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Revolutionising Autonomous Vehicles: Inspiring Consumers in the Age of Industry 4.0 technologies

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ABSTRACT

Advances in AI and Industry 4.0 technologies are reshaping society, yet consumer resistance to innovations like autonomous vehicles (AVs) remains significant. Despite the proven benefits of fully autonomous vehicles, adoption lags. This study addresses gaps in AV adoption research by developing a sequential theoretical framework to explore the psychological relationships between AV stressors, benefits, trust, adoption difficulty, and consumer resistance. Grounded in trust, JTBD theory, and inspiration theories, the model was tested on 671 consumers in Australia and the USA, revealing that trust and inspiration play a crucial role in reducing resistance. Notably, inspired consumers exhibit lower resistance, suggesting a focus on AV benefits to foster inspiration and facilitate adoption. The study's findings have practical implications for promoting AV adoption, highlighting the pivotal role of trust and inspiration in reducing consumer resistance. By understanding how AV stressors and benefits impact resistance, mediated by trust, inspiration, and adoption difficulty, marketers and policymakers can design strategies to inspire consumers and ease adoption barriers.

Keywords: Autonomous vehicles (AVs) technologies; resistance to AV; inspiration; trust, adoption difficulty

INTRODUCTION

Industry 4.0 technologies, including artificial intelligence (AI), advanced robotics, and Big Data, was until only recently in the domain of science fiction. Today, it is revolutionising how consumers enjoy travel while undertaking other activities such as eating, sleeping, working, playing, live streaming, sightseeing, foreplay, lovemaking, and so on (Belk, 2022; Puntoni *et al.,* 2021). Despite Industry 4.0 technologies having the ability to enhance performance, research in the marketing field suggests that consumers still have major reservations and are resistant to adopting some new technologies owing to the risks and uncertainties involved (Kim *et al.,* 2021). As such, it is essential to incorporate behavioral insights when designing and commercialising new products to harness and leverage revolutionary technological innovations (Puntoni *et al.,* 2021). There is, therefore, a pressing need to develop and apply psychological frameworks that enable a better understanding of how consumers embrace or reject Industry 4.0 technologies, given the complexity of consumer decision-making in this context (Belk*,* 2022). This is particularly relevant for revolutionary new technologies such as Level 5, fully autonomous vehicles that represent a ground-breaking and transformative shift in the automotive industry and society at large (McLeay *et al.,* 2022) owing to their disruptive nature, fundamental changes in design, and the profound impact they can have on technology, society, and the economy. Deeper knowledge of the influence of consumer inspiration and psychological mechanisms may increase adoption and lower apprehension (Charness *et al.,* 2018; Hegner *et al.,* 2019).

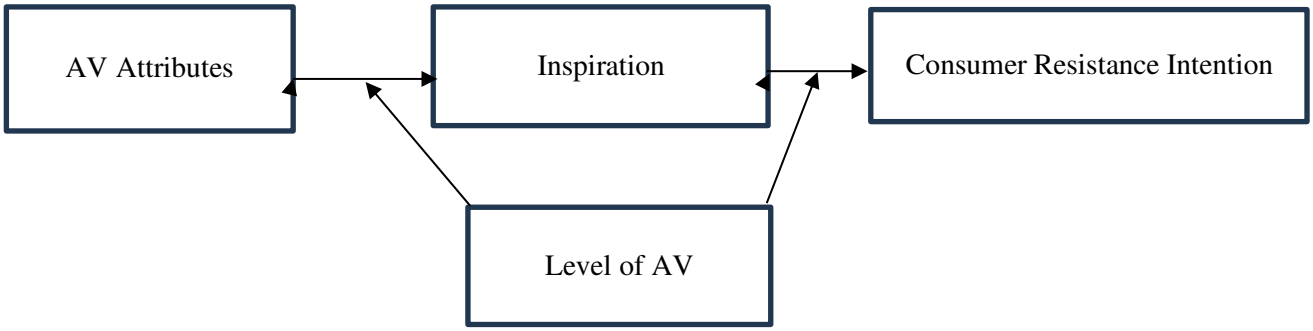
Most extant research has concluded that AVs are technologically superior to traditional vehicles (Osburg *et al*., 2022); however, many consumers continue to be concerned about AV safety (Chakravarthi et al., 2024) as well as societal, ethical (Belk, 2021; Gill, 2021) and psychological considerations (Bonnefon *et al.,* 2016). Citing a government report by the Centre for Data Ethics and Innovation, Vallance (2022) confirms that it is not (yet) possible to state how safe driverless cars will be, although many studies suggest AVs are safer than traditional vehicles (McLeay *et al.,* 2022). Perceived safety and other concerns may create technostress (Agogo & Hess, 2018) resulting in stressors that decrease the level of trust that consumers place in AVs.

From a marketing perspective, lack of clarity between the benefits of AVs and factors that cause technostress (stressors) may exacerbate consumer difficulties in adopting AVs, preventing consumers from being 'inspired by/to' adopt and creating psychological resistance to using AVs. Inspiring consumers to adopt AVs and addressing resistance involves 'selling the

benefits' (Silvestri et al., 2024); manufacturers and marketers play a pivotal role in shaping consumer perceptions and inspiring consumer acceptance of this disruptive and transformative technology (Qian *et al*., 2023; Si *et al.*, 2024).

Extant AV research has often focused on the benefits and usefulness of AVs (rather than on the drawbacks that have a negative influence on AV adoption), largely overlooking strong behavioral frameworks and theoretical foundations (Huang & Qian, 2021) such as those that could be provided by inspiration theory. Therefore, this paper's primary objective is to address the gaps in research focusing on resistance to AVs' adoption by developing a theoretical framework for modelling resistance to using AVs. Using data from Australia and the US, we empirically tested the sequential effects of AV benefits and stressors on trust, customer inspiration, turning to adoption difficulty, and psychological resistance to using AVs. To address the need for research directly comparing consumer perceptions of less intelligent AVs (Level 3) and highly intelligent, fully autonomous AVs (Level 5) (Huang & Qian, 2021; McLeay et al., 2022), we develop the conceptual model shown in Figure 1.

