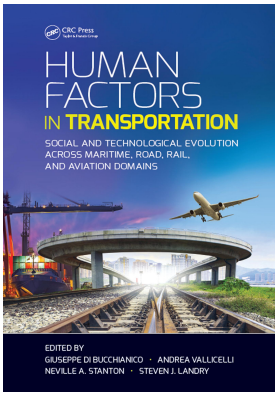

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Giuseppe Di Bucchianico, Andrea Vallicelli, Neville A. Stanton, Steven J. Landry

End Users' Acceptance and Use of Adaptive Cruise Control Systems

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19

End Users' Acceptance and Use of Adaptive Cruise Control Systems

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19.1 Introduction

Advanced driver assistance systems (ADAS) in vehicles are associated with safety and comfort benefits for the driver (Brookhuis et al. 2001). Adaptive cruise control (ACC) is an ADAS that controls speed and distance to vehicles ahead based on speed and time-gap settings (see, e.g., Naranjo et al. 2003 or Stanton and Young 2005). Several studies concerning ACC systems have been carried out and the majority of these studies have however not focused on actual users, instead car drivers in general have been appointed as participants. Such a recruiting strategy has advantages when addressing certain research questions, while for other research questions, knowledge and experience of a specific system are essential. In comparison with studies not including actual users, studies including them are scarce. There are nevertheless a few exceptions including studies by Strand et al. (2011), Larsson (2012), Bianchi Piccinini et al. (2012), and Sanchez et al. (2012) which all focused on actual end users and their assessment of and behavioral adaptation to the systems.

Behavioral adaptation is a psychological issue that explains behaviors that occur in response to change in a road–vehicle–user system (OECD 1990). For a full account of behavioral adaptation, see the review by Saad et al. (2004). Strand et al. (2011) explored end-user experiences of ACC by means of focus group interviews and the study by Bianchi Piccinini et al. (2012) used a similar approach. Both studies showed that, overall, end users are satisfied with their ACC systems and that there are positive effects in terms of convenience as well as safety. Nevertheless, some negative effects were also identified. Strand et al. (2011) revealed that there are end users carrying mental models, which to some extent can be considered rudimentary. Mental models can be viewed as our

understanding of objects and processes that guide our interaction with them (Bernstein et al. 2003) and a proper mental model of system functionality is important to cope with for instance, mode errors (Sarter and Woods 1995). Another finding was that the drivers had experienced situations, such as roundabouts, in which ACC functionality could be improved. Negative aspects related to ACC use concluded in the study by Bianchi Piccinini et al. (2012) were that end users were not fully aware of potential critical situations when driving with ACC and that improper usage of ACC occurred. They also found that tasks distracting driving were more frequent when driving with ACC, compared to manual driving. The study by Larsson (2012) reported on a survey to 130 ACC users. In this case the results indicated that use experience is crucial for the understanding of the functional limitations of ACC.

The report by Sanchez et al. (2012) addressed user acceptance of ACC and presented results based on a survey to 227 participants in the EU project euroFOT (www.eurofot-ip.eu). The majority of them were drivers of passenger cars equipped with ACC, but the study also included those who drove heavy trucks equipped with the same system. The results suggested that acceptance (defined as perceived usefulness and driver satisfaction) was very high and stable over time. ACC was rated most useful in normal traffic on motorways. Furthermore, ACC increased perceived comfort (stated by 80%) and safety (stated by 94%).

The main purpose of this study was to investigate end-users' experiences of ACC in order to assess the system with regard to drivers' use and acceptance of ACC; usability assessment; and perceived influence on driving behavior. An additional aim was to see if these aspects were affected by where ACC has been mainly experienced.

19.2 Method

19.2.1 Data Collection

Data was collected by means of an online questionnaire, set up with SPSS mrInterview software, version 5.5, patch level 3 (SPSS Inc. 2008). The questionnaire included altogether slightly more than 70 questions covering the topics: experience, usage pattern, acceptance, and perceived usability. For acceptance, a new acceptance scale was used, namely Strömberg Karlsson Acceptance Scale (Sagamihara Keio apathy scale) (Strömberg and Karlsson n.d.). The scale included 20 items covering four areas:

- *Trust and control* attempts to capture how secure the user feels with the system. It consists of three items capturing aspects of the perceived technical reliability of the system, whether the user thinks that the information that the system gives or the action it takes can be trusted, and whether the user feels in control of the system.
- *Perceived benefit* aims to find whether the user perceives the system as something useful and as something that provides benefits (in terms of convenience, joy, efficiency, etc.) to them in the task they are trying to perform.
- *Perceived effort* tries to identify the effort the users feel they have to put into gaining the benefits. It draws on classical usability in terms of ease of use, logic, coherence, etc.

