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Research Article

The Effect of Consumer Resistance and Trust on the Intention to Accept Fully Autonomous Vehicles

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Fully autonomous vehicles are a new technology that is expected to be widely accepted by consumers because of their various advantages. This study examined consumers' intention to accept fully autonomous vehicles based on trust and resistance. To this end, consumer data were analyzed by integrating the innovation resistance model and the technology trust model. The subjects of the survey were 400 drivers between the ages of twenty and sixty-nine. As a result of the study, variables related to the "technical characteristics" of fully autonomous vehicles affected the resistance. On the other hand, "experiential characteristics" were confirmed to affect trust. Second, consumers with a high innovation propensity are more likely to accept fully autonomous vehicles when they are commercialized in the future. Third, it was found that resistance had a negative effect and trust had a positive effect on consumers' intention to accept fully autonomous vehicles. Therefore, for consumers to accept these, technology should be developed in the direction of removing factors affecting resistance and providing factors increasing trust. As such, consumers have anxiety and concerns as well as expectations, even though they have not yet experienced a fully autonomous vehicle. In particular, since fully autonomous vehicles completely change the existing driving paradigm, more careful consideration is required in the diffusion of this technology.

1. Introduction

Advances in technology have completely changed the lives of consumers. An unprecedented amount of data is being produced in human life, and the range of objects equipped with computer functions is gradually expanding. In addition, the development of artificial intelligence is encroaching on the realm that has been led by humans, and that realm has expanded to learn and think like humans. As such, various types of new technologies are being introduced in every field, such as manufacturing, architecture, finance, education, and medical care, and they are changing the world.

In the early days, it has been argued that technology is simply composed of knowledge such as machines and techniques. However, recently, technology is also related to cultural characteristics and values. Moreover, it is common to think that technology has become a part of consumers' lives. Therefore, the importance of analyzing human behaviors related to technology, such as the ability to use it, is emerging. In this respect, it is necessary for consumers to flexibly accept the introduction of technology, which is an inevitable trend of the times, and to have the ability to fully utilize the technologies that can enhance convenience in their lives. In addition, developers should consider consumer-oriented aspects when developing technology.

In this context, it is necessary to study the use of new technologies by consumers. Consumers' acceptance of new technology is a decisive indicator that determines the success or failure of technology. While complex technologies such as autonomous vehicles, Fintech, and IoT proliferate into more everyday contexts, it will become increasingly important to study the factors that influence consumers' acceptance of new technologies in real-world settings.

Autonomous vehicles are an innovative technology that is expected to be widely accepted. They will offer several benefits to consumers and completely change their driving

paradigms. In particular, autonomous vehicles can reduce traffic accidents by eliminating or minimizing human errors that can occur in manual driving. In addition, it can reduce the stress that the driver receives from driving situations such as forward gaze and surrounding vigilance, and it will be possible to use the time devoted to driving more productively [1]. Lastly, there are issues regarding the cognitive and judgment ability of older drivers. In South Korea, some local governments carried out a movement to return older driver's licenses. In this context, autonomous vehicles make it possible for older drivers to regain their freedom of movement by maintaining their driving rights. In addition, it is expected to create various socioeconomic effects by providing mobility convenience to vulnerable groups such as the disabled, the elderly, and children. Despite the benefits that the introduction of fully autonomous vehicles will bring to consumers, autonomous vehicles still have many worries related to ethical compass and privacy.

Looking at the research trends in autonomous vehicles so far, technology-related research in the engineering field is dominant [2, 3]. For the new technology to be sustainable, it must be accepted first by consumers. The same is true of innovative technologies called autonomous vehicles. Hence, this study analyzes consumers' acceptance of fully autonomous vehicles, focusing on trust and resistance. Based on the analysis, we intend to contribute to deriving consumer-oriented implications for the direction that fully autonomous vehicles should take.

2. Theoretical Background

2.1. Autonomous Vehicles. An automated driving system (ADS) refers to automation equipment, software, and all the related devices that allow the vehicle to be driven by recognizing and judging the surrounding conditions and road information without the manipulation of the driver or passengers [4]. The society of automotive engineers (SAE) subdivided the autonomous driving system into a total of six levels, from zero to five, through the classification and definition of terms related to driving automation systems for on-road vehicles [5].

