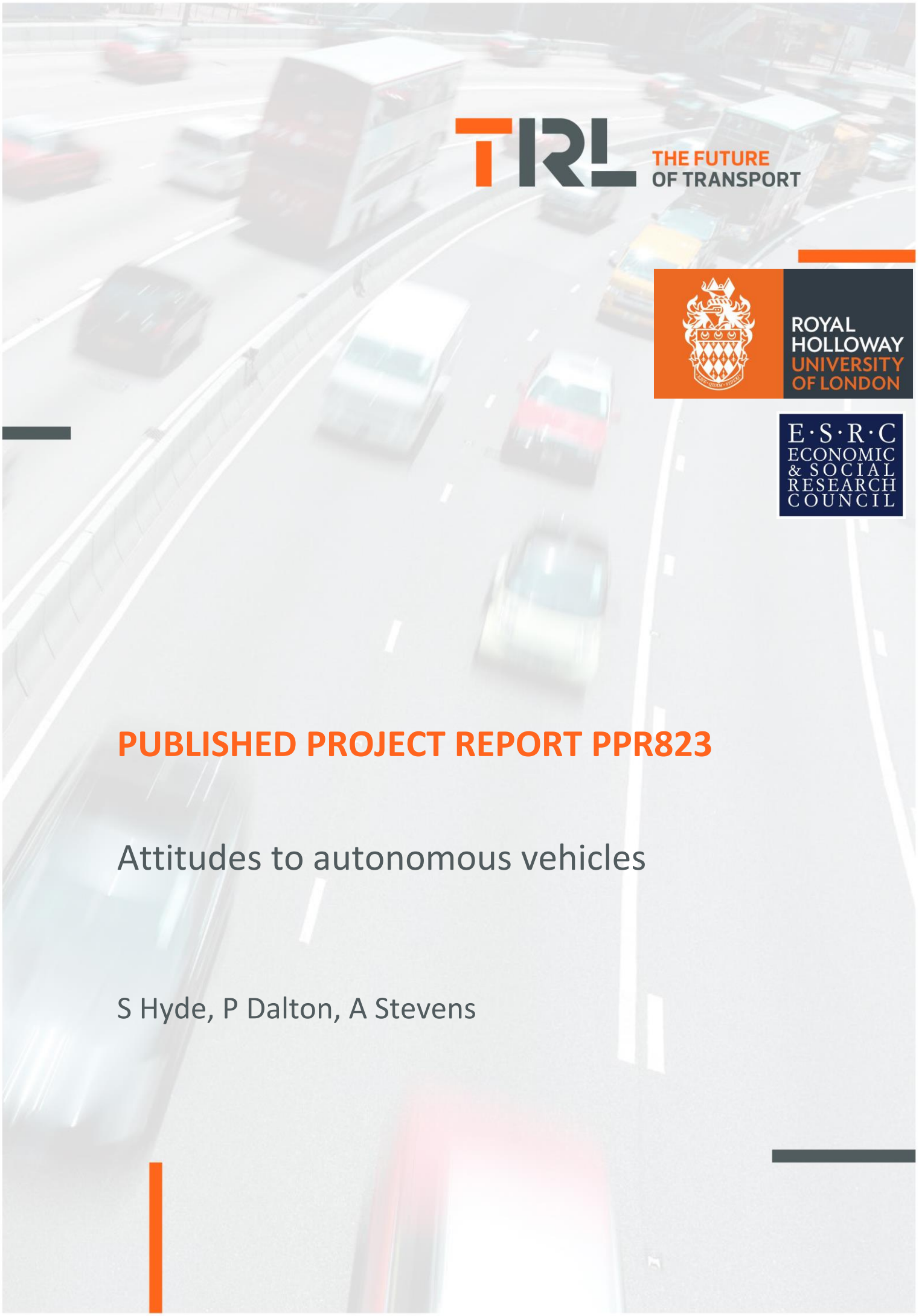

THE FUTURE OF TRANSPORT

ROYAL HOLLOWAY UNIVERSITY OF LONDON

E·S·R·C ECONOMIC & SOCIAL RESEARCH COUNCIL

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Attitudes to autonomous vehicles

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Attitudes to autonomous vehicles

Executive summary

The introduction of fully autonomous vehicles will constitute perhaps the largest change to everyday transportation in living memory and is predicted to deliver a wide range of environmental, social and economic benefits. However, the route to full automation is also likely to involve significant challenges, with public attitudes playing an important role in determining the level of success with which the technology is introduced. This report outlines the results of a survey of 233 people measuring current attitudes to autonomous vehicles.

People's overall openness to the idea of autonomous vehicles was very high, with 81% of respondents agreeing that 'driverless cars are a good idea' and only 1% disagreeing.

The general level of trust in autonomous vehicles was also fairly high, with 55% agreeing that 'I can trust a driverless vehicle', 23% 'somewhat' agreeing, and only 3% disagreeing. Qualitative comments suggested that people's level of trust will depend on the specifics of each vehicle, with factors such as manufacturer, safety record and independent reviews likely to influence their judgements.

Further open comments highlighted a range of concerns that are similar to those seen in previous surveys. These include the security of the software, the safe functioning of the systems, particularly in the early phases of introduction, ethics and legislative issues. However, the comments also revealed high levels of excitement concerning the range of positive changes that the introduction of autonomous vehicles is likely to bring.

The main caveat of the findings concerns the representativeness of the survey, particularly as it was run online (thus excluding all people without internet access) and as a large proportion (64%) of the respondents were recruited via their registered interest in a major UK trial of automated vehicles, the GATEway project. Nevertheless, the responses remained positive even with the GATEway respondents removed.

Attitudes to autonomous vehicles

1 Background

The task of driving is already becoming highly automated, through functions such as adaptive cruise control, collision avoidance and assisted parking. This pattern is likely to continue at pace over the next few decades, resulting in full automation becoming the norm well within this century. This will constitute perhaps the largest change to everyday transportation in living memory and is predicted to deliver a wide range of environmental, social and economic benefits. However, the route to full automation is also likely to involve significant challenges, with public attitudes playing an important role in determining the level of success with which the technology is introduced. This report outlines the results of a survey measuring current attitudes to autonomous vehicles.

The survey was carried out in conjunction with the GATEway (Greenwich Automated Transport Environment) project – an £8m research project, led by TRL, to understand and overcome the technical, legal and societal challenges of implementing automated vehicles in an urban environment. Taking place in the Royal Borough of Greenwich, the project will trial and validate a series of different use cases for automated vehicles, including driverless shuttles and automated urban deliveries. The work aims to inspire and engage the public with the potential of automated transport technology and the project has recruited many supporters and those interested in trialling the technology (GATEway, 2017).

2 Existing research

There already exists a rapidly-growing body of surveys on public attitudes to vehicle automation. For example, Gkartzonikas & Gkritza (2017) identified 25 such surveys published since 2012. In general, the findings remain unclear concerning the public's overall level of interest in using or buying the technology (e.g. Cavoli, Phillips, Cohen, & Jones, 2017). However, there is fairly good agreement regarding the most frequently identified concerns:

1) Safety and reliability of the system: safe functioning is often rated as people's top priority when judging the desirability of autonomous vehicles (e.g. Bansal & Kockelman, 2016; Schoettle & Sivak, 2014)
2) Security of the software: respondents typically raise the potential for people to hack into vehicle control systems as another serious concern (e.g. Kyriakidis, Happee, & de Winter, 2015)
3) Cost: there is an assumption that autonomous vehicles will increase the cost of vehicle ownership (e.g. Bansal & Kockelman, 2016; Howard & Dai, 2014)
4) Liability: several surveys identify concerns around the legal issues associated with use of the technology (e.g. Howard & Dai, 2014; Kyriakidis et al., 2015).

This previous research has typically relied on the respondents' existing knowledge of autonomous vehicles when assessing their views (a problem highlighted, for example, by Cavoli et al., 2017, Clark et al., 2016, and Howard & Dai, 2014). This raises the possibility that many of the respondents in these earlier studies were providing opinions based on a flawed understanding of the technology and its current state of development. The current survey sought to address this possibility directly, by providing a subset of the respondents with up-to-date information.

3 Methodology

An online survey examining people's trust and acceptance of autonomous vehicles was conducted from December 2016 to February 2017 using Qualtrics. The questionnaire items used in the survey were based on previous studies of general driving attitudes, trust and acceptance, and specific attitudes to autonomous vehicles. A range of demographic information was also collected. The full text of the survey, along with responses, is included in Appendix A.

We also provided half of our respondents with up-to-date information on autonomous vehicles (see Appendix C) before they completed the survey, allowing us to examine the possibility (raised by previous research) that a lack of information may cause people to adopt a more cautious attitude. Two comprehension questions were included for this group, with the purpose of screening out participants who did not properly comprehend the additional information.

