The impact of eco-friendly car characteristics and eco-friendly factors on perceived value, trust, and purchase intention

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Abstract: As global awareness of environmental protection has grown since the 1990s, eco-friendly vehicles have emerged as a critical focus in the automobile industry. The depletion of oil resources and rising fuel prices have further catalyzed interest in sustainable transportation options. This study aims to investigate how eco-friendly car characteristics (safety, price, technological advancement, and brand) and environmental factors (carbon neutrality and green ecological environment) influence consumers' perceived value, trust, and purchase intention. Using quantitative methodology, we conducted an online survey with questions adapted from previous research and analyzed data using SPSS 27.0 and Smart PLS 4.0. Our findings reveal that safety, price, and technological advancement significantly impact perceived value, while safety, price, and brand significantly affect trust. Regarding environmental factors, carbon neutrality influences perceived value, while both carbon neutrality and green ecological environment significantly impact trust. Furthermore, perceived value positively influences trust, and both significantly affect purchase intention. These results provide valuable insights for automobile manufacturers, policymakers, and marketers to better understand consumer preferences in the eco-friendly vehicle market, supporting the transition to sustainable transportation as consumers increasingly diversify their decision-making processes toward environmentally conscious choices.

Keywords: Consumer preferences, Eco-friendly vehicles, Perceived value, Purchase intention, Sustainable transportation, Trust.

1. Introduction

As awareness of environmental protection increases and the energy crisis becomes more serious, eco-friendly cars have become a hot topic in the global automobile industry. The world's first electric car appeared in the mid-19th century. This marks the birth of eco-friendly cars, though interest subsequently disappeared with the advent of internal combustion engines. As awareness of environmental protection increased in the 1990s, social concern about vehicle emissions grew [1]. Recent research by Statharas, et al. [2] indicates this environmental consciousness has evolved into marketplace transformation, with electric vehicle adoption rates significantly outpacing earlier projections across multiple developed markets. I became interested in the importance of environmental protection and the sustainable development of eco-friendly energy. The continued rise in oil prices accelerates the development of eco-friendly cars. Due to high oil prices, consumers are burdened with the driving costs of fuel-powered vehicles, sparking interest in eco-friendly vehicles. Chen and Dubinsky [3] concluded that total cost of ownership analyses now favor electric vehicles in the majority of developed markets and an increasing number of developing regions, representing a significant shift from the historical economic advantage held by internal combustion engines.

Many countries are introducing policies to support the development of eco-friendly industries. To promote the long-term development of the eco-friendly automobile industry, carbon emission reduction policies and subsidy policies have been successively announced. Bhagwat, et al. [4] demonstrate these

policy frameworks have matured significantly, evolving from simple purchase incentives to comprehensive ecosystem development approaches that address manufacturing, infrastructure, and recycling simultaneously. The Korean government announced an eco-friendly future mobility plan that includes plans to transition to eco-friendliness, dominate the eco-friendly automobile market, and secure an economic advantage. To popularize electric vehicles, plans were announced to produce 433,000 units in 2022 and a total of 1.13 million units in 2025. It was decided to expand charging facilities by 45,000 units. López, et al. [5] report significant progress in charging infrastructure deployment across European markets, with utilization rates showing substantial improvement as EV adoption accelerates. Despite the government's support policy for eco-friendly cars, market activation faces challenges. This can be found in the properties of eco-friendly cars themselves. Previous studies have argued for the importance of attributes for eco-friendly cars, as they contain both symbolic and valuable characteristics. Higueras-Castillo, et al. [6] have identified that perceived sustainability value now ranks as the second most important purchase factor after reliability, representing a significant shift in consumer priorities. Although studies on eco-friendly cars are beginning, most are case studies focusing on distribution promotion methods. In order to induce demand for eco-friendly cars, individual awareness of environmental protection must increase from a macro perspective. Brozynski and Leibowicz [7] propose an integrated framework combining technology advancement, infrastructure development, brand positioning, and educational initiatives to accelerate market transformation. From a micro perspective, companies must study consumer behavior to accurately recognize products and markets and increase investment in core technologies. We propose a strategy focusing on product design and brand management based on consumer perception.

2. Theoretical Background

2.1. Eco-friendly Car Characteristics and Factors

Eco-friendly Eco-friendly means environmentally friendly and does not pollute the environment. It refers to the environmental industry, eco-friendly development, and eco-friendly residential areas. The dictionary definition of eco-friendliness is not polluting the natural environment and adapting well to the natural environment or indicating such behavior [8]. An eco-friendly vehicle is a vehicle that has excellent energy consumption efficiency and meets zero or low emission standards. Types of eco-friendly vehicles include electric vehicles, solar vehicles, hybrid vehicles, fuel cell vehicles, natural gas vehicles, and clean diesel vehicles. Recent research shows that the eco-friendly vehicle market is expanding rapidly worldwide, with electric vehicle adoption increasing by over 60% in 2022-2023 [9]. This growth is driven by both strengthening environmental regulations and significant advancements in battery technology that address previous limitations in range and charging efficiency [10]. The global trend now focuses not only on developing electric vehicles but also on creating sustainable manufacturing processes and improved battery recycling systems [11]. While passenger electric vehicles have seen widespread adoption, commercial transport sectors including buses are now benefiting from advances in hydrogen fuel cell technology that overcome traditional range limitations [12].

