Routledge
Taylor & Francis Group

Economic Research-Ekonomska Istraživanja

ISSN: (Print) (Online) Journal homepage: https://www.tandfonline.com/loi/rero20

A consumer innovation resistance theory perspective on the advanced driver assistance systems

Kuo-Ming Chu

To cite this article: Kuo-Ming Chu (2023) A consumer innovation resistance theory perspective on the advanced driver assistance systems, Economic Research-Ekonomska Istraživanja, 36:3, 2153716, DOI: 10.1080/1331677X.2022.2153716

To link to this article: https://doi.org/10.1080/1331677X.2022.2153716

Published online: 04 May 2023.

ECONOMIC RESEARCH-EKONOMSKA ISTRAŽIVANJA
2023, VOL. 36, NO. 3, 2153716
https://doi.org/10.1080/1331677X.2022.2153716

A consumer innovation resistance theory perspective on the advanced driver assistance systems

Kuo-Ming Chu

Department of Business Administration, Cheng Shiu University, Kaohsiung, Taiwan

ABSTRACT

Although advanced driver-assistance systems (ADASs) provide many benefits, there is less information on user resistance to innovation. Thus, this study integrates prior research results to draw up a well-established multi-order construct conceptualisation research framework and to deepen the comprehension of the involvement-resistance-innovativeness behaviour in the ADAS adoption context. Based on the hypotheses, an academic model was developed and tested using a large cross-sectional study of 527 ADAS users from Taiwan, using structural equation modelling. The results indicate that it seems to be suitable to acquire access to innovative behaviour from the consumer resistance viewpoint so as to accomplish greater explanatory power in the three orders adoption models. Numerous barriers, however, still hinder the ADAS's widespread acceptance. Furthermore, the outcomes affirm a meaningful interaction effect of the consumer innovation resistance and were aware of the impetus on actualised innovativeness, and further realised that it substantially reduces the consumers' eagerness to hunt for hedonist innovativeness and to buy for the social innovativeness, thereby preventing actualised innovativeness. Researchers and practitioners may come to different conclusions and suggest different approaches to combating consumer resistance to digitisation.

ARTICLE HISTORY
Received 27 October 2021
Accepted 27 November 2022

KEYWORDS
Advanced Driver-Assistance Systems (ADAS); consumer innovation resistance; hedonist innovativeness; social innovativeness; actualised innovativeness

JEL CLASSIFICATION
M31; O33; P46; Q55

1. Introduction

A great mobility-related disruptive innovation that could not only influence how vehicles are developed but also reform the planning of cities and streets as well as the interaction between machines and humans is being currently suffered by the automotive industry (König & Neumayr, 2017). According to statistics from the WHO, around 1.3 million people die yearly on account of traffic accidents and it costs around 3% of annual GDP for most countries yearly, 80–90% of which is owning to human error. Starting from 2022, all new vehicles in the EU must be equipped with the advanced driver assistance system (ADAS) safety technology. Emerging ADAS is

CONTACT Kuo-Ming Chu k0574@gcloud.csu.edu.tw

an electronic system with driving and parking functions developed by a secure human-machine interface to automate, adjust, and improve vehicle systems for safety, flexibility, and more excellent driving, thereby increasing road safety by making up for some of these milder damages. If requisite, ADASs will employ integrating smart automation technology, to discover driver mistakes or nearby impediments, and reply accordingly that alerts the driver to troubles, following safeguards through, and carrying the vehicle's control. From traction control to forward collision warning and traffic signals recognition and adaptive cruise control, ADAS aspects have derived ever since the early-2000s as automakers roll out vehicles that are equipped with modern technologies' variable scopes. As innovations in technology are revealed, it is expected that the prevalence of the ADAS aspects in vehicles will only increase. As a result, the widespread acceptance of this novel technology and hence its adoption is far from certain. In this article, we will address these topics comprehensively and in-depth.

On a social degree, the full self-driving cars have the potentiality to improve vehicle safety through utilising excluding human-related components and mistakes that influence performance of the human driver's practices, like ageing, illness, stress, tiredness, inexperience, or even drug misuse (Nastjuk et al., 2020). Prior researches did not commonly concentrate on the drivers' attitudes towards the advanced driver aid systems in terms of assessing concerns and perceived benefits, alternatively, they either had a more limited focal point or referred to experts rather than the public. However, it has been shown that the greatest barrier to the prevailing utilisation of ADAS driving is psychological, non-technical, in nature (Xu et al., 2018). Achieving anticipated ADAS profits are decided by the drivers' acceptance of, and adaptation to, new technologies' abilities and therefore a novel manner of driving. Above all, the driver's adoption of ADAS driving is determinant for it to become a practical part of succeeding transportation (Panagiotopoulos & Dimitrakopoulos, 2018). A variety of insights have been gained, but more knowledge is needed to identify which barriers are the most problematic, which ADAS benefits are seen as the most significant, or, most importantly, what strategic implications obtained results should lead to. Our study fills a research gap and derives significant strategic implications for the automobile industry. We, in consequence, suggest that a broad sympathy of the components that affect the user adoption has the potentiality to upgrade accomplishment of this technology inherently in the market. Researchers and practitioners working to facilitate the diffusion and adoption of new innovations must also consider consumer resistance as a key area of interest.

To mobilise the innovation failure's principal reasons on the market, the consumer resistance is caused by a failure to fulfil the success of an innovation (Heidenreich et al., 2016), and in consequence, firms need to comprehend consumer resistance and guide their business to become more with productivity, profitability and efficient improvement competitiveness, like distributing innovations towards consumer needs. Notwithstanding, innovation failures' high rates are faced by most commercial firms because consumer demand for services and innovative products stays low. This chapter's objective, consequently, is to dedicate to our prevailing apprehension on the drivers and idea of consumer resistance. The remainder of this study is structured as follows. First, we discuss the empirical context of ADASs and why this is an

appropriate setting for examining the role of brands in overcoming resistance to radical innovation. Next, we conceptualise the link between the involvement-resistance-innovativeness behaviour by extending and developing existing frameworks. We then discuss the methodology and data analytical steps that were taken to test our hypotheses. Finally, this article investigates how both psychological and functional barriers influence the consumer's intention to resist adopting ADAS towards organisational performance in Taiwan. In this study, empirical evidence is provided to address these issues.

2. Theoretical framework and hypotheses

As a commonly applied influential model for the field of information systems, Davis's (1989) technology acceptance model is widely used (Marikyan & Papagiannidis, 2022). Various other acceptance models have since been developed. Furthermore, existing theoretical models do not examine user resistance to innovation (Gupta & Arora, 2017). As important as acceptance and adoption are consumer behaviours towards innovation (Seth et al., 2020), Talwar et al. (2021) depicted consumer resistance towards innovation as one of the main causes for innovations failing to capture market share. Due to the comprehensive nature of the consumer innovation resistance framework, it is an effective approach to studying users' reluctance to adopt innovation (Kaur et al., 2020). Consumer resistance to innovation has historically received little attention despite its critical role and importance (Kaur et al., 2020). In addition, not purchasing represents a real decision, and previous research on consumer innovations concentrated mainly on the factors and motivations related to their adoption in a pro-innovation manner (Hew et al., 2019). The scarcity of evidence-based studies to better comprehend consumer resistance to ADASs persists despite this necessity. Based on these observations, it is clear that consumer resistance towards ADAS must be studied.

2.1. Consumer innovation resistance to ADASs

Product innovation is a procedure of huge inconstancy and a new products' launch can have plenty of influences on the competitiveness of a firm. On the one hand, the firm can raise its competitiveness and profit by new goods and services launching; on the other hand, it may also result in the brand image destroyed and financial loss on investors because of the failure of services development and new products. Identification of new product failure's reason, therefore, is a core challenge when governing a firm's development stage of new products. Many innovations meet resistance (Kleijnen et al., 2009), and consumer innovation resistance is a significant element in the requirement for innovation. Very little advertence, however, has been paid to the resistance's role in the employment process of new products and services. Studies on this topic have demonstrated that consumer resistance towards innovations reveals consumption to be either passive or active. Most of the time, innovation resistance happens passively, and consumers resist innovations without regarding them for adoption purposely. Innovations in a similar way are actively resistible (Bagozzi &

Lee, 1999). Further study on confrontation ought to consequently help to expand the apprehension towards the arguments why people do not employ a novel product is equally significant as appreciating why they adopt it. In the past, an incontrovertible attitude towards new product innovations has been maintained by scholars, but a few researchers have been concerned with resistance (Matsuo et al., 2018).

Due to the developed technology in AI, robots can substitute human work and diminish resources and time. Vehicle technologies are increasing at a disruptive step and support the potential to fulfil a lot of benefits to society by the years. ADASs are one of the principal technological applications of AI providing the chance to raise safety of the vehicle and driving comfort by electronically assisting drivers with driving, lane change help, emergency braking, etc. From non-autonomous to completely autonomous cars, the functions fulfilled through an ADAS are added sequentially. As the innovations in technology are uncovered, it is expected that the prevalence of ADAS attributes in vehicles will only increase. Consumers are limited by the knowledge notch on the utilizations and values of innovative products and services from promising themselves to any buy decisions. Whereas strategies to raise innovation utilisation highlight the more commonly known innovation's advantages, a strategy to diminish risk perception ought not to rely solely on stressing the extra product profits. Risk strategies are critical in decreasing consumer opposition towards product innovation. The worries and anxieties of consumers demand have been taken badly but have to be handled properly.