An internet-based approach was used to enable us to recruit a wide and diverse demographic. However, we specifically targeted members of public who had signed up to take part in the GATEway project. The questionnaire was also disseminated through Twitter, email and the Royal Holloway, University of London intranet. The recruitment process resulted in 299 replies from potential respondents. Only surveys that were at least 85% complete and with at least one of the comprehension questions correct (if relevant) were included for further analysis, resulting in a final sample of 233 respondents.

4 Findings

4.1 Respondent details

148 of the 233 respondents were recruited via TRL's Gateway project, having expressed an interest in taking part in research and trials relating to vehicle automation. The remaining 85 people (henceforth referred to as the 'internet group') indicated that they had been recruited via other means (primarily email and social media). The GATEway group (mean age 41) were significantly older than the internet group (mean age 35; t (231) = 3.38, p = .001). The GATEway group also had a significantly larger proportion of male respondents (79%) than the internet group (60%; χ^2 (1, N = 229) = 9.24, p = .002). Because both age

and gender are known to affect attitudes to autonomous vehicles (e.g. Cavoli et al., 2017; Hohenberger, Spörrle & Welpe, 2016), and in addition the GATEway group were recruited based on an already-stated interest in driverless vehicles, results are compared separately for the GATEway and internet groups on the central questions in this report, in acknowledgement of the fact that the GATEway group may be less representative of mainstream attitudes than the internet group.

4.2 Overall attitudes to autonomous vehicles

Overall attitudes to autonomous vehicles can be gauged from responses to the two general statements "Driverless cars are a good idea" and "I can trust a driverless vehicle". The sections below explore the responses to these two questions.

4.2.1 "Driverless cars are a good idea"

Figure 1 shows responses to this question from all participants where:

- 81% replied 'agree' or 'agree strongly'
- 1% replied 'disagree' or disagree strongly'

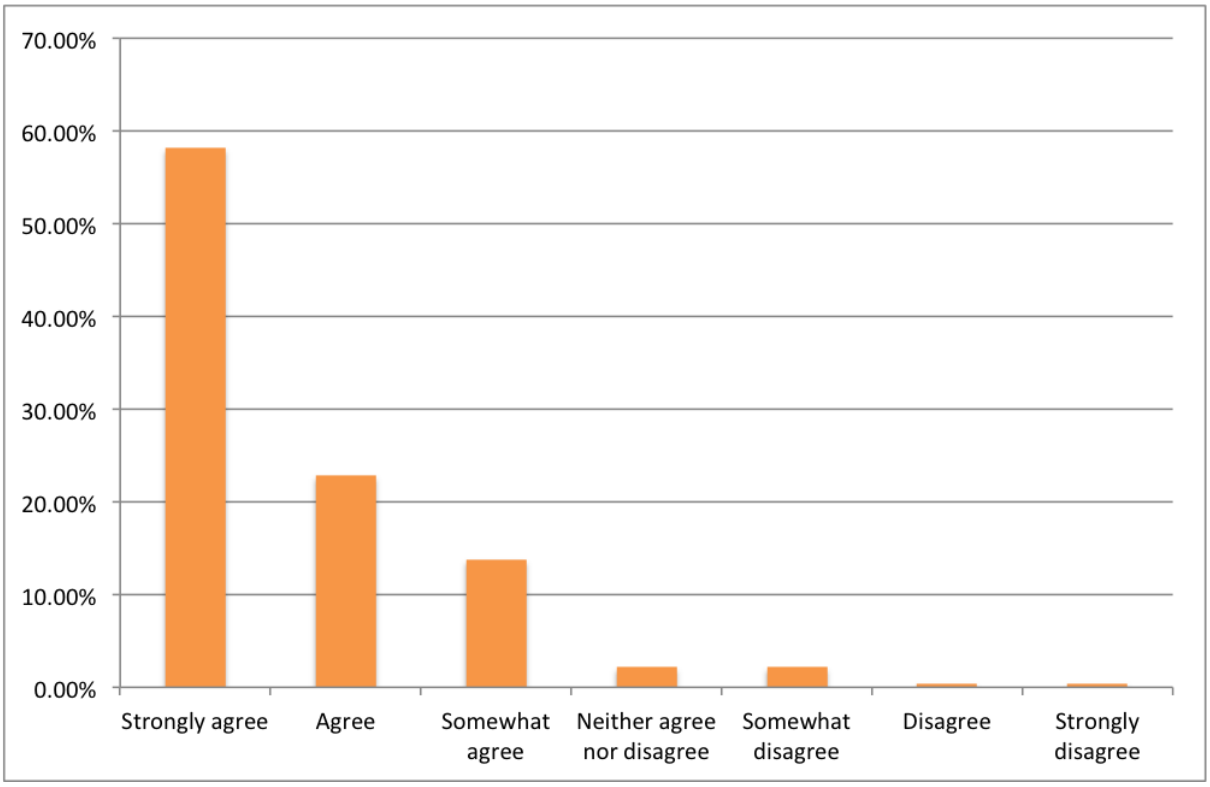

Figure 1: responses from all participants to the statement "driverless cars are a good idea"

In order to test for a difference between the GATEway and internet groups, answers were categorised as 'agree' (comprising both the 'agree' and 'strongly agree' categories), 'neutral' (comprising the 'somewhat agree', 'neither agree

nor disagree' and 'somewhat disagree' categories) or 'disagree' (comprising the 'disagree' and 'strongly disagree' categories). A Fisher's exact test revealed a significant difference in the patterns of responding across the two groups (p = .041). Figure 2 therefore shows responses separately for the GATEway and internet groups. Note that, despite being less positive than the GATEway group, the internet group were nevertheless highly positive overall:

- 74% replied 'agree' or 'agree strongly'
- 1% replied 'disagree' or 'disagree strongly'

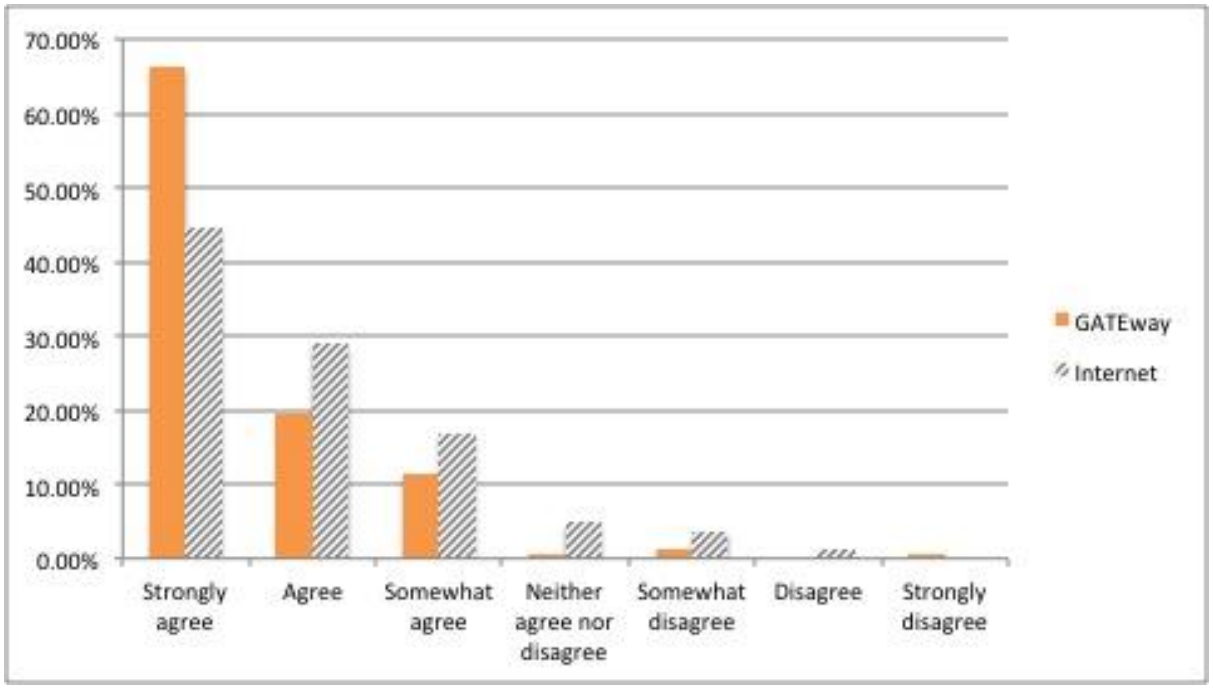

Figure 2: responses to the statement "driverless cars are a good idea" separated by group

In line with previous research (e.g. Hohenberger, Spörrle & Welpe, 2016) a Fisher's exact test using the same response categories identified a significant difference between the response patterns of male and female participants (p < .001). Men were more likely to agree with the target statement than women (89% vs. 62%) and less likely than women to give a neutral response (11% vs. 36%).

We did not undertake detailed qualitative analysis of participants' replies to the freeform response section at the end of the survey (in which respondents were asked "Do you have any additional comments?") However, some examples of these comments are provided throughout the report where they relate to key themes. Two examples of the most positive comments are provided below, taken verbatim from within the questionnaires:

"Bring them on!"

