

Article

# The Influential Factors of Consumers' Sustainable Consumption: A Case on Electric Vehicles in China

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Received: 3 April 2020; Accepted: 22 April 2020; Published: 24 April 2020



**Abstract:** As one of the internationally recognized solutions to environmental problems, electric vehicles feature zero direct emissions and can reduce dependence on petroleum. An increasing number of countries have attached importance to the electric vehicle and developed it, and it is predicted that it will become a main force in the transportation system. Hence, it is necessary to explore the factors that drive consumers to buy electric vehicles. This study analyzes the factors that influence the consumer's intention to buy electric vehicles and tests the relationship between them, and intends to offer information for the formulation of policies designed to popularize electric vehicles in order to reduce carbon emissions from transportation. As a result, consumer attitudes are the most important factor influencing the intention to purchase electric vehicles. The greatest effect is found in this line: Brand Trust→Perceived Benefit→Attitude→Purchase Intention. This means that the brand can increase the consumer's perceived benefit of electric vehicles, make consumers more attracted to electric vehicles, and influence their final purchase intention.

**Keywords:** electric vehicles; consumer attitude; consumer purchase intention; structural equation model

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## 1. Introduction

### 1.1. Background

Environmental deterioration is an inevitable problem caused by human activity [1], and global warming, the greenhouse effect, and acid rain are all nature's warnings against mankind. Moreover, the petroleum crisis and excessive carbon emissions are also regarded as the most urgent challenges confronting the modern world [2], and the survival of human beings has come to a critical juncture. Against such a backdrop, the member states of the United Nations put forth the 2030 Agenda for Sustainable Development (see Figure 1) in 2015. This agenda serves as a blueprint of peace and prosperity according to the present situation and the future development of mankind and the Earth [3]. It is specified in Goal 12 of the agenda: "Responsible consumption and production: ensure that the international community will develop towards green growth and a recycling economy.".

As one of the internationally recognized solutions to environmental problems, electric vehicles feature zero direct emissions and can reduce the dependence on petroleum [4,5]. An increasing number of countries have attached importance to the electric vehicle and have developed it [6], and it is predicted that it will become a main force in the transportation system [7]. Many countries have set corresponding goals and formulated relevant policies [8], including China [9]. Driven by the policies, China has evolved into the largest electric vehicle market in the world [6]. In order to be in tune with the times, vehicle manufacturers across the world have begun to develop electric vehicles [10]. It is

estimated that there will be over 145 million electric vehicles on the planet by 2035 [11]. According to a test in New York, electric vehicles play a positive role in reducing air pollution in urban areas [12]; they can improve the air quality by reducing 20% of carbon emissions [13] and decrease noise.



**Figure 1.** The 2030 Agenda for Sustainable Development by the United Nations [3].

Aside from the endeavors of governments and automobile manufacturers across the world, consumers are also a key factor that have contributed to the popularization of electric vehicles. The more consumers who use electric vehicles, the less petroleum consumed and the less CO<sub>2</sub> emitted [14]. At the critical juncture of the transformation from the production of traditional cars to the development and production of electric vehicles in the automobile industry, consumers who buy electric vehicles will have an enormous impact on the spreading of electric vehicles and the development of the whole industry; hence, it is necessary to explore the factors that drive consumers to buy electric vehicles.

This study analyzes the factors that influence consumer intentions to buy electric vehicles and tests the relationship between them, and intends to offer information for the formulation of policies designed to popularize electric vehicles in order to reduce carbon emissions from transportation.

## 1.2. Electric Vehicle

The electric vehicle is a hot research topic at present, and an increasing number of studies on the electric vehicle market have been conducted at home and abroad. According to Ewing and Sarigöllü, the price, performance, usage cost, and time cost are the key factors that influence the purchase of electric vehicles [15]. However, consumers lack an adequate understanding of the overall impacts of electric vehicles on the environment and the cost to possess electric vehicles [16,17]. This is one of the reasons why electric vehicles have not been widely used. Another factor that affects popularization is the battery life of electric vehicles [18]; therefore, some consumers would choose a plugged hybrid automobile instead [19]. If the problem of battery life is resolved, consumers will have a stronger intention to buy electric vehicles [20]. Liao et al. classified and summarized the influential factors of consumer preferences, such as socioeconomic variables, psychological factors, mobility condition, and social influence [21].

There are many factors that influence the purchase of electric vehicles; in addition to the aforementioned factors, brand effect is another reason. Moreover, the correlation between these factors and the degree to which they influence the consumer's purchase intention are also the focuses of this study.

## 2. Theoretical Framework and Research Hypotheses

### 2.1. Purchase Intention and Attitude

Consumer purchase intentions and attitudes have been discussed in many models, including Theory of Reasoned Action (TRA) [22], Theory of Planned Behavior (TPB) [23,24], and Technology Acceptance Model (TAM) [25]. In these models, attitude is interpreted as a personal inner experience that influences the consumer's purchase intention, and purchase intention is the tendency of consumer

action [23]. In this study, consumer attitudes toward electric vehicles are believed to have an effect on their purchase intention. Therefore, the following hypothesis is proposed:

**Hypotheses 1 (H1):** *Attitude has a significantly positive correlation with the consumer's intention to purchase electric vehicles.*

