested				Very interested

Q3. If this technology was widely used and made available at low cost, how interested are you in having V2V technology in your next car?

SECTION D. OPEN-ENDED QUERIES OF BENEFITS AND BARRIERS

- Q4. In your opinion, what are some potential benefits of V2V technology? Please use a separate line for each benefit. Please write “No benefits” if you do not think there are any potential benefits.

[OPEN-ENDED RESPONSES WILL BE CODED. INCLUDE 12 SEPARATE ENTRY LINES. ALLOW UP TO 400 WORDS PER LINE. PROMPT WITH “PLEASE ENTER A RESPONSE” IF NO RESPONSE.]

- Q5. In your opinion, what are some potential problems with using V2V technology? Please use a separate line for each problem. Please write “No problems” if you do not think there are any potential problems.

[OPEN-ENDED RESPONSES WILL BE CODED. INCLUDE 12 SEPARATE ENTRY LINES. ALLOW UP TO 400 WORDS PER LINE. PROMPT WITH “PLEASE ENTER A RESPONSE” IF NO RESPONSE.]

[RANDOMIZE ORDER OF SECTIONS E AND F. RANDOMIZE ORDER OF QUESTIONS WITHIN SECTION.]

SECTION E. RATING OF POTENTIAL BENEFITS

The items on the next page include possible benefits of using V2V technology.

Please tell us whether you think the situations described would result from using V2V technology. Assume that the system is widely used and available at a low cost.

[NEXT PAGE. PLACE Q6-Q10 IN A GRID.]

Please rate your agreement or disagreement with the following statements.

1	2	3	4	5
Strongly Disagree				Strongly Agree

[RANDOMIZE.]

- Q6. I believe that V2V technology would help make driving more convenient and efficient for drivers in general, by reducing the number of accidents.
- Q7. I believe that V2V technology would help make driving more convenient and efficient for me by reducing the number of accidents.
- Q8. I believe that V2V technology would lower the number of car accidents (and associated injuries and fatalities) among drivers in general.
- Q9. I believe that V2V technology would make me safer.
- Q10. I believe that insurance companies would lower rates for drivers using V2V technology.

Q11. How **important** would these potential benefits of V2V be to you if you were to consider purchasing a vehicle that included V2V technology? Assume that the system is widely used.

[RANDOMIZE]

1	2	3	4	5
Not at All Important				Very Important

- Participating in the system would make driving more convenient and efficient **for drivers in general.**
- Participating in the system would make driving more convenient and efficient **for me.**
- Participating in the system would make driving safer **for drivers in general.**
- Participating in the system would make driving safer **for me.**
- My insurance rates may be reduced if I use the system.

SECTION F. RATING OF POTENTIAL BARRIERS

The items on the next page include possible issues with using V2V technology.

Please tell us whether you think the situations described would result from using V2V technology. Assume that the system is widely used and available at a low cost.

[NEXT PAGE. PLACE Q12-Q18 IN A GRID. RANDOMIZE.]

Please rate your agreement or disagreement with the following statements.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Q12. I believe that **I** may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.

Q13. I believe that **I** may rely too much on V2V technology for safety, and not apply safe driving practices as much as I should (e.g., maintain a safe distance from other vehicles).

Q14. I believe that **other drivers** may be less attentive while driving, due to over-reliance on V2V technology or distractions from the alerts.

Q15. I believe that **other drivers** may rely too much on V2V technology for safety, and not apply safe driving practices as much as they should (e.g., maintain a safe distance from other vehicles).

- Q16. I believe that security breaches and “hacking” of V2V technology would occur.
- Q17. I believe that electromagnetic activity from communication devices such as those used in V2V pose a health risk to drivers.
- Q18. I believe that too few drivers would participate in the system for V2V to be useful (V2V technology depends on a network of drivers, so a minimum number of drivers must use it in order for the system to be useful).
- Q19. How important would these potential challenges of V2V be to you if you were to consider purchasing a vehicle that included V2V technology? [RANDOMIZE.]

1	2	3	4	5
Not at All Important				Very Important

- I may be less attentive while driving due to over-reliance on V2V technology or distractions from the alerts.
- I may rely too much on V2V technology for safety and not apply safe driving practices as much as I should.
- Other drivers** may be less attentive due to over-reliance on V2V technology or distractions from the alerts.
- Other drivers** may rely too much on V2V technology for safety and not apply safe driving practices as much as they should.
- The technology is susceptible to security breaches and “hacking”.
- Electromagnetic activity from the system poses a health risk.-
- Not enough drivers will use the system for it to be useful.

[PLACE Q20 AND Q21 IN A GRID.]

Please indicate whether you agree with the following statements:

1	2	3	4	5
Strongly Disagree				Strongly Agree

SECTION F2. ITEMS THAT COULD BE CONSIDERED BENEFITS OR BARRIERS

[RANDOMIZE.]

- Q20. I believe that law enforcement agencies would use V2V technology to identify illegal or illicit activity, such as speeding, running through stop signs, etc.

Q21. I believe that the government would use V2V technology to track drivers' locations and activities.

Q22. Please state whether you agree or disagree with the following statements.

[RANDOMIZE.]

- a. I believe that law enforcement agencies **should use** V2V technology to identify illegal activity in order make drivers safer.
- b. I believe that the government **should use** V2V technology to track drivers' locations and activities in order to make drivers safer.

1	2	3	4	5
Strongly Disagree				Strongly Agree

Q23. How important would these factors be to you if you were to consider purchasing such a system? Assume that the system would be available at a low cost.

[RANDOMIZE.]