Accomplishing adopted ADAS benefits are affected by the drivers' acceptance of, and adaptation to, the abilities of new technologies, and in consequence, a new technique of driving. Nevertheless, consumer apprehension of ADASs, and licencing for and driver training applying them, are lagging behind the fast-paced technological evolution, which could increase safety topics or deployment of the slow ADAS, so offsetting their potential advantages. It helps to find out what constructs are significant for the decision-making of the consumers when buying a vehicle with ADAS as well as assisting automobile companies in their pursuit for better insights into their consumers' adoption of a new ADAS. Prior researches have been used to test the resistance and barriers towards adoption intentions to the ADAS as different primarily consumer innovations are a quite new issue (Nastjuk et al., 2020). All these theories assist in apprehension and forecast consumer adoption behaviour towards services future and innovative products. In comparison with this, the restricted focus is on the post-adoption topics, such as adoption intentions and intentions to recommend. It helps find what constructs are significant for decision-making of consumers when buying a vehicle with ADAS as well as assisting automobile companies in their pursuit for better insights into their consumers' adoption of a new ADAS.

2.2. Consumer innovation resistance

Rogers (1983) showed that developments and new products are distributed and shared by social systems. Growing interest is clearly implied by this among the academic community towards comprehending the varying barriers prevent the acceptance and increment of diverse digitisation activities. The Consumer innovation

resistance theory's comprehensiveness makes a suitable framework for testing consumer resistance towards innovations. Moreover, the existent theoretical frameworks do not concentrate on testing the resistance towards user innovations (Gupta & Arora, 2017). Consumer innovation resistance theory investigates what affects consumer resistance so as to adopt products or technology-enabled new services (Chian-Son & Wachara, 2016). This theory comprises both functional and psychological barriers from the product-side. First, a functional barrier is an impediment having straightforward effects on the consumers' unwillingness; it is able to segment into the risk, usage, and value barrier. Furthermore, the psychological barrier frequently leads to a conflict with the existent values, norms, and past experience and may obstruct the innovative acceptance, including image barrier and traditional barrier.

2.2.1. Functional barriers

Three classes of functional barriers are usage barriers, consisting of widespread market anomalies, the perceived complicacy of the financial products, and trial ability (Seth et al., 2020); value barriers comprising perceived price and superiority of innovation (Ihli et al., 2018); and risk being comprised of credit availability to the consumers (Santos & Ponchio, 2021), perceived security and barriers. Usage barriers show the obstacle been the result of the probable alters, especially in the circumstance of employing novel innovation in comparison with the existent systems. Usage barriers are a significant variable since the usage-related complicacy of ADAS driving can endanger their opportunities or the usability of substantially transforming mainstream innovations. The usage barrier also implies the role of an innovation's mainly functional usability. Recent research by Oktavianus et al. (2017) pointed out that usage barriers lead to technological innovations' discontinuation. Thus, the hypothesis:

H_1: Functional barriers' usage barriers are a positive influence on consumer innovation resistance toward ADAS driving's acceptance.

Moreover, value barriers invoke resistance leading to antilogy with the existent value idea, especially, in the situation of counterpoising between the expense of studying it in contrast with the offered profits and employing the innovation. Besides, the risk barrier relates in the shape of different risk types like product quality or fraud (Chian-Son & Wachara, 2016). Most of the former researches recommend that value barriers exhibit a negative relation with adopter intents in different kinds of situations (Sivathanu, 2019). Hence, the following hypothesis:

H_2: Functional barriers' value barriers are a positive effect on consumer innovation resistance toward ADAS driving's acceptance.

Risk barriers treat the resistance causing doubts that are an innate role of any driver's anxiety mistakes, risks, and innovation safety when carrying out their ADAS driving. Ram and Sheth (1989) indicated four distinct types of risks consorted with innovation: physical, economic, functional, and social. The former researches have realised that risk barriers have a negative effect on behaviour and motivations of the users (Gupta & Arora, 2017). Risk barriers are able to turn into possible barriers against the adoption, usage, and intent to suggest ADAS driving due to the variabilities raised by them. Hence, we also adopted the study hypothesis:

H_3: Functional barriers' risk barriers are a positive influence on consumer innovation resistance toward ADAS driving's acceptance.

2.2.2. Psychological barriers

Psychological barriers probably occur by means of conflict with the consumer's prior beliefs' structure and they include perception, emotion, mood, and sentiment (Afik & Lahav, 2015). For the reason that consumers' preferences and the environment continue to change, consumer resistance is not only a multivariate phenomenon, but also a dynamic one, and the psychological barriers comprise tradition and image barriers. Furthermore, the tradition barrier emerges while an innovation is not consistent with existing values of an individual, culture, social norms, and may traditionally impede the innovation's adoption. Tradition barriers in a similar way exhibit a negative association with any novel innovation's adoption intents (Laukkanen, 2016). In such cases, consumers will not be willing to substitute their functional and elderly products with innovative products. The tradition barrier to ADAS driving may arise, as not all customers may see the need for novel, complementary driving. Researchers have advised that traditions are strongly embedded in the community, as well as in the lives of people, and any collision may cause a solid backlash from the consumers in the situation of negative word-of-mouth, unfavourable publicity, and boycotting (Andrew & Klein, 2003). We consequently suggest that tradition barriers can't possess any significant combination with the adoption of ADAS driving. Thus, we also observe the hypothesis:

H_4: Psychological barriers' tradition barriers are not correlated with consumer innovation resistance toward ADAS driving's acceptance.

Image barriers deal with an unfavourable feeling of the innovation that emerges from the perceived degree of complication that is related with its origin or its usage (Leong et al., 2021). Psychological obstacles stem from innovations' subversion to the stereotypes or perceived individuals' product image (Jing et al., 2020). On the one hand, an individuals' image can be created by symbolic consumption; on the other hand, the image barrier may be that a number of consumers perceive the technology to be excessively hard to adopt. A cognate relationship is real in the instance of the image of ADAS that drives the car services. If the resistance to ADAS driving should rise, consequently, the intention to resist employing this service would rise. As a barrier exhibiting a negative effect on the behaviour of users with respect to different, prior research has reported new image IT product initiatives. The following hypothesis is led to by the above discussion:

H_5: Psychological barriers' image barriers are a positive influence on consumer innovation resistance toward ADAS driving's acceptance.

2.3. Consumer involvement and innovation resistance

In the innovation technology context, Petty and Cacioppo (1986) chose that consumer involvement, which is mostly affected by talent and intention, has a greater impact on how persons choose their approaches to handle information. Venkatesh and Bala (2008) further integrated past studies on consumer involvement, and derive,

moving forward, four determinants influencing the acceptance of technology and innovation, including social influence, individual differences, system characteristics, and facilitating conditions. Excluding facilitating conditions that belong to the organisational level is not in our research's focus.

2.3.1. Social influence

'Social influence' represents the consumers' perception that significant others (e.g., family, friends, or the idea of major referents) that influence a person's opinion of technology. While a consumer hasn't the sufficient motivation and relative capability to deeply process the information, they may compose their attitude through disposing of the marginal information and trails towards what they are confronted with (Nastjuk et al., 2020). Furthermore, Schepers and Wetzels (2007) asserted that the subjective norm is expected to influence consumer attitude due to a prevailing tendency for persons to depend on information from significant others as witness about the real world, namely, social influence is principally influenced through subjective norms. People's consciousness of technology usefulness or a service can rise in reaction to expressive social information. Some studies have revealed that social influence can decrease risk awareness and further have an importantly positive effect on image of driving automation (Nastjuk et al., 2020). So, this study suggests the following hypotheses:

H_6: Consumer involvement's social influence have a negative influence on psychological barriers and functional barriers toward ADAS driving's acceptance.

2.3.2. Individual differences

'Individual differences' quote personality of the individual, for instance, sure traits and beliefs that might affect technology's perception. Nastjuk et al. (2020) indicated that individual differences are expected to affect ADAS car driving's acceptance. Prior research has mostly examined individual differences in risk perception and acceptance (Siegrist & Hartmann, 2020). This framework is fairly versatile as it adapts primary constructs and barriers recognised through past researches and embodies the opportunity of building individual distinctions among the consumers being screened. In spite of the consumer's indication resistance as consumer behaviour, the effect of their values and preferences has been explored by a few prior studies in emphasising the individual differences in consumers' resistance to digital transformation. Körber and Bengler (2014) pointed out that human-computer interaction is potentially relevant to the four individual differences of dispositions, traits, states, and demographics. The negative perception that is relevant to the control's loss is particularly prevalent while driver experience with ADAS is low (Planing, 2014). Paddeu et al. (2020) further discovered trust, and personality characteristics as related elements in forecasting users' adoption of shared autonomous vehicles. Heidenreich et al. (2016) emphasised that a diminished perception of mastery by reason of technologies results a 'loss of individual option and the freedom to track one's stimulus'. Anderson et al. (2021) further depicted individual differences also play a prominent role in shaping sustainable consumption responses. Thus, we also observe the hypothesis:

H_7: Consumer involvement's Individual differences have a negative influence on psychological barriers and functional barriers toward ADAS driving's acceptance.