## 2.2. Perceived Benefit

The fundamental purpose of a trade is to achieve value [26]. For consumers, the perceived value of a product or service is one of major factors that influence the consumer's intention to purchase [27]. Perceived benefit is the perceived possibility of the positive result of a purchase [28]. As a cognitive emotion, it has positive impacts on the consumer's intention and behavior [29]. The consumer's perceived benefits of electric vehicles can be divided into financial and non-financial benefits. Regarding financial benefit, the subsidy for the purchase of electric vehicles is high [30,31]. Meanwhile, the zero petroleum consumption of electric vehicles and the good after-sale services of manufacturers are two of the reasons why consumers choose electric vehicles. In terms of non-financial benefits, the zero petroleum consumption of electric vehicles indicates that electric vehicles are environmentally friendly [32]. Moreover, electric vehicles feature zero noise, high technology, and steady acceleration [33]. Perceived benefit is one of the main factors that influences the consumer's purchase of electric vehicles [34]; hence, this paper proposes the following hypotheses:

**Hypotheses 2 (H2).** *Perceived benefit has a significantly positive correlation with the consumer's intention to purchase electric vehicles.*

**Hypotheses 3 (H3).** *Perceived benefit has a significantly positive correlation with the consumer's attitude towards electric vehicles.*

## 2.3. Perceived Risk

Perceived risk was originally a research topic in the realm of psychology, and referred to the consumer's predicted negative effects regarding the purchase of a specific product [35]. It is usually in a negative correlation with perceived benefit [36]. As electric vehicles have not been widely used, many consumers are still biased against them [37] in terms of safety [38], reliability [39], and battery life [40]. These are the factors that affect the consumer's selection of electric vehicles. The less consumers know about the electric vehicle, the more biased they will be against it and the more negative effects there will be. In addition, consumers would be influenced not only by the perceived benefit, but also the perceived risk in their intention and behavior, and they would balance benefit against risk before making the final decision and seeking the best solution [41]. Therefore, this paper proposes the following hypotheses:

**Hypotheses 4 (H4).** *Perceived risk has a remarkably negative correlation with the consumer's attitude towards electric vehicles.*

**Hypotheses 5 (H5).** *Perceived risk has a remarkably negative correlation with the consumer's intention to purchase electric vehicles.*

**Hypotheses 6 (H6).** *Perceived risk has a remarkably negative correlation with the consumer's perceived benefit of electric vehicles.*

## 2.4. New Product Knowledge

New product knowledge has a great influence on the consumer's purchase intention [42], and the more that consumers know about a new product, the more they intend to purchase it [43]. According

to Wang and Hazen, consumers with more knowledge of green products and value would be more efficient in using the products [44]. Hence, it is important for consumers to have knowledge of electric vehicles [45]. If consumers know more about electric vehicles, they will be more likely to purchase the product [46]. In addition, new product knowledge is related to perceived benefit [47] and perceived risk [48]. More knowledge can further offset perceived risk [49] and motivate consumers to believe that electric vehicles would create more benefits for themselves and society [46]. Therefore, this paper proposes the following hypotheses:

**Hypotheses 7 (H7).** *New product knowledge has a significantly positive correlation with the consumer's perceived benefit of electric vehicles.*

**Hypotheses 8 (H8).** *New product knowledge has a significantly negative correlation with the consumer's perceived risk of electric vehicles.*

## 2.5. Brand Trust

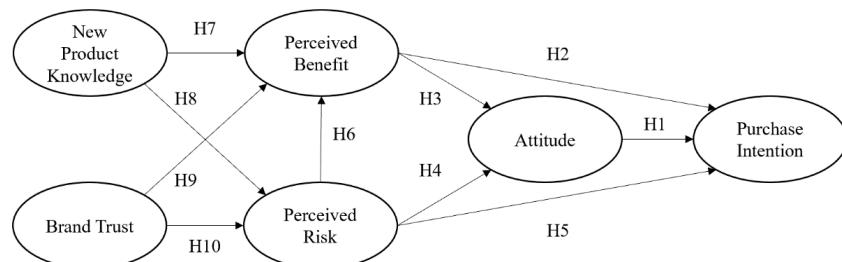
Trust is one of the factors that must be considered in the explanation of the consumer's behavioral intention, as it plays an essential role if there is uncertainty and risk [50]. Brand trust refers to the relationship between the consumer's perceived quality of a product or service and the brand and reputation of manufacturers [51]. If consumers have a higher perceived quality of a desired brand product, they will show more trust in the brand and less perceived uncertainty and risk. Most existing studies on brand trust are about food [50,52], business [53,54], and network media [55–57]. As the electric vehicle is an emerging industry, most electric vehicle manufacturers and models are not popular, with the exception of Tesla. However, this study believes that brand trust would have an effect on consumers and eliminate their perceived uncertainty and risk [50]; thus, trust would influence the consumer's benefit. Hence, this paper proposes the following hypotheses:

**Hypotheses 9 (H9).** *Brand trust has a noticeably positive correlation with the consumer's perceived benefit of electric vehicles.*

**Hypotheses 10 (H10).** *Brand trust has a noticeably positive correlation with the consumer's perceived risk of electric vehicles.*

## 2.6. Proposed Theoretical Model

According to the aforementioned, this study proposes the following model (see Figure 2), which is comprised of six dimensions—"Purchase Intention," "Attitude," "Perceived Benefit," "Perceived Risk," "New Product Knowledge," and "Brand Trust"—and ten relevant research hypotheses.



**Figure 2.** Proposed model of this study.

## 2.7. Definition and Measure of Variables

This study designed the items of the questionnaire according to the research theme and relevant literature. The definitions of variable operability and reference scales are shown in Table 1.