- a. The use of V2V technology by law enforcement agencies to identify illegal behavior.
- b. The use of V2V technology by the government to track drivers' locations and activities.

1	2	3	4	5
Not at All Important				Very Important

SECTION G. PREFERENCES REGARDING V2V OFFERINGS

Q24. What is the *most* you would be willing to pay for V2V technology if it were available to purchase today?

[DROP-DOWN SELECTION]

- a. I would not pay for V2V technology.
- b. \$1-\$100
- c. \$101-\$200
- d. \$201-\$400
- e. \$401-\$600
- f. \$601-\$800
- g. \$801-\$1000
- h. \$1,001-\$1,500
- i. \$1,501-\$2,000
- j. More than \$2,000

[ALLOW PARTICIPANTS TO CONTINUE EVEN IF Q25 IS NOT COMPLETE.]

Q25. We're interested in your opinion about what we might call Vehicle-to-Vehicle technology, other than "V2V technology". Of the following possible names for V2V, which are your favorites?

Please select up to three (3) names.

[MULTI-SELECT OF **UP TO** THREE ITEMS. RANDOMIZE OPTIONS]

- a. 360 Awareness
- b. Auto Alert
- c. Certified Driving
- d. Secured Driving
- e. Total Awareness
- f. Vehicle Awareness Safety System
- g. Vehicle Awareness System
- h. Vehicle Perimeter Safety
- i. Vehicle Positioning System (VPS)
- j. V2V Communications
- k. Connected Vehicles

Q26. Which of the following actions best describes what you would do if V2V were included in a car you purchased? Please select only one option.

[SINGLE SELECT. DO NOT RANDOMIZE]

- a. I would use the technology.
- b. I would ignore the technology but leave it on.
- c. I would disable the technology.
- d. I would remove the technology from the vehicle.

SECTION H. DIGITAL TECHNOLOGY AND CONNECTIVITY USE

Q27. Which of the following statements best describes you?

[SINGLE SELECT]

- a. I prefer to be the first to buy and try new technologies.
- b. I prefer to wait until new product hype has calmed before I purchase and try new technologies.
- c. I prefer to wait until new technologies have been thoroughly tested and reviewed, and others I know have purchased and used new technologies before I purchase.
- d. None of the above.

SECTION I. DECISION-MAKING FACTORS

Q28. Which of the following sources inform your decisions when selecting a vehicle and vehicle options? Please check all that apply.

[MULTI-SELECT. MUST CHOOSE AT LEAST ONE RESPONSE. RANDOMIZE OPTIONS BUT ANCHOR "OTHER" AND "NONE OF THE ABOVE" AT BOTTOM OF LIST.]

- a. Family members
- b. Friends
- c. Sales staff
- d. Professional reviews, such as from Consumer Reports
- e. User/consumer reviews, such as from cars.com or autotrader.com
- f. Advertisements
- g. Manufacturer websites
- h. Insurance Institute for Highway Safety (IIHS), which issues the "Top Safety Pick"
- i. National Highway Traffic Safety Administration, which issues the 5-Star Safety Ratings
- j. Kelly Blue Book
- k. Autotrader
- l. Other source [PLEASE SPECIFY]
- m. None of these sources

SECTION J. DESIRABILITY OF V2V TECHNOLOGY

In the beginning of the survey, we asked about interest in having V2V technology. We would like to ask you the same question again.

Q29. If this technology were widely used and made available at low cost, how interested are you in having V2V technology in your next car?

1	2	3	4	5
Not at all interested				Very interested

SECTION K. DEMOGRAPHICS

Q30. How long ago was the last car accident you were involved in?

- a. I have never been involved in an accident.
- b. Less than 5 years ago
- c. 5-10 years ago
- d. 10-15 years ago

- e. 15-20 years ago
- f. More than 20 years ago

[IF Q30 = (A) SKIP Q31]

Q31. Choose the options below that apply to your most recent car accident.

[MULTI-SELECT. IF C IS SELECTED, DO NOT ALLOW SELECTION OF A OR B. ANY COMBINATION OF A AND/OR B CAN BE SELECTED.]

- a. The accident involved injuries requiring medical attention.
- b. The accident involved damage over \$1000.
- c. The accident involved minor damage or injury (fender bender) ONLY.

Q32. Do you plan on purchasing or leasing a new car in the next 12 months?

[SINGLE SELECTION. RETAIN ORDER.]

- a. Yes
- b. No
- c. Don't know

Q33. [Item removed.]

Q34. How would you describe the area in which you live?

[SINGLE SELECTION. RETAIN ORDER.]

- a. Rural
- b. Suburban
- c. Urban

Q35. Approximately how many miles do you drive your primary vehicle per week?

[DROP-DOWN SELECTION.]