- respondent comment

"I work in the railway industry where digital signalling has meant that driverless trains are the norm for metro railways. I have seen first hand the improvements in safety the technology has delivered therefore I have no doubt it will deliver the same results for road transport. I can see the enormous benefit this technology will have for elderly and disabled people who no longer can drive and find it difficult to use public transport/ walking or cycling as mobility options."

- *respondent comment*

4.2.2 *"I can trust a driverless vehicle"*

Figure 3 shows responses to this question from all participants where:

- 55% replied 'agree' or 'agree strongly'
- 23% replied 'somewhat agree'
- 3% replied 'disagree' or disagree strongly'

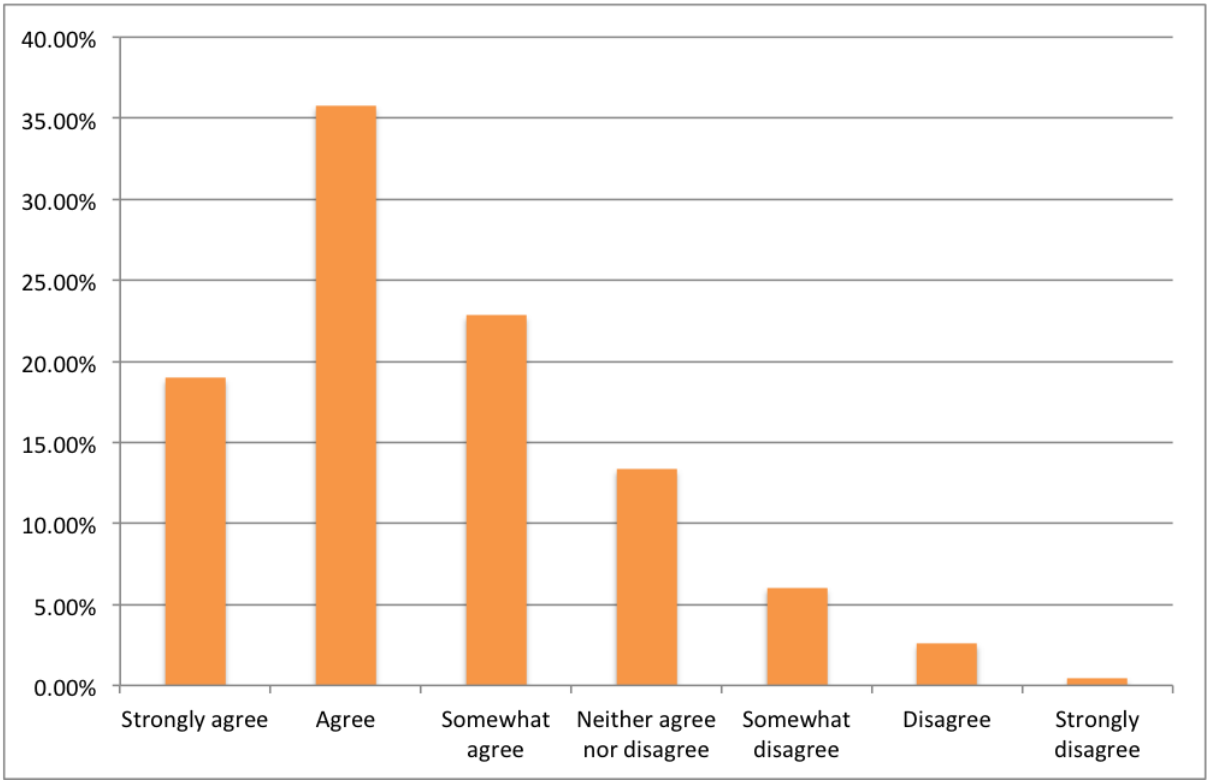

Figure 3: responses from all participants to the statement "I can trust a driverless vehicle"

In order to test for a difference between the GATEway and internet groups, answers were categorised as described for the previous item (see section 4.2.1). A Fisher's exact test again revealed a significant difference in the patterns of responding across the two groups (p = .004). Figure 4 therefore shows responses separately for the two groups. Again, although the internet group was in general less positive, their responses showed a similar pattern overall.

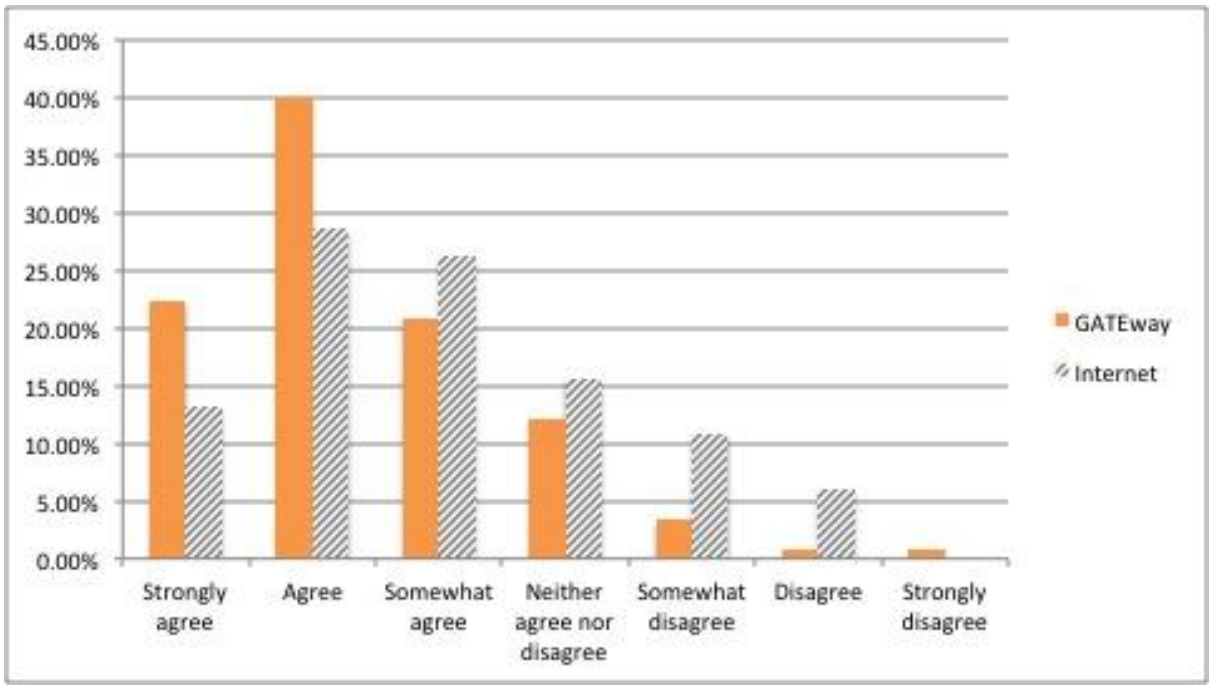

Figure 4: responses to the statement "I can trust a driverless vehicle" separated by group

A Fisher's exact test using the same response categories identified no significant difference between the response patterns to this statement of male and female participants (p = .13).

The reduction in positivity in response to "I can trust a driverless vehicle" compared with "driverless cars are a good idea" perhaps indicates a general openness to the concept of the technology coupled with caution over the reliability of the systems as they currently exist. This is supported by the responses to the freeform response section at the end of the survey. Of the 57 participants who provided responses to this item, eight made the point that their level of trust in an autonomous vehicle would depend on the specifics of the vehicle, with factors such as manufacturer, safety record and independent reviews likely to influence their judgements. It therefore seems likely that people are open in principle to adopting this technology, but that their decisions when given the opportunity to use or purchase an autonomous vehicle will depend on the characteristics of the vehicle in question. This attitude is summed up by the following example comment:

"A lot of the trustworthiness of the driverless vehicles would depend on independent reviews, safety ratings, and other people's experiences, as well as the trustworthiness of the manufacturer and the technology."

- *respondent comment*

4.3 Main concerns about autonomous vehicles

This survey did not ask directly about the nature of people's concerns around autonomous vehicles. However, many respondents did set out their concerns in

the freeform response section at the end of the survey. The most frequently raised concerns involved interactions between autonomous and non-autonomous vehicles in the early phases of introduction and the security of the software. Other common concerns involved: the ethical questions raised by the introduction of the technology; the likelihood of problems with the technology in the early phases of introduction; and the need for new policies and legislation to regulate the use of self-driving vehicles. Typical example comments were:

"Based on what we know about automated systems I would trust it more than a human being in a driving task. It's the other humans on the road that will cause problems in its initiation process."

- *respondent comment*

"My big concern is the possibility of a hack attack."

- *respondent comment*

"I am concerned about the inevitable situation where the vehicle chooses to kill its driver to save a greater number of external people in an unavoidable collision."

- *respondent comment*

4.4 Different degrees of automation

79% of people reported that they were extremely or moderately likely to want to be a passenger in a vehicle with semi-autonomous features (specified in the survey as: "e.g. lateral and longitudinal control, motorway assist systems for travel on high speed roads, remote control parking, Volvo or Tesla autopilot"), with only 3% being extremely or moderately unlikely. Fewer people (73%) were extremely or moderately likely to want to be a driver in a vehicle "which you can allow to take over driving", with 10% reporting that they were extremely or moderately unlikely. The patterns of responding between these two questions were significantly different (χ^2 (1, N = 464) = 8.65, p = .013), suggesting that there may currently be a higher degree of acceptance for partial automation than for full automation.

