Using the UTAUT2 model to explain public acceptance of conditionally automated (L3) cars: A representative questionnaire study among 8,044 car drivers from seven European countries

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ABSTRACT

We investigated public acceptance of conditionally automated (SAE Level 3) passenger cars using a representative questionnaire study among 8,044 car-drivers in seven European countries. The study was part of the European L3Pilot project. 70.16% of respondents considered conditionally automated cars easy to use while only 27.92% of respondents planned to buy a conditionally automated car once it is available. 44% of respondents would like to use the time in the conditionally automated car for secondary activities. Among these 44%, respondents plan to be talking to fellow travellers (45%), surfing the internet, watching videos or TV shows (43%), observing the landscape (42%), and working (17%). The Unified Theory of Acceptance and Use of Technology (UTAUT2) was applied to investigate the effects of performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation on the behavioural intention to use conditionally automated cars. Structural equation analysis revealed that the behavioural intention to buy and use a conditionally automated car was strongly influenced by hedonic motivation, social influence, and performance expectancy. The present study also found positive effects of facilitating conditions on effort expectancy and hedonic motivation. Social influence was a positive predictor of hedonic motivation, facilitating conditions, and performance expectancy. Age, gender and experience with driver assistance systems had significant, yet small (< 0.10), effects on the behavioural intention to use conditionally automated cars. The implications of these results on the policy and best practices to enable large-scale implementation of conditionally automated cars on public roads are discussed.

Keywords: Automated vehicle acceptance, UTAUT2, conditionally automated driving, questionnaire, L3Pilot

1. Introduction

In 1935, Keller (1935, p. 1470) presented the first versions of a driverless car concept: „Old people began to cross the continent in their own cars. Young people found the driverless car admirable for petting. The blind for the first time were safe. Parents found they could more safely send their children to school in the new car than in the old cars with a chauffeur ”. Almost nine decades later, we are finally making significant steps towards realising this vision of a driverless future.

The EU co-funded L3Pilot project, under Horizon2020 Framework program, sets the stage for the safe and acceptable introduction of conditionally automated vehicles on public roads in daily traffic, investigating technology and human interaction through large-scale on-road pilots in mixed-environments and different road networks. L3Pilot focusses on SAE Level 3 "conditional automation" (SAE International, 2018) that allows its users to take their eyes off the road and get engaged in non-driving related activities, such as reading a book, or using a smartphone (Berghöfer et al., 2019; Gold et al., 2018; Naujoks et al., 2017; Naujoks et al., 2018). At the same time, the human driver has to remain receptive for a request to take over control from the conditionally automated car in "situations that exceed the operational limits of the automated driving system" (SAE International, 2018) (e.g., missing lane markings, emergency secondary lanes, construction site with offset of lane marking, sensor malfunctions) (Forster et al., 2017; Gold et al., 2018). This implies that the driver needs to redirect attention from the previous activities s/he was engaged in, to the driving scene, free her/his hands and place them back on the steering wheel, and place the feet on the pedals again (Berghöfer et al., 2019).

The growing adoption and use of Adaptive Cruise Control (ACC) over the years has introduced human drivers to the idea of automation controlling the longitudinal aspect of the driving task. However, very few drivers have had experience in cars where the dynamic driving task (DDT) is fully automated. Various studies have highlighted the public's scepticism towards and fear of automated vehicles (Medina & Jenkins, 2017), which is a concern, because their acceptance by the public is a catalyst for realising their potential to improve traffic safety and efficiency (Litman, 2019). In simple terms, acceptance of new technology can be viewed as the extent to which an individual has the intention to use that technology (Venkatesh et al., 2003). Therefore, in order to improve the likelihood that a particular technology is accepted, it is essential to understand which factors influence the probability that the public would intend to use it.

Technology acceptance has typically been studied investigating structural path relations between the factors predicting acceptance. For example, the Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the most comprehensive technology acceptance models, integrating eight influential acceptance models, including the Theory of Planned Behaviour (Ajzen, 1985) and the Technology Acceptance Model (Venkatesh & Davis, 2000). The UTAUT model assumes that an individual's behavioural intention to use a technology is influenced by performance expectancy (i.e., degree to which the technology is perceived to be useful), effort expectancy (i.e., degree to which using the technology is perceived to be easy to use), social influence (i.e., degree to which using the technology is appreciated in the social network important to the individual), and facilitating conditions (i.e., degree to which the individual believes to be in possession of the resources to use the technology) (Venkatesh et al., 2003). The UTAUT2 posits that, in addition to the UTAUT constructs, the intention to use the technology is influenced by hedonic motivation (i.e., degree to which the technology is perceived to be enjoyable), price value and habit (Venkatesh, Thong & Xu, 2012).

1.1. Study objectives

In light of these considerations, the main objective of the present representative questionnaire study among 8,044 car-drivers from seven European countries was to examine the acceptance of conditionally automated cars. The two sub-research objectives that the present study addressed were:

i. To examine the effect of the UTAUT2 constructs performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation on individuals' behavioural intentions to use conditionally automated cars.
ii. To examine the interrelationships between these constructs

To the best of the authors' knowledge, this is the first large representative European questionnaire study focusing on the acceptance of conditionally automated cars. In addition, the study responds to concerns that most of the previous acceptance research on automated vehicles did not recruit a large representative sample with a good representation of gender and age, and including cross-national populations (Nordhoff et al., 2018).

1.2. Hypothesis development

1.2.1. Main effects of the UTAUT2 constructs on behavioural intention

Various studies have demonstrated that the UTAUT constructs performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation are strongly correlated with the acceptance of private conventional and public pod-like automated vehicles (Kaur & Rampersad, 2018; Madigan et al., 2016, 2017). However, while the academic world has seen a dramatic upsurge of scientific publications in the field of automated driving, there is a dearth of research on the role that these UTAUT constructs play in the acceptance of conditionally automated cars. A limited number of studies exists that examine the effects of the UTAUT constructs on the intention to use conditionally automated cars. For example, Xu et al. (2018) applied an adapted version of the Technology Acceptance Model and found that the behavioural intention to use a conditionally automated car was most strongly determined by perceived usefulness (equivalent to performance expectancy), followed by perceived ease of use (equivalent to effort expectancy), and its perceived safety. Perceived usefulness was also the strongest predictor of the willingness to re-ride, followed by perceived safety. Kaye et al. (2019) applied the Theory of Planned Behaviour and the Technology Acceptance Model to examine the acceptance of conditionally and fully automated cars, and found that the attitude towards using conditionally automated cars was the strongest predictor of intentions to use conditionally automated cars, followed by perceived usefulness, subjective norms, and perceived ease of use. Zhang et al. (2019) applied an adapted version of the Technology Acceptance Model and found a direct effect of perceived usefulness on behavioural intention to use automated vehicles. Perceived ease of use predicted behavioural intention to use automated vehicles indirectly by the attitude towards using automated vehicles. Based on the above findings, we hypothesised:

> **H1–H5:** Performance expectancy **(H1)**, effort expectancy **(H2)**, hedonic motivation **(H3)**, facilitating conditions **(H4)**, and social influence **(H5)** will have a positive effect on the behavioural intention to use conditionally automated cars.