Figure 1: Simple Conceptual Model



1. Theory and hypotheses

2.1. Literature Review and Theoretical background

Many studies draw upon theoretical conceptualisations from established models such as Rogers' Diffusion of Innovation model (DoI, Rogers, 1983); the Technology Acceptance Model (TAM, Davis, 1989), and various versions of the Unified Theory of Acceptance and Use of Technology model (UTAUT, Venkatesh et al. 2023). For example, Zhang et al. (2015) applied Rogers' DoI theory to examine the adoption of AVs in the USA by developing an agent-based model to simulate the diffusion process of AVs. Their findings suggest that early adopters are likely to be younger, tech-savvy individuals with higher income levels, while laggards will

be older adults and those with lower income, highlighting the importance of targeted strategies to promote AV adoption. Rejali et al. (2023) applied TAM to examine the adoption of autonomous vehicles (AVs) in Iran. The findings revealed that both key determinants of intention - attitudes and perceived usefulness - significantly predict individuals' intention to use AVs, with attitudes demonstrating a slightly stronger effect on acceptance. Madigan et al. (2017) employed UTAUT to investigate public acceptance of AVs across different European countries. The research identified performance expectancy, effort expectancy, social influence, and facilitating conditions as predictors of behavioral intention to use AVs. The study also found that cultural differences play a role in acceptance, suggesting that tailored communication and policy strategies are necessary to address region-specific concerns and promote AV adoption. Koh and Yuen (2023) employed the extended Unified Theory of Acceptance (Venkatesh et al., 2003) and Unified Theory of Acceptance and Use of Technology (UTAUT2) (Venkatesh et al., 2012) in conjunction with the Computers-Are-Social-Actors (CASA) framework to explore public acceptance of autonomous vehicles (AVs) in Singapore. The findings indicate that UTAUT2 addressed consumers' behavioral traits such as attitudes, motivations, and beliefs regarding AVs.

Rather than replicating these studies by using these already proven modes of technology innovation and acceptance, our contribution involves drawing upon inspiration theory to provide new insights to marketers and academics who are interested in enhancing their understanding of AV adoption. By doing so, we also build upon existing studies that have focussed on AV barriers and resistance to innovation (cf., Gill 2021; Shariff et al., 2017).

Several theoretical frameworks elucidate consumer adoption of innovative technologies. For example, TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003) are frequently used to identify key determinants of technology adoption. A more recent example is the JTBD theory, which was developed by Christensen et al. (2016) to describe why customers are not interested in a product *per se* but in the functions or solutions that help them solve a specific problem or achieve a goal. While the Christensen Institute conceptualises JTBD as uncovering the underlying progress consumers seek in specific life circumstances, this study adopts a more psychologically grounded interpretation, focusing on how consumers' emotional and cognitive responses (such as trust, inspiration, and stress) shape their resistance or openness to adopting transformative technologies like autonomous vehicles. Drawing on JTBD theory, we employed AV benefits and stressors as the antecedent of our conceptual model. Consumers may adopt

AVs to improve convenience and efficiency, as the technology reduces trip time and allows passengers to engage in other activities during their commute. AVs also address the job regarding safety by reducing human error, a major cause of accidents. Eco-conscious consumers may adopt AVs to reduce their carbon footprint during travel. Lastly, AVs offer customised travel experiences, increasing comfort and enjoyment.

Claudy et al. (2015) applied behavioral reasoning theory to demonstrate that reasons supporting adoption have a positive impact, while reasons opposing adoption have a negative impact on attitudes toward adoption, which can, in turn, influence intentions and actual adoption behavior. Similarly, Davis (1989) argued that individuals tend to develop positive attitudes toward new technologies perceived as useful and easy to use. Trust has long been acknowledged as a significant factor in the adoption of automation, particularly as the complexity of automation systems and the vulnerability of users increase (Shariff et al., 2017). In particular, the extent of consumer trust will significantly influence the widespread acceptance of AVs, as well as the level of tolerance for their presence within society (Shariff et al., 2017). Building on these insights, we propose that AV benefits positively impact trust in AVs, whereas AV stressors have a negative impact.

To our knowledge, this is the first empirical study investigating how consumer inspiration related to AV technology can elucidate the relationship between consumer perceptions of its benefits and stressors with resistance intentions. Leveraging inspiration theory, we examine the sequential effects of AV benefits and stressors on trust, where the influence of perceived adoption difficulty and resistance is mediated by consumer inspiration. Inspiration theory originated in psychology (Thrash & Elliot, 2004) and was introduced to the marketing domain by Böttger et al. (2017). Inspiration theory, adapted to the marketing domain by Böttger et al. (2017), emphasises how a person moves from being passively informed to actively desiring and pursuing a goal based on emotional engagement and personal resonance.

Inspiration theory is particularly suited for studying AV adoption because it incorporates a dual-process model of inspired by (activation) and inspired to (intention) (Thrash & Elliot, 2004). This progression is especially important when consumers encounter unfamiliar or emerging technologies. Inspiration theory can transform AVs into an aspirational goal, helping consumers envision personal benefits and transcend initial apprehensions. In the context of AVs, “inspired by” can mean that consumers’ imagination is broadened by AVs possibilities, while “inspired

to" can indicate an intention to experience or adopt the technology (Thrash et al., 2010; Bottger et al., 2017).

A review of the literature of AVs that does not draw exclusively on theories such as DoI, and UTAUT, which as discussed earlier have already been heavily utilised in studies of AVs is presented in Appendix A. Information presented in Appendix A highlights that scholars have frequently studied the influencers of benefits and stressors on AV adoption. However, inspiration and adoption difficulty as well as a focus on different levels of AV is unique to this paper. Previous research has suggested that trust can influence consumers perceptions of AVs, therefore trust is discussed in the section "Trust in AVs and AV Benefits", after a discussion of inspiration theory.

2.2 Inspiration theory

The concept of inspiration originated in psychology (Thrash & Elliot, 2004). Böttger et al. (2017) adapted this psychological concept to the marketing domain, introducing the notion of customer inspiration. They defined customer inspiration as "a customer's temporary motivational state that facilitates the transition from the reception of a marketing-induced idea to the intrinsic pursuit of a consumption-related goal" (p.117). Consumer inspiration can stimulate strong managerial interests (Wichmann et al., 2021) by offering novel solutions (Bolton et al., 2022). Thrash and Elliot (2003) suggested that inspiration is composed of evocation, transcendence, and motivation. These components promote individual imagination and creativity, trigger exceptional ideas, and stir novel possibilities (Bottger et al., 2017; Thrash et al., 2017; Frasquet & Leva, 2024). Customer inspiration has been examined in marketing (Böttger et al. (2017), retailing (Frasquet et al. 2024), tourism (Khoi et al. 2020), Augmented Reality (AR) marketing (Arghashi & Arsun Yuksel, 2022), social media marketing (Sheng et al., 2020; Yang et al., 2024) and robotic services (Xie et al., 2022). Inspiration is a specific form of intrinsic motivation that is activated by external stimuli, which serves to energise and direct behavior (Thrash & Elliot, 2004). Thrash and Elliot (2004) conceptualised inspiration as a dual-process construct consisting of two components: an activation state (inspired by) and an intention state (inspired to). In later research, the authors introduced the transmission model of inspiration, which describes the progression from one state to the other. With Industry 4.0 technologies, inspiration is at the centre of the decision-making process (Zanger et al., 2022). For instance, it can stimulate health tourism experiences (He et al., 2021); hedonic benefits of AR applications (Rauschnabel et al., 2019), and service robot novelty (Xie

et al., 2022). Based on the model of transmission (Thrash et al., 2010; Bottger et al. 2017), customer inspiration consists of two dimensions, 'inspired by' and 'inspired to'. 'Inspired by' is an activation state 'inspired by' an object (e.g., a consumer's imagination or horizon is broadened by AVs), and 'inspired by' is an intention state that involves adopting a behavior or undertaking an action after inspiration (Liang et al., 2016; Tsaur et al., 2022; Yang et al., 2024) (e.g, a consumer has a desire or interest in experiencing or adopting an AV). However, research in the field of inspiration relating to the adoption of novel technology remains limited.