4.5 Effects of providing information

Participants who received up-to-date information about autonomous vehicles were no more positive in their responses to the statements 'Driverless cars are a good idea' and 'I can trust a driverless vehicle' than participants who did not receive the information. This pattern was the same across the GATEway and internet groups (p > .60 for all comparisons).

5 Conclusions

The attitudes towards autonomous vehicles revealed in this survey are broadly very positive. This may reflect an increasing openness among the general public to engage with driverless cars. However, it is important to note that 64% of the

sample was drawn from a group of people who had registered to take part in trials relating to the GATEway project, perhaps indicating an unusually high level of interest in this topic area. Indeed, this group were significantly more positive than the internet group in their responses to the statements "driverless cars are a good idea" and "I can trust a driverless vehicle". Nevertheless, the responses remained highly positive in general, even with these participants removed.

Of course, the internet group were also self-selecting and might be considered as more engaged with technology than the public in general. So, a further caveat of the findings concerns the representativeness of the sample. For example, by comparison with another larger survey study (Schoettle & Sivak, 2014), the present sample had a higher proportion of male respondents (60% vs. 53%) and was overall somewhat younger and more likely to have a university degree. In addition, both of these surveys were carried out online, necessarily excluding individuals without internet access. Thus, caution should be applied in generalising the findings too far beyond the group reached here.

The fact that providing additional information concerning the technology did not significantly change people's attitudes suggests that knowledge level may not be a central factor in determining people's views of autonomous vehicles, at least for the respondents reached by the current survey. However, very few of the participants had experienced real-world travel in an autonomous vehicle (there were only 37 positive responses to this question out of 233 respondents, meaning that a maximum of 16% of participants had experienced the technology). It is likely that this type of experience would have a much larger impact on attitudes than a brief information sheet. For this reason, it may be useful to re-run this survey both before and after people's first experience of a real-world driverless vehicle. The survey could also be used to track changing attitudes on a more general level, as autonomous vehicles become more widespread, and their benefits become more visible.

6 Acknowledgement

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7 References

Bansal, P., & Kockelman, K. M. (2016). Are we ready to embrace connected and self-driving vehicles? A case study of Texans. *Transportation, 1–35.* https://doi.org/10.1007/s11116-016-9745-z

Cavoli, C., Phillips, B., Cohen, T., & Jones, P. (2017). Social and behavioural questions associated with automated vehicles: a literature review. *Retrieved from https://trid.trb.org/view.aspx?id=1457834*

Clark, B., Parkhurst, G. and Ricci, M. (2016) Understanding the socioeconomic adoption scenarios for autonomous vehicles: A literature review. *Project Report.* University of the West of England, Bristol, UK. Available from: http://eprints.uwe.ac.uk/29134

GATEway, (2017). GATEway project. Retrieved from www.gateway-project.org.uk

Gkartzonikas, C., & Gkritza, K. (2017). A Literature Review on Surveys for Autonomous Vehicles. West Lafayette, IN. Retrieved from https://editorialexpress.com/cgi-bin/conference/download.cgi?db_name=TRF2017&paper_id=47

Hohenberger, C., Spörrle, M., & Welpe, I. M. (2016). How and why do men and women differ in their willingness to use automated cars? The influence of emotions across different age groups. *Transportation Research Part A: Policy and Practice*, *94*, 374-385.

Howard, D., & Dai, D. (2014). Public Perceptions of Self-Driving Cars: The Case of Berkeley, California. Retrieved from https://trid.trb.org/view.aspx?id=1289421

Kyriakidis, M., Happee, R., & de Winter, J. C. F. (2015). Public opinion on automated driving: Results of an international questionnaire among 5000 respondents. *Transportation Research Part F: Traffic Psychology and Behaviour, 32,* 127–140. https://doi.org/10.1016/j.trf.2015.04.014

Schoettle, B. & Sivak, M. (2014) A Survey of Public Opinion about Autonomous and Self- Driving Vehicles in the U.S., the U.K., and Australia, *Technical Report,* The University of Michigan Transportation Research Institute. Retrieved at: https://deepblue.lib.umich.edu/bitstream/handle/2027.42/108384/103024.pdf?sequence=1&isAll owed=y.