In line with Venkatesh et al. (2003, 2012), we expect that the relationships between performance and effort expectancy, social influence, facilitating conditions, hedonic motivation and behavioural intention is moderated by age, gender, and experience with driver assistance systems. We hypothesised:

> **H6:** Age, gender and experience with driver assistance systems moderate the relationship between performance and effort expectancy, hedonic motivation, facilitating conditions, social influence, and the behavioural intention to use conditionally automated cars.

1.3. Interrelations between the UTAUT2 constructs

1.3.1. Effects of effort expectancy on performance expectancy

In order to develop effective strategies to foster acceptance of conditionally automated cars, it is important to understand and identify the underlying beliefs or assumptions behind the UTAUT constructs performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation. The examination of the interrelations between the UTAUT constructs in the field of automated driving has received renewed interest in the literature. However, little is known about the interrelations among the UTAUT constructs in the context of conditional automation. A positive effect of perceived ease of use on perceived usefulness has been supported by the literature on automated vehicle acceptance (Herrenkind et al., 2019; Panagiotopoulos & Dimitrakopoulos; Nordhoff et al., under review; Zhang et al., 2019), which is in line with the broader body of research on technology acceptance (Adams, Nelson, & Todd, 1992; Chang et al., 2015; Karahanna, Agarwal, & Angst, 2006; Venkatesh & Davis, 2000). The positive effect of effort on performance expectancy implies that individuals who consider automated vehicles to be easy to use (i.e., effort expectancy) are more likely to consider automated vehicles useful (i.e., performance expectancy). For this study, we hypothesised that:

H7: Effort expectancy will have a positive effect on performance expectancy.

1.3.2. Effects of social influence on the UTAUT2 constructs

Acheampong and Cugurullo (2019) revealed positive relations between subjective norm (i.e., equivalent to social influence) and the perceived benefits of automated vehicles, and the ease of use of automated driving technology, and a positive relationship between subjective norm and perceived behavioural control. A positive effect of social influence on performance expectancy, facilitating conditions and hedonic motivation was found by Nordhoff et al. (under review). We thus expect a positive relation between social influence and performance and effort expectancy, facilitating conditions, and hedonic motivation. The underlying assumption is that individuals who believe that people important to them in their social network will support their use of conditionally automated cars (i.e., social influence), are more likely to consider conditionally automated cars useful (i.e., performance expectancy), easy to use (i.e., effort expectancy), enjoyable (i.e., hedonic motivation), and are more likely to believe they are in possession of the necessary resources to use these cars (i.e., facilitating conditions). Therefore, in this study, we hypothesised that:

> **H8–H11:** Social influence will have a positive effect on performance expectancy **(H8)**, effort expectancy **(H9)**, hedonic motivation **(H10)**, and facilitating conditions **(H11)**.

1.3.3. Effects of facilitating conditions on the UTAUT2 constructs

In Nordhoff et al. (under review), it was reported that there is a paucity of knowledge on the relationship between facilitating conditions, performance and effort expectancy and hedonic motivation. The study found positive effects of facilitating conditions on effort expectancy and hedonic motivation, but facilitating conditions was not related to performance expectancy. The present study builds on these results and expects that individuals who believe to have the necessary resources to use conditionally automated cars are more likely to consider conditionally automated cars useful, easy to use, and enjoyable. Therefore, in this study, we hypothesised that:

> **H12–H14:** Facilitating conditions will have a positive effect on performance expectancy **(H12)**, effort expectancy **(H13)**, and hedonic motivation **(H14)**.

1.3.4. Effects of hedonic motivation on the UTAUT2 constructs

Literature in the field of technology acceptance has revealed positive effects of perceived enjoyment on usefulness and ease of use in the field of technology acceptance (Koenig-Lewis et al., 2015; Teo & Noyes, 2011). In the study of Nordhoff et al. (under review), however, a positive effect of hedonic motivation on effort expectancy was reported, while the effect of hedonic motivation on performance expectancy was not significant. This corresponds with the results obtained in the study of Herrenkind et al. (2019). While the evidence on the relation between hedonic motivation and effort expectancy is ambiguous, in this study, we expect a positive effect of hedonic motivation on both performance and effort expectancy. The assumption is that individuals who consider conditionally automated cars enjoyable are more likely to give higher ratings to performance and effort expectancy. Therefore, we hypothesised that:

H15–H16: Hedonic motivation will have a positive effect on performance expectancy **(H15)** and effort expectancy **(H16)**.