- *Compliance* tests more abstract level aspects of acceptance. The dispensability item aims to capture whether the users feel that the problem that the product is trying to solve actually is a problem that needs solving, and the appropriateness item aims to capture whether the product is a suitable way of solving that problem.

All but one question was closed-ended. The major part of questions was of a Likert type (Likert 1932) with five response categories, including a neutral category. There were also a few questions with rating scales, from low to high (1–5). In Strömberg Karlsson Acceptance Scale the response scales were instead of semantic differential type. The semantic differential scales used bipolar categories, with one positive and one negative pole. See for instance McQueen and Knussen (2006) for a brief overview of rating scales, Likert scales, and semantic differential scales.

19.2.2 Analysis

Statistical analyses were conducted with IBM SPSS statistics software, version 21 (IBM Corp. 2012). First a descriptive data analysis was conducted. This was then followed by a Mann–Whitney test in which driving context (mainly within urban areas and mainly outside urban areas) was used as a grouping variable. Only significant tests are presented in Section 19.3.

19.2.3 Participants

A list of 414 end users' of ACC was handed over by Volvo Cars Corporation. They were approached by e-mail and invited to answer an online survey. Altogether 90 of them completed the survey. However, three of them were excluded from analysis since they answered that their cars were not equipped with ACC.

The respondents' ages varied between 31 and 76 years ($M = 53.18$, $SD = 10.69$). Nearly a two-thirds majority had completed higher education (higher than upper secondary school). All of them had a valid driver's license and had held their cars for between 13 and 58 years ($M = 34.75$, $SD = 10.69$). The majority drove more than 25,000 km/year. (See Table 19.1 for an overview of participants' characteristics.)

About half of the participants were mainly engaged in nonprofessional driving, and one-third drove equal amounts professionally and nonprofessionally. The remaining drove primarily in a professional role. Furthermore, roughly equal amounts of the drivers drove mainly within urban areas and outside of urban areas respectively. See Table 19.2 for overview of responses regarding context of driving.

The participants were all owners of cars from the S, V, or XC ranges manufactured by Volvo Cars. At the time of the survey, 2013 that is, all cars were fairly recent year models with the oldest being of year model 2009 and the latest 2014. The majority (65.5%) drove a car with automatic transmission. A majority rated themselves as experienced or very experienced ACC users. Only a few considered themselves to be beginners.

19.3 Results

One of the questions posed to the respondents concerned their general attitude toward ACC. Overall the respondents had a very positive attitude toward ACC. As many as 94.3%

TABLE 19.1

Participants' Characteristics

Characteristic	(*n*)	(%)
Gender		
Men	78	89.7
Woman	9	10.3
Highest education level completed		
Compulsory school	3	3.4
Upper secondary school	29	33.3
Higher education: university college; university	49	56.3
Other education after upper secondary school	6	6.9
Annual mileage (km)		
5,001–10,000	1	1.1
10,001–15,000	9	10.3
15,001–20,000	17	19.5
20,001–25,000	15	17.2
>25,000	45	51.7

was "very positive," 4.6% was "somewhat positive," and 1.1% neither negative nor positive. None rated their attitude toward ACC as negative.

Earlier studies (Strand et al. 2011) have indicated that drivers experience that other drivers react to cars driven with the support of ACC. The respondents were therefore asked to answer the question: "Do you worry about how your driving with ACC is perceived by your fellow commuters?" According to the responses to the survey, the major part of the respondents had no such worries. Instead it seems as if they are signifying a positive influence on other commuters (Table 19.3). Nevertheless, 14.9% notes that other road users have a negative perception of the car following distance. Approximately 22% provided answers suggesting that they had not received any reactions to their driving or that they had not considered the matter.

A particular topic addressed was the drivers' usage of ACC (Table 19.4). When asked how often they activate ACC under different circumstances, the respondents answered that the system is frequently used under low as well as high traffic intensity. ACC is also frequently activated when there is a queue, when it is raining, and when driving in the dark. However, there are, as indicated in earlier studies (Strand et al. 2011), also situations where drivers do not activate ACC as often. These include snowfall and slippery road conditions.