2.1.1. Safety

vehicle safety control device is a system that directly controls the vehicle's braking and drive system. This is a system that prevents inappropriate rotation and rollover that can occur due to sudden acceleration and sudden braking. Recently, as the sales ratio of internal combustion engine vehicles decreases and the sales ratio of eco-friendly cars increases, interest in the safety of ultra-small electric vehicles is growing. Automotive safety refers to the excellent safety capabilities of automobiles, which can avoid accidents or reduce casualties [13]. Active safety of automobiles mainly refers to the ability of automobiles to prevent or reduce road traffic accidents. This includes visibility, driving maneuverability, and braking efficiency. It also includes reducing driver fatigue and pedestrian safety. The high-voltage electrical system of an eco-friendly car consists of high-voltage components such as a high-voltage

battery, inverter, drive motor, and electric heater system. Due to structural differences from existing internal combustion engines, the risk of electric shock and fire accidents to the human body is high, and the application and field distribution of evaluation technology for electrical safety verification is necessary to secure electrical safety capabilities that meet global technical standards (GTR: global technical regulation). and evaluation is required.

2.1.2. Price

The price of eco-friendly cars varies depending on various factors. Includes types, manufacturers, models, and technologies of eco-friendly vehicles. Additionally, the price of a car can be lowered through government subsidies or tax benefits. Technological advancement continues to increase price competitiveness. Price is a factor that has a decisive influence on consumers' decisions about eco-friendly cars [14]. Recent research indicates that price parity between electric and conventional vehicles is approaching, with Burke, et al. [15] projecting cost trajectories for battery-electric vehicles through 2040 that show significant reductions due to declining battery costs. While upfront costs remain higher, total cost of ownership analyses that account for operational and maintenance expenses already favor electric refrigerated light commercial vehicles in many scenarios [16]. Price competition for eco-friendly cars is intensifying due to the economic environment and the emergence of various distribution channels. The definition of price is something that must be sacrificed or given up to obtain a product. The price of a product is directly related to its quality. Price refers to the objective external characteristics of the product as perceived by the consumer, and subjective price can be seen as a subjective external representation derived from the perceived price. The eco-friendly car market is evolving rapidly, with pricing strategies now incorporating digital twin technology to better communicate sustainability value propositions beyond traditional approaches [17]. When deciding on the price of an eco-friendly car, brand value and service quality must be comprehensively considered.

2.1.3. Technological Advancement

The technological advancement of eco-friendly cars continues to advance. Technological advancement of eco-friendly vehicles can be summarized as Electric Vehicles, Hydrogen Fuel Cell Vehicles, Material Light-weighting, Autonomous Driving Technologies, Regenerative Energy, and Environmentally Friendly Materials. The characteristics of eco-friendly cars are environmental protection and increased energy efficiency. With the development of software and smart interconnected cars, the scope of automobile safety technology will become increasingly wider in the future [18]. It will develop in the direction of integration, intelligence, and systemization. In the case of eco-friendly cars, the goal of technology development was to reduce driving distance, vehicle price, and system volume. The purpose of quality improvement is to improve the mass production process, develop mass production equipment, and develop quality improvement technology. To expand its distribution, platform development is underway, including technology development that can be applied to various types of commercial hydrogen vehicles.

2.1.4. Brand

Brand refers to a collection of names, symbols, or designs given to a company's goods or services to differentiate them from competitors. The most important reason why companies use brands for goods or services is to distinguish and emphasize their products from competitors. The importance of the brand was emphasized from the perspectives of both companies and consumers [19]. Recent research in Taiwan shows that for battery electric vehicles, brand-specific perceived green attributes significantly influence consumer purchase intentions, demonstrating the importance of sustainability credentials in creating market differentiation [20]. For travelers in the pre-travel decision-making phase, voice assistants can play an important role in sustainable hospitality choices by providing brand recommendations that simplify decision-making, reduce selection risk, and align with consumers' cultural orientation and use purposes [21]. found that established automotive brands transitioning to

eco-friendly offerings must balance brand heritage with new identities communicating technological innovation and environmental commitment. It has been said that for companies, a brand can serve as a source of ease of product management, giving product individuality, a source of competitive advantage, and a source of financial profit. Brand image is defined as brand perception reflected by brand associations stored in consumers' memories [22]. Current studies indicate eco-friendly automotive brands now leverage sustainable storytelling and digital eco-narratives to engage audiences emotionally rather than focusing solely on functional attributes [23].

