A Survey of Public Opinion about Autonomous and Self-Driving Vehicles in the U.S., the U.K., and Australia

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VEHICLES IN THE U.S., THE U.K., AND AUSTRALIA

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16. Abstract

This survey examined public opinion regarding self-driving-vehicle technology in three major English-speaking countries—the U.S., the U.K., and Australia. The survey yielded useable responses from 1,533 persons 18 years and older.

The main findings (applicable to each of the three countries) were as follows:

• The majority of respondents had previously heard of autonomous or self-driving vehicles, had a positive initial opinion of the technology, and had high expectations about the benefits of the technology.

• However, the majority of respondents expressed high levels of concern about riding in self-driving vehicles, security issues related to self-driving vehicles, and self-driving vehicle not performing as well as actual drivers.

• Respondents also expressed high levels of concern about vehicles without driver controls; self-driving vehicles moving while unoccupied; and self-driving commercial vehicles, busses, and taxis.

• The majority of respondents expressed a desire to have this technology in their vehicle. However, a majority was also unwilling to pay extra for the technology; those who were willing to pay offered similar amounts in each country.

• Females expressed higher levels of concern with self-driving vehicles than did males. Similarly, females were more cautious about their expectations concerning benefits from using self-driving vehicles.

In comparison to the respondents in the U.K. and Australia, respondents in the U.S. expressed greater concern about riding in self-driving vehicles, data privacy, interacting with non-self-driving vehicles, self-driving vehicles not driving as well as human drivers in general, and riding in a self-driving vehicle with no driver controls available.

The main implications of these results are that motorists and the general public in the three countries surveyed, while expressing high levels of concern about riding in vehicles equipped with this technology, feel positive about self-driving vehicles, have optimistic expectations of the benefits, and generally desire self-driving-vehicle technology when it becomes available (though a majority is not willing to pay extra for such technology at this time).

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Introduction

Advances in autonomous-vehicle technology (e.g., Daimler, 2014; Google, 2014; Nissan, 2013) have helped bring self-driving vehicles to the forefront of public interest and discussion recently. Self-driving vehicles—particularly the Google self-driving car—have become a popular topic in the media (BBC, 2014; CNN, 2014; Forbes, 2014; Los Angeles Times, 2014), as well as being the focus of various surveys attempting to gauge the public's perception of such future vehicles. Self-driving vehicles are commonly envisioned to be the ultimate, full embodiment of connected-vehicle technology (Narla, 2013; NHTSA, 2013), an area that is currently the focus of several large research projects and government support in the U.S. (NHTSA, 2012a; 2012b; 2014).

In response to the rapid technological progress in the realm of self-driving vehicles, governments—both local and national—have already begun to develop strategies to address the challenges that may result from the introduction of such vehicles. For example, with the announcement of policies to support self-driving vehicles in the U.K. (HM Treasury, 2013), one city (Milton Keynes) has developed plans for self-driving vehicles within the city as a new form of public transportation by the year 2017, with on-road testing planned to begin in 2015 (Milton Keynes Citizen, 2014). In Europe, an amendment was recently proposed to the United Nations Convention on Road Traffic (a treaty that establishes common traffic rules for most of Europe and several other countries outside Europe) to allow self-driving vehicles on public roads in countries governed by the treaty (U.N., 2014).

In the U.S., the state of California recently enacted legislation to permit testing of self-driving vehicles on public roads (State of California, 2014), following Nevada (State of Nevada, 2011), Florida (State of Florida, 2012), and Michigan (State of Michigan, 2013a; 2013b) in allowing operation of such vehicles on public roads. On a national level, the U.S. Department of Transportation recently published an initial policy outlining strategies and recommendations for supporting the widespread introduction of self-driving vehicles on public roads across the U.S. (NHTSA, 2013).

In several recent surveys on the topic of self-driving vehicles (CarInsurance.com, 2013; Cisco, 2013; J.D. Power, 2012; KPMG, 2013; Pew Research Center, 2014; Seapine Software, 2014; TE Connectivity, 2013), the public has generally expressed some concern regarding owning or using vehicles with this technology. (While the study by Cisco [2013] found slightly higher levels of interest in riding in self-driving vehicles than the other surveys, the results varied considerably by country, and interest levels were consistently lower when respondents were asked about allowing their children to ride in such vehicles.)

In order to gain a better understanding of opinions, concerns, and general acceptance by average drivers around the world, this survey was designed to expand upon the existing survey data to include a broader examination of public opinion about autonomous and self-driving vehicles. The survey used several questions comparable to those used in our recent survey concerning public acceptance of connected-vehicles (Schoettle and Sivak, 2014), in addition to using a question analogous to one in the CarInsurance.com study (2013) asking how drivers would spend their extra time if not driving.

As was the case in our previous survey on connected vehicles, this survey was performed in three major countries where English is the primary language—the U.S., the U.K., and Australia.

In this survey, the various levels of autonomous or self-driving technology were defined as follows (adapted from NHTSA, 2013):

- Level 0. No autonomous-vehicle technology. This level also includes automated warnings only or automated secondary functions such as headlights or wipers.

- Level 1. The vehicle controls one or more safety-critical functions, but each function operates independently. The driver still maintains overall control.

- Level 2. This level combines two or more technologies from Level 1, and they operate in coordination with each other. The driver still maintains overall control.

- Level 3. This level provides limited self-driving technology. The driver will be able to hand control of all safety-critical functions to the vehicle, and only occasional control by the driver will be required.

- Level 4. Completely self-driving vehicle. The vehicle will control all safety-critical functions for the entire trip.

Method

Survey instrument

      An online survey was conducted using SurveyMonkey (www.surveymonkey.com), a web-based survey company. A questionnaire was developed to examine several key topics related to autonomous and self-driving vehicles. The main topics addressed were as follows:

- Familiarity with and general opinion about autonomous and self-driving vehicles
- Familiarity with current autonomous-vehicle technology on their own vehicle(s)
- Expected benefits of self-driving vehicles
- Concerns about using self-driving vehicles
- Concerns about different possible implementations of self-driving vehicles
- Overall interest in owning and willingness to pay for self-driving-vehicle technology

      The same core survey was used in each country. However, customized versions of the survey were presented in each country to account for minor differences in terminology (American versus British and Australian) and currency symbols (U.S. and Australian $ versus British £).

      Information related to each respondent's current vehicle type, including the level of autonomous technology on each respondent's vehicle, and additional demographic information was collected for inclusion in the analysis. The full text of the questionnaire is included in the appendix. The survey was performed in July 2014.

Respondents

      SurveyMonkey's Audience tool was used to target and recruit individuals 18 years and older from SurveyMonkey's respondent databases in the U.S., the U.K., and Australia. The recruitment resulted in 1,578 replies from potential respondents. Fully completed surveys were received for 1,533 respondents. The total numbers of completed surveys by country were 501 for the U.S., 527 for the U.K., and 505 for Australia. (These respondents are generally representative of each country's population [SurveyMonkey, 2014]; however, online surveys, by their nature, result in the exclusion of individuals without Internet access.)

The final response rate (i.e., total completed divided by total eligible, or 1,533/1,578) was 97%. The margin of error at the 95% confidence level for the results by country is +/- 4.4%; the corresponding margin of error for the total results is +/- 2.5%.

Demographic breakdowns for the respondents are presented in Table 1. As is evident in Table 1, the samples for each country were very similar demographically, with the only substantial differences related to vehicle type driven most. (The total in this table, and the tables and figures to follow, are based on equal weighting of each country.)

Table 1
Demographic breakdown for the final 1,533 respondents.