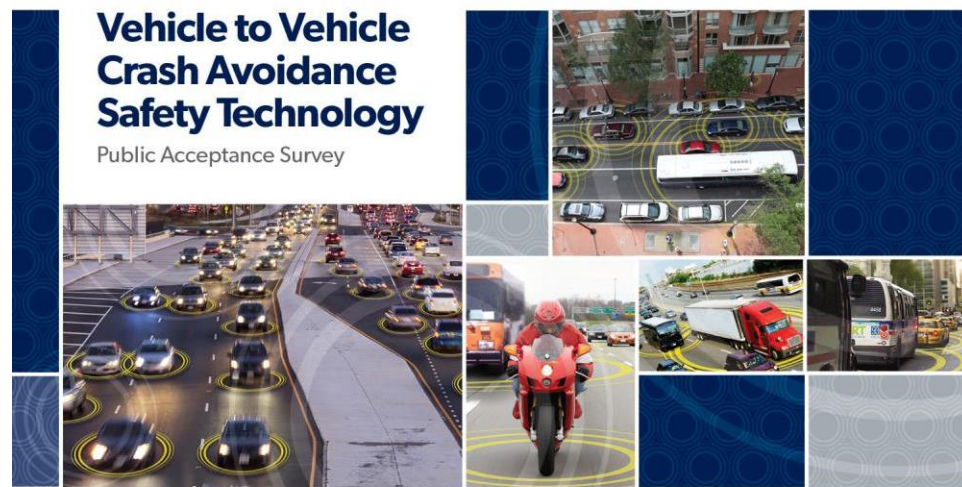
- a. 0 to 49 miles
- b. 50 to 99 miles
- c. 100 to 199 miles
- d. 200 to 299 miles
- e. 300 to 499
- f. 500 miles or more

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APPENDIX F. SURVEY TOPLINE PRESENTATION DECK

Source for All Vehicle Images: USDOT

Source for All Other Images: Ipsos, 2015



September 21, 2015

This document is confidential and is intended



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Agenda

- Project overview & approach
- Current levels of V2V acceptance
- Barriers to V2V use
- Perceived benefits of V2V
- Determinants of acceptance
- Respondent preferences regarding V2V
- Conclusions & recommendations
- Next steps: Final Report

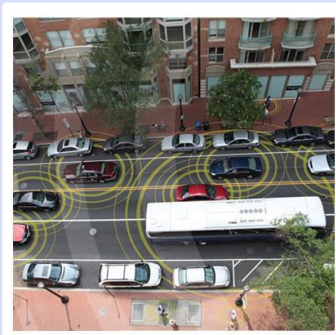


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Project Overview & Approach



Project Overview

RESEARCH OBJECTIVE: Conduct both qualitative and quantitative research to broaden USDOT's understanding of consumers' acceptance of V2V technology and to inform future outreach and communication efforts to the public.



Key Findings from Qualitative Research:

- On a scale of 1 to 10, the majority of participants rated their interest in V2V five (5) or higher for their next car.
- Major concerns expressed about V2V were the need for universal adoption in order for it to be effective, and the potential for drivers reducing attentiveness if they become over-reliant on or distracted by the technology.
- Most focus group participants believed the DSRC technology would allow V2V users to be tracked, but most were unconcerned with the potential lack of privacy.



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Survey Objectives



- What is the degree of public acceptance of V2V?
- **What proportion** of people are concerned about each potential barrier?
 - How much **importance** is attached to that concern?
- **What proportion** of people agree with the potential benefits of V2V?
 - How much **importance** is attached to that benefit?
- How does the population differ on the above viewpoints? (age, gender, urbanicity, etc.)
- What are predictors of acceptance of V2V technology? (age, gender, urbanicity, etc.)



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Survey Approach

- **Survey Development**
 - Ipsos conducted nine cognitive interviews to refine the survey instrument.
 - The instrument was further refined after a pretest (N = 53)
- **Survey Sample**
 - 1,532 respondents from the Ipsos iSay panel. Margin of error = $\pm 2.5\%$
 - Inclusion criteria: age 18+ with a valid drivers license.
 - Sample was matched to target population on: age, gender, ethnicity, income, region.
 - Weights applied to match target population (efficiency = 73%).
- **Survey Design**
 - Respondents view a brief informational video on V2V technology
 - Respondents are asked a question about the video to verify that they attended to it.
 - Survey consists of 35 questions and required 14 minutes to complete, on average.



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Survey Analysis

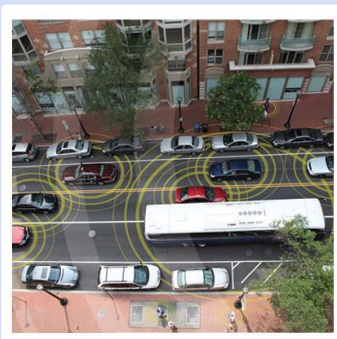
"Top box" analysis is reported



Q3 and Q32. If this technology was widely used and made available at low cost, how interested are you in having



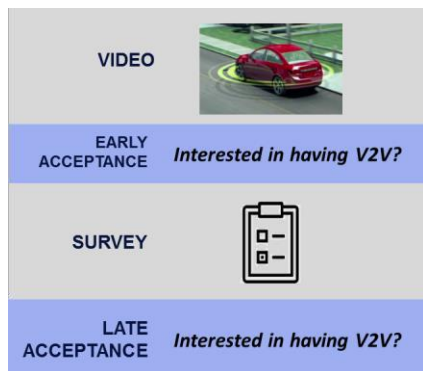
Q10. I believe that insurance companies would lower rates for



V2V Acceptance



Acceptance of V2V: Approximately half of the respondents are interested in having V2V in their next car.



Early Acceptance = 51%
(after educational video)

Late Acceptance = 49%
(after educational video and survey questions on benefits & barriers)

Q3 AND Q32. If this technology were widely used and made available at low cost, how interested are you in having V2V technology in your next car?