2.1.5. Carbon neutral

Carbon neutrality is an important concept as an eco-friendly factor. Various methods are being used to achieve carbon neutrality in eco-friendly vehicles [24]. These are electrification and hydrogenation, the use of renewable energy, the use of eco-friendly materials, and carbon emission reduction technology. Recent methodological reviews of electric vehicle carbon footprint calculations emphasize the importance of comprehensive life-cycle assessment approaches, revealing significant variations in manufacturing-phase emissions based on different production determinants [25]. Carbon neutrality requires not only reducing greenhouse gas emissions from human activities but also implementing emerging bio-capture strategies to absorb and remove remaining emissions, collectively navigating the challenges toward achieving net-zero actual emissions [26]. report that 85% of major automotive brands now target carbon-neutral operations by 2035-2040, significantly accelerating previous timelines. Countries around the world have implemented voluntary efforts to reduce greenhouse gases since 2016 and agreed on long-term low-carbon development strategies. The Korean government's 2050 carbon neutrality strategy, which Kim, et al. [27] analyze for its economic implications, includes aggressive electric vehicle adoption targets and outlines various innovative approaches to emissions reduction across the automotive value chain.

2.1.6. Green Ecological Environment

A green ecological environment is intended to prevent the process of using natural resources from destroying ecological balance, gradually decreasing biodiversity, and worsening climate change. A green ecological environment refers to a clean, healthy, and organic natural ecosystem, including climate and environmental factors of the human environment [28]. Recent research by Daněk, et al. [29] has explored new frameworks for ecological monitoring that could be applied to transportation systems, using AI-assisted deep learning methods for biodiversity assessment and wildlife tracking. A major characteristic of a green ecological environment is that it can self-regulate, as diverse ecosystems interact and maintain ecological balance. The current climate crisis response system focuses on the Framework Act on Low Carbon, Green Growth. The sustainability aspects of electric vehicles positively affect purchase intention, as demonstrated by Degirmenci and Breitner [30] who found that environmental consciousness significantly influences consumers' willingness to adopt electric vehicles. However, battery technology uncertainties, such as costs, charging infrastructure, and sustainability of fuel sources, are perceived as barriers to purchase. Dehghani-Sanij, et al. [31] found these concerns are diminishing as battery technology advances and recycling infrastructure expands globally, with their research highlighting emerging opportunities in end-of-life battery management and second-life applications.

2.2. Perceived value

Value is an important factor that determines consumer behavior. As a standard for judging all actions and situations, it refers to a reasonable way to achieve the ideology, motivation, principles, and goals that an individual or group values and desires [32]. Cognitive response to perceived value is an important factor that consumers feel in the commercialization process of an institution. Emotions refer to an individual's psychological state based on one's sensations or thoughts. Perceived value is a comprehensive evaluation of the use of products and services through these emotional emotions.

Perceived value is a key variable in consumer consumption behavior. It becomes the standard for consumer trust, loyalty, and satisfaction. It influences the customer's response to targeted behaviors and desires. Perceived value is an important factor between customer satisfaction, purchase intention, revisit intention, and concept of service quality [33]. Value occurs when the quality of a product is higher than expected compared to the cost paid by the customer to evaluate the efficiency of the product. Value occurs when the quality of a product is higher than expected compared to the cost paid to evaluate the efficiency of the consumer getting what he or she pays for.

2.3. Trust

Trust is a kind of tendency or belief. It is the belief that the other party will act according to general norms in uncertain situations. When the object and object do not match the definition of trust in each field, each scholar's definition of trust is also different. To form a social network, trust for the target must be formed. As trust increases, the sense of social presence experienced varies depending on the user. As a result of analyzing the influence relationship between social presence and trust, it can be said that trust has the greatest influence on social presence. It forms social exchange relationships based on trust, through which it pursues conflict resolution, cooperation, and promotion of relationships [34]. Trust between users is also important. This is because individual users can also provide services or information. Trusts are different for each research field, and the research field and target must be clear to ensure scientific and targeted research. Trust is used in most studies in the field of consumer purchasing behavior. Tang and Jiang [35] studied the mediating role of trust in online purchase intention based on the TAM model.

2.4. Purchase intention

Purchase intention means that an individual's beliefs and attitudes about a product or service are translated into action. It is a customer's expression of intent when purchasing a product and is used as an important variable to measure customer satisfaction or performance. Purchase intention is defined as the possibility that a consumer's attachment to a specific brand will lead to future behavior [36]. It is the likelihood that a consumer will want to receive a certain product or service, or the subjective tendency to have a consumption preference for a specific product or service [37]. This subjective tendency not only reflects the consumer's subjective attitude but also reflects the probability that the consumer can make a purchase, so purchase intention is used as a measurement variable to predict additional purchase behavior. Purchase intention reflects the likelihood of consumers' final purchase behavior [38]. The correlation between purchase intention and actual purchase behavior is a unified consensus recognized by scholars in the field of consumer behavior research.