2.3.3. System characteristics

Equally significant, we discovered virtually no study on ADAS examining the effect of specific system features thought critical for such systems. According to Pituch and Lee (2006), system characteristics have been posited to influence technology acceptance and user beliefs in other contexts, and further to integrate past research to propose three features taken into account to be crucial for the evolution of IT. The first system characteristic is functionality, which mentions ADAS's perceived ability to raise the vehicle's safety and drive comfort by assisting the drivers electronically with driving, lane change help, emergency braking, etc. The second system characteristic is interactivity that the ADAS must provide an effective self-driving car, and the crux to the driving car process is the interplays among drivers and ADASs and the synergism in driving the consequences from these interactions. Finally, however considerable, the ADAS combines various electronic systems and permits for interactivity, the system won't be perceived as utilitarian or convenient to employ if it owns miserable reaction time, which is the third element we test. The specific and general study hypotheses are as follows:

> *H_8: Consumer involvement's system characteristics have a negative influence on psychological barriers and functional barriers toward ADAS driving's acceptance.*

2.4. Consequences for consumer innovativeness behaviour

The previous study broadly confirms that consumer innovation conduct is indicated through tendencies and behavioural features of consumer innovativeness (Heidenreich & Kraemer, 2015). One such field is consumer innovativeness, the inclination to expect to embrace switch and try new behaviours or products out. Researchers, like a phenomenon or a character construct, have been interested in consumer innovativeness for a lot of time (Manning et al., 1995). Although consumer innovativeness' measures have not always been trustworthy indicators of consumer innovation behaviour, consumer innovation behaviour's forecast is importantly enhanced through the explicit consideration of both behavioural dimensions and tendency (Wood & Swait, 2002). Recent conceptualizations emphasise that innovativeness consists of dual dimensions, both types of consumer innovativeness capturing adoptive or actualised facets of consumer innovation behaviour (Heidenreich & Kraemer, 2015).

2.4.1. Actualised innovativeness

The actualised innovativeness invokes novel product acceptance conduct that earlier is the level to which a consumer is relatively and faster in novel ideas' acquirement, information, products, and service than the majority of laggards or late consumers in its social system (Jeong et al., 2017). Therefore, actualised innovativeness is actual consumer behaviour and that can be exemplified through novel products consumers currently own or intend to own in the near future Al-Jundi et al. (2019) rather than predispositions or individual traits. Oreg's findings acknowledged that consumers with resistance have more excellent levels to alter were more unwilling to examine a novel IT system than consumers with a low tendency to resist transform. Innovation

resistance shown through resistance to alter and current situation gratification in consequence appears to diminish actualised innovativeness. The study specifically implies that resistance happens on account of various psychological and functional barriers consumers can relate to when encountering a radical innovation (Casidy et al., 2021), notwithstanding, psychological barriers relevant to risk and usage are resistance's by far most widely referred to antecedents to revolutionary innovation (de Bellis & Johar, 2020), therefore we propose:

H_9: The negative influence of consumer innovation resistance on actualized innovativeness reinforces toward ADAS driving's acceptance.

2.4.2. Adoptive innovativeness

The adoptive innovativeness' concept concentrates on the consumers' inclination to purchase novelty products. Following Goldsmith and Hofacker (1991), consumers' inclinations to adoptive innovativeness are in harmonious proportion both theoretically and empirically the tie between stimulation need and the necessity for uniqueness (Snyder et al., 1980). In consequence, adoptive innovativeness may be further distinguished in two that are relevant but different constructs: hedonist innovativeness invokes a manifestation for stimulation, when social innovativeness invokes the need for uniqueness.

Hedonist innovativeness depicts a consumer inclination specifically to novelty-seeking, like taking opportunities in purchasing new products, and to frequently change buying behaviour in order to exhibit exciting consumption experiences (Heidenreich & Kraemer, 2015). Jansson (2011) realised that hedonist innovativeness was positively related to new products that were purchased. Likewise, a negative correlation was confirmed by the consequences of research by Heidenreich and Kraemer (2015) between innovation resistance and eagerness of consumers to search variety and novelty. We therefore suggest that innovation resistance might prevent hedonist innovativeness. This results in the following hypotheses:

H_{10}: The negative influence of consumer innovation resistance on hedonist innovativeness reinforces toward ADAS driving's acceptance.

H_{11}: The positive influence of hedonist innovativeness on actualized innovativeness reinforces toward ADAS driving's acceptance.

Social innovativeness mentions eagerness and tendency of a consumer to earlier adopt an innovation to accomplish a need for uniqueness than other consumers in their social system (Sadik-Rozsnyai & Bertrandias, 2019). Grützmann et al. (2013) revealed that social innovativeness is positively related with information search in social networks when Li et al. (2020) confirmed that social innovativeness confirms a precursor to influence the intention to use an innovation, and that positively influences actualised innovativeness. With regard to the connection of social innovativeness and consumer innovation resistance, Heidenreich and Kraemer (2015) confirmed that consumer innovation resistance to alter and social innovativeness are negatively relation. The impact of social innovativeness on consumer adoption of ADAS that drives for innovation has still not been directly examined. In this theoretical argumentation's

support, we suggest that social innovativeness may have in common significant association with adopting consumer innovation resistance and intentions:

H_{12}: The negative influence of consumer innovation resistance on social innovativeness reinforces toward ADAS driving's acceptance.

H_{13}: The positive influence of social innovativeness on actualized innovativeness reinforces toward ADAS driving's acceptance.

3. Methodology and methods

3.1. Research model

The perceptivities obtained by study profiling and viewpoints, we integrated related theories of consumer involvement, innovation resistance, and consumer innovativeness behaviour to draw up a well-established study model, and the research gaps' identification was employed to build an understanding framework for better comprehensive consumers towards adoption of ADAS car driving. The proposed three orders construct can provide practicians and scholars the requisite theoretical foundation for progressing the study and fulfil on involvement-resistance-innovativeness behaviour in the situation of ADAS adoption that is cited in the research literature.

3.2. Study participants

The sampling design that is employed in this study is non-probability sampling, where the elements do not exhibit a known or predetermined probability of being selected as themes (Sekaran, 2003). Our sample (N = 527) is based on an online survey organised via social networks (Messenger, Line, and IG) in Taiwan from July to September 2021. Our survey link to the questionnaire was spread on Facebook and Line based on the snowball principle. A sum of 527 responses were valid for statistical analysis. Gender of our respondents was balanced, with 45.4% females and 54.6% males. Furthermore, half of our respondents were below 39 years old (SD = 0.75); in sum, the median age was 31 years. Our sample is therefore the general Taiwan population's not representative. Most respondents were prevailing college students that studied for a student qualification or already owned one (46.12%). In terms of respondent jobs, the majority were students (25.94%), come after by homemakers (24.75%), and labourers (21.37%). In sessions of respondent job, the majority were undergraduates (26.40%), come after by homemakers (26.48%) and labourers (22.31%). The greater part of the respondents was married or in an actual relation (58.54%).

3.3. Measurement Instruments and model

All measures that were utilised in the research were adapted from existent scales, with a special citation to those that were applied in researches by Seth et al. (2020), and Meyer-Waarden and Cloarec (2022). Prior to the actual study, a pre-test was executed on 50 students to examine questions so as to obtain feedback from the

respondents and likewise to view the validity and reliability of the questions themselves. Participants' existent information about and attitudes towards ADAS driving cars were measured. Stress was identified on discriminating between the kinds of assistants driving cars distinguished via the degree of the probability to obtain mastery over the driving mission manually, and additionally, whether the participants had diverging attitudes depending upon whether to ride in an ADAS merely steering car compared to in-person purchasing one. Respondents were confronted with a set of assessing questions consisting of one-dimensional, even, numeric Likert scales that consisted of five points that ranged from 1 (strongly disagree) to 5 (strongly agree). Second, a subject question was embraced requesting the respondents' willingness to pay for the ADAS so as not to restrict responses to giving scopes. In each dimension, Cronbach's coefficients exceeded 0.8. Exploratory factor analysis revealed that each extracted factor had a factor loading greater than 0.6 and a commonality greater than 0.5 (George & Mallery, 2003). In this study, the constructs met satisfactory reliability and validity standards.

3.4. Reliability and validity analysis

To evaluate the measurement scales' psychometric characteristics, *t* the reflective first-order, the second-order and the third-order construct were measured in one integral SEM model involving all constructs and their direct impacts. For each construct of this study, Cronbach's alpha, composite reliability (*CR*), and average variance extracted (*AVE*) were used to analyse reliability. As shown in Table 1, and met satisfactory standards. Composite reliability (*CR*) and Cronbach's alpha values for all measures were greater than 0.70, whereas values of average variance extracted (*AVE*) were higher than 0.50 (Hair et al., 2016). According to Fornell and Larcker (1981), constructs are evaluated based on their content validity. AVE square roots with greater diagonal values indicate greater dimension correlation coefficients than those with smaller diagonal values. Furthermore, Wilson et al. (2010) performed a principal component analysis with varimax rotation in Table 1 and 2. On the basis of Table 1, all loadings are higher than the required cut-off threshold of 0.70. This study demonstrates reliability and validity.

Confirmatory were conducted and exploratory factor analyses by us to test for the reliability and validity of the assessment tools. Over the scale validation process, all items were preserved by us. Following the literature criteria, the consequences provided acceptable psychometric characteristics for reliability (Cronbach's α and Joreskog' ρ greater than the 0.7 threshold) and convergent validity (ρ_{vc} approximately or above 0.5). The convergent validity values and scale reliabilities are as demonstrated in Table 1. The correlation between constructs was the average variance's less than the square root extracted ($r^2 <$ convergent validity), which is shown on the signal's discriminant validity and diagonal (Bagozzi & Yi, 1988). The measurement model's adequacy was evaluated through the *PLS-PM* validity exams. In weighting the construct validity, Tables 1 demonstrate that all the indicators exhibit factor loadings between 0.80 and 0.94, *AVE* between 0.74 and 0.83, all the AVEs are greater than the corresponding squared inter-construct correlations.

Table 1. Reliability (α and ρ) and convergent validity.