**Table 1.** Definitions of variable operability and reference scales.

Research Variable	Operability Definition	Reference Scale
Purchase intention	It refers to the possibility that consumers will purchase electric vehicles.	Wang et al. [46]; Han et al. [58]
Attitude	It indicates the consumer's actual attitude towards, and the evaluation of, electric vehicles.	Wang et al. [46]
Perceived benefit	It is the consumer's perceived possibility of the positive results of purchase.	Kim et al. [59]; Kim et al. [60]
Perceived risk	It represents the consumer's predicted risk of purchasing electric vehicles.	Wang et al. [46]
New product knowledge	It implies the degree to which consumers know about electric vehicles.	Wang et al. [46]; Han et al. [58]
Brand trust	It signifies the degree to which consumers trust the chosen brand in the purchase of electric vehicles.	Lassoued & Hobbs [52]

### 3. Data and Methodology

#### 3.1. Analysis of Pre-Test Questionnaires

A 7-point Likert scale was adopted for the pre-test questionnaire of this study. The pre-test questionnaire was conducted from 15 January to 3 February 2020, during which, 60 questionnaire copies were distributed and 49 questionnaires were retrieved. For more accurate research results, the reliability and items of the pre-test questionnaire were analyzed to remove irregular items and enhance the reliability and discrimination of items.

As shown in Table 2, with the exception of "Brand Trust," the Cronbach's  $\alpha$  values of all dimensions were higher than 0.6, which indicated that all the dimensions were highly reliable. As the Cronbach's  $\alpha$  of "Brand Trust" was higher than 0.6, after Item BT2 was removed, the item was deleted. Meanwhile, the Cronbach's  $\alpha$  of "New Product Knowledge" would have risen without Item NPK5; thus, this item was also removed. The official questionnaire copies were distributed after the removal of the above two items.

**Table 2.** Analysis of the reliability and items of the dimensions of the pre-test questionnaire.

Dimension	Item	Cronbach's $\alpha$ after the Removal	Correlation Coefficient with the Total Scale Score	p-Value in t-Test on Independent Sample
Perceived Benefit (PB) Cronbach's $\alpha$ = 0.839	PB1	0.810	0.629	0.000
	PB2	0.832	0.541	0.000
	PB3	0.821	0.587	0.000
	PB4	0.786	0.716	0.000
	PB5	0.776	0.745	0.000
Perceived Risk (PR) Cronbach's $\alpha$ = 0.722	PR1	0.696	0.447	0.000
	PR2	0.593	0.617	0.000
	PR3	0.679	0.477	0.000
	PR4	0.665	0.505	0.000
Attitude (ATT) Cronbach's $\alpha$ = 0.892	AT1	0.854	0.795	0.000
	AT2	0.832	0.868	0.000
	AT3	0.840	0.860	0.000
	AT4	0.881	0.683	0.000
Brand Trust (BT) Cronbach's $\alpha$ = 0.565	BT1	0.353	0.517	0.000
	BT2	0.604	0.242	0.000
	BT3	0.242	0.327	0.000
	BT4	0.354	0.354	0.000
Purchase Intention (PI) Cronbach's $\alpha$ = 0.941	PI1	0.936	0.815	0.000
	PI2	0.908	0.902	0.000
	PI3	0.915	0.882	0.000
	PI4	0.929	0.837	0.000
New Product Knowledge (NPK) Cronbach's $\alpha$ = 0.876	NPK1	0.825	0.806	0.000
	NPK2	0.830	0.792	0.000
	NPK3	0.809	0.862	0.000
	NPK4	0.852	0.713	0.000
	NPK5	0.921	0.436	0.000

### 3.2. Sample and Data Collection

The official questionnaire of this study was carried out on the Internet to collect data, and the subjects were from China. There were 24 items as the estimation parameters of the questionnaire, and 496 samples were collected. According to the study by Jackson [61], the ratio of estimation parameters to samples should be 1:20; thus, the collection of the questionnaire copies was stopped. After invalid samples were removed, the number of the remaining samples was 417, and was still higher than the minimum quantity of samples (1:10) [61]; hence, the remaining samples were used for data analysis in the later stage. The valid copies accounted for 84.1%. The data about the samples of the valid copies were statistically analyzed to obtain the information about the gender and age of the samples. The distribution of the demographic variables is shown in Table 3.

**Table 3.** Basic data of the respondents.

Sample	Category	Number	Percentage
Gender	Male	222	53.2%
	Female	195	46.8%
Age	Under 30	99	23.7%
	31–40	171	41.0%
	41–50	104	24.9%
	Above 51	43	10.3%
Marital status	Single	90	21.6%
	Married	327	78.4%
Income (RMB)	Under 4000	56	13.4%
	4001–6000	112	26.9%
	6001–12,000	164	39.3%
	12,001–18,000	50	12.0%
	Above 18,001	35	8.4%
Education	Middle school and below	15	3.6%
	High school or technical secondary school	44	10.6%
	Undergraduate or junior college	252	60.4%
	Graduate and above	106	25.4%
Occupation	Manufacturing	15	3.6%
	Medical care	21	5.0%
	Finance	27	6.5%
	Design	61	14.6%
	Services	65	15.6%
	Others	228	54.7%

Data source: Compiled by this study.