3. Research Design
3.1. Research Model

Many studies have been conducted at home and abroad regarding the selection of eco-friendly vehicles, but these studies differ in analysis methods, data used, survey timing, and target regions. This study focuses on analyzing the impact of eco-friendly car characteristics and eco-friendly factors on purchase intention through perceived value and trust. Guowei [39] attempted to generalize eco-friendly factors by introducing the concepts of Carbon neutral and Green ecological environment in terms of improving the environment. Eco-friendly factors also have a positive effect on consumer perception. In the context of a green ecological development environment, retailers have set high sales prices to create eco-friendly products [40]. Producers' carbon emissions reductions, retailers' offline promotions, and government policy support and guidance affect consumers' perceived value. Through prior research and theoretical consideration, the sub-factors of Eco-friendly car characteristics were set as safety, price, technological advancement, and brand, and the sub-factors of environmental factors were selected as Carbon neutral and Green ecological environment. To analyze the causal relationship between perceived value, trust, and purchase intention, a research model as shown in Figure 1 was designed.
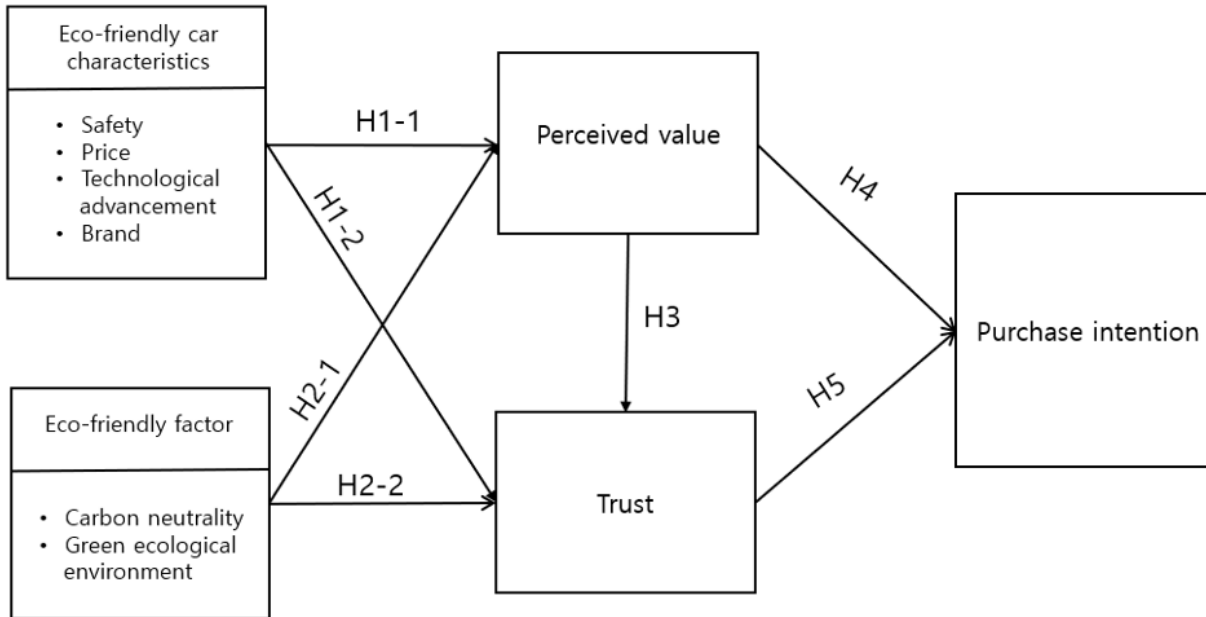
Figure 1.
Research Model.

3.2. Research hypothesis

3.2.1. Hypotheses regarding eco-friendly car characteristics, perceived value, and trust

[41] stated that the new energy automobile industry has greater room for private profit than social profit. New energy vehicles have higher technological requirements than regular vehicles, and huge funds are invested in research and development to foster the market for a long time. Production costs and economic benefits at the beginning of development are inversely proportional. The following hypothesis was established.

Hypothesis H1 Eco-friendly car characteristics have a significant impact on perceived value and trust.
Hypothesis H1-1-1 Safety has a positive and significant impact on perceived value.
Hypothesis H1-1-2 Price has a significant impact on perceived value.
Hypothesis H1-1-3 Technological advancement has a significant impact on perceived value.
Hypothesis H1-1-4 Brand has a positive and significant impact on perceived value.
Hypothesis H1-2-1 Safety has a positive and significant effect on Trust.
Hypothesis H1-2-2 Price has a positive and significant effect on Trust.
Hypothesis H1-2-3 Technological advancement has a positive and significant impact on Trust.
Hypothesis H1-2-4 Brand has a positive and significant impact on Trust.

3.2.2. Hypotheses Regarding Eco-Friendly Factors, Perceived Value, and Trust

Carbon-neutral promotion to reduce greenhouse gases is also being consistently proposed and implemented, and low-carbon awareness is also increasing [40]. Consumers' perceived value of low carbon plays an important role in the emission reduction process, and as low carbon awareness increases, product emission reduction rates, product sales prices, and product demand are continuously increasing. It was analyzed that consumers are influenced by government policy elements for electric vehicles and the green ecological environment [18].

Hypothesis H2 The Eco-friendly factor has a significant impact on perceived value.
Hypothesis H2-1-1 Carbon neutral has a positive and significant effect on perceived value.
Hypothesis H2-1-2 A Green ecological environment has a positive and significant impact on perceived value.
Hypothesis H2-2-1 Carbon neutral has a positive and significant effect on Trust.