2.3 Trust in AVs and AV Benefits

Trust is the ability to depend on an exchange partner (Moorman *et al*., 1993) where one partner has confidence in the other partner's reliability (Morgan & Hunt,1994). According to the TAM (Davis, 1989) and UTAUT (Venkatesh et al., 2003), trust is a significant driver of technology adoption. Kaur *et al. (*2020) discussed that perceptions of consumers on AV attributes such as privacy and security can influence their trust. In this study, trust can be conceptualised as the degree to which consumers believe AVs are safe, reliable, and capable of fulfilling their intended functions without causing harm or errors. Conceptualising 'trust' in the context of Industry 4.0 technologies and AVs involves understanding how consumers perceive the reliability and dependability of AV technology. Past literature has identified functional benefits as critical predictors of consumer trust (Lee & Jun 2007). For instance, research on electronic trust (e-trust) highlights the importance of technical features – such as ease of navigation, visual design, and search functionality – as indicators of trustworthiness (Corritore *et al*., 2003).
However, the uptake of AVs lags significantly behind industry expectations, suggesting that consumers may be resistant to the technology (Acheampong & Cugurollo, 2019; Rubio *et al*., 2020; McLeay *et al*., 2022), which may be explained by a lack of trust in AVs. In this vein, we posit that AV benefits will likely inspire consumers and decrease difficulties associated with adoption. Thus, we hypothesise that:
H1a. AV-specific benefits increase trust in AVs

There is a scarcity of literature examining technostress from a consumer perspective and new-age technologies (e.g., AVs) that revolutionise our lives (Lee & Pan, 2023; Kumar *et al.,* 2022). Technostress refers to "a modern disease of adaptation caused by an inability to cope with the new information and communication technologies healthily" (Agogo & Hess, 2018, p. 575). Chen *et al*. (2019) described technostress as the psychological strain experienced by users of mobile shopping applications when they are overwhelmed and interrupted by an excessive

amount of information and communication within a short period. Furthermore, Krafft et al. (2017) found that some consumers choose to stop using their digital devices when confronted with technostress. Several factors that lead to technostress include technology usage experience (Brod, 1982), sense of invasion (Tarafdar *et al*., 2007), the need to invest time and cognitive resources to understand the technology (Op. cit.), technology overuse (Brooks & Longstreet, 2015), information search tasks and information overload (Kumar *et al*., 2016).

In this study, technostress has been conceptualised as the cognitive construct that focuses on the negative experiences of consumers when engaging with AVs (Kumar *et al*., 2022). Therefore, we hypothesise that

H1b. AV-specific stressors reduce trust in AVs

Trust is an important factor in enabling social relationships (Montague, 2010); it impacts behavioral intentions (Twenge *et al*., 2007), especially in the context of AVs. Ostrom *et al.* (2019) suggest that trust is a key factor that enhances AV-consumer relationships. Zhang *et al* (2019) suggest that trust and technology acceptance models predict consumer acceptance of AVs. Similarly, Kaur *et al. (*2020) contend that a lack of public trust is the key barrier to adopting new technology such as AVs. Therefore, the characteristics of the AVs are important to the development of trust (Lee & Jun, 2007). However, there is little research regarding the relationship between trust and consumer inspiration from more advanced technology (Mou *et al*., 2023); if consumers can achieve a level of trust with AVs, they are more likely to be open-minded in terms of usage and thus, the greater the likelihood of them being 'inspired by' an AV (Böttger *et al*., 2017). Thus, we hypothesise that

H2: Trust positively influences the notion of being 'inspired by' an AV.

Thrash *et al*.'s (2010) transmission model states that inspiration facilitates the transition from 'inspired by' to 'inspired to'. When consumers are exposed to innovations such as AVs, there is a likelihood of a shift from being 'inspired by' the innovation to being 'inspired to' experience, use, or adopt the innovation (Böttger *et al.*, 2017). This acceptance of change can be triggered by a novel idea (Cao *et al.*, 2021) or another consumer who serves as a source of inspiration (Ki et al., 2022), shifting consumers "from the state of 'being inspired by' (an external factor), to a state of 'being inspired to' actualize a new idea" (Böttger *et al*., 2017, p. 116). The more consumers are 'inspired by' an idea or individual, the greater the likelihood of them being 'inspired to' adopt something new (Ki *et al.*, 2022). Thus, inspiration (relating to being 'inspired to' and 'inspired by') is pertinent for investigating consumer psychological

resistance to AVs adoption. For AV adoption to take place, a consumer needs to shift from being 'inspired by' an encounter with a person or idea (i.e., a passive process) to being 'inspired to' adopting a new behavior (i.e., an active process).
Thus, *H3: 'Inspired by' has a positive influence on 'inspired to'.*

An 'inspired to' activation state involves the reception of new ideas and a shift in customer awareness towards experiencing new possibilities (Böttger et al., 2017) where inspiration is connected to approach rather than avoidance behaviors (Thrash & Elliot, 2003). Customer inspiration can be a predictor of consumer responses such as behaviors, emotions, attitudes (Böttger et al., 2017), exploration behavior, unplanned purchases (Böttger et al., 2017), engagement behaviors, or purchase intentions (Izogo & Mpinganjira, 2020). A consumer who is 'inspired to' explore new opportunities or experiences may achieve consumption-related goals (Xie et al., 2022) and a desire to adopt or experience AVs.