Appendix A All questionnaire items and responses by group

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
Age (in years)	18 to 29	30 (20.3%)	29 (34.1%)	59 (25.3%)
	30 to 39	45 (30.4%)	29 (34.1%)	74 (31.7%)
	40 to 49	45 (30.4%)	11 (12.9%)	56 (24.0%)
	50 to 59	14 (9.5%)	8 (9.4%)	22 (9.4%)
	60 to 69	10 (6.75%)	4 (4.7%)	14 (6.0%)
	70 or older	4 (2.7%)	4 (4.7%)	8 (3.4%)
Gender	Male	117 (79%)	50 (60.2%)	167 (71.7%)
	Female	30 (20.3%)	32 (38.6%)	62 (26.6%)
	Trans gender or intersex	1 (0.7%)	0 (0%)	1 (0.4%)
	Would rather not disclose	0 (0%)	1(1.2%)	1 (0.4%)
Region of birth	UK	117 (79.1%)	57 (68.7%)	174 (75.3%)
	ROI	0 (0%)	3 (3.6%)	3 (1.3%)
	EU	7 (4.7%)	7 (8.4%)	14 (6.1%)
	Non-EU	24 (16.2%)	16 (19.3%)	40 (17.3%)
Region of driving licence	UK	114 (77.0%)	57 (67.9%)	171 (74.0%)
	ROI	1 (0.7%)	1 (1.2%)	2 (0.8%)
	EU	5 (3.4%)	3 (3.6%)	8 (3.4%)
	Non-EU	6 (4.1%)	3 (3.6%)	9 (3.9%)
	I don't drive	22 (14.9%)	20 (23.8%)	44 (18.9%)
Licence type (including transmission type permitted to drive)	Provisional manual	59 (30.9%)	29 (31.2%)	88 (30.9%)
	Provisional automatic	7 (3.7%)	3 (3.2%)	10 (3.5%)
	Full manual	118 (61.8%)	59 (63.4%)	177 (62.3%)
	Full automatic	7 (3.7%)	2 (2.1%)	9 (3.2%)
Length of time driving licence held (in years)	0-5 years	24 (19.2%)	12 (19.7%)	36 (19.3%)
	6-10 years	20 (16.0%)	15 (24.6%)	35 (18.8%)
	11-15 years	14 (11.2%)	10 (16.4%)	24 (12.9%)
	16-20 years	14 (11.2%)	6 (9.8%)	20 (10.7%)
	21-25 years	15 (12.0%)	5 (8.2%)	20 (10.7%)
	26-29 years	12 (9.6%)	1 (1.6%)	13 (6.9%)
	30+ years	26 (20.8%)	12 (19.7%)	38 (20.4%)
Average mileage driven per year (approximately)	Less than 1000	39 (31.2%)	14 (22.6%)	53 (29.8%)
	1001 to 2500	15 (12.0%)	10 (16. 9%)	15 (8.4%)
	2501 to 5000	18 (14.4%)	7 (11.3%)	25 (14.0%)
	5001 to 7500	12 (9.6%)	6 (9.7%)	18 (10.1%)
	7501 to 10000	12 (9.6%)	12 (19.4%)	24 (13.5%)
	10001 to 12500	14 (11.2%)	7 (11.3%)	21 (11.8%)
	12501 to 15000	7 (5.6%)	5 (8.1%)	13 (7.3%)
	15001 to 17500	4 (3.2%)	0 (0.0%)	4 (2.2%)
	17501 to 20000	2 (1.6%)	0 (0.0%)	2 (1.1%)
	20001 to 25000	0 (0.0%)	0 (0.0%)	0 (0.0%)
	25001 to 30000	1 (0.8%)	1 (1.6%)	2 (1.1%)
	30001 to 35000	1 (0.8%)	0 (0.0%)	1 (0.7%)
	35001 to 40000	0 (0.0%)	0 (0.0%)	0 (0.0%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
	40000 or more	0 (0.0%)	0 (0.0%)	0 (0.0%)
Have you experienced any driving aids in your time driving? (Select all applicable to you)	Adaptive cruise control	19 (22.1%)	33 (32.7%)	52 (28.8%)
	Lane-keep assistance	9 (10.4%)	15 (14.8%)	24 (12.8%)
	Parking assist	32 (37.2%)	31 (30.7%)	63 (33.7%)
	Collision avoidance systems	12 (13.9%)	10 (9.9%)	22 (11.8%)
	Blind-spot monitoring	8 (9.3%)	9 (8.9%)	17 (.1%)
	Tesla autopilot	3 (3.5%)	0 (0%)	3 (1.6%)
	Other system not mentioned above	3 (3.5%)	3 (2.9%)	6 (3.2%)
Have you experienced travel in a self-driving vehicle? (Select all applicable to you)	Greenwich shuttle	1 (4.2%)	1 (16.7%)	2 (6.7%)
	Heathrow ultra-PODs	17 (71.8%)	3 (50%)	20 (66.7%)
	Google car	0 (0%)	0 (0%)	0 (0%)
	Other self-driving vehicle	6 (25%)	2 (33.3%)	8 (26.6%)
Overall do you enjoy driving?	Definitely yes	58 (46.0%)	30 (47.6%)	88 (46.6%)
	Probably yes	31 (24.6%)	18 (28.6%)	49 (25.9%)
	Neither yes or no	12 (9.5%)	9 (14.3%)	21 (11.1%)
	Probably not	13 (10.3%)	2 (3.2%)	15 (7.9%)
	Definitely not	12 (9.5%)	4 (6.3%)	16 (8.5%)
What roads do you typically drive on most of the time? (Select all applicable to you)	Urban	65 (32.9%)	66 (28.2%)	111 (25.7%)
	Suburban	50 (25.4%)	35 (14.9%)	72 (16.7%)
	Motorway	45 (22.8%)	61 (26.1%)	111 (25.7%)
	Rural	37 (18.8%)	72 (30.8%)	137 (58.5%)
What time(s) of day do you usually drive? (Select all applicable to you)	Early morning	30 (15.3%)	30 (12.9%)	60 (14.1%)
	Morning rush hour	28 (14.3%)	36 (15.5%)	64 (14.9%)
	Off-peak day time	63 (32.3%)	69 (29.7%)	132 (30.9%)
	Evening rush hour	37 (18.9%)	46 (19.8%)	83 (19.4%)
	Night time	37 (18.9%)	51 (21.9%)	88 (20.6%)
When traveling by motor vehicle are you typically the driver or passenger?	Driver	87 (58.8%)	45 (55.6%)	132 (57.6%)
	Passenger	61 (41.2%)	36 (44.4%)	97 (42.4%)
Are you registered disabled?	Yes	5 (3.4%)	4 (4.8%)	9 (3.9%)
	No	142 (6.6%)	77 (92.8%)	219 (95.2%)
	Would rather not say	0 (0.0%)	2 (2.4%)	2 (0.9%)
What is your	Professional	48 (32.4%)	29 (35.4%)	97 (40.4%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
occupation?	Clerical/office	12 (8.1%)	6 (7.3%)	18 (7.5%)
	Service worker	3 (2%)	1 (1.2%)	4 (1.7%)
	Executive/director	23 (15.5%)	15 (18.3%)	38 (15.8%)
	Sales worker	4 (2.7%)	0 (0%)	4 (1.7%)
	Skilled trade	3 (2%)	0 (0%)	3 (1.2%)
	Unskilled/laborer	0 (0%)	1 (1.2%)	1 (0.4%)
	Semi-skilled	2 (1.4%)	0 (0%)	2 (0.8%)
	IT professional	22 (14.9%)	10 (12.2%)	32 (13.3%)
	Student	5 (3.4%)	13 (15.9%)	18 (7.5%)
	Business owner	4 (2.7%)	0 (0%)	4 (1.7%)
	Retired	14 (9.5%)	3 (3.7%)	7 (2.9%)
	Other	8 (5.4%)	4 (4.9%)	12 (5.0%)
What is your highest level of education?	University or college degree	103 (70.1%)	57 (68.7%)	160 (69.6%)
	Other University or college qualification	19 (12.9%)	6 (7.2%)	25 (10.9%)
	Upper secondary school	12 (8.2%)	15 (18.1%)	27 (11.7%)
	Lower secondary school qualification	13 (8.8%)	3 (3.6%)	16 (6.9%)
	None of these	0 (0%)	2 (2.4%)	2 (0.9%)
Where did you hear about this survey?	GATEway project			148 (63.5%)
	Social media			14 (6.0%)
	Email			43 (18.4%)
	Through RHUL			11 (4.7%)
	Through TRL			0 (0.0%)
	Other			17 (7.3%)
How likely are you to want be a driver in a vehicle which you can allow to take over driving	Extremely likely	81 (54.7%)	33 (38.8%)	114 (48.9%)
	Moderately likely	32 (21.6%)	23 (27.1%)	55 (23.6%)
	Slightly likely	10 (6.8%)	14 (16.5%)	24 (10.3%)
	Neither likely nor unlikely	6 (4.1%)	4 (4.7%)	10 (4.3%)
	Slightly unlikely	3 (2%)	3 (3.5%)	6 (2.6%)
	Moderately unlikely	5 (3.4%)	4 (4.7%)	9 (3.9%)
	Extremely unlikely	11 (7.4%)	4 (4.7%)	15 (6.4%)
How likely are you to want be a passenger in a vehicle with semi-autonomous features?	Extremely likely	95 (64.2%)	37 (44.6%)	132 (59.5%)
	Moderately likely	30 (20.3%)	22 (26.5%)	55 (24.7%)
	Slightly likely	10 (6.8%)	14 (16.9%)	24 (10.8%)
	Neither likely nor unlikely	7 (4.7%)	5 (6%)	13 (5.8%)
	Slightly unlikely	0 (0%)	3 (3.6%)	3 (1.3%)
	Moderately unlikely	1 (0.7%)	2 (2.4%)	3 (1.3%)
	Extremely unlikely	5 (3.4%)	0 (0%)	5 (2.2%)
In the future when driverless	Extremely likely	108 (73.0%)	42 (50.6%)	150 (64.9%)
	Moderately likely	30 (20.3%)	22 (26.5%)	52 (22.5%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
vehicle's are available as an option how likely are you to want to ride in one(regardless of cost)?	Slightly likely	5 (3.4%)	8 (9.6%)	13 (5.6%)
	Neither likely nor unlikely	4 (2.7%)	3 (3.6%)	7 (3.0%)
	Slightly unlikely	0 (0.0%)	3 (3.6%)	3 (1.3%)
	Moderately unlikely	0 (0.0%)	5 (6.0%)	5 (2.2%)
	Extremely unlikely	1 (0.7%)	0 (0.0%)	1 (0.4%)
Do you think that a human being should always be in charge of a vehicle?	Strongly agree	6 (4.1%)	5 (6.0%)	11 (4.8%)
	Agree	12 (8.1%)	12 (14.5%)	24 (10.4%)
	Somewhat agree	28 (18.9%)	20 (24.1%)	48 (20.8%)
	Neither agree nor disagree	18 (12.2%)	13 (15.7%)	31 (13.4%)
	Somewhat disagree	11 (7.4%)	10 (12.0%)	21 (9.1%)
	Disagree	30 (20.3%)	17 (20.5%)	47 (20.3%)
	Strongly disagree	43 (29.1%)	6 (7.2%)	49 (21.2%)
How much do you agree with the following statement: 'driverless cars are a good idea?'	Strongly agree	98 (66.2%)	37 (44.6%)	135 (58.19%)
	Agree	29(19.6%)	24 (28.9%)	53 (22.84%)
	Somewhat agree	17(11.5%)	14 (16.9%)	32 (13.79%)
	Neither agree nor disagree	1 (0.7%)	4 (4.8%)	5 (2.16%)
	Somewhat disagree	2 (1.4%)	3 (3.6%)	5 (2.16%)
	Disagree	0 (0%)	1 (1.2%)	1 (0.43%)
	Strongly disagree	1 (0.7%)	0 (0%)	1 (0.43%)
How much do you agree with the following statement: 'driverless cars are an exciting prospect?	Strongly agree	117 (79.1%)	53 (63.9%)	170 (73.6%)
	Agree	18 (12.2%)	12 (14.5%)	30 (13.0%)
	Somewhat agree	9 (6.1%)	10 (12.0%)	19 (8.2%)
	Neither agree nor disagree	1 (0.7%)	4 (4.8%)	5 (2.2%)
	Somewhat disagree	2 (1.4%)	3 (3.6%)	5 (2.2%)
	Disagree	1 (0.7%)	1 (1.2%)	2 (0.9%)
	Strongly disagree	0 (0.0%)	0 (0.0%)	0 (0.0%)
Do you think driverless cars should take control to prevent a crash?	Definitely yes	88 (59.5%)	34 (41.0%)	122 (52.8%)
	Probably yes	47 (31.8%)	37 (44.6%)	84 (36.4%)
	Might or might not	7 (4.7%)	11 (13.3%)	18 (7.8%)
	Probably not	4 (2.7%)	0 (0.0%)	4 (1.7%)
	Definitely not	2 (1.4%)	1 (1.2%)	3 (1.3%)
How much do you agree with the following statement: 'If 90% or more of accidents are down to human	Strongly agree	89 (60.1%)	30 (36.1%)	119 (51.5%)
	Agree	29 (19.6%)	23 (27.7%)	52 (22.5%)
	Somewhat agree	19 (12.8%)	23 (27.7%)	42 (18.2%)
	Neither agree nor disagree	2 (1.4%)	2 (2.4%)	4 (1.7%)
	Somewhat disagree	4 (2.7%)	3 (3.6%)	7(3.0%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
error then there is a strong case for taking driver control out of the equation'	Disagree Strongly disagree	5 (3.4%) 0 (0.0%)	2 (2.4%) 0 (0.0%)	7(3.0%) 0 (0.0%)
How much do you agree with the following statement: 'advances in engineering sciences and automotive technology will allow driverless cars to be at least as safe as human drivers'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	89 (60.1%) 35 (23.6%) 16 (10.8%) 5 (3.4%) 1 (0.7%) 2 (1.4%) 0 (0.0%)	33 (39.8%) 27 (32.5%) 13 (15.7%) 6 (7.2%) 4 (4.8%) 0 (0.0%) 0 (0.0%)	122 (52.8%) 62 (26.8%) 29 (12.6%) 11 (4.8%) 5 (2.2%) 2 (0.9%) 0 (0.0%)
How much do you agree with the following statement: 'driverless cars may be suitable for use in other countries (e.g. USA) but they're not suitable for use on our roads'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	1 (0.7%) 3 (2.0%) 8 (5.4%) 9 (6.1%) 18 (12.2%) 50 (33.8%) 59 (39.9%)	0 (0.0%) 5 (6.0%) 5 (6.0%) 11 (13.3%) 9 (10.8%) 24 (28.9%) 29 (34.9%)	1 (0.4%) 8 (3.5%) 13 (5.6%) 20 (8.7%) 27 (11.7%) 74 (32.0%) 88 (38.1%)
How much do you agree with the following statement: 'driverless cars should be segregated and used only on dedicated roads/lanes'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	7 (4.7%) 8 (5.4%) 22 (14.9%) 18 (12.2%) 18 (12.2%) 41 (27.7%) 34 (23.0%)	5 (6.0%) 9 (10.8%) 17 (20.5%) 14 (16.9%) 13 (15.7%) 11 (13.3%) 14 (16.9%)	12 (5.2%) 17 (7.4%) 39 (16.9%) 32 (13.9%) 31 (13.4%) 52 (22.5%) 48 (20.8%)
How much do you agree with the following statement: 'I would trust manufacturer or government assurances that driverless cars	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	25 (16.9%) 49 (33.1%) 35 (23.6%) 13 (8.8%) 16 (10.8%) 6 (4.1%) 4 (2.7%)	9 (10.8%) 20 (24.1%) 23 (27.7%) 9 (10.8%) 13 (15.7%) 3 (3.6%) 6 (7.2%)	34 (14.7%) 69 (29.9%) 58 (25.1%) 22 (9.5%) 29 (12.6%) 9 (3.9%) 10 94.3%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
were safe'				
How much do you agree with the following statement: 'I enjoy driving too much to ever want a driverless vehicle'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	0 (0.0%) 5 (3.4%) 10 (6.8%) 22 (14.9%) 14 (9.5%) 39 (26.4%) 58 (39.2%)	1 (1.2%) 3 (3.6%) 16 (19.3%) 16 (19.3%) 17 (20.5%) 17 (20.5%) 13 (15.7%)	1 (0.4%) 8 (3.5%) 26 (11.3%) 38 (16.5%) 31 (13.4%) 56 (24.2%) 71 (30.7%)
How much do you agree with the following statement: 'a driverless vehicle would increase my mobility'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	35 (23.6%) 29 (19.6%) 15 (10.1%) 35 (23.6%) 4 (2.7%) 18 (12.2%) 12 (8.1%)	17 (20.7%) 13 (15.9%) 10 (12.2%) 23 (28.0%) 2 (2.4%) 14 (17.1%) 3 (3.7%)	52 (22.6%) 42 (18.3%) 25 (10.9%) 58 (25.2%) 6 (2.6%) 32 (13.9%) 15 (6.5%)
How much do you agree with the following statement: 'a driverless vehicle would reduce the stress of driving'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	65 (43.9%) 48 (32.4%) 23 (15.5%) 4 (2.7%) 5 (3.4%) 1 (0.7%) 2 (1.4%)	21 (25.3%) 26 (31.3%) 18 (21.7%) 9 (10.8%) 7 (8.4%) 1 (1.2%) 1 (1.2%)	86 (37.2% 74 (32.0% 41 (17.7% 13 (5.6% 12 (5.2% 2 (0.9% 3 (1.3%)
How much do you agree with following statement: 'My extent of understanding vehicle automation and driverless technology is a significant factor in my feelings towards driverless vehicles'	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree Disagree Strongly disagree	43 (29.1%) 51 (34.5%) 31 (20.9%) 17 (11.5%) 2 (1.4%) 3 (2.0%) 1 (0.7%)	22 (26.2%) 33 (39.3%) 15 (17.9%) 9 (10.7%) 2 (2.4%) 2 (2.4%) 1 (1.2%)	65 (28.0%) 84 (36.2%) 46 (19.8%) 26 (11.2%) 4 (1.7%) 5 (2.2%) 2 (0.9%)
How much do you agree with the following statement: 'I am suspicious of a driverless vehicles intent,	Strongly agree Agree Somewhat agree Neither agree nor disagree Somewhat disagree	2 (1.4%) 8 (5.4%) 10 (6.8%) 14 (9.5%) 13 (8.8%)	1 (1.2%) 4 (4.8%) 18 (21.7%) 8 (9.6%) 13 (15.7%)	3 (1.3%) 12 (5.2%) 28 (12.1%) 22 (9.5%) 26 (11.3%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
action or outputs'	Disagree	55 (37.2%)	27 (32.5%)	82 (35.5%)
	Strongly disagree	46 (31.1%)	12 (14.5%)	58 (25.1%)
How much do you agree with the following statement: 'I am wary of driverless vehicles'	Strongly agree	2 (1.4%)	6 (7.2%)	8 (3.5%)
	Agree	5 (3.4%)	10 (12.0%)	15 (6.5%)
	Somewhat agree	30 (20.3%)	17 (20.5%)	47 (20.3%)
	Neither agree nor disagree	12 (8.1%)	8 (9.6%)	20 (8.7%)
	Somewhat disagree	15 (10.1%)	11 (13.3%)	26 (11.3%)
	Disagree	39 (26.4%)	20 (24.1%)	59 (25.5%)
	Strongly disagree	45 (30.4%)	11 (13.3%)	56 (24.2%)
How much do you agree with the following statement: 'I am confident in a driverless vehicles performance'	Strongly agree	38 (25.7%)	10 (12.0%)	48 (20.8%)
	Agree	50 (33.8%)	22 (26.5%)	72 (31.2%)
	Somewhat agree	35 (23.6%)	24 (28.9%)	59 (25.5%)
	Neither agree nor disagree	17 (11.5%)	15 (18.1%)	32 (13.9%)
	Somewhat disagree	6 (4.1%)	6 (7.2%)	12 (5.2%)
	Disagree	1 (0.7%)	6 (7.2%)	7 (3.0%)
	Strongly disagree	1 (0.7%)	0 (0.0%)	1 (0.4%)
How much do you agree with the following statement: 'A driverless vehicle will provide safety to both the occupants of the vehicle and pedestrians'	Strongly agree	50 (33.8%)	11 (13.3%)	61 (26.4%)
	Agree	57 (38.5%)	29 (34.9%)	86 (37.2%)
	Somewhat agree	26 (17.6%)	19 (22.9%)	45 (19.5%)
	Neither agree nor disagree	10 (6.8%)	18 (21.7%)	28 (12.1%)
	Somewhat disagree	2 (1.4%)	4 (4.8%)	6 (2.6%)
	Disagree	2 (1.4%)	1 (1.2%)	3 (1.3%)
	Strongly disagree	1 (0.7%)	1 (1.2%)	2 (0.9%)
How much do you agree with the following statement: 'A driverless vehicle will be dependable in all situations'	Strongly agree	12 (8.1%)	4 (4.8%)	16 (6.9%)
	Agree	41 (27.7%)	14 (16.9%)	55 (23.8%)
	Somewhat agree	36 (24.3%)	25 (30.1%)	61 (26.4%)
	Neither agree nor disagree	22 (14.9%)	8 (9.6%)	30 (13.0%)
	Somewhat disagree	22 (14.9%)	16 (19.3%)	38 (16.5%)
	Disagree	12 (8.1%)	11 (13.3%)	23 (10.0%)
	Strongly disagree	3 (2.0%)	5 (6.0%)	8 (3.5%)
How much do you agree with the following statement: 'A driverless vehicle will be reliable'	Strongly agree	33 (22.3%)	5 (6.0%)	38 (16.5%)
	Agree	59 (39.9%)	30 (36.1%)	89 (38.5%)
	Somewhat agree	30 (20.3%)	16 (19.3%)	46 (19.9%)
	Neither agree nor disagree	18 (12.2%)	21 (25.3%)	39 (16.9%)
	Somewhat disagree	7 (4.7%)	7 (8.4%)	14 (6.1%)
	Disagree	0 (0.0%)	3 (3.6%)	3 (1.3%)
	Strongly disagree	1 (0.7%)	1 (1.2%)	2 (0.9%)
How much do you agree with	Strongly agree	33 (22.3%)	11 (13.1%)	44 (18.9%)
	Agree	59 (39.9%)	24 (28.6%)	83 (35.8%)