Hypothesis H2-2-2 A Green ecological environment has a positive and significant impact on Trust.

3.2.3. Hypotheses about perceived value, trust and purchase intention

Chen and Dubinsky [3] studied the perceived value of consumer groups and found that there was a very clear positive relationship between the perceived value obtained by consumer groups and purchase intention. There are many studies on consumer trust and purchase intention. Trust was found to have a positive effect on purchase intention.

Hypothesis H3 Consumers' perceived value has a significant impact on trust.
Hypothesis H4 Perceived value has a significant effect on purchase intention.
Hypothesis H5 Trust has a positive and significant effect on purchase intention.

4. Empirical Analysis and Research Findings
4.1. Operational definition of variables

The survey questions used in previous studies were reorganized to suit the purpose of this study. We empirically analyzed the relationship between Eco-friendly car characteristics (safety, price, technological advancement, Brand) and Eco-friendly factors (Carbon neutral, Green ecological environment) on purchase intention through perceived value and Trust. A total of 27 questions were selected for the survey. Each question used a 5-point Likert scale. The operational definition of variables is listed in Table 1.

Table 1.
Operational Definition of Variables.

Variables	Operational definition	Measuring Items	Previous Studies
Safety	Ability to protect consumer health and property safety during product use, storage, transportation, and sale.	- Eco-friendly car safety is advantageous for consumer purchases - It is important to present safety standards for fuel supply and related facilities for eco-friendly vehicles. - It is important to improve safety equipment and the safety of eco-friendly cars	Lee, et al. [13]
Price	Value of a unit of goods or services	- Cost reduction factors for eco-friendly cars - Continuous development and improvement of manufacturing technology and continuous improvement of production efficiency help with cost and price. - As awareness of eco-friendly cars develops, promotional costs are reduced and price discounts are promoted.	Vassileva and Campillo [14]
Technological advancement	Technological advancement according to the company's technological capabilities, funding sources, actual demand, and company characteristics	- Smartization of eco-friendly car software is important - The development environment for eco-friendly automobile companies is important. - Government subsidies for eco-friendly cars are important.	Liu, 2022
Brand	Refers to names, symbols, designs, etc. used to distinguish products and services.	- Brand awareness of eco-friendly cars is important. - The social responsibility and favorability of eco-friendly car brands are recognized by consumers. - Exterior design and eco-friendly concept are important to consumers	Aaker [36] and Brozynski and Leibowicz [7]
Carbon neutral	Absorbs the same amount of carbon emitted by companies or individuals, reducing emissions to zero.	- Using eco-friendly cars helps reduce carbon emissions. - Continued development of new energy helps reduce carbon - Eco-friendly cars promote eco-friendly development	Streimikiene [24]
Green ecological environment	It means sustainability of an eco-friendly ecosystem.	- The use of eco-friendly cars is beneficial to the development of the ecological environment. - It can reduce human influence on the ecological environment. - Eco-friendly cars can reduce pollution.	Egbue and Long [28]
Perceived value	Compensation for the cost paid for the utility obtained from a product or service, a benefit evaluated based on perception	- Eco-friendly cars can provide a good driving experience - Eco-friendly cars are valuable and worth developing - I think eco-friendly cars will be much fresher than existing cars.	Xie and He [32] and Zhou, et al. [33]
Trust	Consumers' beliefs about use	- Certainty in eco-friendly cars - Recommend the use of eco-friendly cars to people around you - Want to experience eco-friendly car services and eco-friendly activities	Wenqing and Weiwei [34]
Purchase intention	Consumer's intention to make a purchase at a future point in time	- There is a purchase intention for an eco-friendly car. - Eco-friendly cars are more cost-effective than conventional cars - When buying a car, give priority to purchasing an eco-friendly car.	Cai and Jia [37] and Shivam and Avadhesh [38]

4.2. Characteristics of Respondents

A survey was conducted using the convenience sampling method targeting consumers who were willing to purchase eco-friendly cars. Data collection was conducted through an online survey. The survey was conducted for approximately two months from February 1, 2023, to March 28, 2023. 240 copies were distributed to respondents, of which 225 copies, excluding 15 copies with typographical errors and insincere questionnaires, were used for empirical analysis. Looking at the characteristics of the sample subject to analysis, there were a total of 225 respondents, of which 52.00% were male and 48.00% were female. Age was the most in their 20s at 34.67%, education level was highest at 38.22% with a college degree, and 42.67% had an average monthly income of less than 1 million won. The characteristics of respondents are summarized in Table 2.

Table 2.
Characteristics of Respondents.