### 3.3. Measurement Model

#### 3.3.1. Convergent Validity

This study used AMOS v22.0 software for structural equation model analysis. Because a large number of studies have used AMOS for analysis, AMOS is proven to be a reliable structural equation modeling software. According to the research of Anderson and Gerbing, data analysis can be divided into two stages [62]. The first stage was the Measurement Model, where the Maximum Likelihood Estimation method was adopted, and the estimation parameters included factor loading, reliability, convergent validity, and discriminant validity. According to the studies by Hair et al. [63], Nunnally and Bernstein [64], and Fornell and Larcker [65]—and those by Chin [66] and Hooper et al. [67] to probe into standardized factor loading—to explore convergent validity, the standardized factor loadings of this study ranged from 0.441 to 0.917, as shown in Table 4, which were within the acceptable scope.

This meant that most of the items were reliable. The composite reliabilities of the dimensions were between 0.672 and 0.917, and most were above 0.7, which met the criterion suggested by scholars and showed that most of the dimensions were internally consistent. The average variance extractions ranged from 0.407 to 0.736, and most were higher than 0.5 [63], which indicated that most of the dimensions had a high level of convergent validity.

**Table 4.** Results for the Measurement Model.

Construct	Item	Significance of Estimated Parameters				Item Reliability	Construct Reliability	Convergence Validity
		Unstd.	S.E.	Unstd./S.E.	p-Value			
PB	PB1	1.000				0.456	0.208	0.776
	PB2	1.058	0.158	6.704	0.000	0.441	0.194	
	PB3	1.733	0.212	8.174	0.000	0.650	0.423	
	PB4	2.246	0.264	8.516	0.000	0.796	0.634	
	PB5	2.098	0.249	8.437	0.000	0.816	0.666	
PR	PR1	1.000				0.604	0.365	0.752
	PR2	1.361	0.128	10.656	0.000	0.820	0.672	0.439
	PR3	1.045	0.105	9.931	0.000	0.682	0.465	
	PR4	0.853	0.104	8.183	0.000	0.503	0.253	
ATT	AT1	1.000				0.909	0.826	0.890
	AT2	1.048	0.036	28.805	0.000	0.910	0.828	0.672
	AT3	0.843	0.041	20.491	0.000	0.771	0.594	
	AT4	0.783	0.050	15.801	0.000	0.663	0.440	
BT	BT1	1.000				0.688	0.473	0.672
	BT2	0.790	0.079	10.047	0.000	0.634	0.402	0.407
	BT3	0.804	0.092	8.722	0.000	0.587	0.345	
PI	PI1	1.000				0.842	0.709	0.896
	PI2	0.948	0.047	20.271	0.000	0.828	0.686	0.682
	PI3	0.955	0.050	19.191	0.000	0.805	0.648	
	PI4	1.043	0.052	19.987	0.000	0.829	0.687	
NPK	NPK1	1.000				0.884	0.781	0.917
	NPK2	1.033	0.037	27.917	0.000	0.915	0.837	0.736
	NPK3	0.991	0.036	27.547	0.000	0.917	0.841	
	NPK4	0.731	0.044	16.795	0.000	0.696	0.484	

Unstd.: Unstandardized factor loadings; Std: Standardized factor loadings; SMC: Square Multiple Correlations; CR: Composite Reliability; AVE: Average Variance Extracted.

### 3.3.2. Discriminant Validity

The results of Fornell and Larcker [65] were used to test the discriminant validity of this study. If the Average Variance Extracted (AVE) square root of each dimension was higher than the correlation coefficient between dimensions, it would mean that the model had discriminant validity.

As shown in Table 5, the AVE square root of each dimension in the diagonal line was higher than the correlation coefficient beyond the diagonal line; hence, each dimension of this study had a high level of discriminant validity.

**Table 5.** Discriminant validity for the Measurement Model.

	AVE	PB	PR	ATT	BT	PI	NPK
PB	0.425	<b>0.652</b>					
PR	0.439	-0.164	<b>0.663</b>				
ATT	0.672	0.649	-0.261	<b>0.82</b>			
BT	0.407	0.604	-0.182	0.405	<b>0.638</b>		
PI	0.682	0.623	-0.172	0.772	0.382	<b>0.826</b>	
NPK	0.736	0.402	-0.051	0.259	0.374	0.250	<b>0.858</b>

Note: The items on the diagonal in bold represent the square roots of the AVE; off-diagonal elements are the correlation estimates.

### 3.4. Structural Model Analysis

The nine goodness-of-fit indices, as obtained in the study by Jackson et al. [68], are the most widely used in SSCI journals, and were adopted to report the research results of this study. Kline [69] and Schumacker et al. [70] suggested that the goodness of fit of the model should be evaluated with diverse goodness-of-fit indices, rather than with the  $p$  value alone. In theory, a lower “ $\chi^2$ ” is better; however, as “ $\chi^2$ ” is sensitive to the quantity of samples, “ $\chi^2/df$ ” was utilized to facilitate the evaluation, and its ideal value should be lower than 3. In addition, Hu and Bentler [71] argued that each index should be separately evaluated, and that more rigorous model fit indices should be adopted to control the error of the dominant “I,” such as the “Standardized RMR < 0.08” and “CFI > 0.90” or “RMSEA < 0.08”. Finally, the Satorra–Bentler scaled chi-square test [72,73] was used to modify the chi-square different statistics and the model fit. The structural model fit of this study was as follows (see Table 6):

**Table 6.** Model fit processed by Satorra-Bentler scaled chi-square.

Model Fit	Criteria	Model fit of Research Model
ML $\chi^2$	The smaller the better	574.625
DF	The larger the better	241.000
Normed Chi-sqr ( $\chi^2/DF$ )	$1 < \chi^2/DF < 3$	2.384
RMSEA	<0.08	0.058
SRMR	<0.08	0.076
TLI (NNFI)	>0.9	0.907
CFI	>0.9	0.919
GFI	>0.9	0.9
AGFI	>0.9	0.886