2. Methodology

2.1. Procedure and recruitment

An online questionnaire was administered to 8,044 respondents in total from seven European countries, including the U.K., Finland, Sweden, Germany, Italy, France, and Hungary. These countries were selected based on the size of their car market and geographical representation within Europe. The questionnaire was conducted by the German market research institute INNOFACT AG (www.innofact.com) using the survey tool EXAVO (https://www.exavo.de/surveytainment/), except for Finland where the data collection was conducted by Taloustutkimus Oy (https://www.taloustutkimus.fi/in-english.html) among their nationally representative Internet panel using their proprietary survey tool. The questionnaire was translated into English, Swedish, French, German, Italian, Hungarian, and Finnish to be administered in the respective countries. Data were collected between April and June 2019 among a sample that was representative of age, gender, and income of their country population, respectively, and that frequently used a private car and carsharing and rental cars as driver. The invitation to participate in the questionnaire study was sent by online panels having access to large number of respondents via email. Once a representative sample per country was obtained, the questionnaire was closed and participation in the questionnaire was no longer possible. The online panels used a number of technologies to enhance data quality. These included RelevantID (i.e., digital fingerprinting technology to (1) identify duplicate respondents taking the same survey more than once from the same machine, (2) detect if multiple email accounts are being used to take the survey from a single computer, and to (3) identify multiple panel accounts from different research firms using the same computer; Imperium, 2019), GEO-IP verification (i.e., understanding from which country a respondent is registering to the panel and entering the survey), VPN-proxy detection (i.e., identifying and blocking respondents using suspect proxies to avoid GEO-IP restrictions or to hide identity in some way), minFraud (i.e., calculating a risk score per respondent and making an overall risk assessment on each respondent) (Maxmind, 2019), Firehol (i.e., allowing panel providers to hold an IP database of suspicious addresses to assess the overall risk associated with allowing the respondent to proceed using the services), Apility (i.e., email and email provider reputation service allowing panel providers to understand the higher risk associated with the use of certain domains and IP's) (Apility, 2019), reCaptcha (i.e., determining whether the user is a human or bot), and SmartyStreets (i.e., address verification tool) (SmartyStreets, 2019). Respondents were financially compensated for their participation in the questionnaire. In Germany, respondents received 1.00 Euro for completing the questionnaire. The other respondents received points that were worth between 0.80 and 1.00 Euro per respondent, which could be redeeemed as vouchers. The Finnish respondents had a chance to win prizes by being a member in the panel and participating in surveys.

2.2. Questionnaire design

To design the questionnaire, the authors defined a list of research questions for the project and identified those that would best be addressed with this survey by the public. Based on these research needs, the authors of this study reviewed the existing literature on user acceptance of advanced driver assistance systems and higher levels of vehicle automation. This included a review of research on theoretical models of technology acceptance, and the key factors predicting the acceptance of automated vehicles. Several workshops were held with experts of the consortium to further refine the design of the questionnaire and the wording of the questionnaire items.

Before the questionnaire was programmed and launched by INNOFACT AG, it was pre-tested in several iteration rounds to ensure clarity in terms of a common understanding of the logic of the questionnaire (e.g., order of items) and the questionnaire items itself (i.e., meaning of items). This also encompassed ensuring that the questionnaire was correctly translated in the different languages. In addition, INNOFACT AG performed a soft launch of the questionnaire, with approximately thirty respondents, to resolve any implementation or wording errors. To ensure that responses were not influenced by the order in which questionnaire items were presented, those that did not follow a specific logic were presented in a random order across respondents.

2.3. Questionnaire content

The questionnaire was divided into five main parts.

In the first part of the questionnaire, respondents were presented with a limited number of sociodemographic questions and mobility behaviour that were meant to screen out respondents and select a representative sample of the country population as described in Section 2.1. Thus, respondents were asked to provide their age (Q1), gender (Q2), and income (Q3). For these questions, specific quoting criteria were used (see supplementary material S1). Note that age and income were adjusted to account for country-specific differences. In order to select frequent car drivers as potential first users of conditionally automated driving systems, respondents were asked to indicate their frequency of travel mode use (Q4), and the mode of transport they use per trip (Q5).

After respondents were presented with the first part, they received the following description about the functionality of conditionally automated cars, to ensure that they had an accurate understanding of conditionally automated cars:

> „There are different terms to define the capabilities of automated cars, such as self-driving, autonomous, automated, pilotless, driverless, and conditionally automated. With this questionnaire, we would like to get your opinion **on conditionally automated cars.**
>
> Conditionally automated cars can drive under limited conditions, such as **driving on motorways, on congested motorways, in urban traffic, and in parking situations.** They will not operate beyond these conditions.
>
> Conditionally automated cars do the steering, acceleration and braking. They will stay in the lane and maintain a safe distance to the vehicle in front. They will also overtake slower moving vehicles or change the lane. These cars still have gas and brake pedals and a steering wheel.
>
> You are not driving when the car is in conditionally automated mode – even if you are seated in the *driver's* seat. This will allow you to engage in other activities, such as emailing or watching videos. However, the car might ask you to resume vehicle control anytime, e.g., when approaching a construction site, which means you might have to stop what you are doing and resume control of the car.*"*

The second part of the questionnaire concerned respondents' degree of understanding of the concept of conditionally automated cars, based on an introduction to these cars they received at the beginning of the questionnaire. They were also asked of their level of familiarity with automated cars, and their self-rated technology readiness.

The third part consisted of questions measuring respondents' willingness to allow the car collecting data, and their general attitudes towards conditionally automated cars.

The fourth part asked respondents to assess their usage of conditionally automated cars in specific conditions. These included driving a conditionally automated car on urban roads, on congested motorways, motorways, and in parking situations.

The fifth part presented respondents with further information about their sociodemographic characteristics and mobility behaviour that had not been addressed in the first part.

The respondents were informed that it would take around 20 minutes to complete the survey and that the data would be treated anonymously. Respondents were further informed that the survey is executed as part of the EU-financed project L3Pilot.

The present study will only report the results to the questions addressing the UTAUT hypotheses presented above (i.e., Q17, and Q22–Q44). These questions are described below in more detail. The results to the remaining questions will be addressed in consecutive scientific studies.

On a scale from strongly disagree (1) to strongly agree (5), respondents were asked to indicate to what extent they believe they would use the time during which a conditionally automated car is driving for other activities (Q17), and if so, which activities they would like to perform (Q17_b1–Q17_b10); a conditionally automated car would be useful in meeting their daily mobility needs (Q22), using a conditionally automated car would help them to reach their destination more safely (Q23); learning how to use a conditionally automated car would be easy for them (Q24); whether they expect that a conditionally automated car would be easy to use (Q25); help them to reach their destination more comfortably (Q26); it would be easy for them to become skillful at using a conditionally automated car (Q27); using a conditionally automated car would be fun (Q28); people whose people opinions they value would prefer that they use a conditionally automated car (Q29); using a conditionally automated car would be entertaining (Q30); they intend to use a conditionally automated car in the future (Q31); using a conditionally car would be enjoyable (Q32); assuming that they had access to a conditionally automated car, they predict they would use it (Q33); they could acquire the necessary knowledge to use a conditionally automated car (Q34); they plan to use a conditionally automated in adverse weather conditions such as during heavy rain or fog, and in darkness (Q35); they would expect the use of a conditionally automated car to be compatible with other digital devices they use (Q36); they would use a conditionally automated car during their everyday trips (Q37); would expect to have the necessary knowledge to use a conditionally automated car (Q38); would expect that people who influence my behaviour think that I should use a conditionally automated car (Q39); would be able to get help from others when I have difficulties using a conditionally automated car (Q40); would expect that people who are important to me think that I should use a conditionally automated car (Q41); would recommend a conditionally automated car to others (Q42); would assume that a conditionally automated car would be useful in their daily life (Q43); and plan to buy a conditionally automated car once it is available (Q44).