Question	Response selection	GATEway respondents	Internet respondents	Total respondents
the following statement: 'I can trust a driverless vehicle	Somewhat agree	31 (20.9%)	22 (26.2%)	53 (22.8%)
	Neither agree nor disagree	18 (12.2%)	13 (15.7%)	31 (13.4%)
	Somewhat disagree	5 (3.4%)	9 (10.8%)	14 (6.0%)
	Disagree	1 (0.7%)	5 (6.0%)	6 (2.6%)
	Strongly disagree	1 (0.7%)	0 (0%)	1 (0.4%)
Which sector or area do you believe will benefit the most from driverless vehicles (please only select one)	Car industry	7 (4.8%)	8 (9.9%)	15 (6.6%)
	Businesses	19 (13.0%)	9 (11.1%)	28 (12.3%)
	Society	66 (45.2%)	23 (28.4%)	89 (39.2%)
	Environment	19 (13.0%)	12 (14.8%)	31 (13.7%)
	Individuals	24 (16.4%)	19 (23.5%)	43 (18.9%)
	Not sure	11 (7.5%)	10 (12.3%)	21 (9.3%)
Do you think driverless vehicles will bring more freedom	Definitely yes	74 (50.3%)	27 (33.3%)	101 (44.3%)
	Probably yes	45 (30.6%)	31 (38.3%)	76 (33.3%)
	Might or might not	17 (11.6%)	15 (18.5%)	32 (14.0%)
	Probably not	9 (6.1%)	8 (9.9%)	17 (7.5%)
	Definitely not	2 (1.4%)	0 (0.0%)	2 (0.9%)
Do you think driverless vehicles will make future cities better to live and travel in?	Much better	85 (57.8%)	32 (39.5%)	117 (51.3%)
	Moderately better	28 (19.0%)	20 (24.7%)	48 (21.1%)
	Slightly better	20 (13.6%)	13 (16.0%)	33 (14.5%)
	About the same	7 (4.8%)	14 (17.3%)	21 (9.2%)
	Slightly worse	4 (2.7%)	1 (1.2%)	5 (2.2%)
	Moderately worse	2 (1.4%)	0 (0.0%)	2 (0.9%)
	Much worse	1 (0.7%)	1 (1.2%)	2 (0.9%)
Do you think driverless vehicles will 'be the norm on UK roads' within the next 5-10 years?	Definitely yes	17 (11.6%)	5 (6.2%)	22 (9.6%)
	Probably yes	44 (29.9%)	15 (18.5%)	59 (25.9%)
	Might or might not	37 (25.2%)	16 (19.8%)	53 (23.2%)
	Probably not	39 (26.5%)	38 (46.9%)	77 (33.8%)
	Definitely not	10 (6.8%)	7 (8.6%)	17 (7.5%)
Do you think driverless vehicles will 'be the norm on UK roads' within the next 15-20 years?	Definitely yes	63 (42.9%)	22 (26.8%)	85 (37.1%)
	Probably yes	59 (40.1%)	32 (39.0%)	91 (39.7%)
	Might or might not	11 (7.5%)	17 (20.7%)	28 (12.2%)
	Probably not	13 (8.8%)	9 (11.0%)	22 (9.6%)
	Definitely not	1 (0.7%)	2 (2.4%)	3 (1.3%)