First-order constructs measures (AVE/VIF)	α	ρ	Conv. val.	Loading (λ_i)
Social influence (AVE = 0.74; CR = 0.894)	0.91	0.90	0.81	
People who affect my behaviour would consider that I ought to accept an ADAS car.				0.89
People who are significant to me consider that I ought to accept an ADAS car.				0.92
People who affect me would consider that I ought to accept an ADAS car.				0.90
People whose advice I appraise would have rather that I do not accept an ADAS car.				0.88
Source: Venkatesh and Davis (2000); Jansukpum and Kettem (2015).				
Individual differences (AVE = 0.82; CR = 0.960)	0.93	0.92	0.69	
I would have rather be in mastery when accepting an ADAS car.				0.79
It is not significant for me to be capable to take mastery back from an ADAS car.				0.85
I think that my privacy would be brought into danger when accepting an ADAS car.				0.91
I am sure that my data would be safe when accepting an ADAS car.				0.90
Overall, I would trust ADAS car technology.				0.89
If I realise the influence ADAS cars have the environment on, it will affect my usage decision.				0.86
I would prefer to experiment with ADAS cars.				0.89
Generally, I am hesitating to try ADAS cars out				0.92
Source: Körber and Bengler (2014); Paddeu et al. (2020).				
System characteristics (AVE = 0.69; CR = 0.851)	0.87	0.88	0.73	
Using ADAS cars would allow me to achieve driving tasks more efficiently.				0.83
Utilising ADAS cars would enhance my driving performance.				0.90
Utilising ADAS cars would be well-matched with my flexibility behaviour.				0.94
I am sure that my data would be safe when adopting an ADAS car.				0.88
I anticipate using ADAS cars to be pleasurable.				0.91
The sum of money they would cost would be outweighed by ADAS cars' profits.				0.93
I would be willing to pay more to utilise ADAS cars.				0.90
Source: Pituch and Lee (2006); Tan and Teo (2000).				
Second-order construct measures	α	ρ	Conv. val.	Loading (λ_i)
Usage Barrier (AVE = 0.81; CR = 0.948)	0.86	0.87	0.77	
ADAS is easy as the functionality is ordinarily with me.				0.92
ADAS is easy as I can utilise it anytime.				0.89
ADAS is easy as I can utilise it in any situation.				0.85
ADAS is easy as it is not complex.				0.90
Source: Seth et al. (2020); Laukkanen (2016).				
Value barriers (AVE = 0.73; CR = 0.887)	0.94	0.93	0.80	
ADAS offers a lot of advantages compared with operating my financial things in other ways.				0.82
An ADAS's utilisation raises my capability to manage my financial things all by myself.				0.89
I will wait to purchase an ADAS car until it proves to be beneficial for me.				0.86
Buying an ADAS car maybe wastage of money.				0.90

(*continued*)

Table 1. Continued.

First-order constructs measures (AVE/VIF)	α	ρ	Conv. val.	Loading (λ_i)
Source: Laukkanen (2016); Chian-Son and Wachara (2016).				
Risk barriers (AVE = 0.75; CR = 0.892)	0.89	0.89	0.75	
I worry that when I am accepting an ADAS car, I might wrong type the driving's information.				0.89
I worry that when I am utilising an ADAS car, I perhaps, pay more money.				0.90
I worry that when I am accepting an ADAS car, I probably pay money to the improper vendor.				0.86
I worry that when I am accepting an ADAS car, somebody may hack my account.				0.93
Source: Chung and Liang (2020); Laukkanen (2016).				
Tradition barriers (AVE = 0.69; CR = 0.856)	0.85	0.86	0.70	
I feel it hard to contact customer service at the ADAS cars.				0.92
I feel it hard to obtain a number of information about ADAS cars adoption.				0.91
I feel it hard to get my trouble resolved by an ADAS service provider.				0.94
I realise that the customer service that is provided by ADAS is very unpleasant ADAS customer service is not excellent.				0.90
Source: Laukkanen (2016); Andrew and Klein (2003).				
Image barriers (AVE = 0.85; CR = 0.964)	0.87	0.88	0.71	
In my view, an ADAS car is frequently too elaborate to be helpful.				0.91
I hold such an image that an ADAS car is hard to use.				0.92
I feel that utilising ADAS cars is a wise thought.				0.90
In my view, it is suitable to accept ADAS cars.				0.89
Source: Chung and Liang (2020); Laukkanen (2016).				
Third-order constructs measures	α	ρ	Conv. val.	Loading (λ_i)
Actualised innovativeness (AVE = 0.71; CR = 0.869)	0.86	0.87	0.74	
Overall, I am among the first in my circle of friends to utilise ADAS cars, while they appear.				0.83
If I heard that a novel product was available such as an ADAS car, I would not be interesting enough to purchase it.				0.88
I will buy an ADAS car the next time I want a new car.				0.85
Supposing I accessed an ADAS car, I plan to utilise it in the future.				0.91
I plan to often accept the ADAS car.				0.87
Source: Kaur et al. (2020); Jeong et al. (2017); Al-Jundi et al. (2019).				
Social innovativeness (AVE = 0.68; CR = 0.851)	0.85	0.86	0.81	
I have a kick out of purchasing novel high-tech things before most other people realise they exist.				0.87
It is dazzling to be the first to have novel high-tech products.				0.80
I get an excitement out of being the first to buy a high technology thing.				0.84
Being the first to have the newest technological products is very significant to me.				0.89
Source: Heidenreich and Kraemer (2015); Heidenreich et al. (2017).				
Hedonist innovativeness (AVE = 0.83; 0.959)	0.89	0.90	0.85	
If I love a brand, I seldom switch from it only to try something different.				0.93
While I go to an electronics retail shop, I think it is securer to order products I am familiar with.				0.90
I like taking opportunities in purchasing unfamiliar brands only to obtain a number of varieties in my purchases.				0.88
I'm very careful to test new or different products.				0.84
Source: Davis (1989); Heidenreich and Handrich (2014); Heidenreich et al. (2017).				

Source: own work.

Table 2. Fornell & Larcker criterion.

Construct	SI	ID	SC	UB	VB	RB	TB	IB	AIN	SIN	HIN
SI	0.70										
ID	0.24	0.77									
SC	0.19	0.26	0.82								
UB	−0.39	−0.32	0.41	0.80							
VB	−0.41	−0.23	0.47	0.34	0.84						
RB	−0.50	−0.19	0.35	0.31	0.36	0.79					
TB	−0.32	0.29	0.44	0.47	0.28	0.37	0.83				
IB	−0.41	−0.30	0.38	0.21	0.36	0.25	0.20	0.77			
AIN	0.52	0.33	0.46	0.43	−0.27	−0.46	−0.37	−0.47	0.85		
SIN	0.43	0.46	0.57	0.55	−0.36	−0.32	−0.41	−0.38	0.33	0.72	
HIN	0.47	0.39	0.50	0.48	−0.07	−0.39	−0.52	−0.40	0.46	0.39	0.89

Note: Diagonals represent the square root of the average variance extracted, and the other matrix entries are the factor correlations.
Source: own work.

The composite reliability values (*CR*) shown in Table 1 are all greater than 0.7 (Bagozzi & Yi, 1988). A convergent validity assessment was conducted on the scales. According to Table 1, all constructs have AVEs higher than 0.5, confirming their convergent validity (Chin, 1998). From Table 1, $\alpha = 0.85–0.94$. As stated by Bagozzi and Yi (1988), the diagnostics and measurement model parameter estimations provided the reliability strong evidence and validity of the constructs measure. Table 2 provides a summary of the Fornell & Larcker criteria (1981). In this case, the *AVE* square root diagonal indicates that the diagonal value is greater than the dimension correlation coefficient value. From the above, it is clear that the validity and reliability of this study are good.

4. Data analysis and results

4.1. Structure model and hypothesis testing

We tested the data's fit to the model after we built the reliability and validity of the measurement model. Model fit's χ^2/df measure was 2.45, and the *RMSEA* (0.036) was under the threshold of 0.05, showing a good model fit. Comparing our delimited model with the null model, the Index ($CFI = 0.91$) is fitted by the comparative and Normed Fit Index ($NFI = 0.90$) likewise proposed a good fit. The Goodness of Fit Index ($GFI = 0.86$), was lower than the suggested threshold, yet near enough to close that the model considerably fits the data moderately. In summary, the total results show that the model fits the data considerably reasonable (Hooper et al., 2008), so it was suitable to test the hypotheses within the structural model. Their significance and the approximated coefficients are as illustrated in Table 3 concerning the structural model.

The results that are shown in Table 3 and Figure 1 display the results of the examination of the structural model. The outcomes indicate that the suggested model could explain up to 72.4% of the total variation in a three orders consumer innovation resistance construct, The R-square is 51.8% for consumer innovation resistance, 40.3% for social innovativeness, 32.7% for hedonist innovativeness, and 48.9% for actualised innovativeness. Moreover, multicollinearity ought not to be shown at the structural model level as the estimated VIF value was 3.09. In alignment with the

Table 3. Structural equation model statistics.