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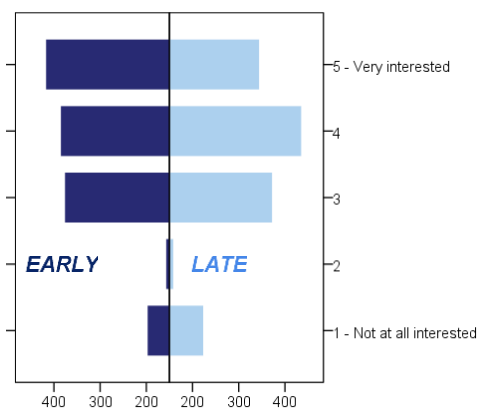
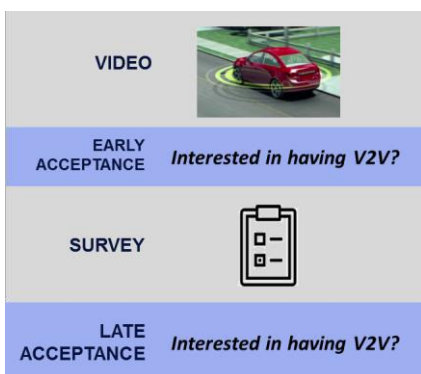
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Taking the survey had little effect on acceptance.



We therefore analyzed **late acceptance**.



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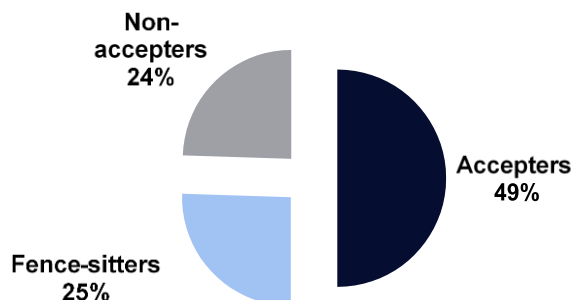
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Acceptance of V2V: Approximately half of the respondents are interested in having V2V technology in their next car.



Q32. If this technology were widely used and made available at low cost, how interested are you in having V2V technology in your next car?

- 1-2 non-accepters
- 3 fence-sitters
- 4-5 accepters

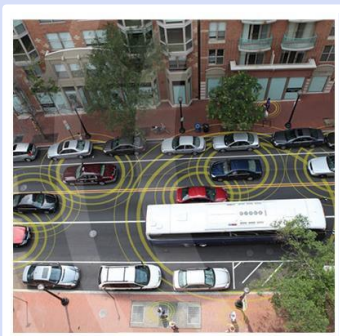


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Determinants of Acceptance



V2V acceptance is higher among...	Than among...
Adults 25+	Young adults (18-24)
Urban and suburban areas	Rural areas
Black and African-Americans	All other races
Those who have been in an accident	Those who have not been in an accident
Those with college degrees	Those without college degrees

Q32. If this technology were widely used and made available at low cost, how interested are you in having V2V technology in your next car?



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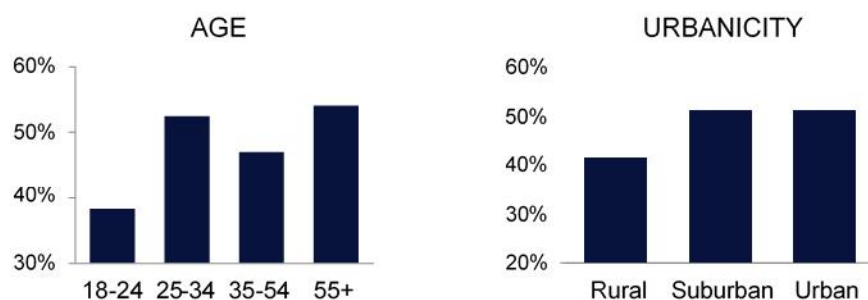
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Acceptance of V2V: Who accepts and rejects it?* Those indicating high interest in having V2V technology in their next car.



* Acceptance was measured using Q32. If this technology were widely used and made available at low cost, how interested are you in having V2V technology in your next car?

