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Retraction

Retracted: A Study on Factors Influencing the Use of Unmanned Driving Technology Based on TAM Model

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This article has been retracted by Hindawi following an investigation undertaken by the publisher [1]. This investigation has uncovered evidence of one or more of the following indicators of systematic manipulation of the publication process:

(1) Discrepancies in scope

(2) Discrepancies in the description of the research reported

(3) Discrepancies between the availability of data and the research described

(4) Inappropriate citations

(5) Incoherent, meaningless and/or irrelevant content included in the article

(6) Manipulated or compromised peer review

The presence of these indicators undermines our confidence in the integrity of the article's content and we cannot, therefore, vouch for its reliability. Please note that this notice is intended solely to alert readers that the content of this article is unreliable. We have not investigated whether authors were aware of or involved in the systematic manipulation of the publication process.

In addition, our investigation has also shown that one or more of the following human-subject reporting requirements has not been met in this article: ethical approval by an Institutional Review Board (IRB) committee or equivalent, patient/participant consent to participate, and/or agreement to publish patient/participant details (where relevant).

Wiley and Hindawi regrets that the usual quality checks did not identify these issues before publication and have since put additional measures in place to safeguard research integrity.

We wish to credit our own Research Integrity and Research Publishing teams and anonymous and named external researchers and research integrity experts for contributing to this investigation.

The corresponding author, as the representative of all authors, has been given the opportunity to register their agreement or disagreement to this retraction. We have kept a record of any response received.

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[1] L. Meng and T. Dong, "A Study on Factors Influencing the Use of Unmanned Driving Technology Based on TAM Model," *Security and Communication Networks*, vol. 2022, Article ID 6861323, 6 pages, 2022.

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Research Article

A Study on Factors Influencing the Use of Unmanned Driving Technology Based on TAM Model

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Unmanned driving technology, as an emerging digital, intelligent technology that is future-oriented, provides practical solutions to a number of transport issues. Compared with traditional manual driving, unmanned driving technology features higher entertainment and conformity, as well as higher risks and new types of cost. To study user acceptance of unmanned driving technology, the paper makes an analysis of statistical significance and regression, with a number of factors as independent variables, including perceived usefulness and perceived ease-of-use (as required by TAM), and perceived enjoyment, perceived risk, perceived cost, and conformity (extension of TAM), and usage intention as dependent variables. The results show the acceptance degree of different factors of driverless technology and provide suggestions for the development of more acceptable driverless functions by users.

1. Introduction

The autonomous vehicle ensures a more smooth mobility in the future. The technology could alleviate heavy traffic, reduce emissions, make parking easier, and reduce the costs of transport, new road, and infrastructure. It could also benefit older persons and persons with disabilities.

In terms of functionality and operational convenience, autonomous driving falls into five levels ranging from 0 (manual driving) to 5 (high automation). Most vehicle manufacturers now focus on Level 2, at which vehicles are equipped with assistance functions for motor steering and acceleration. Drivers of such vehicles are able to be freed from some tasks, but they must be prepared for controlling the vehicle in case of emergency. Meanwhile, they are responsible for most critical security functions and the full surveillance of surroundings.

In terms of enjoyment and fashion, among all the technologies in the world, unmanned driving technology is in the spotlight. Its R&D has been unfolded across high-tech companies based in Silicon Valley, emerging tech startups, and large vehicle manufacturers. The technology also arouses attention and curiosity among the public.

In terms of risk and cost, however, unmanned driving technology is challenged by multiple issues, especially those related to security. The world has seen a lot of incidents caused by the Level 2 autonomous vehicle, even the death of drivers, pedestrians, and traffic policemen. Take the autonomous vehicle of an American manufacturer, for example. In 2021, it has been involved in a number of road accidents in China. On February 21, due to brake failure, it rear-ended two other cars on 341 National Highway, Nanyang, Henan Province. On March 11, it hit the wall for the similar reason in Haikou, Hainan. In another crash that happened on May 17, it ran into two traffic policemen, one of whom died. These accidents, coupled with many consumer rights campaigns against the manufacturer, have triggered hot debate online.

Hence, it is worth studying the public's acceptance of unmanned driving technology and relevant considerations, including functionality, convenience, enjoyment, risk, and cost.

2. Research Model and Research Hypotheses

2.1. Research Model. The technology acceptance model (TAM) is an extension of the theory of reasoned action (TRA), proposed by Davis in 1989 [1]. It focuses on user attitude and behavioral intention to use the new technology. What TAM focuses on and its scope can help us analyze users' attitude towards autonomous driving and their behavioral intention, as well as factors affecting the use of this feature.