Based on the customer inspiration theory, we expect that consumers who view AVs as novel and innovative are likely to get inspired by the AV and tend to engage in positive behavior such as adoption (Frasquet & Ieva, 2024). An AV can inspire people to adopt it as AVs are novel and unfamiliar to anything else they have encountered (Arghashi, 2022). Furthermore, inspiration, characterised as a temporary motivational state, facilitates the transition from the deliberation stage to the implementation stage (Böttger et al., 2017). Consequently, when customers are inspired, they will likely be motivated to interact with AVs (Sun et al., 2023) and be inspired to adopt them. Therefore, we hypothesise that individuals who feel less inspired to engage with an autonomous vehicle (AV) experience, are likely to find it difficult to adopt AV technology (in comparison to those who feel more inspired). Hence, we propose:
H4: 'Inspired to' decreases AV adoption difficulty

2.4 AV Adoption difficulty and resistance to AV

Consumer resistance to innovation, including resistance to AVs, refers to the reluctance of consumers to adopt new technologies, which can lead to delays in the widespread adoption of innovations (Joachim et al., 2018; Ram & Sheth, 1989). Adopting innovations requires consumers to accept significant changes, which invariably creates uncertainty and risk (Garcia et al., 2007) and can arouse strong negative reactions (Heidenreich & Talke, 2020) resulting in market failure and detrimental consequences for the firm (Heidenreich & Kraemer, 2015). Despite its importance, consumer resistance to technology has received less attention (Kaur *et*

al., 2020) than research into the willingness to adopt (rather than resist) technology (Casidy *et al.,* 2020). This oversight can be explained by a preference to publish research that reflects techno-optimism/cyber-optimism, which obfuscates the users' sense of helplessness to change the direction in which technology is shaping the adoption and usage of new technologies (Marabelli & Newell, 2023).

Furthermore, there have been calls for research to understand why consumers are resistant to adopting new offerings (Nel & Boshoff, 2019) and how psychological barriers (Joachim *et al*., 2018) occur when the innovation conflicts with a consumer's social norms and values, or usage patterns (Talke & Heidenreich, 2014). On this basis, Shariff, Bonnefon, and Rahwan (2017, p. 694) suggest that the "biggest roadblocks standing in the path of mass adoption [of autonomous vehicles] may be psychological, not technological".

Consumers may be hesitant to use innovations such as AVs due to the complexity, economic performance, entrenched beliefs, risks associated with the innovation (Mani & Chouk, 2019), perceived low affordability (Bansal et al., 2016), or the fear associated with using AVs (Zmud et al., 2016). Adoption difficulty can also stem from learning to use a new innovative product or change existing behavior (Lee & O'Connor, 2003). Thus, while AVs may offer substantial benefits to potential users, they also introduce significant risks and uncertainties (Colombo *et al.,* 2017), increasing the adoption difficulties and thus encountering considerable resistance from consumers (König & Neumayr, 2017). Based on these arguments, we hypothesise:

H5: *AV adoption difficulty increases resistance to AV*

2.5 Serial mediation hypotheses

Past research has shown that communicating the benefits of products can influence brand perceptions and product evaluations (Dwivedi & McDonald, 2018). In the case of AVs, the potential benefits include improved road safety and mobility capability (Gkartzonikas & Gkritza, 2019). Marketers can foster consumer trust by highlighting the benefits of AVs in ways that 'inspire' consumers, broadening their mental horizons (Böttger *et al*., 2017) and encouraging self-transformation (Kozinets, 2002).

For instance, once customers are exposed to the benefits of AVs, they are likely to develop trust in AVs and embark on a consumer journey from being 'inspired by' to 'inspired to' act upon the new idea. This process can decrease adoption difficulty and, ultimately, resistance to AVs. Thus, we hypothesise:

H6a: AV benefits and resistance to AV are sequentially mediated by trust and customer inspiration ('inspired by'/'inspired to') and adoption difficulty.

Revolutionary innovations such as AVs require consumers to accept significant changes, which create uncertainty and risk (Garcia *et al*., 2007). Furthermore, if marketers fail to communicate the potential stressors associated with AVs effectively, it may result in a loss of consumer trust, thereby increasing the perceived difficulty of adoption (Lee & O'Connor, 2003). However, an 'inspired by' state is receptive to new ideas and will result in a shift in customer awareness towards new possibilities (Böttger *et al*., 2017). 'Inspiration to' could be triggered by an event, object, message or any other stimulus (Winterich *et al*., 2019). Marketer-induced information or adverts could provide consumers with sufficient know-how to stimulate their imagination and offer new ideas. This could reveal new possibilities and lead to self-transformation (Böttger et al., 2017). Recognising this, AV stressors can diminish trust, negatively impact consumer inspiration, increase adoption difficulty, and cause resistance to using AVs. Therefore, we hypothesise.

H6b: AV stressors and resistance to AV, is sequentially mediated by trust and customer inspiration and adoption difficulty.

2.6 Moderating role of AV level

Broadly speaking, Industry 4.0 technologies can be systematically characterised according to the technology's AI capabilities (Kipnis *et al*., 2022; Huang & Rust, 2021). Similarly, the National Highway Traffic Safety Administration classifies AVs from Level 0 (no automation) to Level 5 (full automation) (Saeed *et al*., 2020). Most extant research has considered less intelligent autonomous vehicles (level 2 and especially level 3) that require human input while driving rather than technology. However, enhanced level 5 AVs require no human interaction or intervention (McLeay *et al.,* 2022). While examples of level 2 (e.g., Tesla) and level 3 (e.g., Mercedes-Benz's Drive Pilot[1], currently restricted to use on German motorways) autonomous driving systems are available in the market, futuristic level 5 AVs are still in development – for example, Uber and Volvo are working together to develop an autonomous taxi (Volvo Car Group, 2016). To the best of our knowledge, no prior studies have examined whether perceptions of AVs with higher intelligence (Level 5) versus lower intelligence (Level 3) influence the relationship between perceived AV benefits and consumer inspiration, or how being 'inspired by' affects resistance to AVs. As designers and manufacturers incorporate Tech 4.0 into AVs with higher levels of intelligence such as level 5, the technology would be