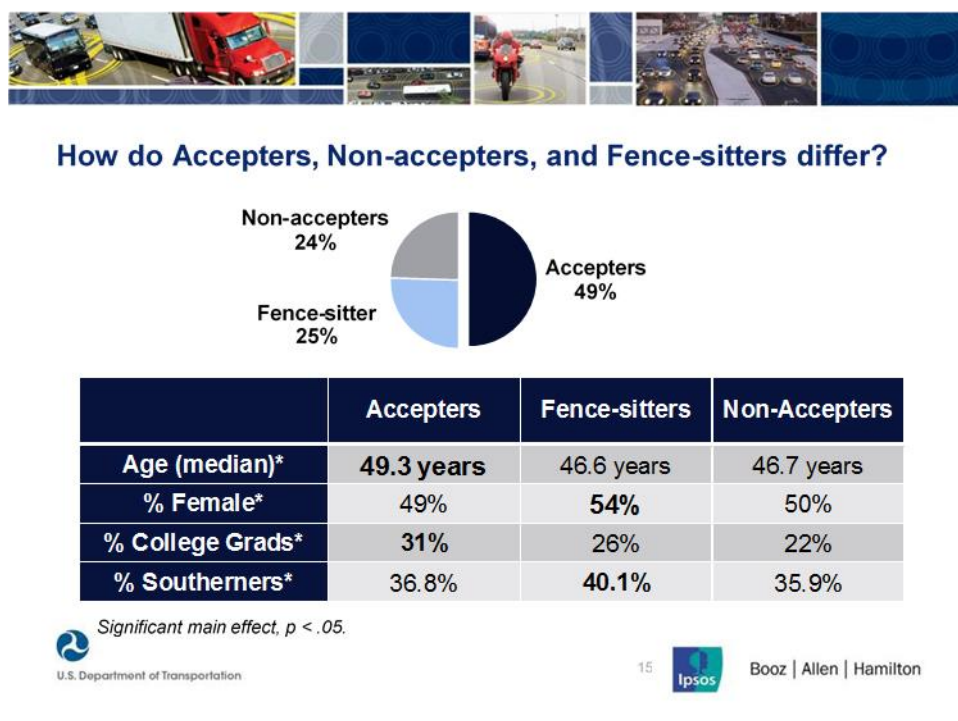
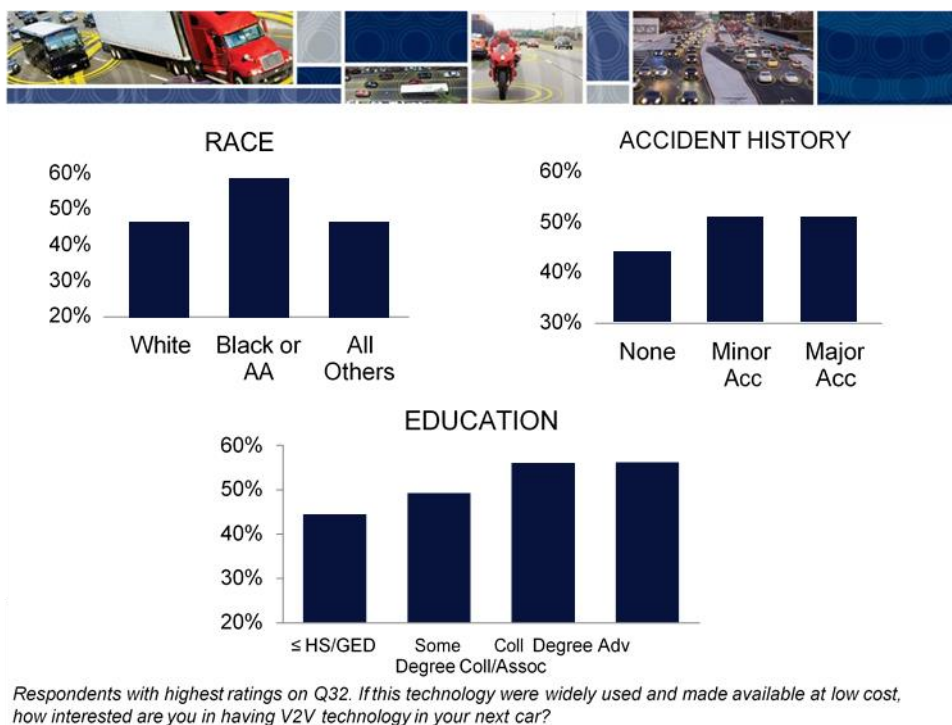


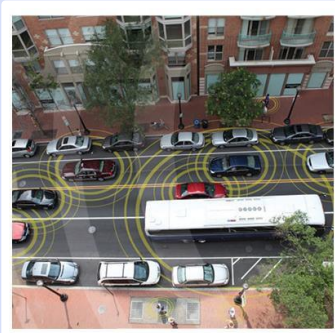
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Barriers to V2V Acceptance



Barriers or Concerns about V2V Acceptance: Prevalence

69% Q17. I believe that **other drivers may rely too much** on V2V technology for safety, and not apply safe driving practices as much as they should (e.g., maintain a safe distance from other vehicles).

69% Q16. I believe that **other drivers may be less attentive** while driving, due to over-reliance on V2V technology or distractions from the alerts.

57% Q20. I believe that **security breaches and hacking** of V2V technology would occur.

56% Q22. I believe that **too few drivers would participate** in the system for V2V to be useful (V2V technology depends on a network of drivers, so a minimum number of drivers must use it in order for the system to be useful).



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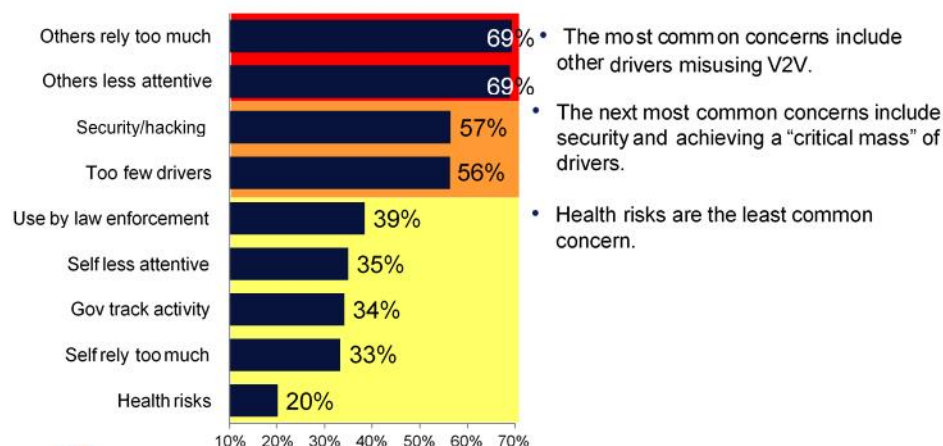


Barriers or Concerns about V2V Acceptance: Prevalence

- 39% Q23a. The use of V2V technology by law enforcement agencies to **identify illegal behavior**.
- 35% Q14. I believe that **I may be less attentive** while driving, due to over-reliance on V2V technology or distractions from the alerts.
- 34% Q23b. The use of V2V technology by the government to **track driver' locations and activities**.
- 33% Q15. I believe that **I may rely too much** on V2V technology for safety, and not apply safe driving practices as much as I should (e.g., maintain a safe distance from other vehicles).
- 20% Q21. I believe that **electromagnetic activity** from communication devices such as those used in V2V pose a health risk to drivers.