Level 4 or 5 automation is considered a fully autonomous vehicle that is responsible for not only general driving situations but also emergencies. This is the point where there is a difference in technical characteristics and distribution of driving tasks, even though both level 3 and 4 automations are classified as autonomous vehicles. The SAE said that during an emergency in dynamic driving, level 3 automation transfers control of the vehicle to the drivers. On the other hand, in the case of level 4 and 5 automation, they take direct action without transferring control. This classification has legal significance in addition to differences in driving subjects, distribution of driving tasks, and application of technology. It is important, for example, when determining whether drivers are free from their duty of care for safe driving. It can also be used to determine the scope of ADS and ADSE liability in the event of an accident [6]. Therefore, in this study, a fully autonomous vehicle is defined as "an autonomous vehicle with at least level 4 driving automation that does not transfer vehicle control to the driver (passenger) even in an emergency."

2.2. Technology Trust Model. It is known that trust is one of the important factors that precede the acceptance of automation systems based on consumers' perceived beliefs [7–11]. Mayer et al. [12] defined this trust as positive expectations of outcomes or positive characteristics of future behavior. In other words, if trust is formed in automation, consumers' intention to accept the automation system increases. Conversely, if trust is not formed, consumers may not adopt the technology. Accordingly, the latest technology adoption studies focus on trust as an important driver of technology acceptance intention [13].

Among them, trust is a more important variable, especially for fully autonomous vehicles. Fully autonomous vehicles are a technology that is not currently being widely used by general consumers. Thus, trust is essential to encourage consumers to easily adopt these innovations, even in unpredictable circumstances. One of the characteristics of trust is that it helps individuals understand the social environment of technology and reduces vulnerability in uncertain situations [12]. Consumers can gain trust in technology through interactions with it [14–16]. However, in the case of fully autonomous vehicles, unlike nonautomated vehicles, there is a difference in the process of trust formation. This is because there is a paradigm shift in the way they interact with technology as the driver indirectly intervenes in driving. Therefore, trust in fully autonomous vehicles should be considered an important factor in acceptance.

In this regard, various studies and conceptual models based on the technology acceptance model (TAM) have been proposed to understand the importance of trust factors for technology adoption. Among them, the technology trust model presented in the study of AlHogail [17] is representative, which constituted a model based on the socio-psychological perspective by combining the two key factors of TAM, namely, ease of use and usefulness, with other factors that can influence the formation of trust for acceptance [18]. The details of the technology trust model are shown in Figure 1.

Based on prior research, it has been established that both innovation characteristics and consumer characteristics can have a significant impact on the level of trust that consumers place in fully autonomous vehicles. However, the nature and extent of this influence may vary depending on a number of factors. With this in mind, this dissertation aims to test a series of research hypotheses designed to explore the relationship between innovation characteristics, consumer characteristics, and trust in fully autonomous vehicles among consumers. By analyzing these factors, the study aims to deepen our understanding of the key drivers of consumer trust in this emerging technology and to offer insights that can help inform the development of more effective strategies for promoting its adoption.

H1: the innovative characteristics of fully autonomous vehicles and consumer characteristics will affect trust

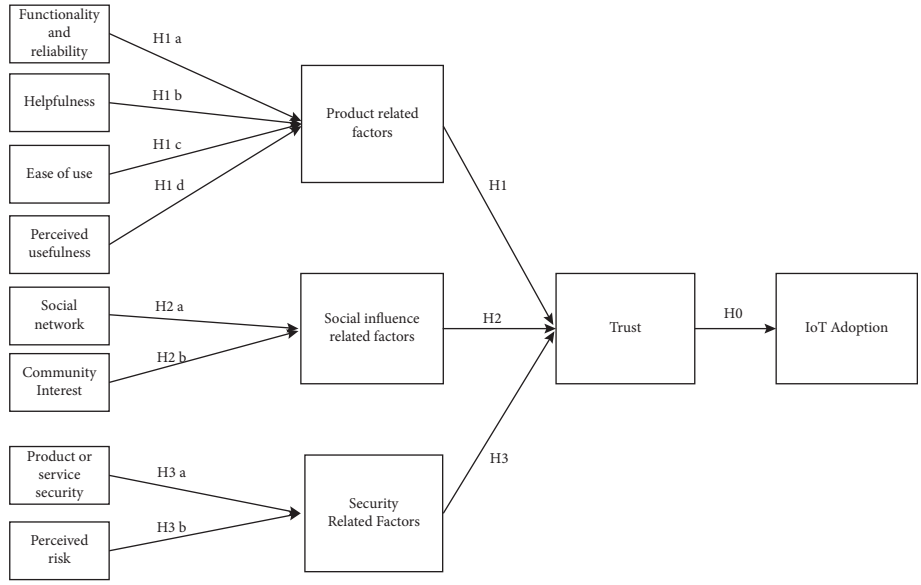

Figure 1: Technology trust model [17].