[1] https://www.mercedes-benz.lu/fr/passengercars/technology/drive-pilot.html

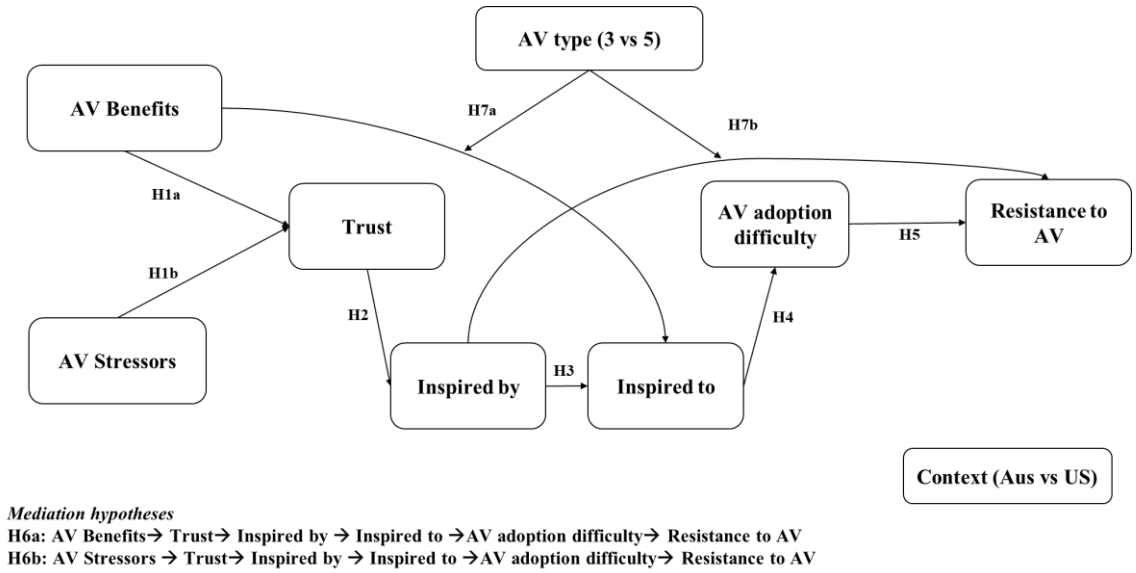
expected to make it easier for consumers to use such AVs and reduce resistance to AVs. Therefore, we propose:

H7a: *AV level positively moderates the effect of AV benefits on 'inspired to'.*

Following H7a, it can be argued that AVs with higher levels of intelligence (level 5) should be more inspirational, owing to the higher level of performance and customisation that a human driver would need to handle when driving traditional cars or lower-level AVs. Therefore:

H7b: *AV level negatively moderates the impact of 'inspired by' on resistance to AV.*

Figure 2: Research model to illustrate our theoretical framework, linking our hypotheses.



Mediation hypotheses

H6a: AV Benefits→ Trust→ Inspired by → Inspired to →AV adoption difficulty→ Resistance to AV

H6b: AV Stressors → Trust→ Inspired by → Inspired to →AV adoption difficulty→ Resistance to AV

2. METHODOLOGY

Prior to data collection, ethical approval, informed consent, and consent to publish were obtained in accordance with institutional guidelines.

3.1 Data

We use a quantitative approach to test our theoretical model (Joachim et al., 2018; Mani & Chouk, 2019). Items were extracted from validated scales (Table 1).

Table 1. The results of descriptive statistics, reliability, and exploratory factor analysis

Scale items (source)	SFL	Descriptive stat.		Normality check	
AV benefits (Hohenberger et al., 2017; Myker et al., 2019; Pettigrew et al., 2019) α=0.917		Mean	SD	Skewness	Kurtosis
AVs may prevent injuries and road deaths	0.818***	4.124	1.712	-0.304	-0.673
AVs will provide greater mobility to disabled and elderly people who cannot drive	0.623***	5.514	1.458	-1.298	1.709
AVs may decrease energy use and fuel emissions	0.758***	4.636	1.590	-0.493	-0.178
AVs may reduce traffic congestion	0.834***	4.185	1.688	-0.169	-0.632
AVs will reduce parking problems	0.787***	4.429	1.732	-0.310	-0.686
AVs will reduce the costs of car ownership	0.654***	3.867	1.721	-0.033	-0.712
AVs will provide more enjoyable travel time by increasing my ability to engage in leisure activities while in transit.	0.764***	4.793	1.776	-0.808	-0.147
AVs will provide more productive travel time by increasing my ability to work while in transit	0.775***	4.705	1.829	-0.685	-0.444
AV Stressors- *I feel that AVs are:* (Brell et al., 2019) α=0.906					
Frightening	0.890***	4.082	1.843	-0.043	-1.083
Creepy	0.870***	3.668	1.841	0.251	-0.985
Spooky	0.834***	3.481	1.827	0.370	-0.898
Mechanical	0.831***	4.917	1.508	-0.628	0.028
Not controllable/ uncontrollable	0.691***	4.204	1.779	-0.097	-0.969
Somehow ‘unmoral’/ unethical	0.097***	3.037	1.694	0.627	-0.338

Intrusive	0.783***	3.905	1.629	0.146	-0.596
Digital authoritarianism	0.542***	3.970	1.732	-0.002	-0.746
Inspired by (Böttger et al., 2017) α=0.943					
My imagination can be stimulated by an AV experience	0.847***	4.337	1.675	-0.490	-0.463
I can be intrigued by the new idea of AVs	0.876***	4.559	1.669	-0.755	-0.136
I unexpectedly and spontaneously could get new ideas by experiencing an AV	0.874***	4.021	1.599	-0.313	-0.512
My horizon could be broadened by the experience of an AV	0.903***	4.350	1.691	-0.524	-0.499
I could discover something new by experience of an AV	0.884***	4.572	1.640	-0.720	-0.088
Inspired to (Böttger et al., 2017) α=0.979					
I felt inspired to experience an AV	0.938***	4.201	1.902	-0.406	-0.982
I felt a desire to experience an AV	0.945***	3.976	2.015	-0.187	-1.261
My interest in experiencing an AV has increased	0.967***	4.033	1.950	-0.255	-1.147
I am motivated to experience an AV	0.966***	3.946	1.949	-0.194	-1.179
I felt an urge to experience an AV	0.923***	3.721	1.952	0.005	-1.198
Adoption Difficulty (Lee & O'Connor 2003) α= 0.612					
I think I would need to learn how to use the AV	0.556***	5.364	1.643	-1.260	1.020
I think I would tend to not adopt the AV	0.525***	4.534	1.789	-0.223	-0.919
I think I would need to change my behavior in order to adopt the AV	0.927***	4.818	1.602	-0.715	0.057

Trust (Kaur and Rampersad, 2018) α= 0.940					
AVs have enough safeguards to make me feel comfortable using them	0.911***	3.627	1.750	-0.011	-0.920
I feel assured that the government will protect me from problems with using AVs	0.892***	3.294	1.743	0.219	-0.980
I feel assured that private industry will protect me from problems using AVs	0.900***	3.426	1.776	0.118	-1.048
In general AVs provide a robust and safe mode of transport	0.918***	3.882	1.695	-0.239	-0.709
AVs can be trusted to carry out journeys effectively	0.873***	4.100	1.664	-0.350	-0.608
Resistance to AV (Hajiheydari et al., 2021; Wiedmann et al., 2011) α= 0.942					
I'm likely to be opposed to the use of AV	0.824***	4.094	1.867	0.083	-1.090
It's unlikely I use AV for transportation purposes	0.839***	4.167	1.917	0.006	-1.162
Using AV has been connected with too many uncertainties	0.876***	4.398	1.790	-0.205	-0.878
I would be making a mistake by using AV	0.915***	3.826	1.760	0.241	-0.816
In sum, using AV causes problems that I don't need	0.913***	4.046	1.789	0.084	-0.899
Fit measures: R2: 2247.695, df: 507, R2/df: 4.433; Comparative fit index (CFI): 0.925 (>0.9), Root mean square error of approximation (RMSEA): 0.072 (<0.08)					

Note: SFL: Standardised factor loading; α: Cronbach's alpha; ***: p<0.001.