Characteristics		Responses	Percentage
Gender	Male	117	52.00
	Female	108	48.00
Age	10-19 years	35	15.56
	20-29 years	78	34.67
	30-39 years	43	19.11
	40-49 years	49	21.78
	50 years or more	20	8.89
Education	High School	81	36.00
	College / University	42	18.67
	Graduate School	86	38.22
	Post Graduate	16	7.11
Annual Income	$0 - $10,000	96	42.67
	$10,000 - $20,000	44	19.56
	$20,000 - $30,000	35	15.56
	$30,000 - $40,000	26	11.56
	$30,000 or more	24	10.67

4.3. Analysis Method

The research hypothesis was verified using Smart PLS 4.0. SPSS 27.0 was used to analyze the characteristics of survey respondents, and Cronbach's α value was used to measure the reliability of each question. To verify the validity of the measurement items, factor analysis and correlation analysis were performed. Confirmatory factor analysis and validity were confirmed to test the causal relationship of the hypothesis. Reliability and validity evaluation were conducted to verify the measurement model. To evaluate reliability, factor analysis, Cronbach's α, and Composite Reliability (C.R.) were checked to determine the consistency of the variables that make up each factor. All consistency results exceeded the standard value of 0.7, ensuring the reliability of the measurement indicators [42]. The standard for determining whether central validity exists is that the average variance extracted (AVE) value is 0.5 or more. Discriminant validity means that there must be a significant difference in measurements between different variables. The results obtained from analysis are given in Tables 3, 4, and 5.

Table 3.
Reliability and Internal Consistency Results.

Variables	Items Name	Factor Loadings	AVE	Composite Reliability	Cronbach's Alpha
Safety	Sa1	0.793	0.628	0.835	0.707
	Sa2	0.763			
	Sa3	0.820			
Price	Pr1	0.840	0.841	0.841	0.717
	Pr2	0.756			
	Pr3	0.799			
Technological advancement	TA1	0.844	0.662	0.854	0.747
	TA2	0.838			
	TA3	0.756			
Brand	Br1	0.806	0.634	0.731	0.864
	Br2	0.798			
	Br3	0.786			
Carbon neutral	CN1	0.715	0.633	0.836	0.701
	CN2	0.831			
	CN3	0.802			
Green ecological environment	GEE1	0.731	0.651	0.848	0.731
	GEE2	0.826			
	GEE3	0.858			
Perceived value	PV1	0.800	0.638	0.841	0.761
	PV2	0.793			
	PV3	0.802			
Trust	Tr1	0.804	0.645	0.845	0.725
	Tr2	0.790			
	Tr3	0.815			
Purchase intention	PI1	0.825	0.652	0.852	0.741
	PI2	0.786			
	PI3	0.839			

Table 4.
Pearson Correlations and Discriminant Validity.

Factors	AVE	A	B	C	D	E	F	G	H	I
A	0.628	0.792a								
B	0.641	0.768	0.799a							
C	0.662	0.723	0.691	0.814a						
D	0.634	0.671	0.714	0.725	0.796a					
E	0.633	0.766	0.761	0.668	0.647	**0.795a**				
F	0.651	0.646	0.637	0.664	0.615	.660	**0.807a**			
G	0.638	0.776	0.757	0.730	0.643	0.766	0.619	**0.799a**		
H	0.645	0.718	0.745	0.676	0.734	0.622	0.666	0.665	**0.803a**	
I	0.652	0.666	0.595	606	0.603	0.603	0.576	0.587	0.671	**0.811a**

Note: a. Diagonal element shows the square root of AVE.
A=Safety, B=Price, C=Technological advancement, D=Brand, E=Carbon neutral, F=Green ecological environment, G=Perceived value, H=Trust, I=Purchase intention.

Multicollinearity demonstrates the relationship between variables. In general, the collinearity statistic (VIF: Variance Inflation Factor) requires an internal VIF value of less than 5.

Table 5.
Collinearity statistic.

Factors	VIF	Factors	VIF
Safety	3.351	Carbon neutral	3.585
Price	3.585	Green ecological environment	3.059
Technological advancement	3.059	Perceived value	3.029
Brand	3.029	Trust	3.292

4.4. Test Hypothesis

Figure 2. shows the relationship between factors, and the direction of the solid arrow indicates a path that has a significant influence. Through this, it was decided whether to accept the hypothesis or not.
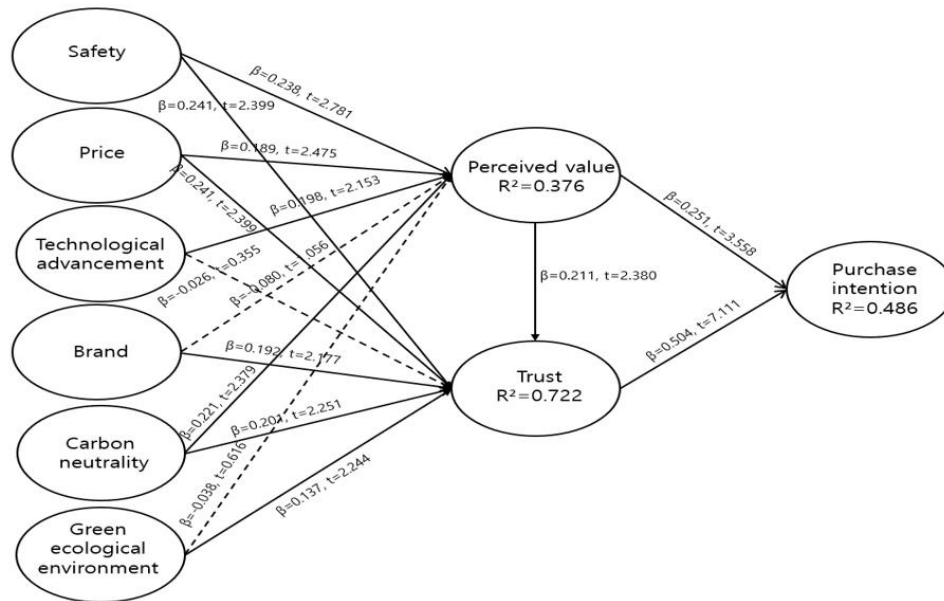
Figure 2.
Path Analysis for the Research Model.