2.3. Innovation Resistance Model. Previous research on innovation has been mainly limited to the perspective of adoption and diffusion [19], and it has been pointed out that the reasons why consumers resist innovation were overlooked. In addition, there was a limitation where it was difficult to explain consumers' resistance to and rejection of innovation, such as the high failure rate of new products in the market [20–22]. The reason for this is that previous studies were mainly based on proinnovation bias and assumed that innovation is positive for consumers and is definitely improved compared to the existing products [21, 23, 24]. Therefore, some scholars have suggested that to understand consumers' acceptance of innovations, they should pay attention to resistance, which is the negative side of the change that acceptance brings. In addition, as technology advances, it becomes more complex and professional. Thus, the importance of resistance to innovation is emphasized because the psychological burden of consumers is increasing in accepting innovation [25].

Sheth [21] first introduced the concept of innovation resistance. It refers to consumers' resistance to changes by innovation. Several theories of psychology explicitly deal with resistance to changes [26, 27], suggesting that consumers tend to maintain their current state by resisting rather than choosing changes that may arise from innovation adoption [28]. Thus, resistance can be seen as a general consumer response to change resulting from innovation [20, 28].

Accordingly, Ram [20] specified the innovation resistance model based on the innovation diffusion theory and classified innovation resistance factors into three categories: innovation characteristics, consumer characteristics, and characteristics of propagation mechanisms. In this process, the greater the consumer's resistance to innovation, the slower the acceptance period. The process by which the three main factors of innovation diffusion influence innovation resistance is as follows: at first, consumers are exposed to innovation through one or more of several dissemination mechanisms. When consumers detect high-level changes in the use of innovation, they resist it. For adoption, companies should revise their innovations to reduce consumer resistance. If innovation is not modified, consumer resistance will not be overcome, and adoption will be rejected. If it is modified, a new version of it is again exposed to consumers. As a result, innovation repeats cycles leading to acceptance or failure.

Based on the existing research, it can be inferred that resistance to fully autonomous vehicles can be influenced by both innovation and consumer characteristics. In order to investigate this further, we proposed a research hypothesis aimed at examining the relationship between innovation characteristics, consumer characteristics, and resistance to fully autonomous vehicles among consumers.

> H2: the innovative characteristics of fully autonomous vehicles and consumer characteristics will affect resistance

2.4. Integration of Innovation Resistance Model and Technology Trust Model. Although the innovation resistance model more systematically explains the acceptance of technology, including resistance, which is a negative attitude toward change caused by innovation, the importance of trust-related factors has increased recently [29]. In particular, since consumers' attitudes are ambivalent in that they reflect both positive and negative emotions toward technology [30], a trust variable, meaning a positive attitude as a concept opposite to resistance, was added. Accordingly, in this study, we integrated the existing innovation resistance model and technology trust model to check the effect of consumers' ambivalence toward innovative technology on acceptance.

First, the innovation resistance model and the technology trust model can be integrated into one model based on the similarity of the progress path. Both models start with

consumers' perceptions of innovative technology, form a positive or negative attitude towards technology, and then go through the process of deciding whether to adopt the technology based on this. Therefore, it can be seen that it is largely composed of three stages: cognition, attitude, and acceptance. Next is the similarity between the variables of the two models. AlHogail [17] suggested that the ease of use and perceived usefulness among product-related factors in the technology trust model influence trust. It was found that the ease of use and perceived usefulness have similar aspects to the relative advantages and complexity of the innovation diffusion theory mentioned above [25]. Therefore, it suggests that the factors that constitute the innovation characteristics of the innovation resistance model can also be connected to trust. Next, factors related to the social influence of the technology trust model have similar characteristics to trialability and observability among the innovation characteristics of the innovation resistance model. It can be inferred that both factors of innovation characteristics can also be linked with trust in terms of reducing uncertainty about new technologies and leading to technology adoption by observing other consumers. Perceived risk, added as a variable influencing innovation adoption by Ostlund [31], refers to purchase-related uncertainties or negative outcomes after purchase. This is similar to security-related factors of the technology trust model in that it refers to the risk consumers have due to technology uncertainty. Accordingly, it is confirmed that perceived risk among the innovation characteristics of the innovation resistance model can also be linked to trust.