Barriers to acceptance: Prevalence

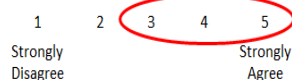




Barriers to acceptance: Importance

Importance of barrier among respondents who agreed that the barrier exists.

Q12-Q18: I believe that security breaches and hacking of V2V technology would occur.



Q19a-Q19g. How important would these potential challenges of V2V be to you if you were to consider purchasing a vehicle that included V2V technology?

The technology is susceptible to security breaches and "hacking".



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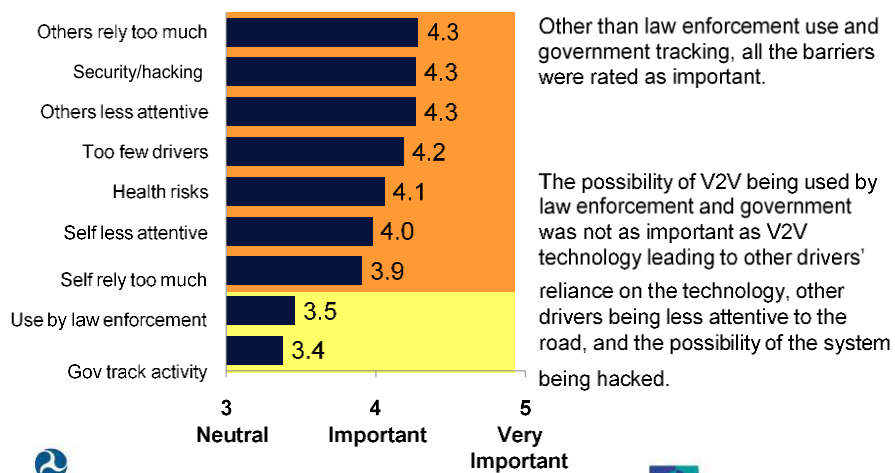
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Barriers to acceptance: Importance



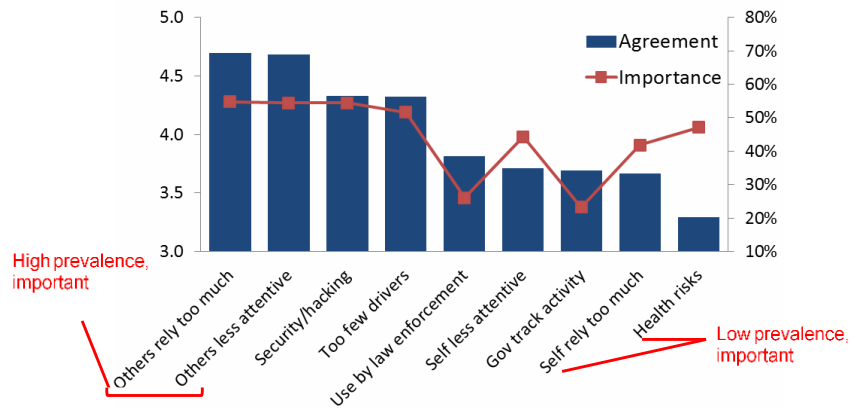
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Barriers to acceptance: Prevalence vs Importance



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Perceived Benefits of V2V



Benefits of V2V

- 55% Q10. I believe that V2V technology would **lower the number of car accidents** (and associated injuries and fatalities) **among drivers** in general.
- 53% Q8. I believe that V2V technology would help make driving **more convenient and efficient for drivers** in general, by reducing the number of accidents.
- 50% Q12. I believe that **insurance companies** would **lower rates** for drivers using V2V technology.
- 49% Q11. I believe that V2V technology would **make me safer**.
- 48% Q9. I believe that V2V technology would help make driving **more convenient and efficient for me** by reducing the number of accidents.



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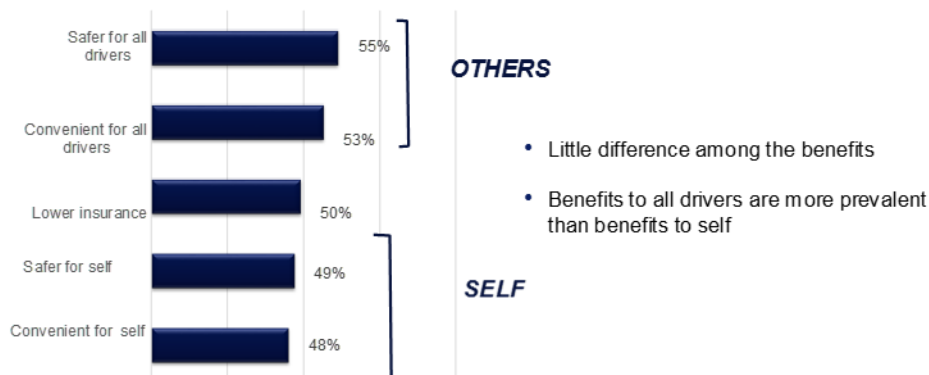
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Perceived Benefits of V2V: Prevalence



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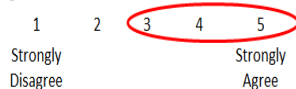
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Benefits of V2V: Importance

Importance of barrier among respondents who agreed that the barrier exists.

Q6-Q10: I believe that V2V technology would help make driving more convenient and efficient for drivers in general, by reducing the number of accidents.



Q11a-Q11e. How important would these potential challenges of V2V be to you if you were to consider purchasing a vehicle that included V2V technology?

Participating in the system would make driving more convenient and efficient for drivers in general.