2.4. Data analysis

A two-step approach (Anderson & Gerbing, 1988) to analyse the data was adopted. In the first step, confirmatory factor analysis was performed to evaluate the measurement relations between the latent and observed variables (i.e., questionnaire items). The psychometric properties of the measurement model were assessed by its indicator reliability, internal consistency reliability, convergent validity and discriminant validity. Convergent validity was assessed by four criteria: 1) All scale items should be significant and have loadings exceeding 0.70 on their respective scales, 2) the average variance extracted (AVE) should be higher than 0.50, 3) construct reliability (CR), and 4) Cronbach's alpha values should exceed 0.70 (Anderson & Gerbing, 1988; Fornell & Larcker, 1981). Discriminant validity of our data was examined with the test of squared correlations by Anderson and Gerbing (1988): The correlation coefficient between two latent variables should be smaller than the square root of the average variance extracted (AVE) of each latent variable.

The second step of the analysis involved estimating the structural model consisting of the path relations between the latent variables. The assessment of the structural equation modelling involved reporting the standardised regression weights, their level of significance, and the amount of variance accounted for by these latent variables. Maximum likelihood estimation (MLE) was used for this calculation.

To assess whether the model fits the data, the fit indices were as follows: Comparative Fit Index (CFI) $\geqslant$ 0.90, Root Mean Square Error of Approximation (RMSEA) $\leqslant$ 0.08, and the

Standardised Root Mean Square Residual (SRMR) ⩽ 0.06 (Hair et al., 2014; Hooper, Coughlan, & Mullen, 2008; Hu & Bentler, 2009; Schreiber et al., 2006).

To assess the moderating effects of age, gender and experience with advanced driver assistance systems on the relationships between the UTAUT constructs performance and effort expectancy, social influence, facilitating conditions, hedonic motivation, and behavioural intention, we created mean-centered product-terms of age, gender, and vehicle experience and the UTAUT predictor constructs, respectively, in line with the literature (Du et al., 2018).

2.5. Data filtering

Data was filtered in two stages. First, the German market institute INNOFACT AG who conducted all the questionnaires, except for the Finnish questionnaire, omitted individuals who indicated that they frequently used all transport modes (Q4), who responded *„I don't know"* to all knowledge questions (Q6–Q10) in order to screen out individuals who had an inaccurate understanding of conditionally automated driving, and who gave inconsistent sociodemographic responses (i.e., being at the age of 20 years old while being retired). To identify frequent car users, individuals were omitted from the sample if they indicated that they rarely used the private car (without carsharing and rental cars), and carsharing and rental cars as driver (i.e., responded with *"almost never"* to these questions), or if they did not provide any response to these questions. In total, there were 8,044 complete questionnaires after omitting individuals in the first data filtering stage. Second, we excluded individuals if they did not respond to one or more of our latent constructs measured by questions Q13–Q44. The second data filtering stage resulted in the removal of 845 individuals, leaving responses from 7,199 individuals for the analysis.

3. Results

3.1. Respondents

An overview of respondents' socio-demographic profile, frequency of car use, and their experience with driving assistance systems is given in Table 2 in the supplementary material.

3.2. Ratings of attitudinal questions

The means, standard deviations and frequency distributions of the attitudinal questions that are the focus of the present study are given in Table 1. The highest ratings were obtained for items pertaining to the ease of use of automated vehicles. The highest mean rating was obtained for respondents' belief that a conditionally automated car would be easy to use (Q25, **M** = 3.78, SD = 0.96, on a scale from strongly disagree (1) to strongly agree (5)), and that they could acquire the necessary knowledge to use a conditionally automated car (Q34, **M** = 3.78, SD = 1.00). The second- and third-highest mean ratings were obtained for respondents' belief that learning how to use a conditionally automated car would be easy for them (Q24, **M** = 3.73, SD = 0.97), and that they would expect to have the necessary knowledge to use a conditionally automated car (Q38, **M** = 3.63, SD = 1.04).

The lowest ratings were obtained for items pertaining to the social influence and willingness to buy a conditionally automated car. The lowest rating (Q44, **M** = 2.77, SD = 1.19) was obtained for respondents' willingness to buy a conditionally automated car. As shown by the frequency distribution underlying Q44, only 27.92% of respondents agreed with the statement capturing their intention to use a conditionally automated car. In contrast, a higher mean rating was obtained for using a conditionally automated car assuming respondents' access to it (Q33, **M** = 3.53, SD = 1.15), with 60.15% of respondents agreeing with this statement.

The second-lowest rating was obtained for respondents' belief that people who are important to them think that they should use a conditionally automated car (Q41, **M** = 2.97, SD = 1.11).

The third-lowest rating was obtained for respondents' belief that people who influence their behaviour think that they should use a conditionally automated car (Q39, **M** = 3.02, SD = 1.11).

A moderate rating was obtained for using the time the conditionally automated car is driving for other activities (Q21, **M** = 3.05, SD = 1.15), with 44% of respondents indicating that they would like to spend the time in a conditionally automated car for secondary eyes-off road activities. As shown by Table 2, the three most preferred activities included talking to fellow travelers; surfing the internet, watching videos or TV shows; and observing the landscape, with 45%, 43% and 42% of respondents favouring these types of activities, respectively.

Table 1. Descriptive statistics (i.e., means (**M**), standard deviations (SD), frequencies). The number of respondents for all questions is 7,199. Questions are presented in descending order according to their means to identify highest, moderate, and lowest mean ratings.