TABLE 19.2

Context of Driving

Context	(*n*)	(%)
Type of driving		
Professional	18	20.7
Nonprofessional	42	48.3
Equal amount of professional and nonprofessional	27	31
Area of driving		
Within urban area	40	46
Outside of urban area	47	54

TABLE 19.3

How Do You Think Your Fellow Commuters Have Perceived Your Driving with ACC Regarding the Following Aspects?

	Answer										
	Very Negative		Somewhat Negative		Neither Nor		Somewhat Positive		Very Positive		N/A
Aspect	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	*N*
1. Your car following distance	10	14.9	–	–	23	34.3	11	16.4	23	34.3	20
2. How you adapt your car following distance	–	–	7	10.6	23	34.8	9	13.6	27	40.9	21
3. How you adapt your speed	–	–	3	4.6	20	30.8	12	18.5	30	46.2	22
4. Your traffic rhythm	–	–	5	7.8	15	23.4	17	26.6	27	42.2	23

Note: Percentages given are the valid percent.

The responses also show that the higher the allowed speed limit, the more frequently ACC is used (Table 19.5). The drivers use the function the most on roads with speed limits of 100/110/120 km/h and the least on living streets.

The respondents' answers to how frequently they use ACC depending on the speed regulation reflect on the answers they provide on how satisfied they are with the function during the same speed regulations (Table 19.6): the higher the speed, the more satisfied the user; and the lower the speed, the less responses are provided.

The respondents' general attitude toward ACC is positive, 94% are very positive and no one negative. The respondents are particularly satisfied with ACC during longer trips and when driving on roads without possibilities to overtake. The respondents' rating of satisfaction when being overtaken and when overtaking was higher for those who drove mainly outside urban areas (mode = 5;5) than it was for those who drove mainly within urban areas (mode = 5;4): $U = 701.5$, $p = 0.021$, and $U = 555.5$, $p = 0.002$. There are nevertheless specific situations, such as driving on roundabouts and curves where satisfaction drops. For instance 35% of the respondents answer that they are somewhat or very dissatisfied with the function when driving on a roundabout. There are also a considerable amount of responses missing which could indicate that the drivers do not use the function in this condition. See Table 19.7 for overview of how ACC was perceived during different circumstances.

TABLE 19.4

How Often Do You Choose to Activate the ACC in the Following Circumstances?

Circumstance	*M*	*Mdn*	*Mo*	*SD*
Low traffic intensity	4.49	5	5	0.680
High traffic intensity	3.99	4	4	0.946
Night, dark	3.89	4	4	0.933
Rainfall	3.67	4	4	0.923
Queues	3.53	4	4	1.302
Fog	3.11	3	4	1.342
Snowfall	2.80	3	3	1.109
Slippery road conditions	2.69	3	3	1.194

Note: 1 = never, 5 = always.

TABLE 19.5

How Often Do You Choose to Activate ACC When the Following Speed Regulations Apply?

Speed Regulation	*M*	*Mdn*	*Mo*	*SD*
Living street	1.25	1	1	0.766
30/40/50 km/h	2.44	2	2	1.291
60/70 km/h	3.38	3	3	1.123
80/90 km/h	4.09	4	4	0.871
100/110/120 km/h	4.56	5	5	0.659

Note: 1 = never, 5 = always.

TABLE 19.6

How Do You Perceive ACC When the Following Speed Regulations Apply?

	Answer										
	Very Dissatisfied		Somewhat Dissatisfied		Neither Nor		Somewhat Satisfied		Very Satisfied		N/A
Factor	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)
Living street	2	7.4	3	11.1	8	29.6	3	11.1	11	40.7	60
30/40/50 km/h	–	–	9	13.2	11	16.2	12	17.6	36	52.9	19
60/70 km/h	–	–	1	1.2	7	8.6	17	21	56	69.1	6
80/90 km/h	–	–	–	–	1	1.2	16	18.8	68	80	2
100/110/120 km/h	–	–	–	–	1	1.2	9	10.5	76	88.4	1

Note: Percentages given are the valid percent.

TABLE 19.7

How Do You Perceive ACC during the Following Circumstances?

	Answer										
	Very Dissatisfied		Somewhat Dissatisfied		Neither Nor		Somewhat Satisfied		Very Satisfied		N/A
Circumstance	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)
1. When you are being overtaken	–	–	2	2.3	11	12.8	14	16.3	59	68.6	1
2. When you overtake	1	1.2	6	7.1	12	14.3	28	33.3	37	44	3
3. Access roads	–	–	9	13	17	24.6	19	27.5	24	34.8	18
4. Curves	3	3.5	19	22.1	11	12.8	28	32.6	25	29.1	1
5. Longer trips	–	–	–	–	2	2.3	3	3.4	82	94.3	–
6. Roads without overtake possibilities	–	–	–	–	3	3.5	10	11.6	73	84.9	1
7. Traffic roundabouts	4	8.3	13	27.1	18	37.5	11	22.9	2	4.2	39

Note: Percentages given are the valid percent.