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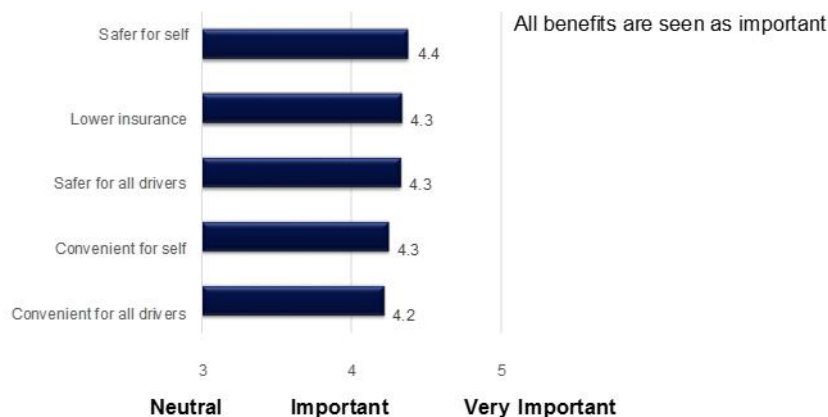
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Perceived Benefits of V2V: Importance



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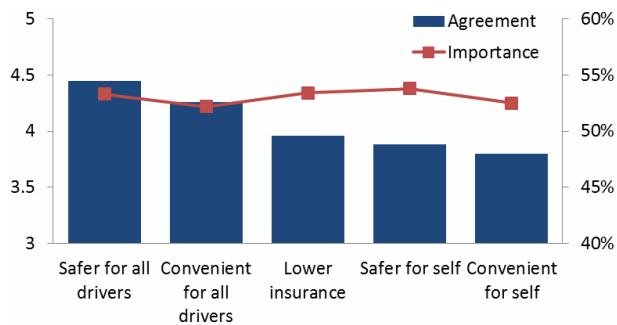


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Perceived Benefits of V2V: Prevalence vs Importance

Lowering of insurance rates and benefits to respondents themselves are seen as important, but are not as prevalent as benefits to all drivers.



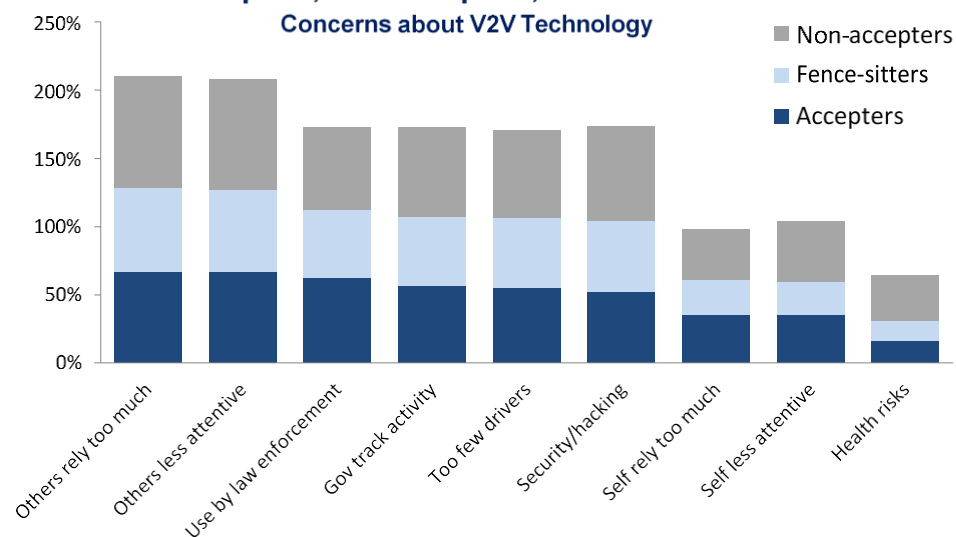
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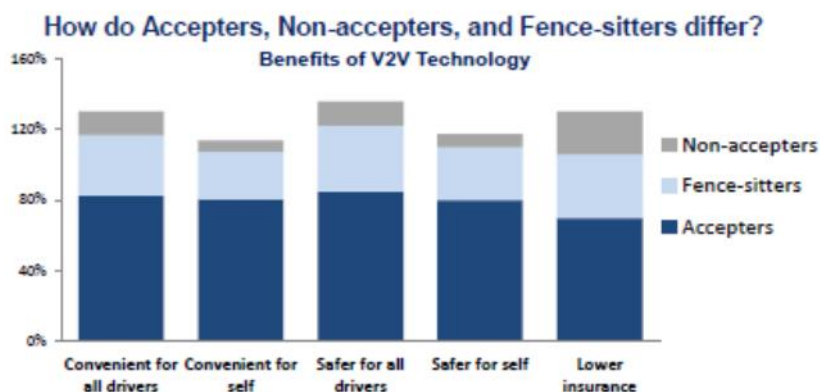


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How do Accepters, Non-accepters, and Fence-sitters differ?





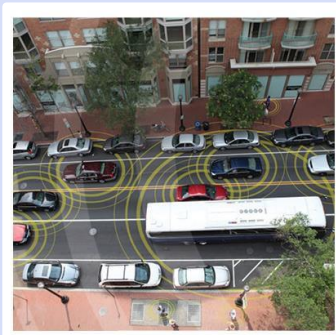
Accepters and fence-sitters agree with non-accepters on the **concerns** about V2V, but **accepters rate the benefits more highly.**



How do Accepters, Non-accepters, and Fence-sitters differ?