Question	**M**	**SD**	**Frequencies**				
			Strongly disagree (1)	**Disagree (2)**	**Neutral (3)**	**Agree (4)**	**Strongly agree (5)**
Q25: I expect that a conditionally automated car would be easy to use.	3.78	0.96	272	401	1475	3563	1488
Q34: I could acquire the necessary knowledge to use a conditionally automated car.	3.78	1.00	327	384	1441	3430	1617
Q24: Learning how to use a conditionally automated car would be easy for me.	3.73	0.97	267	422	1738	3312	1460
Q38: I would expect to have the necessary knowledge to use a conditionally automated car.	3.63	1.04	403	539	1717	3208	1332
Q27: It would be easy for me to become skilful at using a conditionally automated car.	3.59	1.02	384	523	1970	3110	1212
Q36: I would expect the use of a conditionally automated car to be compatible with other digital devices I use.	3.54	1.07	485	569	1947	3004	1194
Q33: Assuming that I had access to a conditionally automated car, I predict that I would use it.	3.53	1.15	620	647	1602	2980	1350
Q26: Using a conditionally automated car would help me reach my destination more comfortably.	3.50	1.10	534	667	1864	2932	1202
Q28 Using a conditionally automated car would be fun.	3.38	1.14	669	730	2093	2608	1099
Q43: I assume that a conditionally automated car would be useful in my daily life.	3.36	1.15	689	822	1915	2755	1018
Q37: I would use a conditionally automated car during my everyday trips.	3.35	1.18	724	903	1791	2691	1090
Q32: Using a conditionally automated car would be enjoyable.	3.34	1.16	727	781	2034	2622	1035
Q23: Using a conditionally automated car would help me reach my destination more safely.	3.33	1.1	612	818	2308	2526	935
Q30: Using a conditionally automated car would be entertaining.	3.33	1.13	677	802	2137	2621	962
Q22: I expect that a conditionally automated car would be useful in meeting my daily mobility needs.	3.31	1.17	763	923	1801	2732	980
Q40: I would be able to get help from others when I have difficulties using a conditionally automated car.	3.31	1.03	513	847	2443	2723	673
Q31: I intend to use a conditionally automated car in the future.	3.19	1.17	879	848	2366	2245	861

Q42: I would recommend a conditionally automated car to others.	3.16	1.13	824	862	2612	2111	790
Q35: I plan to use a conditionally automated car in adverse weather conditions such as during heavy rain or fog, and in darkness.	3.16	1.21	899	1134	2008	2238	920
Q17: I would use the time during which a conditionally automated car is driving for other activities.	3.05	1.15	838	1464	1983	2307	607
Q29: I assume that people whose opinions I value would prefer that I use a conditionally automated car.	3.05	1.09	815	1082	2813	1893	596
Q39: I expect that people who influence my behaviour think that I should use a conditionally automated car.	3.02	1.11	847	1225	2703	1809	615
Q41: I expect that people who are important to me think that I should use a conditionally automated car.	2.97	1.11	920	1232	2686	1836	525
Q44: I plan to buy a conditionally automated car once it is available.	2.77	1.19	1422	1365	2402	1488	522

Table 2. Preference for engagement in eyes-off-road activities (Q17b_1–Q17b_10) sorted in descending order by the number of respondents (n) selecting the activity

Activities	**n**
Q17b_2: Talking to my fellow travellers	1382 (45%)
Q17b_3: Surfing the internet, watching videos or TV shows	1334 (43%)
Q17b_7: Observing the landscape	1300 (42%)
Q17b_8: Relaxing and resting	1032 (33%)
Q17b_6: Eating and drinking	942 (30%)
Q17b_5: Socialising with friends or family (e.g., write messages, make phone calls, use social media)	824 (27%)
Q17b_10: Working	528 (17%)
Q17b_9: Reading a book	457 (15%)
Q17b_1: Taking care of children	441 15%)
Q17b_4: Playing games (e.g., video or board games)	303 (10%)

Note: Only respondents who indicated in Q17 that they would like to use the time the conditionally automated car is driving for other activities were allowed to respond to questions corresponding to Q17b. Respondents could select a maximum number of three activities. In total, 8,543 responses were collected.

3.3. Results of confirmatory factor analysis

The results of the confirmatory factor analysis are shown in Table 3. Model fit parameters were acceptable for all latent variables (CFI = 0.98 $\geqslant$ 0.95, RMSEA = 0.03 $\leqslant$ 0.06 $\leqslant$ 0.08, SRMR = 0.02 $\leqslant$ 0.06) with the exception of the chi-square statistic, which has exceeded the recommended threshold of 3 (i.e., x_2 = 27.43). However, the chi-square statistic is sensitive to sample size, implying that a value larger than 3 is usually expected with larger sample sizes (Hair et al., 2014). The items PE3–PE4, EE1–EE2, HM1 and HM3, SI1–SI2, FC1 and FC3, BI1 and BI5 were maintained in the analysis as their loadings exceeded the threshold of 0.7. The remaining items were omitted from the analysis due to factor loadings that were lower than 0.7, and high inter-construct correlations. The constructs demonstrated sufficient internal consistency reliability as shown by the Cronbach's alpha and composite reliability values, which were both higher than 0.7. Average variance extracted values (AVE) were higher than 0.5 for all latent variables. As shown by Table 4, discriminant validity is acceptable for all latent variables: The Pearson correlation coefficients between two constructs do not exceed the square root of the AVE, are smaller than 0.80, and the variance inflation factors (VIF) for all constructs are below the recommended cut-off value of 3, suggesting the absence of substantial multicollinearity (Garson, 2012; Hair et al., 2014).

Table 3. Results of confirmatory factor analysis

Latent variable	**Observed variable**	**ƛ**	**α**	**CR**	**AVE**
Performance expectancy (PE)			0.83	0.83	0.84
	PE1: I would use the time during which a conditionally automated car is driving for other activities (Q14).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	PE2: I expect that a conditionally automated car would be useful in meeting my daily mobility needs (Q22).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	PE3: Using a conditionally automated car would help me reach my destination more safely (Q23).	0.83			
	PE4: Using a conditionally automated car would help me reach my destination more comfortably (Q26).	0.85			
	PE5: I assume that a conditionally automated car would be useful in my daily life (Q43).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			