Proposed hypotheses (second-order construct) relationships within the consumer innovation resistance		β	t value	p value	Significant
H_1:	Functional barriers' usage barriers are positive effect on consumer innovation resistance toward ADAS driving's adoption.	0.32	7.47	$p < 0.01$	Supported
H_2:	Functional barriers' value barriers are positive effect on consumer innovation resistance toward ADAS driving's adoption.	0.26	6.34	$p < 0.01$	Supported
H_3:	Functional barriers' risk barriers are positive effect on consumer innovation resistance toward ADAS driving's adoption.	0.39	9.95	$p < 0.01$	Supported
H_4:	Psychological barriers' tradition barriers are not correlated with consumer innovation resistance toward ADAS driving's adoption.	0.15	4.81	$p < 0.01$	Not supported
H_5:	Psychological barriers' image barriers are positive effect on consumer innovation resistance toward ADAS driving's adoption.	0.40	11.18	$p < 0.01$	Supported
Proposed hypotheses (First-order construct) relationships between consumer involvement and innovation resistance					
H_6:	Consumer involvement's social influences have a negative effect on psychological barriers and functional barriers toward ADAS driving's adoption.	*-0.02∼ −0.41*	*0.98∼ 11.46*	*n.s.∼ $p < 0.01$*	Not supported
H_7:	Consumer involvement's individual differences have a negative effect on psychological barriers and functional barriers toward ADAS driving's adoption.	*-0.01∼ −0.52*	*0.61∼ 15.62*	*n.s.∼ $p < 0.01$*	Not supported
H_8:	Consumer involvement's system characteristics have a negative effect on psychological barriers and functional barriers toward ADAS driving's adoption.	*-0.02∼ −0.55*	*0.98∼ 16.97*	*n.s.∼ $p < 0.01$*	Not supported
Proposed hypotheses (Third-order construct) Relationships between Consumer Innovation Resistance and Innovativeness behaviour					
H_9:	The negative influence of consumer innovation resistance on actualized innovativeness reinforces toward ADAS driving's acceptance.	−0.27	6.71	$p < 0.01$	Supported
H_{10}:	The negative influence of consumer innovation resistance on hedonist innovativeness reinforces toward ADAS driving's acceptance.	−0.57	17.32	$p < 0.01$	Supported
H_{11}:	The positive influence of hedonist innovativeness on actualized innovativeness reinforces toward ADAS driving's acceptance.	0.29	6.90	$p < 0.01$	Supported
H_{12}:	The negative influence of consumer innovation resistance on social innovativeness reinforces toward ADAS driving's acceptance.	−0.62	19.74	$p < 0.01$	Supported
H_{13}:	The positive influence of social innovativeness on actualized innovativeness reinforces toward ADAS driving's acceptance.	0.12	3.14	$p < 0.05$	Supported

Source: own work.

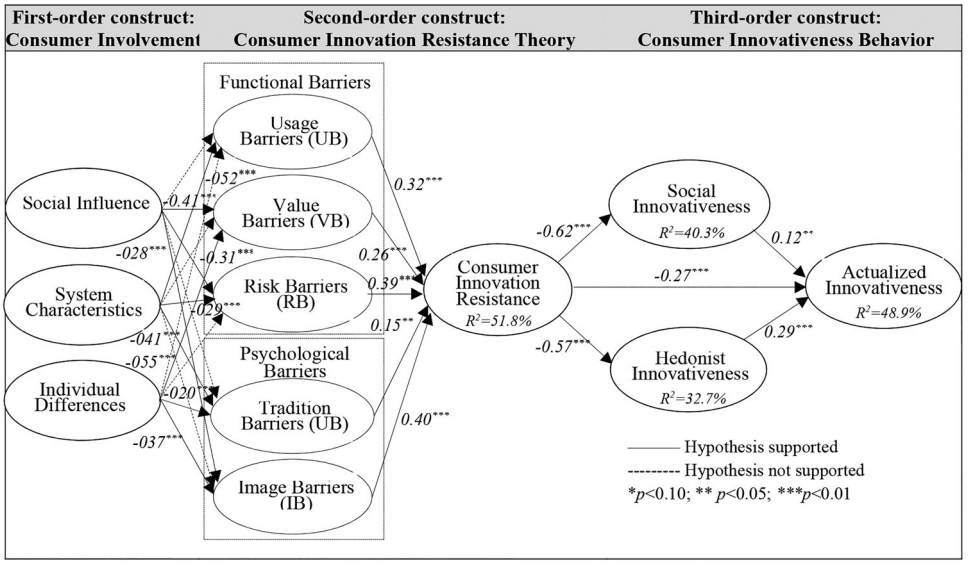

Figure 1. Outcomes of the structural equation model.
Source: own work.

findings of Buckley et al. (2018), attitude is displayed by our study as a statistically important predictor of the actualised innovativeness to accept the ADAS car driving. This finding is similar to former research on the involvement–resistance–innovativeness behaviour relationship, revealing that a generally negative attitude causes a raised likelihood of consumer innovativeness and, therefore, actual adoption (Nastjuk et al., 2020). Furthermore, to examine as to whether a path of coefficients is different substantially from zero, t values were estimated utilising bootstrapping. The analysis showed that all of the proposed relationships were important.

4.2. The effects of consumer innovation resistance theory

In the consumer innovation resistance theory, usage barriers (H_1: $\beta = 0.32$, $t = 7.47$, $p < 0.01$), value barriers (H_2: $\beta = 0.26$, $t = 6.34$, $p < 0.01$), risk barriers (H_3: $\beta = 0.39$, $t = 9.95$, $p < 0.01$), traditional barriers (H_4: $\beta = 0.15$, $t = 4.81$, $p < 0.01$), and image barriers (H_5: $\beta = 0.40$, $t = 11.18$, $p < 0.001$) were of significant effect on the consumer innovation resistance towards ADAS car driving's adoption, thus, H_1, H_2, H_3 and H_5 are supported, but H_4 was rejected. These results showed that the consumer perceived usage, value, risk, tradition, and image barriers had positive impacts on the consumer innovation resistance to accept the ADAS car that drove in this study. This is in conformity with most of the literature available in distinct research contexts (Jing et al., 2020; Laukkanen, 2016). H_4 hypothesised that tradition barriers do not share any important connection with consumer innovation resistance towards the ADAS driving's adoption. The study findings do not support this hypothesis. In such instances, consumers will be not willing to replace their still functional and old products with innovative products. The tradition barrier to ADAS driving may emerge, and the need for new, complementary driving may be seen by not all drivers. Our findings

advise that the tradition barrier probably plays an important barrier in the utilisation of any user innovation, but its connection turns negligible as the innovation matures.

4.3. The effects of consumer involvement

In consumer involvement, social influence demonstrates a highly significant and negative direct impact on value barriers (β=-0.41, $t = 11.46$, $p < 0.01$), risk barriers (β=-0.31, $t = 7.28$, $p < 0.01$), and image barriers (β=-0.28, $t = 6.58$, $p < 0.001$), while the effects on usage barriers (β=-0.02, $t = 0.99$, n.s.) and tradition barriers (β=-0.03, $t = 1.12$, n.s.) were not supported. Thus, H6 cannot be accepted. Though former research has displayed a significant impact of social influence on the consumer resistance to accepting ADAS car driving (Nastjuk et al., 2020; Chung & Liang, 2020), we did not find a direct, statistically important prediction of the result of social influence on usage-related complexity and an individual's existing values to adopting the ADAS car driving.

Next, the system characteristics show a highly important and negative direct influence on the usage barriers (β=-0.52, $t = 15.62$, $p < 0.01$), risk barriers (β=-0.29, $t = 6.85$, $p < 0.01$), and tradition barriers (β=-0.41, $t = 11.41$, $p < 0.001$), while the effects on value barriers (β=-0.03, $t = 1.12$, n.s.) and image barriers (β=-0.01, $t = 0.50$, n.s.) were not supported. Thus, H_7 cannot be accepted. As connected with perceived usefulness, risk, and positively traditional beliefs towards utilising ADAS car driving in interactivity, response time and functionality, the study discovered the relative benefits. The previous study has highlighted the emphasis of thinking about ADAS compatibility in the acceptance-building process (Nastjuk et al., 2020). The result also indicated that image and a higher perceived value of system characteristics with prevailing mobility behaviour leads to lower significance and perceived disruption of the change, which, conversely, decreases reluctance to adopt ADAS cars and raises adoption.

In addition, individual differences show a highly significant and negative direct impact on the value barriers (β=-0.55, $t = 16.97$, $p < 0.01$), tradition barriers (β=-0.20, $t = 5.59$, $p < 0.01$), and image barriers (β=-0.37, $t = 8.91$, $p < 0.001$), while the effects on usage barriers (β=-0.03, $t = 1.12$, n.s.) and risk barriers (β=-0.02, $t = 0.98$, n.s.) were not supported. Thus, H8 cannot be accepted. Our results show a statistically significant impact of individual differences on the perceived benefits-received, existing values and complexity to adopt ADAS car driving. Thus, DAS driving's usage-related used complexity and perceived the technology difficulty towards an individual's personality were not to have a significant and negative effect.

4.4. The effects of consumer innovativeness behaviour

In line with H9, consumer innovation resistance has an important, negative impact on actualised innovativeness (β=-0.27, $t = 6.71$, $p < 0.01$). In support of H_{10} and H_{11}, the effect on consumer innovation resistance is significant and negatively connected to hedonist innovativeness (β=-0.57, $t = 17.32$, $p < 0.01$), and important as positively associated to actualised innovativeness ($\beta = 0.29$, $t = 6.90$, $p < 0.01$). Furthermore, we

found support for H_{12} and H_{13}, more specifically, consumer innovation resistance is negatively associated to social innovativeness (β=-0.62, $t = 19.74$, $p < 0.01$) and positively influence but was weakly connected with actualised innovativeness ($\beta = 0.12$, $t = 3.14$, $p < 0.05$).