3.2 Measurements

In the introduction part of the survey, instructions on the attributes of AV3 (partially automated) and AV5 (fully automated) were described to ensure that respondents were familiar with each level of AV (see Appendix C). Subsequently, they are randomly assigned to one of the AV levels (AV3 or AV5). Scale items were obtained from validated factors. AV benefits were measured using seven items adopted from Hohenberger *et al.* (2017), Myker *et al.* (2019), and Pettigrew et al. (2019). A sample item for AV benefits is "*AVs may decrease energy use and fuel emissions.*" AV stressors were gauged using eight items by Brell *et al*. (2019). A sample item for AV stressors is "*AVs are uncontrollable*." Five items for 'inspired by' and five items for 'inspired to' were adopted from Böttger *et al.* (2017). A representative item for the 'inspired by' construct is: "*My imagination can be stimulated by an AV experience*". For the 'inspired to' construct, a sample item is: "*I felt inspired to experience an AV*."

Adoption difficulty was measured using three items from (Lee & O'Connor, 2003). A sample item for Adoption difficulty is "*I think I would need to learn how to use the AV.*" Trust was measured using five items extracted from Kaur and Pamersad (2018). A sample item for trust is "*AVs can be trusted to carry out journeys effectively*." To measure psychological resistance to adopt AV, five items were used from Hajiheydari *et al.* (2021) and Wiedmann *et al.* (2011). A sample item for trust is "*I'm likely to be opposed to the use of AV*." Based on the level of intelligence, we measured the perception of participants on two levels of AVs (AV3 and AV5).

3.3 Analytical approach

We used the Harman single-factor test as a procedural remedy to check common method variance. The reliability of the scale items was checked using Cronbach's alpha test and composite reliability tests. We used Structural Equation Modelling (SEM) to conduct Confirmatory factor analysis (CFA) using AMOS 29 to evaluate the validity of the measurement model. We tested the proposed hypotheses using regression analysis by Hayes PROCESS Macro. Specifically, we used Model 6 to test sequential mediation hypotheses and Model 75 to test the moderation impact of AV levels (Hayes, 2017).

3. RESULTS OF EMPIRICAL STUDY

4.1. Results of measurement model testing

The results of the Harman single-factor test showed that common method variance is not a threat as the largest percentage of variance for the emerging factors was 20.27%, which is less than the commonly accepted level of 40% (Olya, 2023). The sources of items, descriptive statistics, and results of reliability and validity tests are shown in Table 2. Items are normally distributed with values for skewness and kurtosis falling within an acceptable range of ±3. The results indicated an acceptable level of reliability as the Cronbach's alpha values for the scales were greater than 0.7 (Pallant, 2001). All items were loaded sufficiently (>0.05) and significantly ($p<0.001$) under the respective scales. The results of CFA confirmed fit validity as a fraction of R^2 over df is 4.409 (<5), Comparative fit index (CFI) is 0.918 (>0.9), and Root mean square error of approximation (RMSEA) is 0.070 which is less than the recommended level of 0.08. Composite reliability (CR) results confirmed that study measures are reliable (CR value>0.7). Average variance extracted (AVE) values are larger than the commonly accepted level of 0.5, indicating convergent validity. The results of CFA confirm the discriminant validity of the measures, given that the square root of the AVE for all scales is more than the absolute value of the correlation values. Moreover, the AVE for all factors is more than the MSV (Table 2).

Table 2. The results of composite reliability and construct validity tests

Scale	CR	AVE	MSV	1	2	3	4	5	6	7
1.Trust	0.939	0.756	0.687							
2.Inspired to	0.978	0.899	0.699	0.829	**0.948**					
3.AV benefits	0.913	0.570	0.569	0.800	0.754	**0.755**				
4.AV stressors	0.883	0.592	0.579	-0.733	-0.695	-0.663	**0.720**			
5.Adoption difficulty	0.750	0.515	0.068	-0.139	-0.129	-0.043	0.260	**0.644**		
6.Inspired by	0.943	0.769	0.699	0.740	0.836	0.748	-0.609	0.029	**0.877**	
7.Resistance to AVs	0.942	0.764	0.579	-0.691	-0.714	-0.621	0.761	0.215	-0.612	0.874

Note: CR: composite reliability; AVE: average variance extracted; MSV: maximum shared variance; Square root of AVE for each scale is presented in the bold format.

4.2. Results of Hypothesis Testing

The results of regression analyses are illustrated in Figure 2. Trust builds significantly with AV benefits (b= 0.726, P< 0.001), but is significantly reduced by AV stressors (b= -0.632, P< 0.001). Therefore, H1a and H1b are supported. Trust makes consumers 'inspired by' AV (b= 0.567, P< 0.001), therefore H2 is supported. 'Inspired by' boosts 'inspired to' experience an AV (b= 0.601, P< 0.001), providing support to accept H3. H4 is supported as 'inspired to' decreases AV adoption difficulty (b=- 0.187, P< 0.001). Adoption difficulty increases resistance to AV (b= 0.177, P< 0.001), therefore H5 is also supported.

According to the sequential mediation test results, AV benefits reduce resistance to an AV by trust, 'inspired by' and 'inspired to,' and adoption difficulty ($b_{\text{indirect effect}} = -0.009$, Lower-level CI: -0.015; Upper-level CI: -0.005). Therefore, H6a is supported. The negative impact of AV stressors on resistance to AV is mediated by trust, 'inspired by,' 'inspired to,' and adoption difficulty ($b_{\text{indirect effect}} = -0.014$, Lower-level CI: -0.002; Upper-level CI: -0.013). Thus, Hypothesis 6b is supported.