TAM suggests that behavioral intention determines specific user behaviors and attitudes to use the new technology and is determined by perceived usefulness and perceived ease of use. Perceived usefulness refers to the degree to which a person believes that using the technology would enhance his/her job performance, and perceived ease-of-use refers to the degree to which a person believes that using the technology would be free from effort. Regarding autonomous driving, perceived usefulness means the user believes the feature can upgrade his/her driving skills and experience to a certain extent, and perceived ease of use means the convenience of operation. Both of them will affect the use of the feature.

2.2. Research Hypotheses

2.2.1. TAM-Based Hypothesis. Perceived usefulness and perceived ease of use are one of the most important indicators of the TAM model. It explains whether the practicality and ease of use of new technologies affect users' purchase intention. For unmanned driving technology, perceived usefulness refers to whether unmanned driving technology has actual functions or efficiency improvement for people's driving, while perceived ease of use reflects the difficulty of operation of unmanned driving technology. Therefore, we make the following assumptions:

H1: perceived usefulness has a significant positive impact on purchase intention.

H2: perceived ease of use has a significant positive impact on purchase intention.

2.2.2. Perceived Enjoyment-Based Hypothesis. In their 2014 research on the fully automated car, Payre et al. found that the pursuit of driving-related sensation also has an important impact on the use of the technology [2]. An enjoyable driving experience may lead to much higher user acceptance. In an era when people consider science and technology as the primary productive force, the use of new technology during the transition towards a digital society also draws great attention. Therefore, to what extent does autonomous driving, as a novel and trendy technology, impact users' choice is worthy of study. Hypothesis is as follows:

H3: perceived enjoyment has a significant positive impact on purchase intention.

2.2.3. Perceived Risk-Based Hypothesis. To use a new technology to challenge existing lifestyle, it is necessary to take into account perceived risk. Jansson has discussed safety and privacy in relation to autonomous driving, which unquestionably are factors hindering the use of the technology [3]. Zhang and others considered that initial trust and two types of perceived risk, that is, perceived safety risk (PSR) and perceived privacy risk (PPR), constitute key determinants of autonomous vehicle acceptance. Individuals, society, and surveillance & regulation bodies shall always have an eye for personal security regarding the use of autonomous driving technology [4]. Hypothesis is as follows:

H4: perceived risk has a significant negative impact on purchase intention.

2.2.4. Perceived Cost-Based Hypothesis. Tang found that people are not very enthusiastic about paying additional bills for using autonomous driving technology [5]. After all, vehicle purchase and use are already expensive. Facing the option to apply this novel technology, users need to take the cost into account. Once the technology is applied, some paid assistance features are also required. If the user considers the cost too high, he/she may refuse such service. Hypothesis is as follows:

H5: perceived cost has a significant negative impact on purchase intention.

2.2.5. Conformity-Based Hypothesis. Conformity refers to the process whereby people change their minds or behaviors under outside influences. According to research findings, online consumers of digital technology are more likely to conform to others. Generally speaking, the more people around them drive autonomous vehicles, the more willingly consumers would use the function. The growing market share of new energy vehicles and the brand-new vehicles equipped with digital technology is playing an imperceptible yet transformative role in motivating people to buy such cars. Hence, the impact of conformity on use intention must be considered. Hypothesis is as follows:

H6: conformity has a significant positive impact on purchase intention.

3. Scale Design and Data Collection

3.1. Scale Design. Building on the R&D results of TAM, and combining the features of unmanned driving technology, the paper designs measurement items for each variable of the theoretical model and eventually develops a measurement item list as shown in Table 1. The study applies the questionnaire method to validate the research model. The questionnaire falls into two parts. The first part involves the demographics of the respondents, including gender, age, education background, and driving experience. The second part involves the measurement items of all variables in the research model, each rated by the 5-point Likert scale. The survey was conducted online, and 301 copies of the effective questionnaire were withdrawn. Demographic statistics of the respondents show that there is an almost even split between males (about 50%) and females (about 50%), and the 25–40 age group is the largest. Most respondents have received vocational education or undergraduate education.

Table 1: Questionnaire.