5. Discussion

5.1. Theoretical implications

5.1.1. Findings regarding conceptual model about ADAS driving's adoption

Consumer innovation study keeps on to contribute significant heed to consumers' adoption behaviour of innovative products (Jing et al., 2020; Heidenreich & Kraemer, 2015). Most researches in the past have focussed on the attitude-actual innovativeness behaviour relationship, and the results are revealing that an overall positive attitude causes a raised probability of usage intention and, therefore, actual utilisation (Nastjuk et al., 2020). A significant, but for the most part ignored study field, is the consumer innovation resistance, and specially, whether consumer involvement to resist innovations actually prevents innovative consumer behaviour. This study integrates the research results of Kaur et al. (2020) to draw up a well-established research framework and related assumptions, attempts to make up for the gaps in the past research, and through this framework for the academic and practical circles, to have a deeper and better understanding of the adoption processes of ADAS car. The objects of the existing study were threefold: (1) to judge whether different consumer involvement behaviour produce different results for consumer innovation resistance, (2) to build the model of factors affecting the innovation resistance theory in adopting ADAS car, and (3) to investigate whether a negative resist attitude enhances the negative effects of consumer innovativeness, and further reduce Actualised Innovativeness. Our empirical researches generated several interesting results.

5.1.2. Findings regarding consumer involvement

5.1.2.1. Social influence. On the consumer involvement, the results show that individual differences and system characteristics are the motivations and main ability of consumer behaviour. The social influence affects the risk barriers, image barriers, and value barriers negatively. We did not discover a direct, statistically important estimate of social influence's impact on resisting attitude and intent to accept the ADAS car, although a former study has shown a significant impact of social influence on the intention to accept ADAS car driving (Buckley et al., 2018). The results also implicate those social influences that the perceived value and risk of technological innovations by positive internalisation images, which indicate the 'inclination to interpret knowledge from significant referent groups as proof about real-world' (Schepers & Wetzels, 2007).

5.1.2.2. Individual differences. First, our outcomes display a statistically important influence of individual differences on the consumer resistance towards the intended ADAS car that drives, on tradition, image barriers, and value. Experience of the user can be improved by accurate advanced driver technology by helping them to

comprehend ADAS cars' operation. The negative relation between technology-related trust and resistance to adoption has also been acknowledged through other researches (Buckley et al., 2018; Nastjuk et al., 2020). Second, it has been discovered that personal innovativeness would earlier like to try and use ADAS car than other individuals appear to perceive the ADAS car as easier to use and more beneficial. Finally, individual-owned users' intent will be impacted more through perceived usefulness, trust, and compatibility, particularly while they have already undergone novel technologies in the automotive situation (Dikmen & Burns, 2016).

5.1.2.3. System characteristics. First, the article discloses that system compatibility with prevailing mobility behaviour leads to the lower significance and perceived interruption of the alter, which, in turn, decreases the reluctance to adopt ADAS car driving and raises adoption. Besides, the present study reveals that the perceived enjoyment negatively influences the consumer's resistance to the ADAS car. In alignment with Venkatesh and Bala (2008), we contend that the perceived enjoyment raises the intrinsic motivation to adopt an ADAS car that drives, and therefore makes interaction with ADAS cars easier. Additionally, system characteristics had a stronger overall impact on tradition barriers, perceived usefulness, and risk. Further, yet after taking the use's influence beliefs into the system functionality, system interactivity and charge account and an ADAS car is adopted by the functionality directly affected. Finally, the consumer resistance, nevertheless, as resulted in by the configurations of negations of perceived usefulness and superior functionality to accept an ADAS car. This recommends that consumers might demonstrate resistance to the ADAS car from word of mouth, existing values of individual, social norms or culture that do not offer benefits or functions to be superior.

5.1.3. Findings regarding consumer innovation resistance

In this epoch, the product life cycle is growing much shorter and competition is getting worse, new products are coming into the market with a lot faster steps, and existent products/technologies frequently become old-fashioned very quickly and prematurely. To conclude, consumers survive in a world that is characterised by ever more fast movement. A similar endless stream of innovation has resulted in by these trends. Innovation resistance theory investigates what influences consumer's resistance to adopting technology-enabled new services or products (Chian-Son et al., 2015). This theory consists of both psychological and functional barriers. The research in a similar way debate that over-emphasising the most prevalent barriers may be neglectful of the resistance factors specific to each innovation situation. Innovation managers, in consequence, need to also comprehend their contexts and determine which barriers are related to a specific innovation.

First, this study's consequences indicate that the psychological barrier has more effect on the consumer innovative resistance than functional barriers. Psychological barriers are frequently resulted in by a conflict with former beliefs of the consumers, including image barriers and tradition barriers. The argument might be that the psychological barrier stays closer to what the consumers can perceive. Second, the usage barrier, image barrier, and risk barrier are the greatest hurdles for the consumer's

innovation resistance to accepting ADAS cars. The tradition barrier emerges while innovation is not compatible with an individual's existent values, norms, and past experience, and may obstruct the innovation's adoption. The usage barrier also primarily implies the role of an innovation's functional usability. Besides, the value barrier defines as the perceived superiority of innovation to the service or product it comes along with. Moreover, the risk barrier relates in the shape of distinct risk types such as product quality or fraud (Chian-Son & Wachara, 2016). Finally, the research further found that establishing a good symbolic, ease usefulness, providing benefits and utilising the innovation can reduce the consumers' resistance to using ADAS car driving.

5.1.4. Findings regarding consumer innovativeness behaviour

In total, the discoveries support the proposed relationships and the research model. First, the results indicated that consumer innovation resistance exemplifies a strong stimulus of consumer innovation conduct, diminishing both hedonists, actualised innovativeness, and social on ADAS cars adoption, whereas to the best of the authors' knowledge, no another research in ADAS car's field has measured the relationship between adoption behaviour and consumer innovativeness, the outcomes even more substantiate anecdotal proof by Heidenreich et al. (2017), who showed that ADAS users show higher consumer innovativeness degrees. Tracking this line of deduction, the results offer additional witness that consumer innovativeness behaviour's multidimensional operationalisation might be senior in comparison with single dimension ones concerning their explanatory and predictive power.

Second, in this article, hedonist innovativeness proves to be more effect than social innovativeness, as shown by the lower third-order weight of the latter. That is, consumer innovation resistance inhibits distinct types of innovative consumer behaviour, and that the individual consumer innovation resistance's impact differs across actualised innovativeness, social, and hedonist while appraised simultaneously. Apart from these sideways impacts of consumer innovation resistance on actualised innovativeness, we discovered a strong direct impact, affirming that consumers high on consumer innovation resistance are more unwilling to accept ADAS cars. High consumer innovation resistance, therefore, results in a high refusal chance of new products, diminishing consumers' actualised innovativeness. These discoveries are similar to a former empirical study finding that consumer innovation resistance had negative influences on new product assessment and adoption [52]. The route from consumer resistance to innovativeness to actual new product purchase was accepted in this article, which was not examined in the previous literature. This contributes to our apprehension of what motivates consumers to accept the ADAS car, sheds light on the contradictory findings within the literature that concerns the relationship between new product adoption and consumer innovativeness, and raises the literature that surrounds comprehension, ADAS car adoption, actual intention, and attitude.

5.2. Implications

From an academic viewpoint, our study's discoveries promote to the adoption theory in three primary approaches. First, our discoveries devote to the progress of

theoretical argument on whether consumer innovation resistance depicts a significant predisposition in adoption study (Heidenreich & Handrich, 2014). Our outcomes conclusively show that consumer innovation resistance expresses a significant inhibitor of innovative consumer behaviour. It, therefore, appears to be suitable to acquire access to innovative consumer behaviour from a resistance viewpoint so as to accomplish greater explanatory power in the adoption models. Our outcomes, nevertheless, are similar to the discoveries of Heidenreich & Handrich (2014), and clearly give support to consumer innovation resistance's significance as a predisposition in an innovation utilisation study.

Second, strategies to conquered consumer innovation resistance were not apparent in the findings and were demonstrated merely in a few types of research. While the past studies from the feedback and supporter perspective, as well as the rational stimulation and profit comparison viewpoint, provided this domain of research guidelines, there remains a rather limited apprehension of strategies to conquer the consumers' resistance (Longoni et al., 2019). Therefore, this article suggested a three-order construct that can provide practitioners and scholars the required theoretical foundation for progressing the study and practice on involvement-resistance-innovativeness behaviour in the context of ADAS adoption. Its reasons and consumer innovation resistance alter in degree, consumer innovativeness, and antecedences maybe are beneficial for naming strategies from a consumer perspective. Examining how companies utilise strategies to conquer consumer innovation resistance by methods like the actual sampling method would also be helpful to help clarify the intricate relations between innovativeness behaviour, barriers, and innovation resistance.

Similarly, this study offers the first empirical witness that consumer innovativeness behaviour boosts ADAS car adoption and therefore reacts to echoes by Heidenreich et al. (2017) for empirical researches shedding light on the interaction between ADAS car adoption and consumer involvement. The corresponding discovery is similar to a former study on consumer utilisation behaviour overall, which emphasises the significance of consumer innovativeness behaviour for the adoption of innovations. By comparison with prior studies regularly using a one-order construct, nevertheless, construct operationalisation of consumer innovativeness (Manning et al., 1995), this research followed more existing studies proposing the measurement of consumer innovativeness as a multi-order construct. Specifically, the multi-order construct conceptualisation of Casidy et al. (2021) was employed and consumer innovativeness was therefore operationalised as a third-order construct with two dimensions, in other words, hedonist and social innovativeness. Based on this multi-construct operationalisation, a strong highly significant and positive impact of consumer innovativeness on ADAS car adoption was detected. Conforming to this line of deduction, the outcomes provide extra evidence of multi-order construct consumer innovativeness' operationalisation might be superior in comparison with one-order construct ones concerning their predictive and explanatory power.