Demographic aspect		Percent			
		U.S. (N=501)	U.K. (N=527)	Australia (N=505)	*Total (N=1,533)*
Age group	18 to 29	29.2	23.7	26.6	*26.5*
	30 to 39	21.6	24.5	22.8	*23.0*
	40 to 49	19.2	21.0	21.6	*20.6*
	50 to 59	23.2	21.4	22.6	*22.4*
	60 to 69	7.0	8.7	6.5	*7.4*
	70 or older	0.0	0.6	0.0	*0.2*
Gender	Female	52.1	52.9	51.7	*52.2*
	Male	47.9	47.1	48.3	*47.8*
Education	Less than bachelor degree	56.3	59.0	51.3	*55.5*
	Bachelor degree	29.5	23.5	32.1	*28.4*
	Graduate degree	14.2	17.5	16.6	*16.1*
Employment	Employed full-time	46.5	42.7	43.6	*44.3*
	Employed part-time	17.0	19.4	19.6	*18.7*
	Not currently employed	20.6	20.1	17.4	*19.4*
	Retired	9.0	8.5	9.5	*9.0*
	Full-time student	6.0	8.9	8.3	*7.7*
	Part-time student	1.0	0.4	1.6	*1.0*
Vehicle type driven most often	Passenger car	55.3	66.4	74.1	*65.3*
	Minivan / van / MPV	7.0	6.3	2.4	*5.2*
	Pickup truck	8.0	0.6	2.8	*3.8*
	SUV	16.8	4.0	11.1	*10.6*
	Motorcycle / scooter	0.4	1.1	0.8	*0.8*
	Do not drive	12.0	21.2	8.7	*14.0*
	Other	0.6	0.4	0.2	*0.4*
Autonomous-vehicle technology installed on vehicle(s)	Level 0	47.7	49.7	45.3	*47.6*
	Level 1	25.5	16.7	29.7	*24.0*
	Level 2	4.6	3.6	4.4	*4.2*
	Do not know	6.4	5.5	4.6	*5.5*
	Do not own vehicle	15.8	24.5	16.0	*18.8*

Results

Familiarity with and general opinion about autonomous and self-driving vehicles

The majority of respondents in each of the three countries had heard of autonomous or self-driving vehicles before the survey (Figure 1). The U.S. had the highest percentage responding that they had previously heard of autonomous or self-driving vehicles (70.9%), followed by the U.K. (66.0%) and Australia (61.0%).
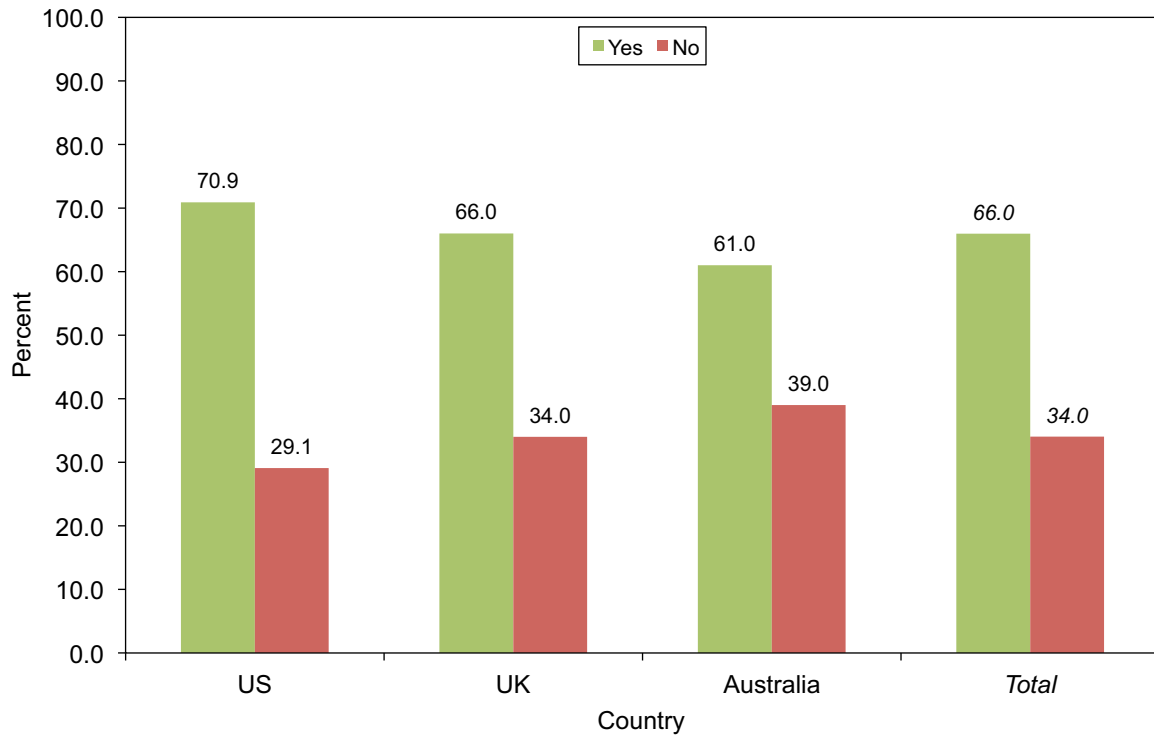

Figure 1. Summary of responses, by country, to Q1: "*Had you ever heard of autonomous or self-driving vehicles before participating in this survey?*"

Table 2 presents a complete summary of responses by country, while Figure 2 presents collapsed summaries (positive responses versus negative responses). Most respondents had a positive impression of the technology, with the most positive responses coming from Australia (61.9%), followed by the U.S. (56.3%) and the U.K. (52.2%). Only a modest percentage of respondents had any negative impressions, with the highest incidence in the U.S. (16.4%), followed by the U.K. (13.7%) and Australia (11.3%).

Approximately 30% of respondents in each country had a neutral opinion of autonomous and self-driving vehicles.

Table 2
Percentage of responses, by country, to Q2:
"*What is your general opinion regarding autonomous and self-driving vehicles?*"

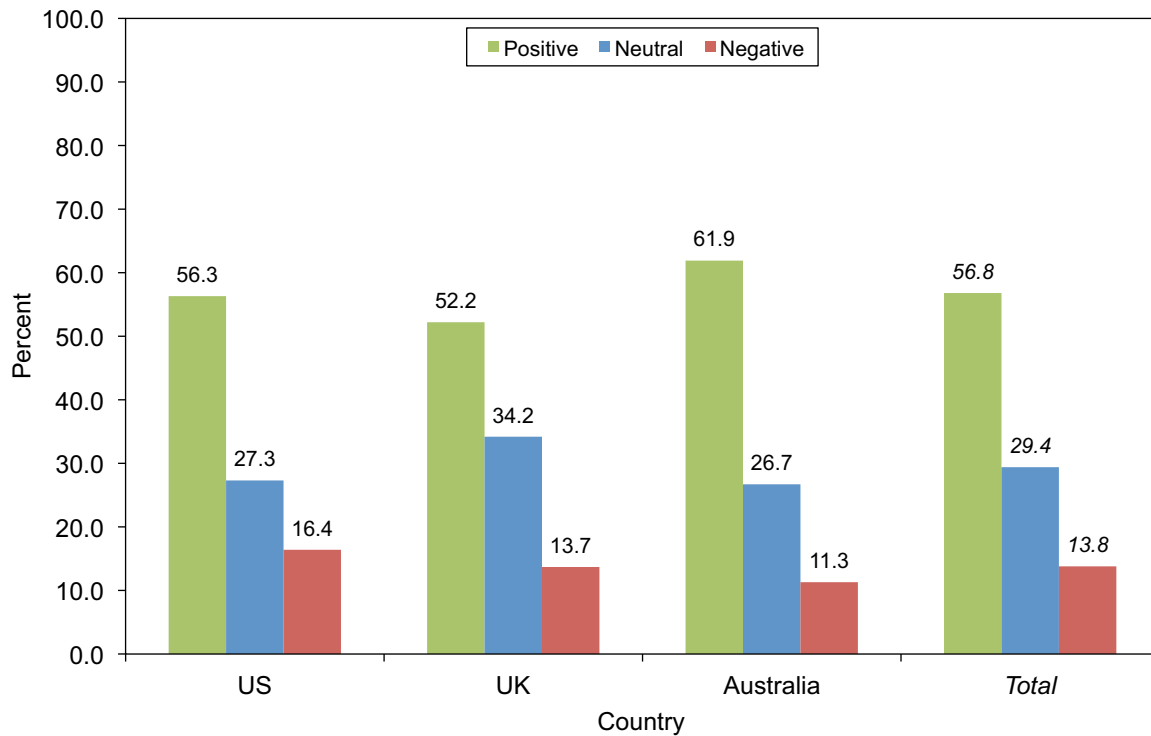| Response	U.S.	U.K.	Australia	*Total*
Very positive	22.0	13.9	16.2	*17.4*
Somewhat positive	34.3	38.3	45.7	*39.4*
Neutral	27.3	34.2	26.7	*29.4*
Somewhat negative	12.4	11.2	8.3	*10.6*
Very Negative	4.0	2.5	3.0	*3.2*

Figure 2. Summary of responses (collapsed), by country, to Q2: "*What is your general opinion regarding autonomous and self-driving vehicles?*"

Expected benefits of self-driving vehicles

Respondents were asked: "*How likely do you think it is that the following benefits will occur when using completely self-driving vehicles (Level 4)?*" They were asked to select "very likely," "somewhat likely," "somewhat unlikely," or "very unlikely" for each item in a list of expected benefits for completely self-driving vehicles (Level 4). Table 3 presents a complete summary of responses by country, while Figure 3 presents collapsed summaries (likely responses versus unlikely responses). "Somewhat likely" was the most frequent response for all items in all three countries. The majority of respondents felt that each of the expected benefits was likely to occur with self-driving vehicles, with the exception of less traffic congestion and shorter travel times (a majority felt that these two benefits were unlikely to occur). The respondents were most confident about better fuel economy occurring (when collapsed, 72.0% said this was "likely"), while they were least confident about shorter travel times (43.3% said this was "likely").