Hypothesis H1-1-1: Safety has a significant impact on perceived value. The hypothesis was accepted as it was analyzed that there was an influence relationship at the significance level of 95% (β=0.238, t=2.781, p<0.05). Safety affects perceived value. Hypothesis H1-1-2: Price has a significant effect on perceived value. The hypothesis was accepted as it was analyzed that there was an influence relationship at the significance level of 95% (β=0.189, t=2.475, p<0.05). Price affects perceived value.

Hypothesis H1-1-3: Technological advancement has a significant effect on perceived value. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.198, t=2.153, p<0.05), and the hypothesis was accepted. Technology development affects perceived value. Hypothesis H1-1-4: Brand has a positive and significant effect on perceived value. Significance level 95% (β=-0.080, t=1.056, p>0.05) It was analyzed that there was no influencing relationship, so the hypothesis was rejected. The brand does not affect perceived value. The results estimated from hypothesis testing are summarized in Table 6.

Table 6.
Hypothesis Testing of Model.

Paths	Estimate	T-statistics	Results
H1-1-1: Safety → Perceived value	0.238	2.781**	Supported
H1-1-2: Price → Perceived value	0.189	2.475*	Supported
H1-1-3: Technological advancement → Perceived value	0.198	2.153*	Supported
H1-1-4: Brand → Perceived value	-0.080	1.056	Not supported
H1-2-1: Safety → Trust	0.187	2.110*	Supported
H1-2-2: Price → Trust	0.241	2.399*	Supported
H1-2-3: Technological advancement → Trust	-0.026	0.355	Not supported
H1-2-4: Brand → Trust	0.192	2.177*	Supported
H2-1-1: Carbon neutral → perceived value	0.221	2.379*	Supported
H2-1-2: Green ecological environment → perceived value	-0.038	0.616	Not supported
H2-2-1: Carbon neutral → Trust	0.201	2.151*	Supported
H2-2-2: Green ecological environment → Trust	0.137	2.244*	Supported
H3: Perceived value → Trust	0.211	2.380***	Supported
H4: Perceived value → Purchase intention	0.251	3.558***	Supported
H5: Trust → Purchase intention	0.504	7.111***	Supported

Note: $p < 0.05$*, $p<0.01$**, $p<0.001$***.

Hypothesis H1-2-1: Safety has a significant positive effect on trust. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.187, t=2.110, p<0.05), and the hypothesis was accepted. Stability affects trust. Hypothesis H1-2-2: Price has a positive and significant effect on Trust. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.241, t=2.399, p<0.05), and the hypothesis was accepted. The price affects the trust. Hypothesis H1-2-3: Technological advancement has a positive and significant impact on Trust. It was analyzed that there was no influencing relationship at the significance level of 95% (β=0.026, t=0.355, p>0.05), so the hypothesis was rejected. Technological advancement does not affect the Trust. Hypothesis H1-2-4: Brand has a positive and significant effect on trust. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.192, t=2.177, p<0.05), and the hypothesis was accepted. Brand influences trust.

Hypothesis H2-1-1: Carbon neutrality has a positive significant effect on perceived value. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.221, t=2.379, p<0.05), and the hypothesis was accepted. Carbon neutrality affects perceived value. Hypothesis H2-1-2: A green ecological environment has a significant impact on perceived value. It was analyzed that there was no influencing relationship at the significance level of 95% (β=-0.038, t=0.616, p>0.05), so the hypothesis was rejected. A green ecological environment does not affect perceived value.

Hypothesis H2-2-1: Carbon neutrality has a positive and significant effect on Trust. It was analyzed that there was an influence relationship at the significance level of 95% (β=-0.201, t=2.244, p<0.05), and the hypothesis was accepted. Carbon neutral means that it affects trust. Hypothesis H2-2-2: A green ecological environment has a positive and significant impact on Trust. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.137, t=2,244, p<0.05), and the hypothesis was accepted. Green ecological environment affects the Trust.