Accepters and fence-sitters agree with non-accepters on the **concerns** about V2V, but **accepters rate the benefits more highly.**

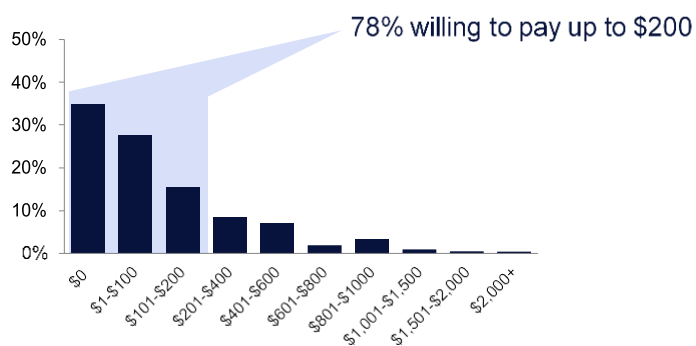
- The difference between accepters and non-accepters is the degree to which they are convinced by the benefits of V2V technology.
- Accepters think there are potential barriers, though not to the degree that non-accepters do.
- But accepters are willing to accept concerns because they are outweighed by the benefits.
- Fence-sitters are more like accepters than non-accepters with respect to perceived benefits.



Respondent Preferences



How much are respondents willing to pay for V2V?



Q24. What is the most you would be willing to pay for V2V technology if it were available to purchase today?



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What names for V2V do respondents prefer?



Q26. Of the following possible names for V2V, which are your favorites? [pick three]

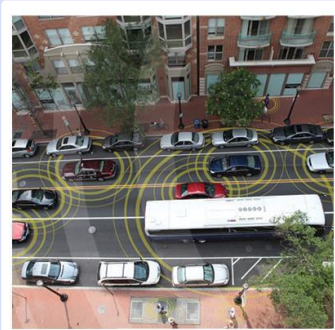


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Conclusions & Recommendations



Conclusions

- **The acceptance rate of V2V technology was 49% in our study of 1,532 U.S. licensed drivers** (margin of error = $\pm 2.5\%$).
- 24% do not accept the technology and 25% are undecided
- Acceptance is lowest among:
 - Respondents 18-24 years of age
 - Rural respondents
 - Respondents who had not been in an accident
 - Respondents without a college degree
- Women and southerners are more likely to be undecided than men and respondents from other regions.
- Accepters differ from non-accepters primarily by how they view the benefits of V2V, as opposed to how they view the potential concerns about V2V.



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Conclusions

- The most prevalent concerns about V2V technology are that it will result in:
 - Inattention in other drivers
 - Over-reliance on the technology in other drivers
 - Susceptibility to security breaches and hacking
 - Too few drivers participating in the system for it to be successful
- In terms of importance, respondents rated most potential barriers as important.
 - Use by law enforcement and use by the government to track drivers were rated lower in importance.
- Other drivers' inattention and over-reliance on the technology were rated high in prevalence and importance.
- Health risks and one's own over-reliance on the technology were both low in prevalence, but rated as important.



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Conclusions

- Demographics were not strong predictors of most of the concerns measured.
 - Income, race, ethnicity, education, and age were all predictors of concern over health risks.
- As with barriers, all benefits were deemed important.
- Agreement with benefits was not as widely distributed as agreement with barriers: Prevalence of agreement with benefits ranged from 48%-55%, versus 20%-69% for barriers.
 - Fence-sitters agreed with accepters about benefits more than they did with non-accepters.
- The most prevalent benefits perceived were for safety and convenience for drivers in general.



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Initial Recommendations

- May want to focus communications on fence-sitters to increase acceptance of V2V technology.
 - Women and southerners are more likely to be fence-sitters.
 - Based on feedback received in the focus group, these individuals prefer statistics and proof points to sway their opinions.
- As non-accepters may be harder to convince, recommend spending less initial time focusing on this group.
- Communications may be more successful if focused on the benefits of V2V (versus communications that target potential barriers or concerns).
- Communications may be more successful when highlighting the safety and convenience for drivers at large.
- Individuals who have never been in an accident may be less likely to value to safety benefits of V2V. Emphasize the prevalence of accidents to engage interest in safety.
- Concerns over health risks from V2V are not common, but are important among those individuals. Low income, low education, Hispanics, and those in rural areas are more likely to have this concern.



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Next Steps



Final Report

- Major sections to include background, methods, findings, and limitations

Findings to address:

- Consumers' impressions of V2V after viewing informational materials
- Barriers (perceived or actual) that may affect consumers' use of V2V
- Drivers or motivators to using V2V
- Messaging and outreach strategies
- Subgroups of drivers that may require different messages/ communication channels to speed adoption of V2V



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Appendix



Barriers to acceptance: Predictors of Prevalence

Concern over electromagnetic activity has the strongest predictors

Predictor	R-sq	Direction
Income	31.7%	Highest among those with low income (< \$20,000)
Race	26.7%	Highest among those of more than one race and those who selected "other"
Ethnicity	22.7%	Higher among Hispanics than non-Hispanics
Education	12.1%	Highest among those with HS degree or less
Age	10.8%	Highest among 25-54 year olds (central age or sample) Lowest among young and old
Urbanicity	7.3%	Higher in rural than suburban; higher in suburban than urban
Region	4.1%	Highest in western region
Accident Severity	2.6%	Highest among those who have NOT been in an accident
Gender	-	
Accident Recency	-	

U.S. Department of Transportation
National Highway Traffic Safety Administration
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Washington, DC 20590

Toll-Free "Help Line" 866-367-7487
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