Table 3

Percentage of responses, by country, to Q6: "*How likely do you think it is that the following benefits will occur when using completely self-driving vehicles (Level 4)?*"

| Expected benefit	Response	U.S.	U.K.	Australia	*Total*
Fewer crashes	Very likely	26.1	23.5	24.2	*24.6*
	Somewhat likely	41.7	47.6	48.1	*45.8*
	Somewhat unlikely	22.2	21.6	21.4	*21.7*
	Very unlikely	10.0	7.2	6.3	*7.8*
Reduced severity of crashes	Very likely	25.0	21.8	23.6	*23.5*
	Somewhat likely	43.9	50.9	49.9	*48.2*
	Somewhat unlikely	20.8	20.9	20.2	*20.6*
	Very unlikely	10.4	6.5	6.3	*7.7*
Improved emergency response to crashes	Very likely	32.5	18.8	23.0	*24.8*
	Somewhat likely	39.1	41.4	45.7	*42.1*
	Somewhat unlikely	21.2	29.6	24.4	*25.1*
	Very unlikely	7.2	10.2	6.9	*8.1*
Less traffic congestion	Very likely	19.2	15.2	15.2	*16.5*
	Somewhat likely	30.5	32.1	32.3	*31.6*
	Somewhat unlikely	32.9	37.4	36.2	*35.5*
	Very unlikely	17.4	15.4	16.2	*16.3*
Shorter travel time	Very likely	16.8	11.0	13.3	*13.7*
	Somewhat likely	29.1	28.3	31.5	*29.6*
	Somewhat unlikely	36.9	44.2	40.2	*40.4*
	Very unlikely	17.2	16.5	15.0	*16.2*
Lower vehicle emissions	Very likely	21.2	23.0	16.8	*20.3*
	Somewhat likely	42.3	44.2	45.5	*44.0*
	Somewhat unlikely	26.1	26.4	27.5	*26.7*
	Very unlikely	10.4	6.5	10.1	*9.0*
Better fuel economy	Very likely	25.3	27.5	21.0	*24.6*
	Somewhat likely	44.7	48.4	49.1	*47.4*
	Somewhat unlikely	21.2	19.7	22.6	*21.2*
	Very unlikely	8.8	4.4	7.3	*6.8*
Lower insurance rates	Very likely	22.6	18.0	16.6	*19.1*
	Somewhat likely	30.9	40.2	38.0	*36.4*
	Somewhat unlikely	27.9	27.7	28.9	*28.2*
	Very unlikely	18.6	14.0	16.4	*16.3*
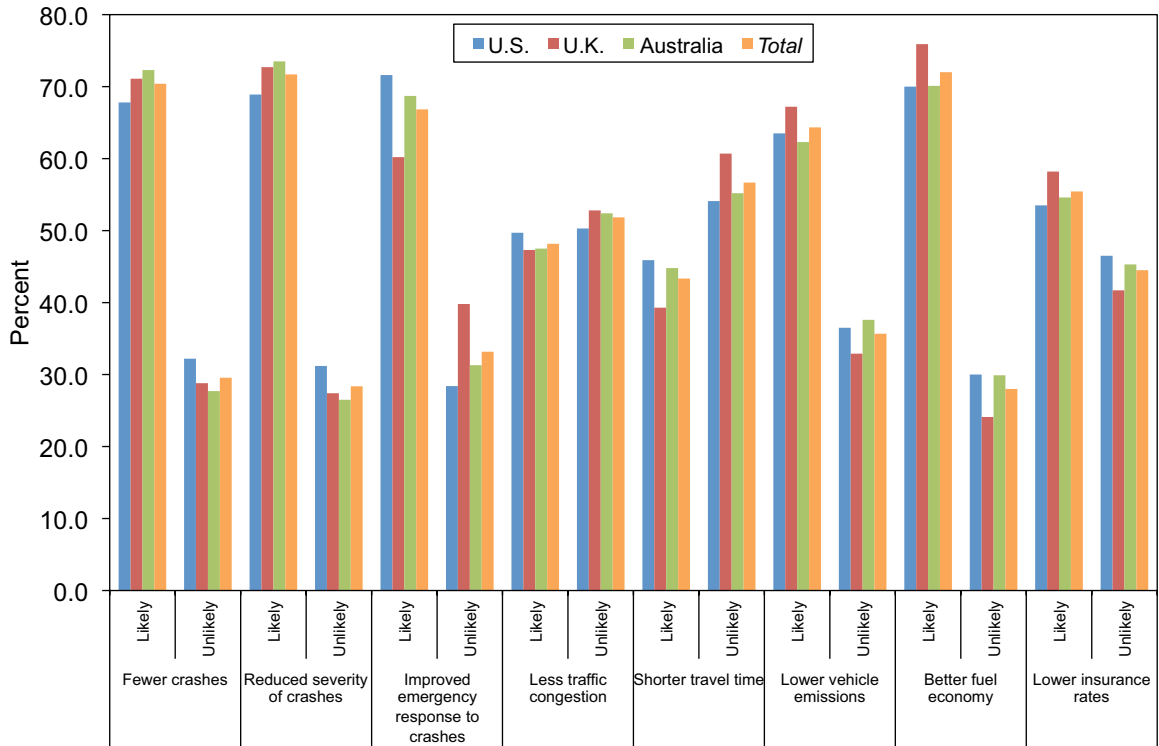
Figure 3. Summary of responses (collapsed), by country, to Q6: "*How likely do you think it is that the following benefits will occur when using self-driving vehicles?*"

Concerns about using self-driving vehicles

Respondents were asked: "*How concerned would you be about driving or riding in a vehicle with [Level 3] self-driving technology?*" (Respondents were provided with a detailed definition of Level 3 technology immediately preceding the question.) Figure 4 presents a complete summary of responses by country. The most frequent response was "moderately concerned" except in the U.K., where "slightly concerned" was the top response.
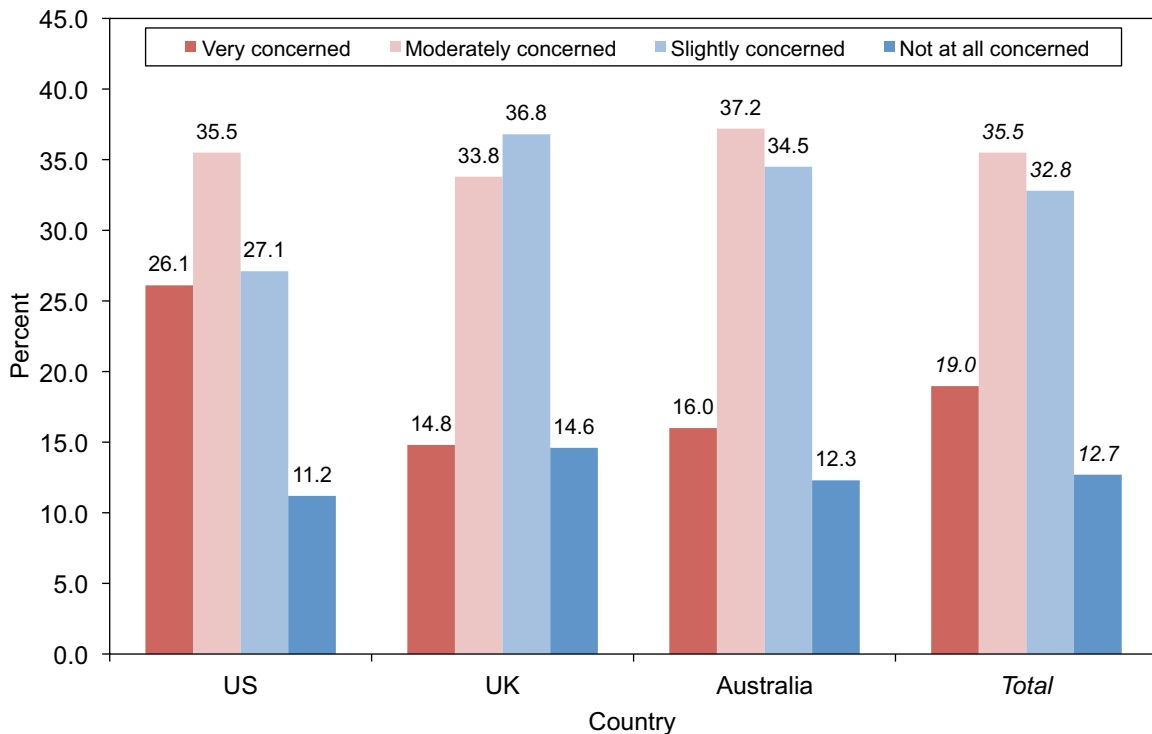

Figure 4. Summary of responses, by country, to Q4: "*How concerned would you be about driving or riding in a vehicle with [Level 3] self-driving technology?*"