Regarding this integrated model, trust and resistance, as well as innovation characteristics and consumer characteristics, have been shown to affect acceptance intention, and the degree and direction of influence are expected to appear differently depending on each factor. Therefore, in this study, the following research hypotheses were established to check how innovation and consumer characteristics, trust, and resistance affect consumers' acceptance of fully autonomous vehicles.

H3. the innovation characteristics and consumer characteristics will affect the acceptance intention of fully autonomous vehicles

H4. trust and resistance will affect the acceptance intention of fully autonomous vehicles

Moreover, it is anticipated that trust and resistance would function as mediators in the correlation between consumers' perceptions of fully autonomous vehicles and their intention to accept them. In light of this, the following research hypotheses have been formulated:

H5-1 trust in fully autonomous vehicles will mediate the relationship between innovation characteristics, consumer characteristics, and acceptance intention

H5-2. resistance to fully autonomous vehicles will mediate the relationship between innovation characteristics, consumer characteristics, and acceptance intention

In conclusion, by integrating the innovation resistance model and the technology trust model, we aimed to provide a comprehensive understanding of consumers' acceptance of fully autonomous vehicles. This study has the potential to shed light on the specific factors that drive consumer acceptance of these vehicles [25, 32, 33].

3. Materials and Methods

The purpose of this study is to analyze consumers' perceptions of fully autonomous vehicles. Also, we aim to investigate the effects of driving characteristics, innovation characteristics, and consumer characteristics on resistance, trust, and acceptance of fully autonomous vehicles. Accordingly, by combining the innovation diffusion resistance model and the technology trust model, we developed a research model and hypotheses, and conducted the survey based on "fully autonomous vehicles." A research model was constructed as shown in (Figure 2). Specifically, we analyzed the effect of resistance or trust, which is the attitude of consumers towards the changes that the use of technology will bring, on acceptance intentions. Among them, this study focused to identify the factors affecting trust, a parameter predicted to play an important role in consumer acceptance of fully autonomous vehicles, and to verify the role of trust in the model.

4. Results

4.1. General Characteristics of the Study Subjects. This study conducted a consumer survey to analyze consumers' perceptions of fully autonomous vehicles. The subjects of the survey were 400 consumers between the ages of twenty and sixty-nine living in Seoul, South Korea, and the survey was conducted in consideration of age, gender, and educational background. The study considered only consumers with driving experience. Excluding insincere responses, a total of 400 subjects were included in the final analysis.

4.2. Exploratory Factor Analysis

4.2.1. Validity and Reliability Verification. Exploratory factor analysis (EFA) was performed to analyze the validity of the measurement tool. In addition, discriminant validity analysis was performed as a method to examine construct validity, and the maximum likelihood estimation method was used for discriminant validity analysis. Factor rotation was performed through direct Oblimin rotation, which is a square rotation method. As a result of the analysis, items that were classified by overlapping with various factors appeared, so the analysis was performed again except for the items. As a result, the validity of the extracted factors was secured, and the factors and measurement items were used as observation variables for structural equation model analysis for later hypothesis testing.

Next, Cronbach's α coefficient was checked to test the reliability of the measurement items constituting the factor. As a result of the analysis, all items showed the reliability of 0.7 or higher, indicating that there was internal consistency.

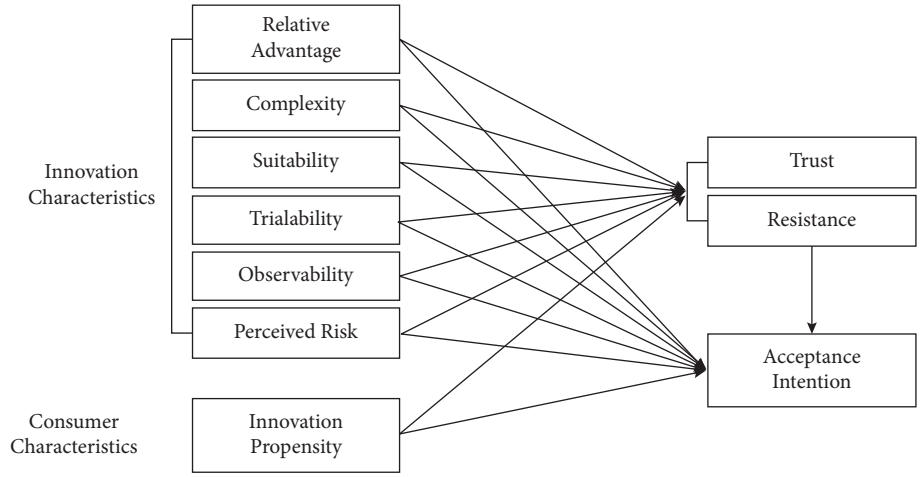

Figure 2: Research model.