### Path Analysis

As shown in Table 7, “Brand Trust (BT)” ( $b = 0.345, p < 0.001$ ) and “New Production Knowledge (NPK)” ( $b = 0.103, p < 0.001$ ) had significant impacts on “PB”; “Brand Trust (BT)” ( $b = -0.182, p = 0.015$ ) had a marked effect on “Perceived Risk (PR)”; “Perceived Benefit” (PB) ( $b = 1.163, p < 0.001$ ) and “Perceived Risk (PR)” ( $b = -0.205, p = 0.002$ ) had a noticeable influence on “Attitude (ATT)”; “Perceived Benefit (PB)” ( $b = 0.385, p < 0.001$ ) and “Attitude (ATT)” ( $b = 0.630, p < 0.001$ ) exerted a remarkable effect on “Purchase Intention (PI).”

**Table 7.** Regression coefficient.

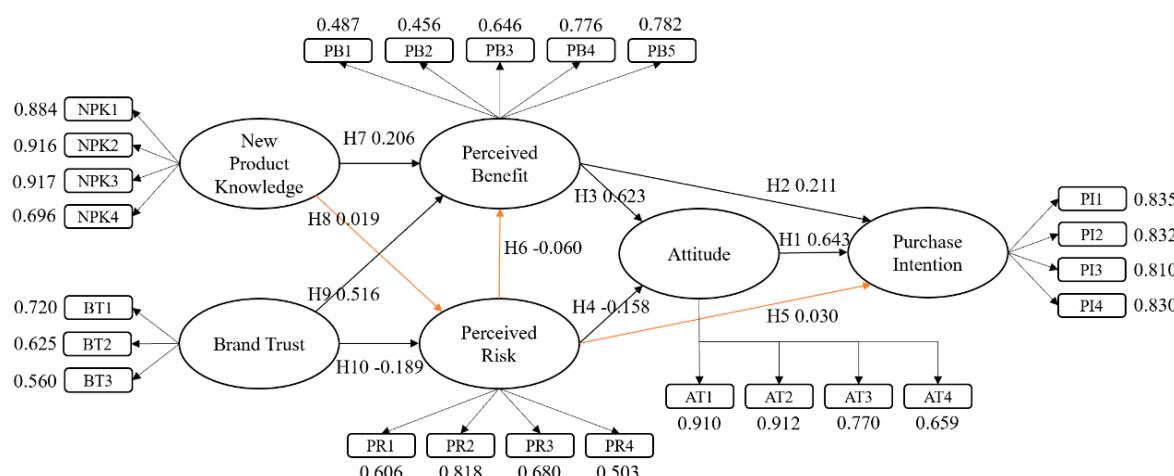
DV	IV	Unstd	S.E.	Unstd./S.E.	p-Value	Std.	R <sup>2</sup>
PB	PR	-0.041	0.040	-1.040	0.298	-0.060	0.404
	BT	0.345	0.063	5.481	0.000	0.516	
	NPK	0.103	0.029	3.516	0.000	0.206	
PR	BT	-0.182	0.075	-2.432	0.015	-0.189	0.033
	NPK	0.014	0.046	0.305	0.760	0.019	
ATT	PB	1.163	0.139	8.381	0.000	0.623	0.446
	PR	-0.205	0.065	-3.151	0.002	-0.158	
PI	PB	0.385	0.110	3.499	0.000	0.211	0.623
	PR	0.038	0.054	0.701	0.483	0.030	
	ATT	0.630	0.061	10.308	0.000	0.643	

The power of “Perceived Risk (PR),” “Brand Trust (BT),” and “New Production Knowledge (NPK)” to explain “Perceived Benefit (PB)” was 40.4%; the power of “Brand Trust (BT)” and “New Production Knowledge (NPK)” to explain “Perceived Risk (PR)” was 3.3%; the power of “Perceived Benefit (PB)” and “Perceived Risk (PR)” to explain “Attitude (ATT)” was 44.6%; the power of “Perceived Benefit

(PB)," "Perceived Risk (PR)," and "Attitude (ATT)" to explain "Purchase Intention (PI)" was 62.3%. It is obvious that the research results support the model and research questions of this study.

### *3.5. Hypothesis Explanation*

Table 7 shows the normalization coefficient of the SEM model in this study. The higher coefficient implies that the independent variable plays a more important role in the dependent variable. With the exception of H5, H6, and H8, the remaining hypotheses of this model are valid. Figure 3 shows the influence between variables in the structural model.



**Figure 3.** Research structure pattern diagram.

### *3.6. Results and Discussion*

This study utilized the structural equation model to determine the factors that influence the consumer's intention to purchase electric vehicles, draw conclusions, and give some suggestions, with the intention of offering information for the formulation of policies designed to popularize electric vehicles in order to reduce the carbon emissions of transportation. The results of the empirical analysis have revealed some important findings, which are discussed as follows.

H1 is valid, which means that attitude has a remarkably positive correlation with the consumer's intention to purchase electric vehicles. Moreover, the path coefficient is the highest, which shows that the consumers who have a more positive attitude towards the use and purchase of electric vehicles are more willing to buy the products [33,74]. The direct effect of attitude on intention is manifested in TRA [22], TPB [23,24], and TAM [26]. In addition, the consumer's awareness of environmental protection has gradually enhanced in recent years [75,76], which indicates that attitude is a supportive index for predicting the consumer's purchase intention.