Effort expectancy (EE)			0.77	0.78	0.80
	EE1: Learning how to use a conditionally automated car would be easy for me (Q24).	0.75			
	EE2: I expect that a conditionally automated car would be easy to use (Q25).	0.83			
	EE3: It would be easy for me to become skillful at using a conditionally automated car. (Q27).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
Hedonic motivation (HM)			0.80	0.80	0.82
	HM1: Using a conditionally automated car would be fun (Q28).	0.77			
	HM2: Using a conditionally automated car would be entertaining (Q30).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	HM3: Using a conditionally automated car would be enjoyable (Q32).	0.86			
Social influence (SI)			0.80	0.80	0.81
	SI1: I assume that people whose opinions I value would prefer that I use a conditionally automated car (Q29).	0.86			
	SI2: I expect that people who influence my behaviour think that I should use a conditionally automated car (Q39).	0.76			
	SI3: I expect that people who are important to me think that I should use a conditionally automated car (Q41).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	SI4: I would recommend a conditionally automated car to others (Q42).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
Facilitating conditions (FC)			0.78	0.78	0.80
	FC1: I could acquire the necessary knowledge to use a conditionally automated car (Q34).	0.82			
	FC2: I would expect the use of a conditionally automated car to be compatible with other digital devices I use (Q36).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	FC3: I would expect to have the necessary knowledge to use a conditionally automated car (Q38).	0.77			
	FC4: I would be able to get help from others when I have difficulties using a conditionally automated car (Q40).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
Behavioural intention (BI)			0.83	0.83	0.85
	BI1: I intend to use a conditionally automated car in the future (Q31).	0.88			
	BI2: Assuming that I had access to a conditionally automated car, I predict that I would use it (Q33).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	BI3: I plan to use a conditionally automated car in adverse weather conditions such as during heavy rain or fog, and in darkness (Q35).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			
	BI4: I would use a conditionally automated car during my everyday trips (Q37).	Omitted from analysis due to factor loadings < 0.70 and high inter-construct correlations			

	BI5: I plan to buy a conditionally automated car once it is available (Q44).	0.81			
CFI	0.981				
RMSEA	0.060				
SRMR	0.021				
x_2	27.67				

Note: Measurement of the UTAUT constructs were used from Xu et al. (2018) and Venkatesh et al. (2012) and adjusted to the context of this study.

ƛ = Lambda, factor loading; **α** = Cronbach's alpha, internal consistency measure; CR = Construct reliability, internal consistency measure; AVE = average variance extracted, summary measure of convergence among observed variables representing a latent variable; VIF = variance inflation factor, measure of multicollinearity (Hair et al., 2014)

Table 4. Inter-construct correlation matrix

Construct	Performance expectancy	Effort expectancy	Social influence	Facilitating conditions	Hedonic motivation	Behavioural intention
Performance expectancy	**0.92**					
Effort expectancy	0.59	**0.88**				
Social influence	0.64	0.46	**0.90**			
Facilitating conditions	0.56	0.73	0.42	**0.89**		
Hedonic motivation	0.76	0.59	0.64	0.55	**0.90**	
Behavioural intention	0.72	0.54	0.70	0.51	0.73	**0.92**

Note: The diagonal values represent the square root of the average variance extracted (AVE) of the constructs. The below diagonal values represent the coefficients of the Pearson correlation between two constructs. Sufficient discriminant validity is provided if the square root of the AVE exceeds the correlation coefficients.

3.4. Results of structural equation modeling

The results of the structural equation modelling are shown in Table 5. The model fit was acceptable except for the chi-square statistic (see Section 3.3.). The majority of our hypotheses was supported. Age and gender had negative, yet small (< 0.10), effects on behavioural intention, respectively. To examine the differences between males and females regarding the behavioural intention to use conditionally automated cars, we computed Pearson's chi-squared tests (see Table 6). As shown by Table 6, all differences between males and females regarding the behavioural intention to use conditionally automated cars were significant. Males are more likely than females to intend to use conditionally automated cars. Age, gender, and experience with driver assistance systems did not moderate the relationships between performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation, and behavioural intention.

Table 5. Results of structural equation modelling; significant structural path relations between latent variables, socio-demographics and experience with driver assistance systems (β), variance explained (R^2), and model fit parameters

Hypothetical path		**Model 1**	**Model 2**
Independent variable	**Dependent variable**	**Effect β & significance level**	**Effect β & significance level**
UTAUT constructs			
Performance expectancy	Behavioural intention	0.11*	0.14*
Social influence	Behavioural intention	0.38***	0.39***
Hedonic motivation	Behavioural intention	0.50***	0.48***
Facilitating conditions	Effort expectancy	0.84***	0.84***
Facilitating conditions	Hedonic motivation	0.39**	0.39***
Social influence	Performance expectancy	0.18***	0.18***
Social influence	Facilitating conditions	0.55***	0.55***
Social influence	Hedonic motivation	0.57***	0.57***
Hedonic motivation	Effort expectancy	0.14***	0.14***
Hedonic motivation	Performance expectancy	0.70***	0.71***
Experience with driver assistance systems			
Blind Spot Monitoring	Behavioural intention	–	0.03*
Automated Emergency Braking	Behavioural intention	–	0.04***
Socio-demographics			
Age	Behavioural intention	–	-0.09***
Gender	Behavioural intention	–	-0.02**
Assessment of model fit			
CFI		0.98	0.82
RMSEA		0.06	0.05
SRMR		0.02	0.04
χ^2/df		27.67	20.69
R^2 of BI		0.871	0.871
R^2 of PE		0.873	0.873
R^2 of EE		0.917	0.917
R^2 of HM		0.722	0.723
R^2 of FC		0.298	0.300

Note: * p < 0.05, ** p< 0.01, *** p < 0.001, n.s. = not significant

For experience with driver assistance systems, a dummy variable was created with 1 representing the response categories “I have it and I use it” and “I have it and I don’t use it”, and 0 representing the response categories “Don’t know if I have it”, “I don’t have it but I would use it”, “I don’t have it and I would not use it”.

Table 6. Results of Pearson’s Chi-squared test

Latent variable	Observed variable	Gender	Strongly disagree (1)	Disagree (2)	Neutral (3)	Agree (4)	Strongly agree (5)	Chi-square value, df
Behavioural intention (BI)	I intend to use a conditionally automated car in the future (Q31).							53.14, 8 ***
		Male	653	665	1202	855	301	
		Female	767	698	1196	632	220	
	I plan to buy a conditionally automated car once it is available (Q44).							45.02, 8 ***
		Male	408	401	1158	1207	502	
		Female	469	447	1206	1033	358	

Note: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$, n.s. = not significant

4. Discussion

As part of the L3Pilot project, the present study investigated the acceptance of conditionally automated cars among 8,044 car drivers from seven European countries using an online questionnaire. There is a paucity of knowledge on the role of the UTAUT2 constructs performance and effort expectancy, social influence, facilitating conditions and hedonic motivation for the behavioral intention to use conditionally automated cars, and the moderating influences of age, gender and experience with driver assistance systems on these relationships. Previous research on automated vehicle acceptance has not recruited a representative and stratified age- and gender-balanced sample. The present study filled both of these gaps in research and performed the first representative questionnaire study on the acceptance of conditionally automated cars in Europe.