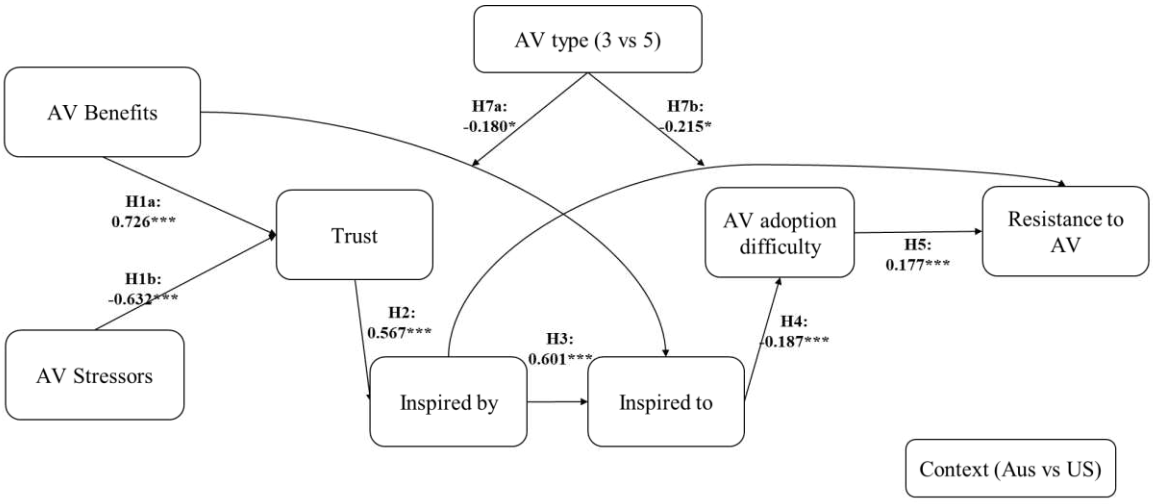


Figure 3. The results of hypotheses testing

AV level (AV3: partially automated vs AV5: fully automated) moderates the linkage between AV benefits and 'inspired to' (b=-0.184, p<.05, t=-2.426, LLCI: -0.332, ULCI: -0.036). Our hypothesis suggested that the levels of AV (AV3 vs AV5) positively moderate the relationship between AV benefits and feeling inspired to experience it. However, contrary to our assumption, the moderating effect was negative. Therefore, H7a is not supported. This implies

that consumers who perceive lower levels of AV (AV3) intelligence are more likely to feel inspired to experience them.

As illustrated in Figure 4, individuals felt 'inspired to' experience an AV3 (partially automated) compared to an AV5 (fully automated) when they perceived a higher benefit of the AV. Interestingly, AV level (reflecting the intelligence levels of AV), significantly moderates the effect of inspiration on resistance to AV (b= -0.215, P< 0.05, t=-2.179, LLCI: -0.408, ULCI: -0.021). H7b is therefore supported. The mean effect of 'inspired by' on resistance to AV is negatively moderated by AV level (AV3: partially automated vs AV5: fully automated). This means individuals are more 'inspired by' more intelligent AV5 technology which reduces resistance to AVs (Figure 4).

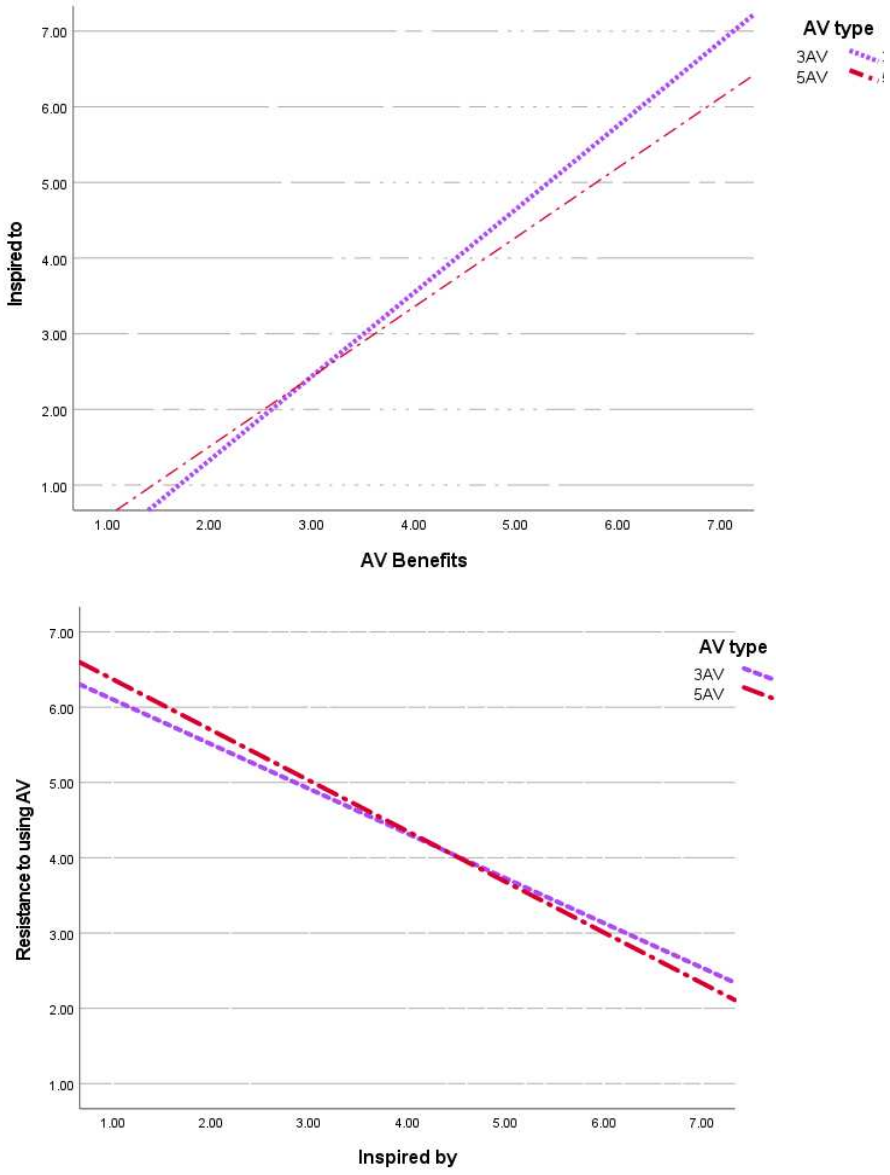


Figure 4. The moderation impacts of AV levels

We also conducted moderation tests of AV level to examine how its interaction with AV stressors and AV benefits influence inspiration. As shown in Appendix C, our analysis revealed that the interaction between AV stressors and AV level had no significant impact on inspiration. However, the interaction between AV level (1: Level 3, 2: Level 5) and AV benefits had a significant impact on inspiration. This suggests that the benefits of Level 3 AVs (compared to Level 5 AVs) have a greater effect on inspiring consumers (Appendix D). xxx

4. DISCUSSION AND CONCLUSIONS

Advances in artificial intelligence (AI) and Industry 4.0 technologies are revolutionising the way we live our lives. However, many consumers continue to be resistant to adopting innovative products and services. For example, fully autonomous vehicles (AVs) that require no human intervention offer proven technological benefits, as well as the potential to transform the travel landscape. However, their adoption has been slower than forecast. In this paper, we address gaps in research by utilising inspiration theory which emphasises the role of emotions and aspirations in shaping consumer attitudes and behaviors toward AVs.