Respondents were asked: "*How concerned would you be about driving or riding in a vehicle with [Level 4] self-driving technology?*" (Again, respondents were provided with a detailed definition of Level 4 technology immediately preceding the question.) Figure 5 presents a complete summary of responses by country. The most frequent response varied by country, with "very concerned" being most frequent in the U.S., "moderately concerned" in the U.K., and "slightly concerned" in Australia.
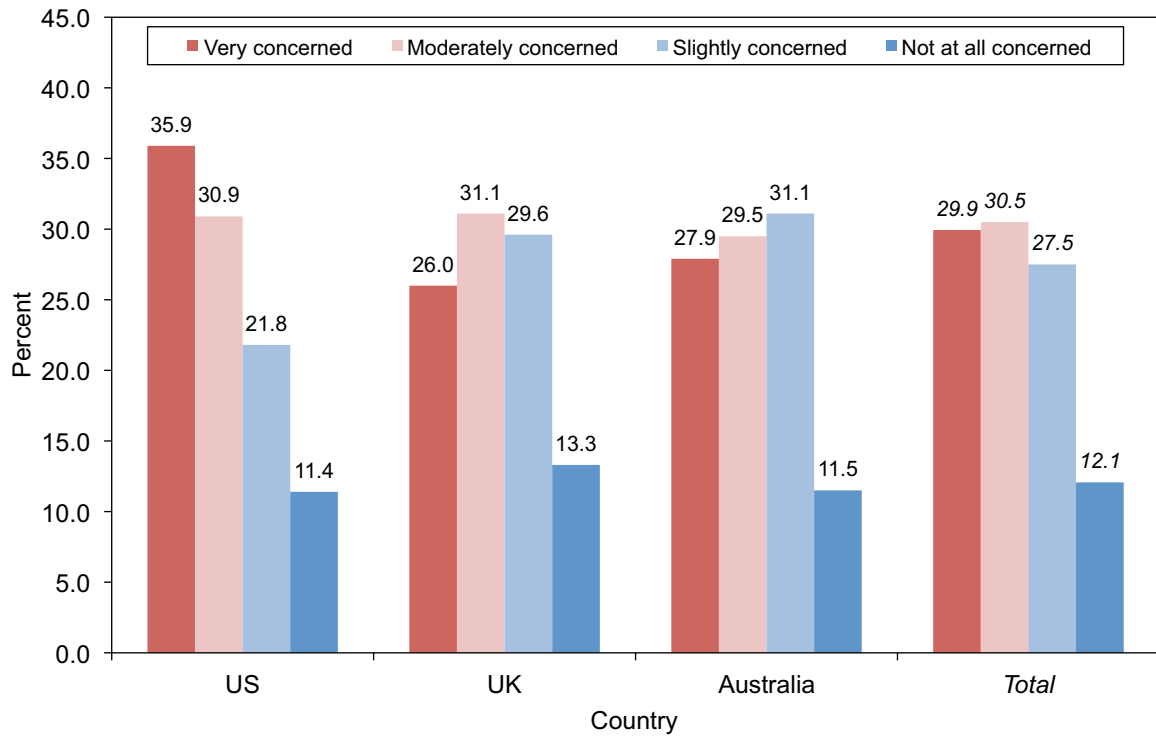

Figure 5. Summary of responses, by country, to Q5: "*How concerned would you be about driving or riding in a vehicle with [Level 4] self-driving technology?*"

Respondents were asked: "*How concerned are you about the following issues related to completely self-driving vehicles (Level 4)?*" They were asked to select "very concerned," "moderately concerned," "slightly concerned," or "not at all concerned" for each item in a list of possible concerns regarding self-driving vehicles. Table 4 presents a complete summary of responses by country. The most frequent response was either "very concerned" or "moderately concerned," depending on the issue in question. In general, there was agreement across all three countries for the most frequent response to each issue, except for the following items in the U.S. and U.K.:

- U.S. respondents were <u>more</u> likely to be concerned about:
    - Legal liability for drivers/owners
    - Data privacy (location and destination tracking)
    - Interacting with non-self-driving vehicles
    - System performance in poor weather
    - Self-driving vehicles not driving as well as human drivers in general
- U.K. respondents were <u>less</u> likely to be concerned about:
    - System security (from hackers)
    - Vehicle security (from hackers)
    - Interacting with pedestrians and bicyclists

Table 4
Percentage of responses, by country, to Q7: "*How concerned are you about the following issues related to self-driving vehicles?*"

Possible concern	Response	U.S.	U.K.	Australia	*Total*
Safety consequences of equipment failure or system failure	Very concerned	51.1	44.8	44.4	*46.8*
	Moderately concerned	30.7	36.8	34.3	*33.9*
	Slightly concerned	14.6	14.6	17.4	*15.5*
	Not at all concerned	3.6	3.8	4.0	*3.8*
Legal liability for drivers/owners	Very concerned	41.1	30.0	33.1	*34.7*
	Moderately concerned	36.1	42.5	39.6	*39.4*
	Slightly concerned	15.4	20.1	20.4	*18.6*
	Not at all concerned	7.4	7.4	6.9	*7.2*
System security (from hackers)	Very concerned	40.1	30.7	34.9	*35.2*
	Moderately concerned	30.7	36.4	33.3	*33.5*
	Slightly concerned	19.8	23.5	23.4	*22.2*
	Not at all concerned	9.4	9.3	8.5	*9.1*
Vehicle security (from hackers)	Very concerned	39.9	29.2	33.7	*34.3*
	Moderately concerned	30.7	37.2	32.7	*33.5*
	Slightly concerned	20.6	23.1	23.2	*22.3*
	Not at all concerned	8.8	10.4	10.5	*9.9*
Data privacy (location and destination tracking)	Very concerned	38.7	23.9	28.1	*30.2*
	Moderately concerned	30.7	37.8	32.1	*33.5*
	Slightly concerned	20.0	23.3	26.5	*23.3*
	Not at all concerned	10.6	15.0	13.3	*13.0*
Interacting with non-self-driving vehicles	Very concerned	40.1	29.6	30.7	*33.5*
	Moderately concerned	35.5	37.4	35.8	*36.2*
	Slightly concerned	16.8	25.6	24.0	*22.1*
	Not at all concerned	7.6	7.4	9.5	*8.2*
Interacting with pedestrians and bicyclists	Very concerned	42.1	33.4	35.6	*37.0*
	Moderately concerned	32.9	35.5	29.9	*32.8*
	Slightly concerned	18.0	23.1	25.1	*22.1*
	Not at all concerned	7.0	8.0	9.3	*8.1*
Learning to use self-driving vehicles	Very concerned	29.1	15.4	20.8	*21.8*
	Moderately concerned	30.3	33.0	31.9	*31.7*
	Slightly concerned	25.7	30.2	26.9	*27.6*
	Not at all concerned	14.8	21.4	20.4	*18.9*
System performance in poor weather	Very concerned	39.7	18.4	25.9	*28.0*
	Moderately concerned	33.7	37.0	33.7	*34.8*
	Slightly concerned	19.2	30.2	28.9	*26.1*
	Not at all concerned	7.4	14.4	11.5	*11.1*
Self-driving vehicles getting confused by unexpected situations	Very concerned	53.1	38.1	43.4	*44.9*
	Moderately concerned	29.1	34.2	29.1	*30.8*
	Slightly concerned	13.4	22.0	21.6	*19.0*
	Not at all concerned	4.4	5.7	5.9	*5.3*
Self-driving vehicles not driving as well as human drivers in general	Very concerned	39.7	27.5	30.1	*32.4*
	Moderately concerned	33.5	34.0	35.6	*34.4*
	Slightly concerned	19.6	25.6	24.6	*23.3*
	Not at all concerned	7.2	12.9	9.7	*9.9*

Respondents were asked: "*How concerned are you about the following possible scenarios with completely self-driving vehicles (Level 4)?*" They were asked to select "very concerned," "moderately concerned," "slightly concerned," or "not at all concerned" for each item in a list of possible scenarios involving different methods of using or deploying self-driving vehicles. Table 5 presents a complete summary of responses by country. "Very concerned" was the most frequent response for all items in each country. In general, respondents were most concerned about riding in a vehicle with no driver controls and about commercial vehicles that are completely self-driving (overall 54.3% were "very concerned" about each scenario), followed by self-driving busses (45.9%), self-driving taxis (42.9%), and self-driving vehicles moving by themselves from one location to another while unoccupied (39.2%).