H2 is valid, which implies that perceived benefit has a noticeable correlation with the consumer's intention to purchase electric vehicles. The fact that H3 is also valid means that perceived benefit has an obviously positive correlation with the consumer's attitude toward electric vehicles. Moreover, the path coefficient is relatively high, indicating that the consumer's perceived benefit would influence their attitude towards electric vehicles and their purchase intention. Instead of exerting direct influence on purchase intention, the consumer's perceived benefit affects purchase intention through attitude [77]. Consumers perceive that electric vehicles overtake traditional automobiles with a combustion engine for zero petroleum consumption, little pollution, and smooth movement [78], and that electric vehicles enjoy supporting policies, such as "better access to get a license plate" and "a higher purchase subsidy" [79]. Therefore, they have developed a positive attitude towards electric vehicles. Finally, other factors, such as environmental protection and petroleum price, would also influence the consumer's purchase intention. Thus, perceived benefit is a supportive index for predicting the consumer's purchase intention [80].

H4 is valid, which implies that perceived risk has a significantly negative correlation with the consumer's attitude towards electric vehicles. Neither H5 nor H6 are valid, which indicates that there is no noticeable correlation between perceived risk and the consumer's intention to purchase electric vehicles or their perceived benefit of electric vehicles. This also means that consumers will develop a more negative attitude towards electric vehicles if their perceived risk of electric vehicles is higher. However, the fact that there was no remarkable correlation between perceived risk and perceived benefit is inconsistent with the findings of previous studies [81]. The possible reason for this is that the consumer's perceived risk of electric vehicles is focused on the weaknesses of existing electric vehicles, such as low safety, a short battery life, and the long time required for charging [82], and is not directly connected with the consumer's perceived benefit of the strengths of the products, including zero petroleum consumption, little pollution, and smooth movement [78]. According to the results of this study, perceived risk does not have an immediate effect on the consumer's purchase intention; instead, it influences purchase intention through attitude. This indicates that these weaknesses (low safety, a short battery life, and a long time for charging) will be constantly reduced with the development of the electric vehicle industry and technological advancements; however, the electric vehicles still fail to meet the expectations of consumers. Worse still, the concern about the weaknesses will result in a more negative attitude from consumers, and then affect their purchase intention. Moreover, the dimension correlation also shows that the effect of perceived risk on attitude is far greater than that of perceived benefit on attitude, which means that consumers believe that the strengths of electric vehicles, including zero petroleum consumption (low cost) [83], little pollution (environmentally friendly), and smooth movement (user experience) [30] can offset the risk caused by the weaknesses. The reasons for this are as follows: firstly, most consumers drive electric vehicles in urban areas, which reduces the cost of petroleum consumption caused by traffic jams; secondly, there are many charging points in urban areas and these charging points are near to each other, which reduces the concern caused by the weaknesses.

H7 is valid, which means that there is a markedly positive correlation between new product knowledge and the consumer's perceived benefit of electric vehicles. H8 is invalid, which implies that there is no noticeable correlation between new product knowledge and the consumer's perceived risk of electric vehicles, and that the consumers who have more new product knowledge of electric vehicles would perceive more benefits. The new product knowledge of electric vehicles, as defined in this study, includes various strengths, such as comfort, a high accelerated speed, low pollution, and little noise [83], as well as other features, such as time of charging and application scope. The greater the new product knowledge of consumers, the more they know about the features (strengths and weaknesses) of electric vehicles. Meanwhile, consumers with more new product knowledge would be clearer about the strengths of electric vehicles compared with traditional automobiles with a combustion engine, and, thus, have more perceived benefit, which will influence their attitude towards electric vehicles and purchase intention. There is no marked correlation between new product knowledge and the consumer's perceived risk of electric vehicles, which indicates that the consumer's knowledge of electric vehicles may not reduce their concern. Regarding the previous paragraph, the perceived risk of electric vehicles comes from the weaknesses of electric vehicles (low safety, a short battery life, and a long time for charging). As electric vehicles are still in the stages of development at present, it is impossible to reduce the perceived risks of consumers with more new product knowledge before a better solution to the weaknesses of electric vehicles is found in the overall industry [84].

H9 is valid, which means that brand trust has a significantly positive correlation with the consumer's perceived benefit of electric vehicles, and the path coefficient is relatively high. H10 is valid, which implies that there is a noticeably negative correlation between brand trust and the consumer's perceived risk of electric vehicles; it also shows that the consumer's brand trust in electric vehicles influences their perceived benefits and risks, and this greater brand trust leads to more perceived benefits and less perceived risks. With the gradual development of the electric vehicle industry, some new brands have been formed, such as Tesla and NIO. Famous brands would reduce the consumer's

perceived risk and increase their perceived benefit; consumers tend to trust the quality and service of well-known brands [85] and feel less concern. Moreover, brand trust has a greater effect on perceived benefit than new product knowledge, which indicates that consumers tend to trust the reliability created by brands rather than evaluating the benefit of electric vehicles with their own knowledge. This also implies that consumers tend to believe that the products of their favorite brands will give them a better experience than those equipped with the same functions and performance.