The participants were also asked to assess if and in what way their access to ACC had influenced their driving and their experience of driving (Table 19.8). According to the responses, the most common effect concerns comfort. A majority of the drivers stated that access to ACC has increased their comfort. It is also apparent that ACC has perceived safety effects. Approximately half of the respondents indicated a reduced inclination to

TABLE 19.8

How Would You Assess the Influence of Using the ACC on the Following Factors?

	Answer										
	Drastically Reduced		Somewhat Reduced		Neither Nor		Somewhat Increased		Drastically Increased		N/A
Circumstance	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)	(%)	(*n*)
1. Safety	–	–	1	1.1	4	4.6	49	56.3	33	37.9	–
2. Stress level	15	17.2	40	46	15	17.2	10	11.5	7	8	–
3. Distances of travel	–	–	–	–	64	81	12	15.2	3	3.8	8
4. Fuel consumption	–	–	31	44.3	32	45.7	6	8.6	1	1.4	17
5. Compliance with speed regulation	–	–	2	2.3	20	23	53	60.9	12	13.8	–
6. Inclination to overtake	1	1.1	44	50.6	40	46	2	2.3	–	–	–
7. Annual mileage	–	–	–	–	79	95.2	4	4.8	–	–	4
8. Attention to other traffic	–	–	9	10.6	43	50.6	30	35.3	3	3.5	2
9. Comfort	–	–	–	–	2	2.3	42	48.3	43	49.4	–
10. Ability to judge following distance	–	–	–	–	40	46	36	41.4	11	12.6	–
11. How rested you are at the end of journey	–	–	–	–	24	27.9	46	53.5	16	18.6	1

Note: Percentages given are the valid percent.

overtake other vehicles, a response which is in line with earlier findings (Strand et al. 2011), and almost three out of four answered that ACC has meant that their compliance with speed regulations has increased.

Somewhat incongruent with the response regarding comfort, approximately 20% of the respondents answered that their stress level had increased rather than decreased as a consequence of their access to ACC. Less or no effects were indicated for distances traveled, annual mileage, or fuel consumption. Negative effects were only reported by 10% of the drivers and concerned their attention to other traffic. Almost 40% thought, on the other hand, that the same function had resulted in an increase of their attention. A rated increase in "*attention toward other traffic*" was more common for those who drove mainly outside urban areas (mode = 4) than it was for those who drove mainly within urban areas (mode = 3): $U = 671.0$, $p = 0.028$.

A number of studies have shown that trust and control is a key component for acceptance. The answer to survey question "does it happen that the ACC is behaving in a way you did not expect?" shows that the drivers find ACC to be a fairly predictable system (1 = always, 5 = never: $N = 87$, $M = 4.07$, $Mdn = 4$, mode = 4, $SD = 0.938$). Those who drove mainly outside urban areas (mode = 5) consider the system more predictable than those who drove mainly within urban areas (mode = 4): $U = 679.0$, $p = 0.018$. More than half or 51.7% of the drivers feel very safe when handing over the control to ACC, 46% feels safe, and only 4% feels neither safe nor unsafe. No one feels unsafe.

Finally the respondents were asked to answer a number of questions which together made up the acceptance scale by Strömberg and Karlsson (n.d.). The scale included 20 items addressing the topics: trust and control (Table 19.9); perceived benefit (Table 19.10); perceived effort (Table 19.11); and compliance (Table 19.12). Overall, the ratings indicate that acceptance of ACC was very high: according to the rating ACC is reliable, usable, and driving becomes easier and more convenient. Driving does not however necessarily become

TABLE 19.9

Responses to Items 1–3 (Trust and Control) on the Acceptance Scale

Item	Scale	N/A	*M*	*Mdn*	*Mo*	*SD*
1. ACC is…	1 = operationally reliable, 7 = prone to fuss	3	1.69	1	1	1.006
2. ACC is…	1 = reliable, 7 = arbitrary	3	1.52	1	1	0.719
3. ACC…	1 = leaves all control for me, 7 = takes over control from me	3	3.62	4	4	1.536