Table S1 in the Supplementary Materials shows the results of the exploratory factor analysis and reliability test.

4.3. Assessment of the Measurement Model. Confirmatory factor analysis (CFA) verifies the relationship between latent variables and observed variables and the relationship between latent variables and is used to measure construct validity because it can assess the overall fit of the structural equation model [34]. Therefore, in this study, to verify the measurement model based on the sample, CFA was performed based on the results of the exploratory factor analysis.

The Relative Fit Index (Incremental Fit Index) is a value that shows how well the theoretical model explains data compared to the baseline model [35]. Several indices have been developed to evaluate the fit of the theoretical model compared to the baseline model. Relative fitness indices include NFI, NNFI, and CFI. On the other hand, the Absolute Fit Index is an index that absolutely evaluates how well the theoretical model fits the data, and GFI, AGFI, and RMSEA are typical examples. Accordingly, Hair et al. [36] recommended χ^2, CFI, TLI, SRMR, RMSEA, etc., and Kline [37] recommended χ^2, RMSEA, CFI, SRMR, etc., as indicators for model confirmation [38]. The specific criteria for the recommendation index are outlined in Table 1.

Based on this, CFA was conducted. The principal component analysis (PCA) method was used to estimate the parameters of the measurement model. Based on this, the Model Fit Index was confirmed for model evaluation.

As a result of the analysis, it was found that some of the recommended criteria for model fit were not met [36]. Therefore, after removing the items with a factor load of less than 0.5 of the observed variables in the measurement model, CFA was performed again. At this time, the model fit was $\chi^2 = 1581.633$ (df = 508, $p < 0.001$), CMIN/DF = 1.965, CFI = 0.938, TLI = 0.930, RMSEA = 0.049, and GFI = 0.838, which satisfies the fitness criteria [36] (see Table 2).

Afterwards, factor loading, concept reliability, and mean variance were examined to verify the validity of concentration. As a result of the analysis, the factor loading of all items was found to be greater than 0.5 and the t-value was also greater than 1.965, which was confirmed to be statistically significant. Therefore, the observed variables effectively explain the latent variables. The composite reliability was also higher than 0.753 in all latent variables, and all mean-variance extraction was higher than 0.5, thus satisfying the standard. As a result of comparing the AVE value and the correlation coefficient between factors for verification, the AVE value for each factor was larger than the square of the correlation coefficient of the two factors, indicating that there is no problem with discriminant validity between all factors.

Table 1: Recommendation index and acceptance criteria [36].

N	χ^2	CFI	TLI	SRMR	RMSEA
$N > 250$, $m > 30$	$p < 0.5$	0.90<	0.90<	<0.08	<0.07

Table 2: Fit indices for confirmatory factor analysis (CFA).

	χ^2/df	df	p value	CFI	TLI	SRMR	RMSEA
N	1.965	805	≤0.001	0.938	0.930	0.0432	0.049

4.4. Structural Equation Modeling Test. A structural equation modeling test was performed to verify the hypothesis and to confirm the mediating effect based on this research model. In regression analysis, since one variable plays only one role, it plays a role as an independent variable or a dependent variable. However, it is difficult to verify the parameters in regression analysis because the parameters play the roles of independent and dependent variables at the same time [35]. Therefore, to compensate for the shortcomings of regression analysis, path analysis was conducted to confirm how the variables affect each other by assuming a causal sequence between the variables.

First, the fitness of the research model is shown in Table 3, indicating that the research model is suitable and there is no problem in accepting the research results.

Table 3: Fit indices for structural equation modeling (SEM).

	χ^2/df	df	p value	CFI	TLI	SRMR	RMSEA
N	1.969	777	≤0.001	0.937	0.930	0.0450	0.049

Table 4: Hypothesis test for trust.