This study established 10 hypotheses overall, of which, seven are supported (H1–H4, H7, H9, and H10), which means the research model is acceptable in explaining the factors that influence the consumer's purchase decisions on electric vehicles. From this, it is known that consumers will consider a variety of factors when choosing whether to buy an electric vehicle, and the most influential factor is their attitude towards electric vehicles. In addition, their attitudes are affected by other factors, including perceived benefit, perceived risk, new product knowledge, and brand trust. These factors have different degrees of influence on consumer attitudes and electric vehicle purchase decisions. Perceived benefit and perceived risk, as factors that directly impact attitudes, greatly influence the consumer's final decisions. The consumer's perception on the strengths of the products, including zero petroleum consumption, little pollution, and smooth movement, in perceived benefit, and safety considerations, endurance ability considerations, or long charging time in perceived risk all reflect their cost considerations for electric vehicles [86]. These cost considerations include the cost of value, the cost of use, the cost of time, and the cost of risk of electric vehicles. In this study, among the perceived factors, new product knowledge and brand trust was selected for discussion to mine the influencing factors that consumers can perceive more intuitively from various cost considerations. From the research results, consumers have a certain degree of perception of new product knowledge and brand trust, which act on perceived benefit and perceived risk, which, in turn, affect attitude and purchase intention. This means that it is indispensable to enhance the product power of electric vehicles and carry out corresponding brand marketing and promotion to increase the consumer's brand trust in order to influence their attitudes and purchase decisions.

#### 4. Conclusions and Suggestions

##### 4.1. Conclusions

The greatest contribution of this study is that it has established a theoretical model regarding the factors that influence the consumer's intention to purchase electric vehicles through various dimensions, such as new product knowledge, brand trust, perceived risk, and perceived benefit. In addition, the relevant effect analysis of this study shows that all of the above dimensions exert direct or indirect effects on the consumer's intention to purchase electric vehicles. This study has aimed to explore the meaning of the consumer's perceived benefit and perceived risk with electric vehicles and selectively discuss the more intuitive possibilities, thus, setting up the foundation for subsequent in-depth research. Meanwhile, the conclusions of this study can be taken as reference information for governments, consumers, and those working in the field of electric vehicles to promote purchase and reduce the carbon emission of transportation [87].

According to the analysis results, consumer attitudes are the most important factor in influencing their intention to purchase electric vehicles, and the factors that influence attitudes include perceived benefit (direct and positive), perceived risk (direct and negative), new product knowledge (indirect and positive), and brand trust (indirect and positive). The greatest effect is found in this line: Brand Trust→Perceived Benefit→Attitude→Purchase Intention. This means that the brand can increase the consumer's perceived benefit of electric vehicles, make consumers more attracted to electric vehicles, and influence their final purchase intention. Meanwhile, the consumer's trust in the brand can also reduce their perceived potential risk of purchasing electric vehicles and contribute to their more positive attitude towards the products. The concern about the use of electric vehicles and their higher requirements are the main obstacles that affect the consumer's attitude towards electric vehicles and

their purchase intention [84]. In addition, the consumer's knowledge of electric vehicles would create an indirect positive effect on their attitude and purchase intention; the more they know about electric vehicles, the clearer their understanding is of whether they need the product.

For most potential consumers of electric vehicles, the weaknesses of electric vehicles, low popularization, and inadequate demand are the reasons why they have not purchased electric vehicles. Therefore, this study offers the following suggestions:

1. On government policies: (1) at least maintain the existing policies on purchase subsidy for electric vehicles in the near future and arouse the consumer's initiative to purchase electric vehicles; (2) popularize the knowledge of electric vehicles through market-oriented publicity and incentives; (3) encourage the manufacturers and enterprises of electric vehicles to generate better products, including batteries and engines; (4) cooperate with relevant enterprises to establish more charging points for electric vehicles.
2. On electric vehicle manufacturers: (1) make greater effort to develop electric vehicles and increase functions according to government policies; (2) improve the purchase experience and after-sale services, such as encouraging consumers to take a trial drive and adopting a new marketing model that features the combination of online reservation and offline purchase; (3) organize more driver social activities on a more regular basis, such as holding electric vehicle track days and forming an electric vehicle culture in order to further the development of the electric vehicle industry and market.

#### 4.2. Future Research Directions

The limitations of this study may indicate some future research directions.

1. This study probed into the factors influencing the consumer's intention to purchase electric vehicles from the perspective of consumers; however, the effects of continuously improving government policies for consumers were not considered. Hence, future researchers can focus on this issue.
2. This study did not analyze the samples according to their social or financial conditions; therefore, emphasis can be placed on the differences in attitudes towards electric vehicles and the purchase intentions among consumers from different regions, with different earnings, and of different ages in future studies.
3. The correlation between some dimensions in the model of this study is not marked, which is probably because some latent variables or sub-dimensions were not explored. For that reason, future researchers can add new dimensions, including sub-dimensions and mediating variables, to improve the model by strengthening its explanatory power.
4. This research has focused on the constructed model, without any in-depth or specific discussion on cost, price difference, performance difference, etc. In the future, a deeper discussion can be carried out on the basis of this research model.

**Author Contributions:** Conceptualization, C.Y. and Q.J.; Data curation, C.Y. and Q.J.; Formal analysis, C.Y.; Supervision, J.-C.T.; Writing—original draft, C.Y.; Writing—review and editing, C.Y., J.-C.T. and Q.J. All authors have read and agreed to the published version of the manuscript.