Table 5
Percentage of responses, by country, to Q8: "*How concerned are you about the following possible scenarios with completely self-driving vehicles (Level 4)?*"

Possible concern	Response	U.S.	U.K.	Australia	*Total*
Riding in a vehicle with no driver controls available	Very concerned	60.1	51.8	51.0	*54.3*
	Moderately concerned	25.7	26.2	27.4	*26.4*
	Slightly concerned	10.4	14.6	14.5	*13.2*
	Not at all concerned	3.8	7.4	7.1	*6.1*
Self-driving vehicles moving by themselves from one location to another while unoccupied	Very concerned	41.5	36.6	39.4	*39.2*
	Moderately concerned	31.3	29.5	31.9	*30.9*
	Slightly concerned	16.6	20.0	17.7	*18.1*
	Not at all concerned	10.6	13.9	11.0	*11.8*
Commercial vehicles such as heavy trucks or semi-trailer trucks that are completely self-driving	Very concerned	58.2	51.7	53.0	*54.3*
	Moderately concerned	24.4	25.7	23.6	*24.6*
	Slightly concerned	12.2	15.0	16.1	*14.4*
	Not at all concerned	5.2	7.6	7.3	*6.7*
Public transportation such as buses that are completely self-driving	Very concerned	49.7	44.0	44.1	*45.9*
	Moderately concerned	28.1	28.5	26.6	*27.7*
	Slightly concerned	15.4	16.3	19.5	*17.1*
	Not at all concerned	6.8	11.3	9.7	*9.3*
Taxis that are completely self-driving	Very concerned	45.7	41.3	41.7	*42.9*
	Moderately concerned	31.4	28.8	29.4	*29.9*
	Slightly concerned	15.9	19.2	19.4	*18.2*
	Not at all concerned	7.0	10.7	9.5	*9.1*

Overall interest in owning and willingness to pay for self-driving technology

Overall interest in having completely self-driving-vehicle technology (Level 4) was similar across all three countries, with most respondents expressing some level of interest in having the technology (see Figure 6). Respondents in Australia were most likely to say they were interested in having this technology (67.7% said "very/moderately/slightly interested"), followed by the U.S. (66.3%), and the U.K. (63.4%). While the majority expressed some level of interest in having this technology, "not at all interested" was the most frequent response in all three countries (34.2% overall).
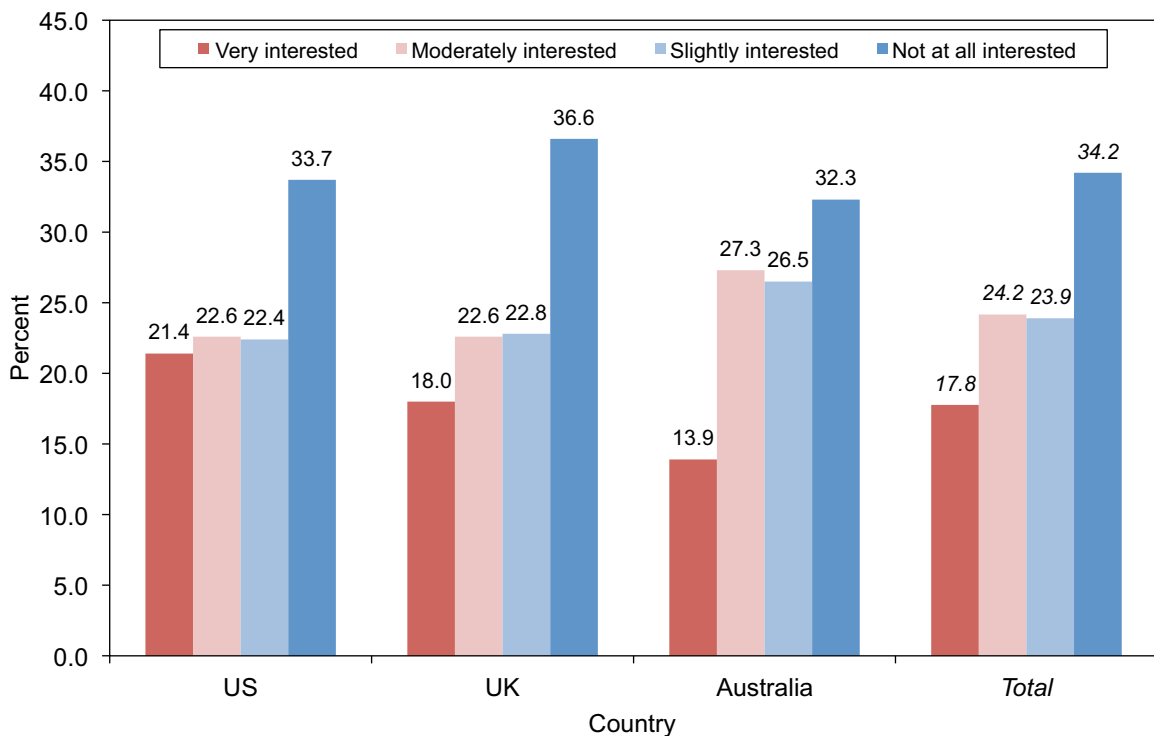
Figure 6. Summary of responses, by country, to Q9: "*How interested would you be in having a completely self-driving vehicle (Level 4) as the vehicle you own or lease?*"

Results showing how much extra individuals would be willing to pay to have self-driving-vehicle technology are presented in Table 6. (Respondents were asked to input an amount in their local currency—U.S. dollar, Australian dollar, or British pound; these amounts were recalculated to US\$ using current currency-conversion rates.)

In the U.S., 25% of respondents (75th percentile) were willing to pay at least \$2,000 for this technology. The corresponding amounts in the U.K. and Australia were \$1,710 and \$2,350, respectively. Analogously, 10% of U.S. respondents would be willing to pay at least \$5,800, with the corresponding U.K. and Australian values being \$5,130 and \$9,400, respectively. However, the majority of respondents said they would not be willing to pay extra for this technology (a response of \$0 was given by 54.5% in the U.S., 59.8% in the U.K., and 55.2% in Australia).

Table 6
Summary, by country, for Q10: "*How much EXTRA would you be willing to pay to have completely self-driving technology (Level 4) on a vehicle you own or lease in the future?*"
(Responses were given in the local currency; amounts in this table were recalculated to US\$ using current currency conversion rates.)

Measure	U.S.	U.K.	Australia	*Total*
10th percentile	\$0	\$0	\$0	*\$0*
25th percentile	\$0	\$0	\$0	*\$0*
50th percentile (median)	\$0	\$0	\$0	*\$0*
75th percentile	\$2,000	\$1,710	\$2,350	*\$1,880*
90th percentile	\$5,800	\$5,130	\$9,400	*\$8,550*
Percent responding \$0	54.5%	59.8%	55.2%	*56.6%*

How extra time would be spent when riding in self-driving vehicles

Respondents were asked: "*If you were to ride in a completely self-driving vehicle (Level 4), what do you think you would use the extra time doing instead of driving?*" Table 7 presents a complete summary of responses by country. Respondents most frequently said, "watch the road even though I would not be driving" (41.0% overall); the second most frequent response was "I would not ride in a completely self-driving vehicle" (22.4% overall). Of those who would participate in a specific activity while

riding in self-driving vehicles (other than watching the road), the most common response varied by country, with the top three choices as follows (with the rank within each country in parentheses):

- Read (#1 in U.S. and U.K.; #3 in Australia)
- Text or talk with friends/family (#1 in Australia; #2 in the U.S.; #3 in the U.K.)
- Sleep (#2 in the U.K. and Australia; #3 in the U.S.).

Table 7
Summary of responses, by country, to Q11: "*If you were to ride in a completely self-driving vehicle (Level 4), what do you think you would use the extra time doing instead of driving?*"

Response	U.S.	U.K.	Australia	*Total*
Watch the road even though I would not be driving	35.5	44.0	43.4	*41.0*
I would not ride in a self-driving vehicle	23.0	23.0	21.2	*22.4*
Read	10.8	7.6	6.5	*8.3*
Text or talk with friends/family	9.8	5.5	7.9	*7.7*
Sleep	6.8	7.2	7.1	*7.0*
Watch movies/TV	6.0	4.2	5.7	*5.3*
Work	4.8	4.9	5.1	*4.9*
Play games	2.0	1.9	2.0	*2.0*
Other	1.4	1.7	1.0	*1.4*

Statistically significant demographic effects

For each question in the survey, the responses for each individual demographic variable or grouping were compared using one-way analyses of variance (ANOVA). Table 8 presents a summary matrix from the series of ANOVAs, indicating statistically significant effects of demographic groupings on individual questions, either at $p \leq .05$, $p \leq .01$, or $p \leq .001$. The statistically significant results at the $p \leq .001$ level are briefly discussed below.

Table 8

Summary matrix from a series of one-way ANOVAs indicating statistically significant effects of demographic groupings (columns) on responses to individual questions (rows).