H	Path	Unstandardized coefficients	Standard error	Standardized coefficients	t (C.R.)	p values
H1-1	Relative advantage → trust	0.354	0.049	0.354	7.284	≤0.001
H1-4	Trialability → trust	0.104	0.031	0.104	3.354	≤0.001
H1-5	Observability → trust	0.34	0.059	0.34	5.771	≤0.001
H1-6	Perceived risk-safety → trust	−0.159	0.037	−0.159	−4.328	≤0.001
H1-8	Innovation propensity → trust	0.132	0.041	0.132	3.207	≤0.01

Table 5: Hypothesis test for resistance.

H	Path	Unstandardized coefficients	Standard error	Standardized coefficients	t (C.R.)	p values
H2-1	Relative advantage → resistance	−0.361	0.06	−0.361	−6.051	≤0.001
H2-2	Complexity → resistance	0.394	0.05	0.394	7.807	≤0.001
H2-3	Suitability → resistance	0.25	0.053	0.25	4.682	≤0.001
H2-6	Perceived risk-privacy → resistance	0.138	0.05	0.138	2.764	≤0.01

4.4.1. Path Analysis

(1) Hypothesis Test for Trust. To verify the effect of innovation and consumer characteristics on innovation trust, a test was conducted based on the research questions and hypotheses. First, among the innovation characteristics, it was found that relative advantage, trialability, and observability had a positive effect on trust, and perceived risk related to safety had a negative effect on it. In addition, it was found that innovation propensity, which is a characteristic of consumers, has a positive effect on trust. The results of the hypothesis test for trust are shown in Table 4.

(2) Hypothesis Test for Resistance. Next, tests were performed to find out how innovation and consumer characteristics affect resistance. It was found that relative advantage had a negative effect on resistance, while complexity, suitability, and perceived risk related to privacy had a positive effect (see Table 5).

(3) Hypothesis Test for Acceptance Intention. Next, tests were performed to find out how innovation and consumer characteristics, trust, and resistance affect acceptance intention. First, among the innovation characteristics of fully autonomous vehicles, observability was found to have a positive effect on acceptance intention, and the perceived risk related to safety factors was found to have a negative effect. In addition, consumers' innovation propensity had a positive effect on acceptance intention. It was found that both trust and resistance, which are mediating factors, affect acceptance intention. Specifically, trust has a significant positive effect on acceptance intention with a path coefficient of 0.486 ($t = 7.33$, $p < 0.001$), and resistance has a significant negative effect on acceptance intention with a path coefficient of −0.074 ($t = -2.176$, $p < 0.05$). The results of the analysis are presented in Table 6.

(4) Analysis of Mediating Effects of Trust and Resistance. Mediation analysis was conducted to test whether innovation trust and resistance play a mediating role in the relationship between innovation or consumer characteristics and acceptance intention, which were found to be significant. For this, the indirect effect was verified using the bootstrap proposed by Preacher and Hayes [39]. As a result of the analysis, the direct effect was significant in the path from innovation propensity to acceptance intention, and the indirect effect by parameters was significant in the relationship between perceived risk related to safety and acceptance intention (see Table 7).

However, since the parameters of this study are parallel multiparameter models with two or more parameters, it is necessary to measure the effect of each parameter. In this regard, using phantom variables, we analyzed individual mediating effects of innovation trust and innovation resistance in the path between perceived risk related to safety and innovation propensity and acceptance intention, where the significance of the overall mediating effect was verified.

As a result of the analysis, both perceived risk related to safety and innovation propensity mediate innovation trust and affect acceptance intention. It was confirmed that trust played a fully mediating role in the path from perceived risk related to safety to acceptance intention and played a partial mediating role in the path from innovation propensity to acceptance intention. The results of the analysis are shown in Table 8.

Table 6: Hypothesis test for acceptance intention.

H	Path	Unstandardized coefficients	Standard error	Standardized coefficients	t (C.R.)	p values
H3-5	Observability → acceptance intention	0.3	0.064	0.3	4.718	≤0.001
H3-6	Perceived risk-safety → acceptance intention	−0.125	0.039	−0.125	−3.237	≤0.01
H3-8	Innovation propensity → acceptance intention	0.349	0.044	0.349	7.841	≤0.001
H4-1	Trust → acceptance intention	0.486	0.066	0.486	7.33	≤0.001
H4-2	Resistance → acceptance intention	−0.074	0.034	−0.074	−2.176	≤0.05

Table 7: Hypothesis test for mediating effects of trust and resistance.