Variable	No.	Measurement item	Source
Perceived usefulness	YA1	Autonomous driving (AD) is helpful when I'm too exhausted to drive.	Fagnant D. J. [6]
	YA2	The superiority of AD meets my needs when I drive.	
	YA3	AD and manual driving can both satisfy my needs.	
	YA4	AD enables people with poor driving skills to avoid potential accidents.	
Perceived ease of use	YB1	With AD, instead of MD, drives become more relaxed physically and mentally.	C. F. Chen [7]
	YB2	AD is easier to use than MD.	
	YB3	AD is easier to learn than traditional MD.	
	YB4	I'm proficient in operating the phone and other systems supporting AD.	
Perceived enjoyment	YC1	AD brings me a new experience.	Payre W. [2]
	YC2	AD can ease my driving stress.	
	YC3	I'll enjoy AD's high-tech vibe.	
	YC4	The AD-oriented trend is bound to sweep the world.	
Perceived risk	YD1	I'm afraid AD has security issues.	J. Jansson [3]
	YD2	I'm afraid AD might be out of control.	
	YD3	I'm afraid AD might be hacked.	
	YD4	I'm afraid bad communications network and other factors might influence driving.	
Perceived cost	YE1	AD increases the cost of the vehicle.	Krueger [8]
	YE2	I need to pay for more vehicle software service if I apply AD.	
	YE3	AD's unpredictability will result in more traffic accident requiring damages.	
	YE4	I have to learn more emergence responses if I apply AD.	
Conformity	YF1	I'd like to have a try if someone I know has an AD vehicle.	Zhang [9]
	YF2	I'll accept AD if it is used by most of the public.	
	YF3	I'd like to have a try if someone I know speaks high of it.	
	YF4	I think AD is cool.	
Intention to use	YG1	I'll buy an AD vehicle.	Gefen D. [10]
	YG2	I'll add AD feature to my vehicle.	
	YG3	I'll depend on AD more than MD.	

Table 2: Test of reliability and validity.

Second-level indicator	Number of terms	Cronbach's alpha	Kaiser–Meyer–Olkin	Statistical significance	Chi-square	Degree of freedom
Perceived usefulness	4	0.892	0.839	0.000	701.463	6
Perceived ease of use	4	0.947	0.800	0.000	1321.927	6
Perceived enjoyment	4	0.972	0.861	0.000	1737.610	6
Perceived risk	4	0.993	0.845	0.000	3129.441	6
Perceived cost	5	0.990	0.907	0.000	3432.655	10
Conformity	4	0.966	0.838	0.000	1585.521	6
Intention to use	3	0.901	0.756	0.000	581.878	3

A majority of them have a driving experience of two years or above.

4. Result Analysis

4.1. Analysis of Reliability and Validity. Reliability refers to the consistency or stability of a measure [11]. The study applies Cronbach's alpha to check the reliability of the measurement model. In the fundamental research, Cronbach's alpha value of 0.70 or higher indicates a good data reliability, which can be used for further analysis. The reliability results of the paper are shown in Table 2. Cronbach's alpha value of each factor is higher than 0.70 [12, 13], indicating that the measure is reliable.

Validity refers to the extent to which the measuring tools accurately measure what they are supposed to measure, including content validity and structure validity. Since the questionnaire of the study is designed based on measurement items adopted by the previous study, the content has a strong validity. The study applies Kaiser–Meyer–Olkin (KMO) and Bartlett's test of sphericity to check structure validity, with the KMO value of each variable higher than 0.7 [14], and Bartlett's test value is significant. Both reliability and validity are significant, and this indicates that each variable in the measurement model has great structure validity [15].

4.2. Analysis of Correlation and Regression. The paper conducts a Pearson correlation analysis of six factors including perceived usefulness, perceived ease-of-use, perceived enjoyment, perceived risk, perceived cost, and conformity, as well as the use intention factor. Analysis results are shown in Table 3. Obviously, perceived usefulness and perceived ease of use have an insignificant correlation with intention to use while, for other factors, the impact is significantly positive.

Table 3: Variable correlation.

Variable		Perceived usefulness	Perceived ease of use	Perceived enjoyment	Perceived risk	Perceived cost	Conformity	Intention to use
Perceived usefulness	Pearson correlation	1	0.499	0.044	−0.052	−0.017	−0.044	0.020
	Sig. (2-tailed)		0.000	0.444	0.367	0.775	0.450	0.724
	Number of cases	301	301	301	301	301	301	301
Perceived ease-of-use	Pearson correlation	0.499	1	0.090	0.001	−0.046	−0.007	0.007
	Sig. (2-tailed)	0.000		0.121	0.980	0.425	0.910	0.903
	Number of cases	301	301	301	301	301	301	301
Perceived enjoyment	Pearson correlation	0.044	0.090	1	−0.100	0.009	0.349	0.306
	Sig. (2-tailed)	0.444	0.121		0.082	0.872	0.000	0.000
	Number of cases	301	301	301	301	301	301	301
Perceived risk	Pearson correlation	−0.052	0.001	−0.100	1	−0.014	−0.115	−0.249
	Sig. (2-tailed)	0.367	0.980	0.082		0.807	0.046	0.000
	Number of cases	301	301	301	301	301	301	301
Perceived cost	Pearson correlation	−0.017	−0.046	0.009	−0.014	1	0.087	−0.244
	Sig. (2-tailed)	0.000	0.000	0.000	0.000		0.000	0.000
	Number of cases	301	301	301	301	301	301	301
Conformity	Pearson correlation	−0.044	−0.007	0.349	−0.115	0.087	1	0.517
	Sig. (2-tailed)	0.450	0.910	0.000	0.046	0.132		0.000
	Number of cases	301	301	301	301	301	301	301
Intention to use	Pearson correlation	0.020	0.007	0.306	−0.249	−0.244	0.517	1
	Sig. (2-tailed)	0.724	0.903	0.000	0.000	0.000	0.000	
	Number of cases	301	301	301	301	301	301	301