Question		Demographic variable or group							
	Q1 Ever heard of	Q2 Initial opinion	Q3 Current vehicle technology	Q12 Gender	Q13 Age	Q14 Education	Q15 Employment status	Q16 Vehicle type	Country
Q4		***	*	***			*	***	***
Q5		***	***	***		*	**	***	***
Q6_a	***	***	***	***	*	***	***		
Q6_b	***	***	***	***	*	***	***		
Q6_c	***	***	*	***	*	**			***
Q6_d	***	***	***	***	***	***	**		
Q6_e	*	***	***	***	***	***	**		
Q6_f	*	***	***	**	*				*
Q6_g	***	***	***	**	*		*		**
Q6_h	**	***		**	***	***	***		
Q7_a		***		***			*	**	
Q7_b		***		***				***	*
Q7_c		***		***		*	**		
Q7_d		***		***		*	**		*
Q7_e		***		**				**	***
Q7_f		***		***			*		***
Q7_g		***		***	*				**
Q7_h	***	***		***			***	*	***
Q7_i	**	***		***			*	*	***
Q7_j		***	**	***		**		*	***
Q7_k	**	***		***			*	*	***
Q8_a		***	*	***	**	**	***	***	***
Q8_b	***	***		***		**	***	*	
Q8_c		***	**	***	***	***	***	**	*
Q8_d	*	***	**	***	***	**	***	*	*
Q8_e	**	***		***	**	*	***	**	*
Q9	***	***	***	***	***	***	***		
Q10					*	**		*	
Q11	***	***	***	**	***	***	***		*

* = *p* ≤ .05

** = *p* ≤ .01

*** = *p* ≤ .001

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Ever heard of autonomous or self-driving vehicles (Q1). Respondents who had previously heard of autonomous or self-driving vehicles were more likely to expect crash-reduction benefits and better fuel economy. These respondents were also less concerned about learning to use self-driving vehicles, and less concerned about self-driving vehicles moving around while unoccupied. Those having previously heard of self-driving vehicles were more likely to say that they were interested in having this technology on their vehicle(s). Conversely, those who had not previously heard of self-driving vehicles were more likely to say they would not ride in such vehicles.

Initial opinion of autonomous and self-driving vehicles (Q2). Predictably, a respondent's initial opinion of self-driving vehicles had a significant effect on nearly every response. As such, we will not examine these results in detail.

Current autonomous-vehicle technology on own vehicle(s) (Q3). The higher the level of autonomous-vehicle technology installed on the respondents' current vehicles, the more likely respondents were to expect crash-reduction benefits, less traffic congestion, shorter travel time, lower vehicle emissions, and better fuel economy. Those with higher levels of autonomous-vehicle technology were more likely to express concern about system security and data privacy. Higher levels of autonomous-vehicle technology on their current vehicles also corresponded with increased interest in having self-driving-technology on their vehicle, and with being less likely to say that they would not ride in self-driving vehicles.

Gender (Q10). For all but one question regarding concerns with self-driving vehicles (the single exception being data-privacy concerns), females were more likely to express higher levels of concern compared to males. Similarly, females generally felt that the majority of the expected benefits with self-driving vehicles were unlikely to occur. (In contrast, a majority of males felt that the expected benefits were likely to occur.)

Age (Q11). Younger respondents were more likely to expect less traffic congestion, shorter travel time, and lower insurance rates with self-driving vehicles. They were also less concerned about commercial self-driving vehicles than older respondents. Younger respondents were more interested in having self-driving-

technology on their vehicle, and less likely to say that they would not ride in self-driving vehicles.

Education (Q12). Higher education levels were associated with higher expectations that self-driving vehicles will result in fewer crashes, reduced severity of crashes, less traffic congestion, shorter travel times, and lower insurance rates. Individuals with a bachelor degree were less concerned about self-driving commercial vehicles than those with higher or lower education levels. Higher levels of education were associated with greater interest by respondents in having self-driving-technology on their vehicle, and being less likely to say that they would not ride in self-driving vehicles. Those with higher levels of education were more likely to say they would read or work while using self-driving vehicles.

Employment status (Q13). Respondents who were employed full time were more likely to expect fewer crashes, reduced severity of crashes, and lower insurance rates; they were also less concerned about all scenarios presented in Q8. Being employed full time or being a full-time student were both associated with lower concern about learning to use self-driving vehicles, greater interest in having self-driving-technology on their vehicles, and being less likely to say that they would not ride in self-driving vehicles.

Vehicle type (Q15). Drivers of vehicles other than passenger cars or SUVs were more likely to express concern about riding in Level 3 and Level 4 self-driving vehicles in general. Drivers of pickup trucks were generally less concerned about legal liability when using self-driving vehicles. Those who do not drive were less concerned about riding in a self-driving vehicle with no driver controls available; minivan and SUV drivers expressed more concern about riding in such vehicles.

Country. Respondents in the U.S. expressed greater concern about riding in Level 3 and Level 4 self-driving vehicles in general. U.S. respondents were more optimistic about improved emergency response to crashes. U.S. respondents expressed greater concern about data privacy, interacting with non-self-driving vehicles, learning to use self-driving vehicles, system performance in poor weather, self-driving vehicles getting confused by unexpected situations, self-driving vehicles not driving as well as human drivers in general, and riding in a self-driving vehicle with no driver controls available. Respondents in the U.S. were more likely to have previously heard of self-driving

vehicles. U.K. respondents were less likely to drive, while U.S. respondents were more likely to drive pickup trucks or SUVs.

Discussion

Country

The results from all three countries surveyed were similar in most regards. However, some subtle but noteworthy differences among the countries do exist.

The U.S. Respondents in the U.S. were more likely to have heard of self-driving vehicles, and were more likely to have a "very positive" view of such vehicles. However, U.S. respondents were more likely than their foreign counterparts to say they were "very concerned" about legal liability, data privacy (location and destination tracking), interacting with non-self-driving vehicles, system performance in poor weather, and self-driving vehicles not driving as well as human drivers. They most frequently said they were "very concerned" (35.9%) about riding in Level 4 vehicles in general.

The U.K. Respondents in the U.K. were least likely to have a "very positive" opinion about self-driving vehicles, but were also least likely to say they were "very concerned" about riding in Level 3 or Level 4 self-driving vehicles, and only said they were "moderately concerned" about system security (from hackers), vehicle security (from hackers), and interacting with pedestrians and bicyclists, versus the most common response of "very concerned" for the other countries. They most frequently said they were "moderately concerned" (31.1%) about riding in Level 4 vehicles in general.

Australia. Australians were least likely to have previously heard of self-driving vehicles, but were the most likely to have a positive view overall regarding such vehicles. They also expressed the lowest level of concern about riding in Level 4 vehicles, most frequently saying they were only "slightly concerned" (31.1%) about riding in such vehicles.

Level 3 and Level 4 self-driving vehicles

In general, respondents expressed relatively high levels of concern about riding in Level 3 and Level 4 self-driving vehicles. Despite the fact that a potential safety-risk exists during the transition if it becomes necessary to hand control back to the human driver with Level 3 vehicles (limited self-driving), concern was <u>higher</u> for riding in Level 4 vehicles (completely self-driving). Overall, similar percentages of respondents

expressed some level of concern about riding in such vehicles (87.3% said "very/moderately/slightly concerned" about Level 3 while 87.9% gave one of those responses for Level 4). However, respondents who did express concern generally indicated higher levels of concern about riding in Level 4 compared to Level 3. This higher level of concern with Level 4 vehicles is also evident in the responses to Q11 (how extra time would be spent), as a majority of respondents said they would either watch the road (41.0%) or would prefer not to ride in a Level 4 vehicle (22.4%); both categories indicate an unwillingness to completely rely on the self-driving vehicle.

Contrary to the general trend, Australians expressed slightly lower concern about riding in Level 4 vehicles versus Level 3. While they most frequently said they were "moderately concerned" (37.2%) about riding in Level 3 vehicles, "slightly concerned" (31.1%) was the most common response about riding in Level 4 vehicles.

Human drivers versus self-driving vehicles

In each country, a large percentage of respondents said they had concerns that self-driving vehicles would not drive as well as human drivers. Overall, 90.1% said they had some level of concern ("very/moderately/slightly concerned") about self-driving vehicle performance compared to human drivers. Respondents in the U.S. expressed the greatest concern about this issue (92.8% expressed some level of concern), followed by Australia (90.3%) and the U.K. (87.1%). Concern was even higher regarding the possibility that self-driving vehicles will get confused by unexpected situations, with the frequency of those expressing some concern being highest in the U.S. (95.6%), followed by the U.K. (94.3%) and Australia (94.1%).

Opinions regarding self-driving vehicles versus connected vehicles

Several key similarities and differences exist between the present findings and those of our previous survey on connected vehicles (Schoettle and Sivak, 2014). (The two surveys were conducted using two independent samples of respondents.)

Ever heard of connected or self-driving vehicles. Opposite trends were found regarding whether respondents had ever heard of each vehicle type. While a majority of individuals had previously heard of self-driving vehicles, a majority had not previously heard of connected vehicles.

Expected benefits. Similar trends were found regarding respondents' expectations for potential benefits of each vehicle type. A majority felt that the expected benefits were likely to occur with both vehicle types, with the exceptions being that most respondents felt that less traffic congestion and shorter travel time were each unlikely to occur with self-driving vehicles.