Drawing on theoretical foundations from the literature on trust, customer inspiration, and resistance, we develop and test a theoretical model that assesses the sequential impacts of AV stressors and AV benefits, trust, 'inspired by'– 'inspired to' experience AV, adoption difficulty, and resistance to AV. We also investigate the moderating role of AV level on the impacts of AV benefits on 'inspired to' and the effect of 'inspired by' on resistance to AV.

Our results show that the perceptions of stressors and benefits of AV could reduce resistance to AV if consumers trust in AV, feel 'inspired by' AV, and perceive less adoption difficulty. We also found that the benefits of AV inspire consumers to experience less automated AV (AV3); however, consumers who trust in and are 'inspired by' more intelligent AV (AV5) show less resistance to AV. We suggest that manufacturers and marketers emphasize the benefits of AVs that inspire consumers. By fostering consumer inspiration through these benefits ("inspired by"), they can, in turn, motivate consumers to engage with AVs ("inspired to"), thereby facilitating the adoption process.

5.1 Theoretical contributions

The theoretical contributions of this study are twofold. First, this study advances the current knowledge of consumer behavior by developing and testing a new sequential theoretical model. Specifically, based on JTBD theory, we identified and measured AV benefits and AV stressors employed as antecedents of our conceptual model. We demonstrate that AV stressors and

benefits significantly impact consumer resistance to AV. In accordance with Davis (1989), our results demonstrate that AV benefits can indeed enhance trust in AV technology. In contrast to Claudy et al. (2015), who found no significant impact of reasons against adoption on attitudes toward adoption, our findings reveal that AV stressors reduce trust in AV. These insights offer a more nuanced understanding of the dual impact of benefits and stressors on consumer trust in emerging technologies.

These associations between AV benefits and AV stressors with resistance intention are sequentially mediated by trust, inspiration, and adoption difficulty. These findings are consistent with Sánchez-Prieto *et al.* (2019) and Cham *et al.* (2021), who suggest that the difficulty of adopting technology would impact the adoptive and non-adoptive intentions to use that technology. Although positive advances in AI technologies could contribute to AV adoption, increasing physical safety (Lee et al., 2019), there is resistance to AV, as they are not commonplace in the automobile industry (McLeay *et al*., 2022). We found that trust is a key driver of consumer inspiration, resulting in reduced adoption difficulty and resistance to using AVs.

The key findings both complement and contrast with existing literature. If consumers are 'inspired by' AV benefits, they can then be 'inspired to' experience AV, making it less challenging to adopt AV, which complements existing studies of consumer inspiration (Böttger *et al.,* 2017; Ki *et al.*, 2022). The findings further suggest that consumers who are 'inspired to' experience AVs show reduced resistance: an effect that, to our knowledge, has not been examined in the extant literature. If consumers are familiar with (knowledgeable about) the benefits of AV, they are likely to trust AV and find it less difficult to adopt (McLeay *et al.,* 2022). Conversely, consumers may lose trust due to various stressors, which in turn makes adopting AVs more difficult. Unlike previous studies that primarily focus on adoption rather than resistance (with some exceptions, e.g., Casidy et al., 2021; König and Neumayr, 2017), our findings suggest that when consumers perceive AV adoption as difficult, they exhibit greater resistance to AVs, that is, perceived difficulty increases resistance.

Second, this study extends the AV adoption literature by examining the moderation role of AV level (level of intelligence). Our results indicate that although consumers are 'inspired to' experience AV3 benefits, they express less resistance to AV5 that they felt 'inspired by'. This is in accordance with Huang and Rust's (2018) research, which states that more intelligent technologies are more user-friendly. These findings are also consistent with Huang and Qiaun (2021), who suggest that perceived benefits of AV would increase the adoption of AV due to the positive evaluation of AV even though the technology is still in its nascent stage.

Finally, this study enriches the AV adoption literature by investigating the level of AV (level of intelligence) as a moderating factor. Findings reveal that consumers are "inspired to" engage with mid-level AVs (AV3) yet exhibit less resistance to highly intelligent AV5 systems they felt "inspired by." This supports Huang and Rust (2018), who argue that intelligent technologies enhance user-friendliness, and aligns with Huang and Qian (2021), who suggest that perceived AV benefits increase adoption likelihood even at early development stages.

5.2. Managerial implications

Our findings also provide important managerial recommendations and suggest that consumers' perceptions of AV benefits and stressors significantly reduce adoption difficulty and resistance to AV if consumers trust and are 'inspired by' AV.

Accordingly, when launching AV on the marketplace, managers should focus on communicating the benefits of using AV and building trust to inspire consumers to experience AV. For instance, managers could clarify AV capabilities and focus on AV technology's novelty and design or additional AV entertainment capabilities (Erskine *et al.*, 2020). Another important implication is educating consumers regarding the capabilities and benefits of AV. Marketers should continually inform consumers of the facts about AV stressors, such as safety features and roadworthiness, especially for consumers who have high-risk barriers and are hesitant to use AV (Gill, 2021). The trialability of AV would be an important factor to consider, as both indirect and direct experiences are important for inspiration (Rogers, 2003). Providing more hands-on experiences with an AV will likely reduce the technostress, improve adoption, and decrease resistance to AV. Finally, given the newness of the revolutionary technology, only a small percentage of innovative consumers are likely to adopt AV initially.

Thus, focusing on these consumers would be crucial as they may become trailblazers (or ambassadors) for the technology. They can shape the dispersed information, possibly influencing much of the remaining population (Erskine et al., 2020). We recommend that manufacturers invest in advancing AV intelligence to provide solutions that reduce the impact of adoption difficulty on resistance to AV.

5.3. Limitations and Future Research Directions

This study offers valuable insights but has several limitations that suggest directions for future research. The use of cross-sectional data limits the applicability of the findings; a longitudinal approach could enhance reliability and capture changes over time. This study employed a survey-based approach to test the proposed model. We recommend future research utilises

experimental methods to manipulate the impact of inspiration on consumer behavioral outcomes. Additionally, the study focused on the US and Australian markets, representing only two of the core Anglosphere countries (Australia, Canada, New Zealand, the UK, and the USA). Expanding to other cultural contexts – such as Latin countries (e.g., France), where eco-activists raise concerns about non-recyclable components in AVs (cf., S&P Global Mobility, 2023), or the BRIC nations (Brazil, Russia, India, and China) – could yield diverse perspectives on AV adoption. Further investigation into the model's relevance for service innovations (Joachim et al., 2018) is also warranted. Lastly, research into individual factors like consumer innovativeness (Roehrich, 2004), technology readiness (Parasuraman, 2000), and perceived risk and uncertainty (Herzenstein et al., 2007; Hoeffler, 2003) could offer valuable insights into adoption patterns.

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