4.1. Ratings of questionnaire items

The study revealed that the highest mean rating was obtained for the questionnaire item pertaining to the perceived ease of use of conditionally automated cars, with 70.16% of respondents considering conditionally automated cars easy to use. This result may be counterintuitive as conditionally automated driving may pose excessive demands on the abilities of the human driver to safely, comfortably and efficiently take back control from a conditionally automated car. Zeeb, Buchner, and Schrauf (2016) found that the quality of taking over control from a conditionally automated car deteriorated for distracted drivers (i.e., reading a news text and watching a video). Gold et al. (2018), who modelled the take-over performance in conditionally automated cars on the basis of 729 take-over situations, found significant effects of the time budget, traffic density, and experience with take-over situations on drivers' take-over performance, while the engagement in non-driving related activities only accounted for a small amount of variance in the take-over performance. However, the positivity of our respondents towards the perceived ease of use of conditionally automated cars may be explained by their lack of physical exposure to conditionally automated cars, which may make it difficult for them to accurately envision their interaction with these cars.

Second, the items measuring perceived ease of use (i.e., effort expectancy) did not measure the specific take-over situation and interaction with a conditionally automated car but were phrased generically. This means that it is not very clear which associations respondents had with the construct effort expectancy. Davis (1993) posit that perceived ease of use (i.e., effort expectancy) reflects part of the cost of using the system. In line with Davis (1993), we posit that future research should adjust the operationalisation of effort expectancy to the context of conditionally automated driving.

The lowest mean rating was obtained for the questionnaire item pertaining to respondents' willingness to buy a conditionally automated car, with only 27.92% of respondents planning to buy a conditionally automated car once it is available. This finding corresponds with Power (2012) who surveyed 17,400 vehicle owners and found that only 37% of respondents would definitely or probably be interested in purchasing automated driving technology, and with Pfleging, Rang, and Broy (2016) who revealed that 44% of their respondents could imagine buying a highly automated car. In contrast, in our study, a higher mean rating was obtained for the behavioral intention to use conditionally automated cars, implying that the intention to use a conditionally automated car is higher than the intention to buy a conditionally automated car. This finding can be seen with regards to the context of societal and technological changes, among which is the rapid growth of shared mobility services such as car-sharing, bike-sharing, scooter sharing, on-demand ride services, ridesharing and micro-transit (Stocker & Shaheen, 2018). These shared mobility concepts challenge traditional business concepts (Min, So, & Jeong, 2018), posing a threat to the competitiveness of the private car, especially in urban environments, where individuals have an increasingly diversified and dense mobility offer at their disposal that is easily accessible, convenient, and affordable.

Interestingly, only 44% of respondents reported a willingness to use the time the conditionally automated car is driving for other activities. The most preferred activities were talking to fellow travellers (45%), surfing the internet, watching TV shows or videos (43%), and observing the landscape (42%). Working was preferred by only 17% of respondents. This finding mirrors the literature, which has shown that respondents favor the engagement in activities that require less attentional resources, and that they can already perform in traditional transport modes (Cunningham et al., 2019; Cyganski et al., 2015; Pfleging et al., 2016). This finding could imply that the possibility to relax and perform lighter activities is a need in conditionally automated driving, implying that the car interior has to be adjusted to accommodate for these activities in line with the reflections of Pfleging et al. (2016).

Our finding could be explained with regards to the particular nature of conditionally automated cars. Conditionally automated driving places considerable demands on the sensory, motoric and cognitive state of the human driver (Naujoks et al., 2018). Gold et al. (2018) provide a short review of the driver behaviour in take-over situations that ranges from mode confusion and errors, delayed responses to critical rear-end collision events, and impaired driving performance after automated driving. We posit that the human driver has to direct his/her attentional resources to both the driving environment, the performance of the automated system, and the activity s/he is engaged in. Conditionally automated cars that will be commercialised will have to enable a safe, comfortable and efficient take-over situation, without jeopardising the added benefits that this level of automation entails. If the capability is achieved, the human driver will not have to divide their attentional resources between the driving environment, while also supervising the performance of the automated system, and managing their own activity all at the same time. To be safe, useable and acceptable, the systems that will enter the market will have to enable the driver to comfortably engage in the non-driving related activity, and provide sufficient time for a request to intervene and take over control of the automated system. We recommend future research to investigate the types of activities that drivers of conditionally automated cars can pursue to prevent mental overload and underload, and ensure that a drivers' situation awareness matches the requests of the automated car.

4.2. Structural equation modelling analysis: UTAUT2 model without moderator effects

Structural equation modelling was performed to examine the effects of the UTAUT constructs performance and effort expectancy, social influence, hedonic motivation, and facilitating conditions on individuals' behavioural intentions to use conditionally automated cars as well as their interrelations.

Hedonic motivation was the strongest predictor of individuals' behavioural intention (H3), implying that individuals who consider conditionally automated cars enjoyable are more likely to intend to use them. This finding corresponds with the study of Madigan et al. (2017) and Nordhoff et al. (under review), which have also identified hedonic motivation as the strongest predictor for the acceptance of driverless public transport. In the studies of Madigan et al. (2017) and Nordhoff et al. (under review), most of the respondents were physically exposed to the automated vehicle they were asked to rate using a questionnaire after their ride with the vehicle. We encourage further research into the hypothesis that the ratings of perceived enjoyment (i.e., hedonic motivation) do not differ before and after the exposure to conditionally automated cars.

The second-strongest predictor of behavioural intention was social influence, implying that individuals who believe that people important to them in their social network appreciate their use of conditionally automated cars are more likely to intend to use them. Performance expectancy was the third-strongest predictor of the behavioural intention to use conditionally automated cars. This means that individuals who consider conditionally automated cars useful are more likely to form positive intentions to use these cars.

In our study, performance expectancy was the weakest predictor of the behavioural intention to use conditionally automated cars, while in previous research performance expectancy was the strongest predictor (Madigan et al., 2016; Panagiotopoulos & Dimitrakopoulos, 2018). As shown by the relatively strong correlation between performance expectancy and hedonic motivation, hedonic motivation may represent some of the effects of performance expectancy on behavioural intention. One explanation for the strong correlation between these two constructs may be the conceptual similarity between performance expectancy and hedonic motivation, which may make it difficult for respondents to clearly discriminate between these constructs. Furthermore, the UTAUT constructs are expressed in very generic terms, which leaves ample room for respondents to attach different meaning to them.