Concerns. While respondents expressed concern about using each vehicle type, a higher level of concern was expressed regarding the use of self-driving vehicles. However, concern was high in both studies regarding data privacy for U.S. respondents.

Interest in owning. Interest in having connected-vehicle technology was much higher than the interest in having self-driving technology on respondents' vehicles.

Willingness to pay. A higher percentage of respondents were willing to pay extra for connected-vehicle technology. However, those who were willing to pay for self-driving technology were willing to pay more than those who would pay for connected-vehicle technology.

Conclusions

This survey examined public opinion regarding self-driving-vehicle technology in three major English-speaking countries—the U.S., the U.K., and Australia. The survey yielded useable responses from 1,533 persons 18 years and older.

The main findings (applicable to each of the three countries) were as follows:

- The majority of respondents had previously heard of autonomous or self-driving vehicles, had a positive initial opinion of the technology, and had high expectations about the benefits of the technology.

- However, the majority of respondents expressed high levels of concern about riding in self-driving vehicles, security issues related to self-driving vehicles, and self-driving vehicle not performing as well as actual drivers.

- Respondents also expressed high levels of concern about vehicles without driver controls; self-driving vehicles moving while unoccupied; and self-driving commercial vehicles, busses, and taxis.

- The majority of respondents expressed a desire to have this technology in their vehicle. However, a majority was also unwilling to pay extra for the technology; those who were willing to pay offered similar amounts in each country.

- Females expressed higher level of concern with self-driving vehicles than did males. Similarly, females were more cautious about their expectations concerning benefits from using self-driving vehicles.

In comparison to the respondents in the U.K. and Australia, respondents in the U.S. expressed greater concern about riding in self-driving vehicles, data privacy, interacting with non-self-driving vehicles, self-driving vehicles not driving as well as human drivers in general, and riding in a self-driving vehicle with no driver controls available.

The main implications of these results are that motorists and the general public in the three countries surveyed, while expressing high levels of concern about riding in vehicles equipped with this technology, feel positive about self-driving vehicles, have optimistic expectations of the benefits, and generally desire self-driving-vehicle

technology when it becomes available (though a majority is not willing to pay extra for such technology at this time).

References

BBC [British Broadcasting Corporation]. (2014, May 27). *Google is to start building its own self-driving cars*. Available at: http://www.bbc.com/news/technology-27587558

CarInsurance.com. (2013). *Survey: Drivers ready to trust robot cars?* Available at: http://www.carinsurance.com/Articles/autonomous-cars-ready.aspx

Cisco. (2013). *Cisco customer experience research, Automotive industry, Global data*. Available at: https://www.cisco.com/web/about/ac79/docs/ccer_report_manufacturing.pdf

CNN [Cable News Network]. (2014, May 28). *Google's new self-driving car has no steering wheel or brake*. Available at: http://www.cnn.com/2014/05/28/tech/innovation/google-self-driving-car/

Daimler. (2014). *Future Truck 2025: World premiere for the transport of the future*. Available at: http://www.daimler.com/dccom/0-5-1714412-1-1714446-1-0-0-0-0-0-0-0-0-0-0-0-0-0.html

Forbes. (2014, May 29). *The big public transit promise for Google's new self-driving car*. Available at: http://www.forbes.com/sites/michelinemaynard/2014/05/29/the-big-public-transit-promise-for-googles-new-self-driving-car/

Google. (2014). *Google self-driving car project*. Available at: https://plus.google.com/+GoogleSelfDrivingCars/posts

HM Treasury. (2013). *National Infrastructure Plan 2013*. Available at: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/263159/national_infrastructure_plan_2013.pdf

J.D. Power. (2012). *Vehicle owners show willingness to spend on automotive infotainment features*. Available at: http://www.jdpower.com/sites/default/files/2012049-uset.pdf

KPMG. (2013). *Self-driving cars: Are we ready?* Available at: http://www.kpmg.com/US/en/IssuesAndInsights/ArticlesPublications/Documents/self-driving-cars-are-we-ready.pdf

Los Angeles Times. (2014, May 28). *Look, Ma, no hands: Google to test 200 self-driving cars*. Available at: http://www.latimes.com/business/autos/la-fi-google-car-20140529-story.html

Milton Keynes Citizen. (2014, May 13). *Makers of Milton Keynes' driverless public transport pods unveiled*. Available at: http://www.miltonkeynes.co.uk/news/local/makers-of-milton-keynes-driverless-public-transport-pods-unveiled-1-6055974

Narla, S. R. K. (2013). The evolution of connected vehicle technology: From smart drivers to smart cars to… self-driving cars. *ITE Journal, 83*, 22-26.

NHTSA [National Highway Traffic Safety Administration]. (2012a). *Light vehicle driver acceptance clinics. Preliminary results*. Available at: http://www.safercar.gov/staticfiles/safercar/connected/Driver_Acceptance_Clinics_Results.pdf

NHTSA [National Highway Traffic Safety Administration]. (2012b). *Questions & answers about DOT's safety pilot "model deployment"*. Available at: http://www.safercar.gov/staticfiles/safercar/connected/Technical_Fact_Sheet-Model_Deployment.pdf

NHTSA [National Highway Traffic Safety Administration]. (2013). *Preliminary statement of policy concerning automated vehicles*. Available at: http://www.nhtsa.gov/staticfiles/rulemaking/pdf/Automated_Vehicles_Policy.pdf

NHTSA [National Highway Traffic Safety Administration]. (2014). *U.S. Department of Transportation announces decision to move forward with vehicle-to-vehicle communication technology for light vehicles*. Available at: http://www.nhtsa.gov/About+NHTSA/Press+Releases/2014/USDOT+to+Move+Forward+with+Vehicle-to-Vehicle+Communication+Technology+for+Light+Vehicles

Nissan. (2013). *Nissan announces unprecedented autonomous drive benchmarks*. Available at: http://nissannews.com/en-US/nissan/usa/releases/nissan-announces-unprecedented-autonomous-drive-benchmarks

Pew Research Center. (2014). *U.S. views of technology and the future. Science in the next 50 years*. Available at: http://www.pewinternet.org/files/2014/04/US-Views-of-Technology-and-the-Future.pdf

Schoettle, B, and Sivak, M. (2014). *A survey of public opinion about connected vehicles in the U.S., the U.K., and Australia* (Technical Report No. UMTRI-2014-10). Available at: http://deepblue.lib.umich.edu/bitstream/handle/2027.42/106590/102996.pdf?sequence=1

Seapine Software. (2014). *Study finds 88 percent of adults would be worried about riding in a driverless car*. Available at: http://www.seapine.com/pr.php?id=217

State of California. (2014). *Autonomous vehicles in California*. Available at: https://www.dmv.ca.gov/vr/autonomous/testing.htm

State of Florida. (2012). *Chapter 2012-111. Committee Substitute for House Bill No. 1207. Vehicles with Autonomous Technology*. Available at: http://laws.flrules.org/2012/111

State of Michigan. (2013a). *Enrolled Senate Bill 0169*. Available at: http://legislature.mi.gov/doc.aspx?2013-SB-0169

State of Michigan. (2013b). *Enrolled Senate Bill 0663*. Available at: http://legislature.mi.gov/doc.aspx?2013-SB-0663

State of Nevada. (2011). *Assembly Bill No. 511–Committee on Transportation*. Available at: http://www.leg.state.nv.us/Session/76th2011/Reports/history.cfm?ID=1011

SurveyMonkey. (2014). *Is my SurveyMonkey Audience sample representative?* Available at: http://help.surveymonkey.com/articles/en_US/kb/Is-my-SurveyMonkey-Audience-sample-representative.

TE Connectivity. (2013). *TE Connectivity survey finds safety the top consumer priority in adopting autonomous vehicle technology*. Available at: http://www.te.com/content/dam/te/global/english/industries/automotive/te-autonomous-vehicles-survey-press-release.doc

U.N. [United Nations]. (2014). *Convention on Road Traffic (1968): Consistency between the Convention on Road Traffic (1968) and Vehicle Technical Regulations*. Available at: http://www.unece.org/trans/roadsafe/wp12014.html

Appendix: Questionnaire

Opinions Concerning Autonomous and Self-Driving Vehicles
(via SurveyMonkey)

We are conducting a survey of opinions about autonomous and self-driving vehicles.

A general explanation of what is meant by autonomous and self-driving vehicles will be shown on the next page. Please take a moment to read that description carefully before continuing with the survey.

Autonomous vehicles are those in which at least some aspects of a safety-critical control (such as steering, throttle, or braking) operate without direct driver input. Vehicles that provide safety warnings to drivers (for example, a forward-crash warning) but do not take control of the vehicle are not considered autonomous.