Finally, the ubiquity of consumer resistance in distinct innovation situations alerts managers to resistance's significance within the need and innovation diffusion to discover better methods to handle resistance. The various factors that cause innovation resistance that is summed up in this research could aid innovation managers to

comprehend the variations and dynamics of consumer innovation resistance and formulate strategies to conquer resistance. In summary, mentioning our exploratory outcomes and conceptualisation, marketers might be capable of realising why distinct categories of consumers do or don't buy environment innovations products. In total, it can be figured out that during the diverse classes of consumer resistance, perceived risk plays a significant role. Risk decreases strategies, in consequence, are critical in reducing consumer resistance towards ADAS cars. One such risk decrease strategy can be to make sure information's available to raise knowledge about solutions and possible risks. Consumers, nevertheless, need to possess entire knowledge about superior functionality, perceived usefulness, and safety, so that they can select products least affecting the environment. This result's import is to raise consumer awareness about environmental topics, which can be really well reached through multi-channel media promotional appeals and campaigns through government agencies. Primarily, the latent lesson analysis provides perceptiveness into the role technology readiness dramas in ADAS cars' customer acceptance by making consumers adopt social norms, stereotypes, and existent values from an early age, as this consents to the former comment by Roy et al. (2018). Therefore, so as to diminish ADAS car resistance, managers ought to customise ADAS cars' promotion strategy for different segments of their customers that are based on technology readiness. These findings broaden our apprehension of factors hindering ADAS cars' customer adoption.

5.3. Limitations and future research

In spite of many significant contributions to literature, the research is not loose from limitations. First, the intention-behaviour gap is emphasised in diverse fields, although researchers have often used purchase aim as a proxy for real intent. Next research studies can, therefore, test emotional and cognitive features of ADAS car acceptance, as emotions play a significant function in acceptance decisions concerning technological products. Second, as successful implementation of ADAS cars relies on innovativeness and continued utilisation, this research collected responses from Taiwan customers that had no former experience with ADAS car adoption. In addition, the present research was conducted using a self-reporting questionnaire and the sample in this study was not randomly drawn and reflects only individuals living in Taiwan markets. Ever since the factors and continuing pleasure technology products' determining customer adoption differ, the next researches could screen these factors' differential role in customers' initial trial and continued adoption of ADAS cars. Third, this research is supposed in a developed country where consumer usage of ADAS cars that drive is prevailing.

Developing countries should be included in future studies so that a generalisation of our integral study framework is more significant. Second, behavioural intentions were screened by this study towards ADAS cars. Future researches could use secondary data and field experiments to test what extent TAM, technology readiness, and organisational features affect real behaviours in ADAS cars. Finally, customers' acceptance of the ADAS case was evaluated by this study in general. Future study can examine customers' acceptance of specific ADAS cars and check other customer

behaviours in terms of raised adoption of ADAS cars or intent to utilise other autonomous technologies, as smart technologies differ in terms of their interactivity, presence, and risk perceptions. Research examining the association between ADAS cars' operational features and the distinct motivational/emotional elements of consumer innovativeness would offer worthwhile perceptivities into how to acquire access to specific ADAS cars' promotion and help to diminish new product failures.

Disclosure statement

No conflict of interest has been reported by the authors.

ORCID

Kuo-Ming Chu http://orcid.org/0000-0002-2680-7780

References

Afik, Z., & Lahav, Y. (2015). Thinking near and far: Modeling the formation of traders' beliefs in asset markets using experimental data. *Journal of Behavioral and Experimental Economics*, *57*, 73–80. https://doi.org/10.1016/j.socec.2015.04.009

Al-Jundi, S. A., Shuhaiber, A., & Augustine, R. (2019). Effect of consumer innovativeness on new product purchase intentions through learning process and perceived value. *Cogent Business & Management*, *6*(1), 1–22. https://doi.org/10.1080/23311975.2019.1698849

Anderson, I., Gil, S., Gibson, C., Wolf, S., Shapiro, W., Semerci, O., & Greenberg, D. M. (2021). "Just the Way You Are": Linking music listening on Spotify and personality. *Social Psychological and Personality Science*, *12*(4), 561–572. https://doi.org/10.1177/1948550620923228

Andrew, J., & Klein, J. (2003). The boycott puzzle: Consumer motivation for purchase sacrifice. *Management Science*, *49*(9), 1196–1209. https://doi.org/10.1287/mnsc.49.9.1196.16569

Bagozzi, R. P., & Lee, K. H. (1999). Consumer resistance to, and acceptance of, innovations. *Advances in Consumer Research*, *26*(12), 218–225.

Bagozzi, R., & Yi, Y. (1988). On the evaluation of structural equation models. *Journal of the Academy of Marketing Science*, *16*(1), 74–94. https://doi.org/10.1007/BF02723327

Buckley, L., Kaye, S. A., & Pradhan, A. K. (2018). Psychosocial factors associated with intended use of automated vehicles: A simulated driving study. *Accident; Analysis and Prevention*, *115*, 202–208. https://doi.org/10.1016/j.aap.2018.03.021

Casidy, R., Claudy, M., Heidenreich, S., & Camurdan, E. (2021). The role of brand in overcoming consumer resistance to autonomous vehicles. *Psychology & Marketing*, *38*(7), 1101–1121. https://doi.org/10.1002/mar.21496

Chian-Son, Y., Chien-Kuo, L., & Wachara, C. (2015). Analysis of consumer e-lifestyles and their effects on consumer resistance to using mobile banking: Empirical surveys in Thailand and Taiwan. *The International Journal of Business and Information, 10*(2), 198–232.

Chian-Son, Y., & Wachara, C. (2016). Consumers' resistance to using mobile banking: Evidence from Thailand and Taiwan. *International Journal of Electronic Commerce Studies*, *7*(1), 21–38.

Chung, K. C., & Liang, S. W. J. (2020). Understanding factors affecting innovation resistance of mobile payments in Taiwan: an integrative perspective. *Mathematicsm, 8*(10), 1–18.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, *13*(3), 319. https://doi.org/10.2307/249008

de Bellis, E., & Johar, G. (2020). Autonomous shopping systems: Identifying and overcoming barriers to consumer adoption. *Journal of Retailing*, *96*(1), 74–87. https://doi.org/10.1016/j.jretai.2019.12.004

Dikmen, M., & Burns, C. M. (2016). Autonomous driving in the real world: Experiences with Tesla autopilot and summon. *Proceedings of the 8th International Conference on Automotive User Interfaces and Interactive Vehicular Applications (AutomotiveUI '16)*, (May), 225–228. https://doi.org/10.1093/ndt/gfn515

Fornell, C., & Larcker, D. F. (1981). Evaluation structural equation models with unobservable variable and measurement error. *Journal of Marketing Research*, *18*(1), 39–50. https://doi.org/10.1177/002224378101800104

George, D., & Mallery, M. (2003). *Using SPSS for Windows Step by Step: A Simple Guide and Reference* (7th ed.). Allyn & Bacon.

Goldsmith, R. E., & Hofacker, C. F. (1991). Measuring consumer innovativeness. *Journal of the Academy of Marketing Science*, *19*(3), 209–221. https://doi.org/10.1007/BF02726497

Grützmann, A., Macedo, F., F, M., & Zambalde, A. L. (2013). Knowledge management and innovation: The role of virtual social networks in innovative consumer behavior. *Journal of Technology Management and Innovation*, *8*, 209–220.

Gupta, A., & Arora, N. (2017). Understanding determinants and barriers of mobile shopping adoption using behavioral reasoning theory. *Journal of Retailing and Consumer Services*, *36*, 1–7. https://doi.org/10.1016/j.jretconser.2016.12.012

Hair, J. F., Jr., Hult, G. T. M., Ringle, C., & Sarstedt, M. (2016). *A Primer on Partial Least Squares Structural Equation Modeling (PLS-SEM)* (2nd ed.). Sage Publications.

Heidenreich, S., & Handrich, M. (2014). What about passive innovation resistance? Investigating adoption-related behaviour from a resistance perspective. *Journal of Product Innovation Management, 32*(6), 878–903. https://doi.org/10.1111/jpim.12161

Heidenreich, S., & Kraemer, T. (2015). Passive innovation resistance: The curse of innovation? Investigating consequences for innovative consumer behavior. *Journal of Economic Psychology*, *51*, 134–151. https://doi.org/10.1016/j.joep.2015.09.003

Heidenreich, S., Kraemer, T., & Handrich, M. (2016). Satisfied and unwilling: Exploring cognitive and situational resistance to innovations. *Journal of Business Research*, *69*(7), 2440–2447. https://doi.org/10.1016/j.jbusres.2016.01.014

Heidenreich, S., Spieth, P., & Petschnig, M. (2017). Ready, steady, green: Examining the effectiveness of external policies to enhance the adoption of eco-friendly innovations: enhancing the adoption of eco-friendly innovations. *Journal of Product Innovation Management, 34*(3), 343–359. https://doi.org/10.1111/jpim.12364

Hew, J. J., Leong, L. Y., Tan, G. W. H., Ooi, K. B., & Lee, V. H. (2019). The age of mobile social commerce: An artificial neural network analysis on its resistances. *Technological Forecasting and Social Change*, *144*, 311–324. https://doi.org/10.1016/j.techfore.2017.10.007

Hooper, D., Coughlan, J., & Mullen, M. R. (2008). Structural equation modeling: Guidelines for determining model fit. *Electronic Journal of Business Research Methods*, *6*(1), 53–60.

Ihli, H. J., Gassner, A., & Musshoff, O. (2018). Experimental insights on the investment behavior of small-scale coffee farmers in central Uganda under risk and uncertainty. *Journal of Behavioral and Experimental Economics*, *75*, 31–44. https://doi.org/10.1016/j.socec.2018.04.011

Jansson, J. (2011). Consumer eco-innovation adoption: Assessing attitudinal factors and perceived product characteristics. *Business Strategy & the Environment, 20*(3), 192–210.