Future research should assess whether it is reasonable to develop more specific items as indicators of the UTAUT constructs. It should also be assessed whether the questions pertaining to the UTAUT constructs have the same meaning across countries. It was beyond the scope of this study to examine how the acceptance of conditionally automated cars differs across countries. This will be executed by the authors of the present study in a subsequent study.

Investigating the interrelations between predictors, this study advances our knowledge of the mechanisms to promote the individual beliefs underlying the UTAUT predictor constructs. Social influence was the strongest predictor of hedonic motivation, implying that promoting the use of conditionally automated cars in individual's networks can enhance their perceived enjoyment. Facilitating conditions was the second-strongest predictor of hedonic motivation, implying that the belief of individuals to have the necessary resources to use conditionally automated cars has a positive influence on hedonic motivation. This finding corresponds with Madigan et al. (2017) and Nordhoff et al. (under review) who investigated the acceptance of driverless public transport. Facilitating conditions was the strongest predictor of effort expectancy, followed by hedonic motivation. This implies that individuals who believe to be in possession of the necessary resources and who believe that conditionally automated cars are enjoyable are more likely to consider conditionally automated cars easy to use. Facilitating conditions, in turn, was influenced by social influence, meaning that the perceived capabilities to use conditionally automated cars can be increased by increasing the reliance on the individual's social networks. Effort expectancy was determined by hedonic motivation, implying that the perceived ease of use of conditionally automated cars has a positive influence on the perceived enjoyment.

Hedonic motivation was the strongest predictor of performance expectancy, followed by social influence. This means that individuals who consider conditionally automated cars to be enjoyable and who believe that important people in their social network appreciate the use of conditionally automated cars are more likely to consider them useful.

These findings imply that to enhance the acceptance of conditionally automated driving, promoting the benefits of conditionally automated driving must be clearly demonstrated and promoted by public (e.g., media, policy-makers) and private decision-makers (e.g., manufacturers) in people's everyday lifes and social networks.

4.3. Structural equation modelling analysis: UTAUT2 model with moderater effects

In the second structural model, the moderating effects of age, gender and experience with driver assistance systems on the relationships between the UTAUT2 constructs performance and effort expectancy, social influence, hedonic motivation, facilitating conditions, and behavioural intention were investigated. The effects of the moderators on the proposed relationships were not significant. Small (< 0.10) negative effects of age were found on behavioural intention. This suggests that elderly people are less likely than younger people to intend to use conditionally automated cars. Small negative (< 0.05) effects of gender were found on behavioural intention. Pearson's chi-squared test revealed that males were more likely than females to intend to use conditionally automated cars (i.e., behavioural intention). These findings mirror the literature on automated vehicle acceptance in two substantial ways. First, it corresponds with the studies which have shown significant, yet small, effects of age and gender on the factors predicting automated vehicle acceptance, as well as the acceptance construct itself (Kettles & Van Belle, 2019; Kyriakidis, Happee, & De Winter, 2015; Nordhoff et al., 2018). Second, the findings corroborate the more positive attitudes, higher ratings of the perceived usefulness, social norms, and trust of automated vehicles of males than females, which reflects a pattern that has emerged relatively consistently across research studies on automated vehicle acceptance (Rahman et al., 2019; Rice & Winter, 2019).

Small positive (< 0.05) effects of experience with driver assistance systems were found on behavioural intention. Individuals who currently have Blind Spot Monitoring, and Automated Emergency Braking in their cars are more likely to intend to use conditionally automated cars. The effect of Adaptive Cruise Control on the behavioral intention to use conditionally automated cars was not significant. This does not correspond with Kyriakidis et al. (2015) who reported that people who currently use Adaptive Cruise Control would be willing to pay more for automated vehicles, and are more comfortable about driving without a steering wheel. Future research should examine more closely the effect of experience with driver assistance systems that differ in their functionality.

4.4. Limitations

The results of the present study have to be interpreted with regards to a number of limitations.

First, as automated vehicles do not yet exist in the market, our respondents have not physically experienced the conditionally automated car but were asked to imagine the use of conditionally automated cars. To increase the internal validity of our study findings, respondents who replied to all knowledge questions on conditionally automated cars with 'I don't know' were omitted from the analysis, ensuring that all respondents were aware of the specific functionality of conditionally automated cars. Nevertheless, respondents may overestimate their capabilities and general positivism to use these cars. The social desirability and acquiescence biases in survey research, the novelty factor that surrounds automated cars, and the influence and power of the media in marketing automated cars (Lee et al., 2019; Nordhoff, De Winter et al., 2019) may have further contributed to their positivity towards conditionally automated cars. The limitation of this study that pertains to asking respondents to imagine rather than directly exposing respondents to conditionally automated cars will be addressed by work that will be conducted in the context of the L3Pilot itself, exposing a smaller and non-representative set of individuals to conditionally automated cars. A comparison of the attitudes of experienced versus less experienced individuals will be made.

Second, the present study did not examine the effects of individuals' socio-demographics except for age and gender, travel-behaviour and personality. Therefore, we will examine the added contributions of individuals' socio-demographic characteristics, travel behaviour, and personality on the behavioral intention to use conditionally automated cars in subsequent studies within the L3Pilot project.

4.5. Final conclusions

We investigated public acceptance of conditionally automated (SAE Level 3) passenger cars using a questionnaire study conducted among 8,044 car-drivers in seven European countries. Respondents considered conditionally automated cars easy to use, but were less inclined to consider a purchase of conditionally automated cars. Sightly less than the majority imagined the engagement in eyes-off road activities such as talking to fellow travellers, surfing the internet, watching videos or TV shows, observing the landscape, and working. The present study also applied UTAUT2 to investigate the effects of performance and effort expectancy, social influence, facilitating conditions, and hedonic motivation on the behavioural intention to use conditionally automated cars. Structural equation modeling revealed that hedonic motivation was the strongest predictor of the behavioral intention to use conditionally automated cars, followed by social influence and performance expectancy. Age, gender and experience with driver assistance systems had significant, yet small (< 0.10), effects on the behavioural intention to use conditionally automated cars. We recommend future research to expose individuals to conditionally automated cars in realistic and complex traffic situations.

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