Autonomous vehicles may use on-board sensors, cameras, GPS, and telecommunications to obtain information in order to make decisions regarding safety-critical situations and act appropriately by taking control of the vehicle at some level. Examples of autonomous-vehicle technologies range from those that take care of basic functions such as cruise control, to completely self-driving vehicles with no human driver required.

Q1) Had you ever heard of autonomous and/or self-driving vehicles before participating in this survey?

Yes

No

Q2) What is your general opinion regarding autonomous and self-driving vehicles?
Even if you had never heard of autonomous or self-driving vehicles before participating in this survey, please give us your opinion based on the description you just read.

Very positive

Somewhat positive

Neutral

Somewhat negative

Very negative

There are several different levels of autonomous-vehicle technology. Some of these technologies already exist now, while others are expected to become available in the future. Descriptions of each level of autonomous vehicle technology are shown below. Please take a moment to read each description carefully before continuing with the survey.

Current technology:

Level 0. No autonomous-vehicle technology.

Level 1. The vehicle controls one or more safety-critical functions, but they operate independently. The driver still maintains overall control.

Level 2. This level combines two or more technologies from Level 1, but they operate in coordination with each other. The driver still maintains overall control.

Future technology:

Level 3. This level provides limited self-driving technology. The driver will be able to hand control of all safety-critical functions to the vehicle, and only occasional control by the driver will be required.

Level 4. Completely self-driving vehicle. The vehicle will control all safety-critical functions for the entire trip.

Q3) Which of the following autonomous-vehicle technologies, if any, do you have on the vehicle(s) that you own or lease?

Please select one response only. If you have more than one vehicle with this technology, please select the most advanced level installed on your vehicles.

☐ I do not currently own or lease a vehicle

☐ Level 0: No automation. The driver is in complete and sole control of the primary vehicle controls (brake, steering, and throttle) at all times, and is solely responsible for monitoring the roadway and for safe operation of the vehicle. Vehicles that have certain driver support or convenience systems but do not have control over steering, braking, or throttle would still be considered Level 0 vehicles. Examples include systems that provide only warnings (forward collision warning, lane departure warning, blind spot monitoring), as well as systems providing automated secondary controls such as wipers, headlights, (*U.S.: turn signals, U.K./Australia: indicators*), hazard lights, etc.

☐ Level 1: Automation at this level involves one or more primary vehicle controls (brake, steering, or throttle); if multiple controls are automated, they operate independently from each other. The driver has overall control, and is solely responsible for safe operation, but can choose to hand over limited control to the vehicle (such as cruise control); or the vehicle can automatically control a function (such as electronic stability control); or the vehicle can provide added control to aid the driver in certain situations (such as dynamic brake support in emergencies). The vehicle may assist the driver in operating one of the controls— steering, braking, or throttle—but each function is controlled independently from the others. Other examples of Level 1 systems include automatic braking and automatic lane keeping.

(Q3 continued on next page)

☐ Level 2: This level involves automation of at least two primary vehicle controls (brake, steering, and/or throttle) designed to work together to relieve the driver of control of those functions. Vehicles at this level of automation can share control with the driver in certain limited driving situations. The driver is still responsible for monitoring the roadway and safe operation, and is expected to be available for control at all times and on short notice. The system can relinquish control with no advance warning and the driver must be ready to control the vehicle safely. An example of a Level 2 system is adaptive cruise control in combination with automatic lane keeping. Automatic parking systems are also considered Level 2.

☐ I do not know if my vehicle has any of these technologies

Q4) Level 3 vehicles are expected to provide limited self-driving automation. Vehicles at this level enable the driver to hand over control of all safety-critical functions under certain traffic conditions, and to rely on the vehicle to monitor for changes that require switching back to driver control. The driver will be expected to be available for occasional control, but with sufficiently comfortable transition time. An example would be a self-driving car that can determine when the system is no longer able to support automation, such as in a construction area, and then signals the driver to take control of the vehicle with an appropriate amount of time to safely react. The major difference between Level 2 and Level 3 is that at Level 3, the vehicle is designed so that the driver is not expected to constantly monitor the roadway while driving.

How concerned would you be about driving or riding in a vehicle with this level of self-driving technology?

Very concerned

Moderately concerned

Slightly concerned

Not at all concerned

Q5) Level 4 vehicles are expected to provide complete self-driving automation. The vehicle will be designed to perform all safety-critical driving functions and monitor roadway conditions for an entire trip. The "driver" will provide destination or navigation input, but will not be expected to be available for control at any time during the trip. This includes both occupied and unoccupied vehicles. By design, safe operation rests solely with the automated vehicle system.

How concerned would you be about riding in a vehicle with this level of self-driving technology?

Very concerned

Moderately concerned

Slightly concerned

Not at all concerned

Q6) How likely do you think it is that the following benefits will occur when using **completely self-driving vehicles (Level 4)**?

Please select one response per row.

	Very likely	Somewhat likely	Somewhat unlikely	Very unlikely
a. Fewer crashes	☐	☐	☐	☐
b. Reduced severity of crashes	☐	☐	☐	☐
c. Improved emergency response to crashes	☐	☐	☐	☐
d. Less traffic congestion	☐	☐	☐	☐
e. Shorter travel time	☐	☐	☐	☐
f. Lower vehicle emissions	☐	☐	☐	☐
g. Better fuel economy	☐	☐	☐	☐
h. Lower insurance rates	☐	☐	☐	☐

Q7) How concerned are you about the following issues related to **completely self-driving vehicles (Level 4)**?

Please select one response per row.

	Very concerned	Moderately concerned	Slightly concerned	Not at all concerned
a. Safety consequences of equipment failure or system failure	☐	☐	☐	☐
b. Legal liability for "drivers"/owners	☐	☐	☐	☐
c. System security (from hackers)	☐	☐	☐	☐
d. Vehicle security (from hackers)	☐	☐	☐	☐
e. Data privacy (location and destination tracking)	☐	☐	☐	☐
f. Interacting with non-self-driving vehicles	☐	☐	☐	☐
g. Interacting with pedestrians and bicyclists	☐	☐	☐	☐
h. Learning to use self-driving vehicles	☐	☐	☐	☐
i. System performance in poor weather	☐	☐	☐	☐
j. Self-driving vehicles getting confused by unexpected situations	☐	☐	☐	☐
k. Self-driving vehicles not driving as well as human drivers in general	☐	☐	☐	☐

Q8) How concerned are you about the following possible scenarios with **completely self-driving vehicles (Level 4)**?

Please select one response per row.

	Very concerned	Moderately concerned	Slightly concerned	Not at all concerned
a. Riding in a vehicle with no driver controls available (no steering wheel, no brake pedal, and no gas pedal/accelerator)	☐	☐	☐	☐
b. Self-driving vehicles moving by themselves from one location to another while unoccupied	☐	☐	☐	☐
c. Commercial vehicles such as heavy trucks or semi-trailer trucks (*U.K.: lorries or heavy goods vehicles*) that are completely self-driving	☐	☐	☐	☐
d. Public transportation such as buses that are completely self-driving	☐	☐	☐	☐
e. Taxis that are completely self-driving	☐	☐	☐	☐

Q9) How interested would you be in having a **completely self-driving vehicle (Level 4)** as the vehicle you own or lease?

Very interested
Moderately interested
Slightly interested
Not at all interested

Q10) How much EXTRA would you be willing to pay to have **completely self-driving technology (Level 4)** on a vehicle you own or lease in the future?

(Please enter 0 if you would not be willing to pay extra for this technology.)

[Respondents were asked to input an amount in their local currency—U.S. dollar, Australian dollar, or British pound; these amounts were recalculated to US$ using current currency conversion rates.]

Q11) If you were to ride in a **completely self-driving vehicle (Level 4)**, what do you think you would use the extra time doing instead of driving?

Please select one response only.

    Text or talk with friends/family

    Read

    Sleep

    Watch movies/TV

    Play games

    Work

    Watch the road even though I would not be driving

    I would not ride in a completely self-driving vehicle

    Other (please specify): _____

Q12) Now we would like to know some basic background information about you. What is your gender?

    Female

    Male

Q13) What is your age?

    18 to 24

    25 to 29

    30 to 34

    35 to 39

    40 to 44

    45 to 49

    50 to 54

    55 to 59

    60 to 64

    65 to 69

    70 or older

Q14) What is the highest level of education you have completed?

    Less than bachelor degree

    Bachelor degree

    Graduate degree

Q15) What is your current level of employment?
Please select only ONE option that best describes you.
      Employed full-time
      Employed part-time
      Not currently employed
      Retired
      Full-time student
      Part-time student

Q16) What kind of vehicle do you use most often?
Please select one response only.
      Passenger car (any type or size)
      Minivan / van / MPV (multipurpose vehicle)
      Pickup truck
      SUV (sport utility vehicle)
      Motorcycle / scooter
      I do not drive
      Other (please specify): _____

Thank you for completing this survey about autonomous and self-driving vehicles!