Path	Effect			
	Direct effect	Indirect effect	Total effect	Mediation
Relative advantage → acceptance intention	−0.057	0.114 (≤0.01)	0.057	
Complexity → acceptance intention	−0.039	−0.008	−0.047	
Suitability → acceptance intention	0.005	0.017	0.021	
Trialability → acceptance intention	0.042	0.026	0.067	
Observability → acceptance intention	0.030	0.075 (≤0.05)	0.105	
Perceived risk-safety → acceptance intention	−0.085	−0.082 (≤0.01)	−0.167 (≤0.01)	Full mediation
Perceived risk-privacy → acceptance intention	0.031	−0.023	0.009	
Innovation propensity → acceptance intention	0.126 (≤0.01)	0.037	0.162 (≤0.01)	

Table 8: Verification of individual mediating effects of trust and resistance.

H	Path	Effect	
		Direct effect	Indirect effect
H5-1	Perceived risk-safety → trust → acceptance intention	−0.085	−0.174 (≤0.01)
H5-2	Perceived risk-safety → resistance → acceptance intention		0.170
H5-1	Innovation propensity → trust → acceptance intention	0.126 (≤0.01)	0.046 (≤0.01)
H5-2	Innovation propensity → resistance → acceptance intention		−0.004

5. Conclusions

5.1. Summary and Interpretation of Study Results. The purpose of this study was to identify various factors influencing consumers' acceptance of fully autonomous vehicles. In specific, we constructed the acceptance process by integrating the innovation resistance model and the technology trust model. The main research results of this study are as follows:

First, regarding the effect of innovation propensity on trust and resistance, it was found that consumers' innovation propensity had a positive (+) effect only on trust in fully autonomous vehicles but had no significant effect on resistance to them. Accordingly, consumers with high innovative propensities have higher confidence in new technologies even though they have not yet encountered them. They believe that new technologies will produce better performances than previous ones. Based on this trust, consumers with high innovation propensity are expected to play the role of innovators or early adopters when the innovation of fully autonomous vehicles is introduced to the market, as verified in Rogers's [22] study.

Second, it was found that innovation characteristics of fully autonomous vehicles have different effects on consumer resistance and trust. Specifically, the variables related to "technical characteristics", such as complexity, suitability, and perceived risk related to privacy, affected the resistance, while the variables related to the "experiential characteristics," such as trialability, observability, and perceived risk related to safety, affected the trust. These results are different from the previous research applying the innovation model, which showed that all innovation characteristics affect resistance.

Third, it was found that consumers' resistance to fully autonomous vehicles had a negative effect on their acceptance intention, while trust in fully autonomous vehicles had a positive effect on it. Through this result, it was confirmed once again that consumers' conflicting attitudes toward innovative technology coexist, and at the same time, it was found that these attitudes influence the acceptance of the technology in different directions.

Lastly, technologies and consumer characteristics affect the acceptance intention of fully autonomous vehicles. Existing studies mostly confirmed the direct path that exogenous variables such as innovation characteristics and consumer characteristics have on technology acceptance intention without considering parameters. In this study, we hypothesized that the technical characteristics of fully autonomous vehicles and the characteristics of consumers will affect the attitudes (resistance and trust) towards fully

autonomous vehicles, and the attitudes will, in turn, affect the acceptance of fully autonomous vehicles. As a result of this analysis, it was found that the mediating effect of trust plays a greater role in this research model than resistance. Resistance incompletely mediated the path from the characteristics of fully autonomous vehicles and consumer characteristics to acceptance intention. On the other hand, trust plays a mediating role in the path from perceived risk related to safety and innovation propensity to acceptance intention. Specifically, it was found to play a role of full mediation in the path from perceived risk related to safety to acceptance intention and partial mediation in the path from innovation propensity to acceptance intention.

This study suggested evidence to support the social construction of technology (SCOT) theory that technology does not determine human action, but human action shapes technology. Despite consumers' high expectations for the innovative potential of autonomous driving, they also experience feelings of anxiety and uncertainty. In this study, we found that consumers can hold two conflicting attitudes towards the same technology, namely, trust and resistance. These attitudes have opposite effects on technology acceptance, and we also found that technological and experiential characteristics, each affect resistance and trust. Therefore, our research provides valuable insights that it is necessary to look at the consumer aspects in advance and grasp the social context of the technology to understand the reasons for its acceptance or rejection.