Jansukpum, K., & Kettem, S. (2015). *Applying innovation resistance theory to understand consumer resistance of using online travel in Thailand* [Paper presentation]. 2015 14th International Symposium on Distributed Computing and Applications for Business Engineering and Science (DCABES), 18–24, Aug. 2015, Guiyang, China. https://doi.org/10.1109/DCABES.2015.42

Jeong, S.-Y., Jang, J., Kang, K.-J., & Kim, H.-S. (2017). Implementation of ship performance test in brash ice channel. *Ocean Engineering*, *140*, 57–65. https://doi.org/10.1016/j.oceaneng.2017.05.008

Jing, P., Xu, G., Chen, Y., Shi, Y., & Zhan, F. (2020). The determinants behind the acceptance of autonomous vehicles: A systematic review. *Sustainability*, *12*(5), 1719. https://doi.org/10.3390/su12051719

Kaur, P., Dhir, A., Singh, N., Sahu, G., & Almotairi, M. (2020). An innovation resistance theory perspective on mobile payment solutions. *Journal of Retailing and Consumer Services*, *55*, 102059. https://doi.org/10.1016/j.jretconser.2020.102059

Kleijnen, M., Lee, N., & Wetzels, M. (2009). An exploration of consumer resistance to innovation and its antecedents. *Journal of Economic Psychology*, *20*(3), 344–357.

König, M., & Neumayr, L. (2017). Users' resistance towards radical innovations: The case of the self-driving car. *Transportation Research Part F*, *44*, 42–52. https://doi.org/10.1016/j.trf.2016.10.013

Körber, M., & Bengler, K. (2014). Potential individual differences regarding automation effects in automated driving. In C. S. G. González, C. C. Ordóñez, & H. Fardoun (Eds.), *Interacción 2014: Proceedings of the XV International Conference on Human Computer Interaction* (pp. 152–158). ACM.

Laukkanen, T. (2016). Consumer adoption versus rejection decisions in seemingly similar service innovations: The case of the internet and mobile banking. *Journal of Business Research*, *69*(7), 2432–2439. https://doi.org/10.1016/j.jbusres.2016.01.013

Leong, L.-Y., Hew, T.-S., Ooi, K.-B., & Lin, B. (2021). A meta-analysis of consumer innovation resistance: Is there a cultural invariance? *Industrial Management & Data Systems*, *121*(8), 1784–1823. https://doi.org/10.1108/IMDS-12-2020-0741

Li, D., Wei, Y. D., Miao, C., & Chen, W. (2020). Innovation, innovation policies, and regional development in China. *Geographical Review*, *110*(4), 505–535. https://doi.org/10.1080/00167428.2019.1684194

Longoni, C., Bonezzi, A., & Morewedge, C. K. (2019). Resistance to medical artificial intelligence. *Journal of Consumer Research*, *46*(4), 629–650. https://doi.org/10.1093/jcr/ucz013

Manning, K. C., Bearden, W. O., & Madden, T. J. (1995). Consumer innovativeness and the adoption process. *Journal of Consumer Psychology*, *4*(4), 329–345. https://doi.org/10.1207/s15327663jcp0404_02

Marikyan, D. & Papagiannidis, S. (2022) Technology acceptance model: A review. In S. Papagiannidis (Ed), *TheoryHub Book*. http://open.ncl.ac.uk

Matsuo, M., Minami, C., & Matsuyama, T. (2018). Social influence on innovation resistance in internet banking services. *Journal of Retailing and Consumer Services*, *45*, 42–51. https://doi.org/10.1016/j.jretconser.2018.08.005

Meyer-Waarden, B. L., & Cloarec, J. (2022). "Baby, you can drive my car": Psychological antecedents that drive consumers' adoption of AI-powered autonomous vehicles. *Technovation, 109*(January), 102348. https://doi.org/10.1016/j.technovation.2021.102348

Nastjuk, I., Herrenkind, B., Marrone, M., Brendel, A. B., & Kolbe, L. M. (2020). What drives the acceptance of autonomous driving? An investigation of acceptance factors from an end-user's perspective. *Technological Forecasting and Social Change*, *161*, 120319–120326. https://doi.org/10.1016/j.techfore.2020.120319

Oktavianus, Y., Chang, H., Goldsworthy, H. M., & Gad, E. F. (2017). Component model for pull-out behavior of headed anchored blind bolt within concrete filled circular hollow section. *Engineering Structures*, *148*, 210–224. https://doi.org/10.1016/j.engstruct.2017.06.056

Paddeu, D., Parkhurst, G., & Shergold, I. (2020). Passenger comfort and trust on first-time use of a shared autonomous shuttle vehicle. *Transportation Research Part C: Emerging Technologies*, *115*, 102604. https://doi.org/10.1016/j.trc.2020.02.026

Panagiotopoulos, I., & Dimitrakopoulos, G. (2018). An empirical investigation on consumers' intentions towards autonomous driving. *Transportation Research Part C: Emerging Technologies*, *95*, 773–784. https://doi.org/10.1016/j.trc.2018.08.013

Petty, R. E., & Cacioppo, J. T. (1986). The elaboration likelihood model of persuasion. *Advances in Experimental Social Psychology*, *19*, 123–205.

Pituch, K., & Lee, Y. (2006). The influence of system characteristics on e-learning use. *Computers and Education*, *47*(2), 222–244. https://doi.org/10.1016/j.compedu.2004.10.007

Planing, P. (2014). *Innovation acceptance: The case of advanced driver-assistance systems*. Springer Fachmedien.

Ram, S., & Sheth, J. N. (1989). Consumer resistance to innovations: The marketing problem and its solutions. *Journal of Consumer Marketing*, *6*(2), 5–14. https://doi.org/10.1108/EUM0000000002542

Roy, S. K., Balaji, M. S., Quazi, A., & Quaddus, M. (2018). Predictors of customer acceptance of and resistance to smart technologies in the retail sector. *Journal of Retailing and Consumer Services*, *42*, 147–160. https://doi.org/10.1016/j.jretconser.2018.02.005

Sadik-Rozsnyai, O., & Bertrandias, L. (2019). New technological attributes and willingness to pay: The role of social innovativeness. *European Journal of Marketing*, *53*(6), 1099–1124. https://doi.org/10.1108/EJM-12-2016-0834

Santos, A. A., & Ponchio, M. C. (2021). Functional, psychological and emotional barriers and the resistance to the use of digital banking services. *Innovation & Management Review*, *18*(3), 331–348. https://doi.org/10.1108/INMR-07-2020-0093

Schepers, J., & Wetzels, M. (2007). A meta-analysis of the technology acceptance model: Investigating subjective norm and moderation effects. *Inf. Manag*, *44*(1), 90–103. https://doi.org/10.1016/j.im.2006.10.007

Sekaran, U. (2003). *Research methods for business: A skill-building approach* (4th Ed.). John Wiley & Sons.

Seth, H., Talwar, S., Bhatia, A., Saxena, A., & Dhir, A. (2020). Consumer resistance and inertia of retail investors: Development of the resistance adoption inertia continuance (RAIC) framework. *Journal of Retailing and Consumer Services*, *55*, 102071. https://doi.org/10.1016/j.jretconser.2020.102071

Siegrist, M., & Hartmann, C. (2020). Consumer acceptance of novel food technologies. *Nature Food*, *1*(6), 343–350. https://doi.org/10.1038/s43016-020-0094-x

Sivathanu, B. (2019). Adoption of digital payment systems in the era of demonetization in India: An empirical study. *Journal of Science and Technology Policy Management*, *10*(1), 143–171. https://doi.org/10.1108/JSTPM-07-2017-0033

Snyder, C. R., Howard, C., & Fromkin Howard, C. (1980). *Uniqueness: The human pursuit of difference*. Plenum Press.

Talwar, S., Talwar, M., Kaur, P., Singh, G., & Dhir, A. (2021). Why have consumers opposed, postponed, and rejected innovations during a pandemic? A study of mobile payment innovations. *Australasian Journal of Information Systems*, *25*, 1–27. https://doi.org/10.3127/ajis.v25i0.3201

Tan, M., & Teo, T. (2000). Factors influencing the adoption of internet banking. *Journal of the Association for Information Systems*, *1*(1), 1–44. https://doi.org/10.17705/1jais.00005

Venkatesh, V., & Bala, H. (2008). Technology acceptance model 3 and a research agenda on interventions. *Decision Sciences*, *39*(2), 273–315. https://doi.org/10.1111/j.1540-5915.2008.00192.x

Venkatesh, V., & Davis, F. D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. *Management Science*, *46*(2), 186–204. https://doi.org/10.1287/mnsc.46.2.186.11926

Wilson, K., Fornasier, S., & White, K. M. (2010). Psychological predictors of young adults': Use of social networking sites. *Cyberpsychology, Behavior and Social Networking*, *13*(2), 173–177.

Wood, S. L., & Swait, J. (2002). Psychological indicators of innovation adoption: Cross-classification based on need for cognition and need for change. *Journal of Consumer Psychology*, *12*(1), 1–13. https://doi.org/10.1207/S15327663JCP1201_01

Xu, Z., Zhang, K., Min, H., Wang, Z., Zhao, X., & Liu, P. (2018). What drives people to accept automated vehicles? Findings from a field experiment. *Transportation Research Part C: Emerging Technologies*, *95*, 320–334. https://doi.org/10.1016/j.trc.2018.07.024