Appendix B All additional comments from respondents (verbatim)

GATEway respondents

"Have a look at the case story's from TESLA, you will see quite a few of their "driverless cars" crashing at high speeds, and crossing red lights, breaking driving laws etc. Now ask yourself why aren't any other brands doing what TESLA are doing with their driverless cars and systems?"

"I think there's too many people who enjoy driving manually for driverless to be the norm in the short term, but the closer we get to making manually driven cars less attractive to people looking for a car, the better. Whether this is by law or by cost, will be interesting."

None

"Success of driverless vehicles depend on the infrastructure (and security of) for success. In a closed - short distance environment it would be beneficial to all. Further testing and development is needed to change mindsets before they would be the norm on main roads."

"Can you please push for driverless vehicles to be on the roads sooner!"

"I think the discussion on potential accidents - a car choosing to hit elderly vs. Younger people in case an accident cannot be avoided will be very interesting"

"My big concern re driverless cars is the possibility of a hack attack"

"Based on what we know about automated systems I would trust it more than a human being in a driving task. There are too many variables even in regular driving especially in unforeseen situations that a normal human can react well too. Every human has to be trained to drive to do automotive processes and machines have been proven to be able to do tasks better. Driving can be seen as a relative simple task to teach. It's the other humans on the road that will cause problems in its initiation process."

"I think the technology will have a massive impact on society and the environment. Driverless cars can be cleaner and more fuel-efficient. They will be safer on the road because they will not take unnecessary risks, drive erratically, speed, or get tired. Travelling long distances will be less stressful and safer, especially for the old or disabled."

"Cant wait ...."

"Interesting concept and once safety issues are firmly in public mind I can see there being a real shift towards driverless cars"

"I am wary of driverless vehicles in the short term but confident they will quickly (5-15 years) become substantially safer and more efficient than driven vehicles."

"I am concerned about the inevitable situation where the vehicle chooses to kill its driver to save a greater number of external people in an unavoidable collision."

"Many of these questions assume a level of knowledge and experience of driverless vehicles which the vast majority of respondents will not have - so the results of this survey can hardly be accurate or even representative. Certainly many of my answers have been pure guesswork or based on supposition. Sadly, I suspect that the aim of this survey is to tick the "public consultation" box ..."

"As a philosophy graduate with an interest in ethics, I find the moral arguments about driverless cars fascinating, but not as complex as they may first seem. I think that when viewed rationally, the main issue most people raise ('who would be responsible in a crash?') is not actually that important."

"Morally, the primary consideration should be maximising the benefits and minimising the risks. Motor vehicles cause a gargantuan amount of death, illness and injury directly through collisions and indirectly through increasing inactivity, dominating road space and polluting."

"As driverless cars already surpass humans in terms of pollution generated and collisions involved in, there is a very strong moral case that transition to driverless vehicles gets underway swiftly."

"Of course, doing so in a rash and irresponsible manner would not be morally justifiable, yet delaying unnecessarily would be no more right or reasonable."

"The 'I like to drive' argument is frankly worthy of contempt and should be immediately countered by facts about the harm human drivers cause."

"Whilst it is assumed that driverless cars of the future will run on cleaner fuel sources, it should also be bourne in mind that much pollution comes from particulates caused by braking and general vehicle functioning. Perhaps it would be worth considering if driverless vehicles were able to minimise the volume of particulates emitted."

"The sooner we can switch to full automation and electric vehicles, the safer and cleaner we'll be."

"I have a motorcycle licence, a car licence, a HGV licence, a Coach Licence, a certificate to drive dangerous goods, I have been a transport supervisor, a Hospital Ambulance driver, a HGV delivery driver, and an Army driver."

"I look forward to driverless vehicles becoming the norm on UK roads as soon as possible, because I want to cycle on London's roads safely, I want children to be able to play safely on London's roads, I'm tired of being abused by young impatient drivers when I don't race to the next set of traffic lights, and I find the time that I spend driving to be wasted time so I look forward with eager anticipation to being in the rear browsing the internet or being asleep."

"I think the prospects of driverless cars being accepted depend on changes to traffic and road policies and strategy as much as the reliability as the cars."

"Bring them on !"

"Driverless technology is exciting but with all new technologies, younger people will be more trusting of the technology than older people. It is this level of trust that will be the barrier to success for the adoption of driverless vehicles."

"I would only doubt a driverless cars abilities in adverse weather conditions or unpredictable situations such as flooding, landslides etc, and would appreciate manual override to avoid fatalities."

"The government has outlined Levels 0-5 of automated vehicle control, it might have been better if explanations outlined these to give a greater idea as to the expected levels of sophistication and asked questions relating to these levels, rather than just dividing questions between 'driver assist (driver still has responsibility)' and 'fully automated' (i.e. Level 5 automation)."

"Yes driverless vehicle may good for the mobility of people , but it's business that will be the big winner saving millions and meaning less jobs putting more people out of work"

"Driverless vehicles are only a small part of an intelligent integrated transport system. One should be very wary of seeing them as some sort of transport panacea."

"An ideal transport future would have autonomous portions, but a like for like replacement of private human controlled cars with private autonomous cars would solve very few problems."

"Additionally, the more significant use case is in moving goods rather than people."

"I find it difficult to answer questions on trust and faith etc in a driverless vehicle as I (and the majority of the public in the UK) have no experience of driverless vehicles, and so not much to base an opinion on. A lot of the trust will come when manufacturers start bringing products to market. For example, consumers put their trust in various car brands based on factors such as quality, safety, reliability etc. I believe consumers will make similar opinions for driverless cars - for example Volvo owners may be more likely to trust a Volvo-manufactured driverless car than one of a different brand."