Table 4: Regression results with intention to use as the dependent variable.

Independent variable	Standardized regression coefficient	T-value	Statistical significance	Significant or not
Perceived usefulness	0.020	0.354	0.724	No
Perceived ease of use	0.003	0.053	0.958	No
Perceived enjoyment	0.321	5.864	0.000	Yes
Perceived risk	−0.244	−4.357	0.000	Yes
Perceived cost	−0.246	−4.388	0.000	Yes
Conformity	0.529	10.786	0.000	Yes

Table 5: Summary of hypothesis testing.

Hypothesis	Content	Yes or no
H1	Perceived usefulness has a significant positive impact on intention to use	No
H2	Perceived ease of use has a significant positive impact on intention to use	No
H3	Perceived enjoyment has a significant positive impact on intention to use	Yes
H4	Perceived risk has a significant negative impact on intention to use	Yes
H5	Perceived cost has a significant negative impact on intention to use	Yes
H6	Conformity has a significant positive impact on intention to use	Yes

In addition, regression results of each independent variable and intention to use as the dependent variable are shown in Table 4. Regression results of other hypotheses are shown in Table 5.

4.3. Summary of Hypothesis Testing Results. The results of hypothesis testing are included in Table 5, which, together with the above analyses, confirm the relationship between variables of the theoretical model constructed in the paper.

5. Analysis and Conclusion

Surprisingly, in terms of the analysis results of statistical significance and regression, perceived usefulness and perceived ease-of-use have no correlation and regression relationship with unmanned driving technology. On the contrary, perceived enjoyment and conformity have a significant positive impact on the technology. Also, perceived risk and perceived cost have a significant negative impact. In this regard, currently, what drives people to accept unmanned driving technology, a new technology that is novel and trendy, is mainly enjoyment and conformity. Its popularization also motivates more people to have a try. Risk and cost constitute two major barriers for acceptance. Usefulness and ease of use, that is, functionality and convenience, are not critical factors for now [16].

It is surprising that perceived usefulness and perceived ease of use are not the acceptable factors when people use the self-driving technology, for they are the most important indicators of the technology acceptance model. But if we return to the original problem analysis, which is what, after all, attracts new users trying to use self-driving technology, it can be found that the interest and user experience of unmanned driving technology are the most important factors in this period of time. However, with the popularization of autonomous driving technology, the usefulness and ease of use of unmanned driving technology will eventually become significant factors for people to accept it.

Regarding the risk and cost of unmanned driving technology, users' top concerns are privacy security [17], driving safety, communications stability, and software cost. On the one hand, for companies seeking for technological improvement, these concerns may be inspiring. On the other hand, they will hinder the universal access to this technology. More importantly, companies in the sector shall carry out in-depth research so as to make the technology's functions more useful and easier to use. Though research shows that regarding this novel technology, currently usefulness and ease of use have less impact on users, it can never win over and retain users by its novelty in the long run [18]. This poses challenges to companies.

In conclusion, unmanned driving technology will be a new trend in the future. At the current phase, it has already become a focus of high-tech companies. Once it is mature, we will see the technological transformation and industrial restructuring in vehicle manufacturing, transport, energy, entertainment, and other industries [19]. However, user attitude from the survey indicates that people will not get rid of manual driving and turn to driverless vehicles just because of the functionality and convenience of unmanned driving technology. What lies behind this shift now are novelty and conformity. But the pattern will change. While functionality and convenience lack attraction, cost and risk are negative factors that require users' consideration. The two also impede the popularization of unmanned driving technology. Relevant companies may conduct targeted improvement of unmanned driving technology based on this study, which is informative for the technology's large-scale application.

Data Availability

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Conflicts of Interest

The authors declare no conflicts of interest.

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