TABLE 19.10

Responses to Items 4–10 (Perceived Benefits) on the Acceptance Scale

Item	Scale	N/A	*M*	*Mdn*	*Mo*	*SD*
4. For driving the ACC is…	1 = usable, 7 = unusable	3	1.14	1	1	0.352
5. If I use ACC driving becomes…	1 = easier, 7 = more challenging	3	1.57	1	1	0.765
6. If I use ACC driving becomes more…	1 = convenient, 7 = inconvenient	3	1.35	1	1	0.526
7. If I use ACC driving becomes more…	1 = safe, 7 = dangerous	3	1.61	1	1	0.728
8. If I use ACC driving becomes more…	1 = fun, 7 = boring	3	2.49	2	1	1.367
9. If I use ACC during driving I perform driving more…	1 = effective, 7 = ineffective	3	2.05	2	2	0.877
10. If I use ACC the driving I perform gets…	1 = less environmental impact, 7 = greater environmental impact	3	2.62	3	2	1.211

TABLE 19.11

Responses to Items 11–18 (Perceived Effort) on the Acceptance Scale

Item	Scale	N/A	*M*	*Mdn*	*Mo*	*SD*
11. To use ACC is…	1 = easy, 7 = difficult	4	1.27	1	1	0.607
12. To orientate in ACC is…	1 = easy, 7 = difficult	4	1.34	1	1	0.720
13. ACC is built…	1 = consistently, 7 = inconsistently	4	1.43	1	1	0.666
14. To understand the information provided by ACC is…	1 = easy, 7 = difficult	4	1.33	1	1	0.543
15. To understand how I should act based on information provided by ACC is…	1 = easy, 7 = difficult	4	1.37	1	1	0.657
16. To understand how I should do to get the ACC to do what I want it to do is…	1 = easy, 7 = difficult	4	1.34	1	1	0.547
17. To learn ACC is…	1 = easy, 7 = difficult	4	1.31	1	1	0.562
18. To remember how ACC is used from time to time is…	1 = easy, 7 = difficult	4	1.22	1	1	0.470

TABLE 19.12

Responses to Items 19–20 (Compliance) on the Acceptance Scale

Item	Scale	N/A	*M*	*Mdn*	*Mo*	*SD*
19. ACC is…	1 = necessary, 7 = unnecessary	4	2.48	2	2	1.075
20. ACC is…	1 = expedient, 7 = inexpedient	4	1.28	1	1	0.502

TABLE 19.13

Recurring Themes Concerning ACC Improvements

Description	Illustrative Quotes
1. Functionality in specific traffic infrastructure (roundabouts and steep curves): aggressive accelerations; target loss; traffic infrastructure	"…today the ACC tend to accelerate to the max when the car in front turns"
	"…the car should understand that it is still behind the vehicle in front, without increasing any speed"
	"…sometimes it loses the car in front"
	"The only negative is when driving in curves…"
	"The feeling or experience when driving in a roundabout. The speed increase feels unpleasant"
2. Functionality in specific tasks relevant for driving (overtaking); harsh decelerations; incorrect target	"The only negative is /…/ and when overtaking it can target the wrong vehicle"
	"The discomfort when it sometimes activates braking in a curve when overtaking for example a truck"
3. User interface and specific settings: usability; adaptability	"…I would like a warning when the radar sees the vehicle ahead but before the speed drops. This is relevant for taking the decision to overtake, or not, before my speed drops"
	"…sometimes I would like to be able to increase the distance to the car in front even more"
	"…I often have to look at the buttons"

Note: Some quotes are relevant for more than one theme.

more fun or more effective. The drivers assess ACC not to completely "take control away" and ACC is not considered "absolutely necessary" by all.

When answering the questionnaire the participants were also given the opportunity to provide answers as to how they would like to improve ACC. Even though the respondents were very positive toward and considered ACC to work well in different situations, there were (as already indicated) some limitations and there were also a few suggestions for modifications. Three recurring themes could be distinguished from the provided answers (Table 19.13). These themes were connected to (1) the functionality of ACC in relation to specific traffic infrastructure, (2) a specific task relevant for driving, and (3) the user interface.

19.4 Discussion

In large, the results are in line with previous studies on the subject (e.g., Strand et al. 2011; Bianchi Piccinini et al. 2012; Larsson 2012; Sanchez et al. 2012). It shows for example that end users, in general, are satisfied with their ACC. More in particular, it confirmed many of the findings by Strand et al. (2011) regarding safety and comfort. The results also show that use frequency increases as do how positive the ratings of the performance of ACC when speed limits increase and road types are more adapted toward higher speeds, a result which is in accordance with Sanchez et al. (2012). However, some earlier findings could not be supported by results of the present study. For example, the results do not show that worries about other road users are a frequent matter.