"To the individual, there could be substantial benefits. However, at a city-wide level, if they reduced the cost and inconvenience of using cars, problems like congestion could get worse"

"I'm very keen for driverless cars to be introduced as I really dislike driving as my spatial awareness skills are not strong"

"My biggest worry is ability of criminals to hack into the systems"

"I think driverless cars are a great idea. I have concerns over security and software viruses affecting safety. And how this is implemented needs very

careful thought as it could put public transport costs out of reach of people. This should not be a private only enterprise."

"I am far far more wary of the semi-autonomous vehicles than the full driverless vehicles It allows humans to take back control and have an accident. So if we had a society where all cars were automated it feels safer as they'd all be working within their programmed parameters for safety. But if it is 'some' driverless cars in amongst normal drivers speeding, drink driving, aggressive driving etc, then it feels unsafe to be in a driverless car at that point - if I do not have control of my driverless car I cannot make sure I get out of the way when the bad driver is near me and I do not trust the driverless car to be able to react correctly/quickly to all the possible bad 'human' driving possibilities that could occur. Does that make sense? Summary: All cars fully automated feels safe, half and half feels risky to me."

"No"

"I am visually impaired and no longer have a licence. I can't wait for a driverless vehicle to give me back my freedom."

"I have a good understanding of the technology as I work in the railway industry where digital signalling has meant that driverless trains are the norm for metro railways. I have seen first hand the improvements in safety the technology has delivered therefore I have no doubt it will deliver the same results for road transport. I am primarily a cyclist (and pedestrian) so I see on a daily basis the hazards in cities of human drivers - also for motorway and rural roads driver fatigue is a massive problem. For me personally the biggest benefits of driverless vehicles will be the improvement in safety. However I can see the enormous benefit this technology will have for elderly and disabled people who no longer can drive and find it difficult to use public transport/ walking or cycling as mobility options."

"I think that driverless vehicles will have a significant impact on our city's landscape. No longer do we need streets lined with parked vehicles or parking lots. Cars will move themselves out of the way to less dense areas"

"I also think that the model of ownership will change - one will rent time in a driverless vehicles rather than own one."

"I am short sigted in my vision and i am legally not permitted to have a licence. I have answered the questions as if i was a driver. I am interested to see how the semi autonomous features of driverless cars might benefit people like me and our mobility"

Internet respondents

"I love the idea of driverless vehicles but the concern is the early days where they will not be able to compensate for human drivers errors. Once all cars are driverless roads will be much more efficient with no more ripple effect of tiny human delays causing jams. Also there's been some concerning reports of

crashes where the driverless vehicle has failed to detect a large white lorry in the lane next to it. Although I'm confident these issues will improve other time with more testing"

"My main concern is not with the driverless cars it's other road users. The period with non autonomous and autonomous cars will be strife with concern and blame. Were dedicated routes be driverless only I would be completely confident due to the removal or human error"

"I would love to take part in the trials please."

"It is hard to form opinions on a hypothetical driverless system. Early systems will not be as robust as more mature systems in years to come. I would be cautious of early systems, but expect drivers to be fully replaced eventually. In the future you will not be able to buy a car that you can drive yourself."

"I feel the biggest benefit will be to non drivers in rural areas who will be able to utilise these vehicles"

"Driverless vehicles will provide a great deal of independence, mobility and freedom to the disabled community if we are allowed to make use of them, especially those of us whose conditions mean we are unable to attain a driving licence for a normal car and so are completely dependant on another person being willing to drive us currently."

"Driverless vehicles make sense on boring roads like motorways where we could get greater throughout from by using platoons but I would want to drive without assistance if I was driving on say the A830 Road to the Isles where it is all about the driving experience"

"I think it will be necessary to show that the existing infrastructure can adapt to driverless vehicles at the same time as showing the qualities of the vehicles themselves because our learned traffic responses are bound up with what we know about the existing infrastructure"

"No"

"Trust in driverless cars is dependent on performance which at this stage is unproven. The fear of 3 rd party intervention is a real risk. Potentially a great idea that will increase safety and people mobility in an ageing society."

"I think there needs to be clear responsibility over the actions of the vehicle even if the driver is 'hands and eyes off'. I can see how a minority could benefit from it but the cost of it may be prohibitive to many especially in poorer urban areas where owning a car at all is difficult."

"I'm for the introduction of driverless cars during rush hours as it would be feasible to me that by maximising the vehicle to vehicle interaction the traffic flow would become more efficient and reduce stress on the drivers and passengers..."

"The mix of external factors outside the cars control causes the levels of uncertainty I have. If all cars were automated then I would have stronger trust. Obviously next risk is their security and being hacked, but I think inside a city they would have a large benefit."

"Everybody will benefit from driverless cars once they can trust them, but getting people to trust them will be the hardest part to implement them into society."

"Can't wait to try them"

"I don't know enough about this subject to give useful answers. Good luck!"

"Sounds like the future might actually be happening. I can see huge positives with automatic cars but these will work better with more on the road and i doubt the majority will want this."

"I hope driverless vehicles in future will all be EVs."

"My main concerns around driverless cars is the reliability and ethics of the artificial intelligence."

"My answers to a lot of the questions would ideally be prefaced by It depends on the safeguards in the technology, which I don't know much about."

"A lot of the trustworthiness of the driverless vehicles would depend on independent reviews, safety ratings, and other people's experiences, as well as the trustworthiness of the manufacturer and the technology"

"I worry about reliability long term and cost to maintain. Could be great for people who would otherwise be housebound. It would take a lot for me to feel comfortable driving one and would worry that I couldn't trust it."

Appendix C Information sheet

The following information is taken from British government reports, a report by KPMG and academic research reports from UK and US universities.

Driverless cars currently on the road

Google reports that collectively their driverless cars have driven over 1.5 million miles driverless and more than 500,000 miles without crashing. The first reported fatality in a semi-autonomous vehicle was recently reported by Tesla in over 130 million miles of driving. This fatality rate compares favourably to that of manual driving in the US (on average one fatality for every 94 million miles driven) and manual driving worldwide (one fatality per 60 million miles) but not to that of manual driving in the UK (one fatality per 178 million miles).

Predicted societal impacts

Driverless vehicles could enable more efficient use of road space, through developments such as platooning (vehicle groups travelling close together), narrowing of lanes, and reduced junction stops. This could lead to improved traffic flow, reduced congestion, improved fuel economy, reduced pollution emissions and lower costs. Changes in engine design could also reduce emissions and increase fuel efficiency. Driverless technology could enhance disabled or older people's mobility, giving transport access to those who currently cannot drive. This could reduce both the need for motorists to chauffeur non-drivers and the use of subsidised public transport. The introduction of driverless vehicles could facilitate car sharing (vehicle rental services that substitute for personal vehicle ownership) leading to reductions in various costs associated with car ownership (e.g. insurance premiums, maintenance). Driverless technology could reduce driver stress and allow motorists to relax, socialise and work while traveling.

Predicted economic impacts

Driverless vehicle technologies could lead to improved productivity and increased trade for the UK, as industries capture part of a wider global market for Intelligent Mobility estimated to be worth £900bn worldwide by 2025. This influx of new business and industry for driverless vehicles could create an additional 320,000 jobs in the UK by 2030, of which 25,000 would be in automotive manufacturing. It is estimated that driverless technology could increase GDP by 1% by 2030. Overall, the economic and social benefits of connected and driverless vehicles (i.e. fewer accidents, improved productivity and increased trade) are predicted to amount to somewhere in the region of £51 billion per year by 2030. Longer-term estimates predict that by 2040 these benefits will more than double, to £121 billion.

Predicted safety impacts

More than 90% of road traffic collisions are currently thought to be caused by human error. Recent collision avoidance technologies such as Electronic Stability Control and Autonomous Emergency Braking Systems have shown a more than

20% benefit in collision reduction. The adoption of semi-autonomous and driverless technology could save over 2,500 lives and prevent more than 25,000 serious accidents in the UK by 2030. This increased safety may reduce many common accident risks and therefore crash costs and reduce insurance premiums.

Predicted risks and costs

There may be reduced employment and business activity in sectors such as haulage and private vehicle hire, which rely heavily on people to drive vehicles. There could be additional short- to mid-term costs to consumers and governments as vehicles require additional equipment, services and maintenance, and changes are required to roadway infrastructure. There could be additional risks both anticipated (e.g. encouraging road users to take additional risks) or unforeseen (e.g. technological, economic, political) that could cause problems for us and future generations.

Attitudes to autonomous vehicles

ABSTRACT

An online questionnaire survey examining people's current attitudes trust and acceptance of autonomous vehicles was conducted from December 2016 to February 2017. The questionnaire items were based on previous studies of general driving attitudes, trust and acceptance, and specific attitudes to autonomous vehicles. A range of demographic information was also collected. This report presents and analyses the survey results from 233 responses.

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