Also, we found that experiential characteristics are important in building consumer trust in fully autonomous vehicles. Therefore, technological advances should consider the aspects of experiential consumption. For example, it is crucial to move beyond traditional methods, such as test driving, and instead, prioritize offering tailored and immersive experiences that cater to consumers' needs and preferences. These experiences will go beyond simple interactions and provide consumers with a comprehensive understanding of the technology's experiential aspects. This is consistent with the studies of Zhu et al. [40]. They emphasized that improving human-machine interfaces and providing early guidance and hands-on experiences with autonomous vehicles will help increase the credibility of potential users and drive word-of-mouth. Moreover, they underscore the importance of leveraging mass media as a crucial tool for fostering trust in this context. By utilizing mass media platforms to publicize and report on autonomous vehicles that are yet to be commercialized, consumers can develop a sense of positive self-awareness, thereby strengthening trust and ultimately influencing their intention to embrace these vehicles [40, 41]. Therefore, it is imperative to implement experiential approaches to increase the likelihood of the successful adoption and integration of fully autonomous vehicles into the market. The integration of these insights offers valuable implications for strategies aimed at cultivating trust and driving widespread adoption of autonomous vehicles.

5.2. Contributions and Limitations. This paper contributes to the very timely discussion of fully autonomous vehicles by predicting the consumer's perception and behavior in the process of accepting innovative technology. First, in terms of research, this study contributed to the elaboration of research models that explain the acceptance of innovative technologies. We presented a research model by integrating the innovation resistance model and the technology trust model and identified factors affecting consumers' attitudes and acceptance intentions of innovative technologies. This integrated model of technology acceptance contributed to verifying the path through which technological characteristics and consumer characteristics affect the acceptance intention of fully autonomous vehicles through the attitudes of consumers. Also, in this study, the role as a parameter of the trust variable was confirmed. In previous studies, trust was mainly located as an exogenous variable in models related to various technologies. However, given that fully autonomous vehicles are innovations that consumers have never encountered, we predicted that trust in that technology will be formed through a combination of several exogenous factors, such as the characteristics of the technology or consumer propensity, and verified the influence of trust as a parameter. These results showed consistent results with several studies that verified trust as a parameter. This study suggested that considering the role of trust in the process of acceptance and diffusion of innovative technologies becomes more important in the future.

This study is also meaningful because it analyzed innovative technologies from a consumer-oriented perspective. As a result of examining the major research trends on fully autonomous vehicles so far, research on the technical aspects has been the main focus. Of course, there is no doubt that research in this aspect should be established to improve product quality and secure safety. Nevertheless, new technologies cannot survive in the market if they are not chosen by consumers, so it is also necessary to reflect the opinions of consumers. Therefore, this study is significant in that it analyzed factors for considering the acceptance of fully autonomous vehicles from the consumer's point of view. If consumers' opinions can be reflected in the technology development process through these studies, it is expected that consumer satisfaction, as well as product improvement, will be increased.

Lastly, in terms of marketing, as shown in the results of this study, efforts from various fields to reduce consumers' resistance to fully autonomous vehicles and secure trust are suggested. It is important to convey the advantages of technology to consumers, in the direction of existing advertising, but it is also emphasized to build trust by providing them with elements of experience with innovative technology, such as a test drive. In particular, since automobiles are high-value-added products, consumers decide on acceptance by going through a complex decision-making process for purchase. Therefore, it is thought that prior experience can help in decision-making.

Through this study, we identified two ambivalent attitudes that create a conflict in the process of consumers accepting this technology. We believe that this finding could

be significant in devising strategies to promote the widespread adoption of autonomous driving models. Despite the valuable contributions of this study, there are still some limitations that need to be addressed in future research. For instance, we conducted our study to understand consumer behavior before fully autonomous vehicles were commercialized. Therefore, further research is needed to analyze consumers' acceptance and use behavior when fully autonomous vehicles are widely available in the market. By conducting further studies, we can gain more insights into consumer behavior and their attitudes towards autonomous driving, which could help inform policymakers, manufacturers, and stakeholders in the industry.

Data Availability

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

Conflicts of Interest

The authors declare that there are no conflicts of interest regarding the publication of this paper.

Supplementary Materials

Table S1: specific results of exploratory factor analysis and reliability. (*Supplementary Materials*)

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