Hypothesis H3: Perceived value has a significant impact on trust. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.211, t=2.388, p<0.05), and the hypothesis was accepted. Perceived value influences purchase intention. Hypothesis H4: Perceived value has a significant effect on purchase intention. It was analyzed that there was an influence relationship at the significance level of 95% (β=0.251, t=3.558, p<0.05), and the hypothesis was accepted. Perceived value influences purchase intention. Hypothesis H5: Trust has a positive and significant effect on purchase intention. It was analyzed that there was an influence relationship at the significance level of 95%

(β=0.504, t=7.11, p<0.05), and the hypothesis was accepted. Trust affects purchase intention. Table 6 summarizes the hypothesis test results.

5. Conclusion

The influence relationship between eco-friendly car characteristics and consumers' purchase intention was empirically studied. By reviewing previous research, safety, price, technological advancement, and brand were selected as sub-elements of eco-friendly car characteristics. We verified how these selection factors affect perceived value, trust, and purchase intention. The influence relationships between variables were verified using PLS structural equations. The results of the research through empirical analysis are as follows. First, the influence relationship between the characteristics of eco-friendly cars and perceived value and trust is as follows. Among the characteristics of eco-friendly cars, stability and price have a significant impact on perceived value and trust. This can be said to be a result that confirms that eco-friendly cars are an important factor for consumers who make practical consumption. Stability and price were identified as important factors in consumers' perceived value. Among the characteristics of eco-friendly cars, technological advancement was found to have no effect on trust. These results are interpreted to mean that although technological advancement can increase consumer satisfaction, it has no direct effect on consumer trust. Among eco-friendly car characteristics, brand was found to have no effect on perceived value. The result is that although the brand of an eco-friendly car can increase consumers' selection factors, it does not directly affect consumers' perceived value. Second, the influence relationship between the eco-friendly factor of eco-friendly cars and perceived value and trust is as follows. Among eco-friendly factors, carbon neutral has a significant impact on perceived value. This shows that the reason consumers actually prefer eco-friendly cars is because they are concerned about the environment. This result confirms that eco-friendliness is an important factor for consumers who prefer eco-friendly cars. Among eco-friendly selection factors, Green ecological environment was found to have no effect on perceived value. This is the reason why Green ecological environment is not known to consumers. In the case of carbon neutral, a lot of research has been done by environmental groups, but green ecological environment is felt by consumers as the work of environmental groups. Carbon neutral and Green ecological environment have nourished the Trust. This confirms that preferring eco-friendly cars protects the environment. Third, the influence relationship between perceived value, trust, and purchase intention is as follows. Consumer perceived value and trust were found to have a significant impact on purchase intention. In other words, the higher consumers' perceived value and trust of eco-friendly cars, the higher their purchase intention. Among these, Green ecological environment does not affect perceived value, but it does affect Trust, which means that for consumers, Trust is more important than perceived value. Consumers value trust more than perceived value. In order to enable eco-friendly car consumers to achieve useful purposes in daily life, we must focus on trust, but we must also be able to satisfy the emotional aspect through eco-friendly cars. It is believed that eco-friendly car operators can improve purchase intention only by increasing both perceived value and trust among consumers.

The academic implications of this study are as follows. First, this study has academic significance in that it empirically verified the relationship between eco-friendly car characteristics and environmental factors on perceived value, trust, and purchase intention. The research results are expected to provide a theoretical basis that can have a positive impact and help in research in the eco-friendly automobile field. Second, there is not much research on eco-friendly cars in Korea so far. It has academic significance in that it compares the selection factors for eco-friendly cars in Korea. Based on this research, is expected to provide the theoretical basis necessary for the development of eco-friendly automobiles. Based on the research results derived from this study, practical implications for establishing an eco-friendly car sales strategy are as follows. First, the government's policy is premised on consumers' eco-friendly preferences. The government must continue to strengthen the level of subsidies for eco-friendly products. We need to encourage many consumers to purchase eco-friendly products and create a green environment. The government must pay attention to eco-friendliness and effectively control carbon

emission reduction activities. Second, environmental damage comes from products with high emissions. The growth of a green environment requires widespread use and promotion of eco-friendly products. Consumption of eco-friendly products depends on the consumer. Consumers must keep in check the continued deterioration of the current environment and cultivate an awareness of environmental protection. We need to build a good green supply chain system by increasing preference for eco-friendly products, promoting producers' passion for emission reduction and retailers' initiative to promote eco-friendly distribution.

The limitations of the study and future research directions are as follows. First, there was little research on eco-friendly cars. It was not easy to find useful data as there were not many studies domestically and internationally that combined awareness of the attributes of eco-friendly cars and the technology acceptance model with eco-friendly cars. In this regard, there is a need to strengthen the theoretical foundation by continuing related research in the future. Second, the valid sample number of consumers with the purchase intention of eco-friendly cars is small, so there is a limit to generalizing the issue. Third, although only the demographic analysis of respondents was conducted, future research can identify various factors that can affect purchase intention by gender, age, education, and occupation based on demographic characteristics. This can be expected to expand the eco-friendly car market by suggesting a collective customized marketing strategy.

Transparency:
The authors confirm that the manuscript is an honest, accurate, and transparent account of the study; that no vital features of the study have been omitted; and that any discrepancies from the study as planned have been explained. This study followed all ethical practices during writing.

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