The study by Bianchi Piccinini et al. (2012) presented results indicating that end users were not fully aware of the limitations of the ACC function. This study indicates that ACC is a perceived as a very predictable system. These results could be interpreted as though

end users really are not aware of ACC limitations as was evident in the Bianchi Piccinini et al. (2012) study, or that drivers are aware of the limitations and therefore view ACC as a predictable system. In this particular study the respondents were experienced ACC users and their use patterns indicate that they use it under some conditions and not under other. Hence, it is feasible that the end users in this study are aware of the limitations and have adapted to it.

The study by Bianchi Piccinini et al. (2012) suggested that drivers engage in tasks that distract them from driving when the ACC is activated. In the study by Sanchez et al. (2012), 13% of the participants stated that they use ACC in order to free more time to perform other tasks, such as changing the radio channel or eating. This study present results on a related question, namely if the drivers were less attentive to other traffic (as could be a consequence of a distractive task). Half of the answers were that ACC does not affect how attentive they are to other traffic. Of the remaining answers, the majority provided answers suggesting that they are even more attentive to other traffic. On the other hand, about 10% provided answers suggesting that ACC had a negative effect on how attentive they are to other traffic (worth noting is that there were no answers stating that it had drastically reduced). The difference in responses between overall experienced ACC users is interesting but not altogether easy to explain. It is possible that the drivers do not want to admit to becoming distracted from driving; it is also possible that they are not aware that they are distracted. How drivers make use of the handing over control to an assistance system is a topic that needs further investigation.

Overall the drivers were satisfied with ACC, a result which comply with the findings of Sanchez et al. (2012), and their acceptance of the system is high. Nevertheless the drivers' responses to the different items in the acceptance scale and their comments indicate a potential for improvement. One concerns control. It is possible that a goal should be to design the function so that the drivers feel more in charge, or control, even when the ACC is performing its duties. Such reasoning is in line with Norman (2007) who stated "make people think they are in control" (193). However, it can be debated whether this is a desired strategy when designing ADAS. Instead, the strategy could be to design systems which are more transparent in order to contribute to the drivers developing a correct and meaningful mental model of the system, developing enough trust in order to hand over the control, but at the same time be aware of the limitations of the system so that they will be able to master takeover when so required.

Another item concerns effectiveness of driving where the ratings suggest that drivers' experience becomes more effective in their driving with access to ACC. However, the earlier study by Strand et al. (2011) highlighted a potential to improve ACC in situations where drivers overtake and the answers in the present study also display some improvement potential regarding such situations.

The drivers were very satisfied with ACC and even though it was considered to contribute to comfort as well as to safety, the function was not considered absolutely necessary. The respondents in the survey were experienced drivers who had driven a considerable number of kilometers without the support of ACC or other ADAS. Safety and comfort benefits of ACC are by no means insignificant, but they are most probably viewed as a bonus to a higher order need, rather than crucial for it. An investigation some 10 or 20 years from now may well tell another story. Future generations of drivers, given the present automation trend, may never have first-hand experience of driving without support systems. Rather than questioning the drivers' trust in handing over control to the system, the challenge may be to design vehicles in which the drivers are comfortable with taking over control.

The differences between the present study and earlier ones could be partly attributed to the differences in methods used, but perhaps also to sampling differences. The participants who took part of this study were very positive toward their ACC as well as rated themselves to be very experienced ACC users. At the same time the response rate was 21.7%, which means that a substantial number of the population did not provide any answers. The mean age of the respondents was fairly high and very few women answered the survey. It is possible that this profile reflects the end-user population, but it could also be the case that those who did not provide any answers represent another user group with other experiences of their ACC systems compared to those who provided answers. Due to this, the responses may fail to reflect the views of users who have found ACC less useful and therefore choose not to activate it. If so, the results are a display of the experiences of a particular user group, and not the whole ACC end-user population.

At the same time a major part of the results are consistent with earlier studies why it is feasible to assume that a considerable amount of drivers appreciate the ACC function and adapt to its limitations. There are benefits in terms of increased perceived comfort and safety. Reported changes in driving behavior in terms of less overtaking and increased compliance with speed regulations support this assumption. At the same time some drivers report feeling more stressed when driving with ACC than without and there are contradictory results regarding drivers' attention to traffic. These factors need further investigation.

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