**Funding:** This research received no external funding.

**Conflicts of Interest:** The authors declare no conflict of interest.

#### References

1. Enzler, H.B.; Diekmann, A. All talk and no action? An analysis of environmental concern, income and greenhouse gas emissions in switzerland. *Energy Res. Soc. Sci.* **2019**, *51*, 12–19. [[CrossRef](#)]
2. Sang, Y.-N.; Bekhet, H.A. Modelling electric vehicle usage intentions: An empirical study in malaysia. *J. Clean. Prod.* **2015**, *92*, 75–83. [[CrossRef](#)]

3. Nations, U. *Transforming Our World: The 2030 Agenda for Sustainable Development*; General Assembly: Vienna, Austria, 2015.
4. ElTayeb, T.K. The examination on the drivers for green purchasing adoption among ems 14001 certified companies in malaysian. *J. Manuf. Technol. Manag.* **2010**, *21*, 206–225. [[CrossRef](#)]
5. Buekers, J.; Van Holderbeke, M.; Bierkens, J.; Panis, L. Health and environmental benefits related to electric vehicle introduction in eu countries. *Transp. Res. Part D Transp. Environ.* **2014**, *33*, 26–38. [[CrossRef](#)]
6. Cazzola, P.; Gorner, M.; Schuitmaker, R.; Maroney, E. *Global ev Outlook 2016*; International Energy Agency: Paris, France, 2016.
7. Burns, L.D. Sustainable mobility: A vision of our transport future. *Nature* **2013**, *497*, 181. [[CrossRef](#)] [[PubMed](#)]
8. Bakker, S.; Trip, J.J. Policy options to support the adoption of electric vehicles in the urban environment. *Transp. Res. Part D: Transp. Environ. Sci. Technol.* **2013**, *25*, 18–23. [[CrossRef](#)]
9. Han, S.; Zhang, B.; Sun, X.; Han, S.; Höök, M. China’s energy transition in the power and transport sectors from a substitution perspective. *Energies* **2017**, *10*, 600. [[CrossRef](#)]
10. Ustun, T.S.; Zayegh, A.; Ozansoy, C. Electric vehicle potential in australia: Its impact on smartgrids. *IEEE Ind. Electron. Mag.* **2013**, *7*, 15–25. [[CrossRef](#)]
11. Weiss, M.; Patel, M.K.; Junginger, M.; Perujo, A.; Bonnel, P.; van Grootveld, G. On the electrification of road transport-learning rates and price forecasts for hybrid-electric and battery-electric vehicles. *Energy Policy* **2012**, *48*, 374–393. [[CrossRef](#)]
12. Gao, H.O.; Kitirattragarn, V. Taxi owners’ buying preferences of hybrid-electric vehicles and their implications for emissions in new york city. *Transp. Res. Part A Policy Pract.* **2008**, *42*, 1064–1073. [[CrossRef](#)]
13. Huo, H.; Zhang, Q.; Liu, F.; He, K. Climate and environmental effects of electric vehicles versus compressed natural gas vehicles in china: A life-cycle analysis at provincial level. *Environ. Sci. Technol.* **2013**, *47*, 1711–1718. [[CrossRef](#)] [[PubMed](#)]
14. Peters, A.; Gutscher, H.; Scholz, R.W. Psychological determinants of fuel consumption of purchased new cars. *Transp. Res. Part F Traffic Psychol. Behav.* **2011**, *14*, 229–239. [[CrossRef](#)]
15. Ewing, G.O.; Sarigöllü, E. Car fuel-type choice under travel demand management and economic incentives. *Transp. Res. Part D Transp. Environ.* **1998**, *3*, 429–444. [[CrossRef](#)]
16. Lane, B.; Potter, S. The adoption of cleaner vehicles in the uk: Exploring the consumer attitude–action gap. *J. Clean. Prod.* **2007**, *15*, 1085–1092. [[CrossRef](#)]
17. Krupa, J.S.; Rizzo, D.M.; Eppstein, M.J.; Lanute, D.B.; Gaalema, D.E.; Lakkaraju, K.; Warrender, C.E. Analysis of a consumer survey on plug-in hybrid electric vehicles. *Transp. Res. Part A Policy Pract.* **2014**, *64*, 14–31. [[CrossRef](#)]
18. Franke, T.; Krems, J.F. What drives range preferences in electric vehicle users? *Transp. Policy* **2013**, *30*, 56–62. [[CrossRef](#)]
19. Carley, S.; Krause, R.M.; Lane, B.W.; Graham, J.D. Intent to purchase a plug-in electric vehicle: A survey of early impressions in large us cities. *Transp. Res. Part D Transp. Environ.* **2013**, *18*, 39–45. [[CrossRef](#)]
20. Koetse, M.J.; Hoen, A.J.R.; Economics, E. Preferences for alternative fuel vehicles of company car drivers. *Resour. Energy Econom.* **2014**, *37*, 279–301. [[CrossRef](#)]
21. Liao, F.; Molin, E.; van Wee, B. Consumer preferences for electric vehicles: A literature review. *Transp. Rev.* **2016**, *37*, 252–275. [[CrossRef](#)]
22. Fishbein, M.; Ajzen, I. *Understanding Attitudes and Predicting Social Behavior*; Prentice-Hall: Upper Saddle River, NJ, USA, 1980.
23. Fishbein, M.; Ajzen, I. *Belief, Attitude, Intention, and Behavior: An Introduction to Theory and Research*; Addison-Wesley: Reading, MA, USA, 1977.
24. Ajzen, I. From intentions to actions: A theory of planned behavior. In *Action Control*; Springer: Berlin, Germnay, 1985; pp. 11–39.
25. Davis, F.D.; Bagozzi, R.P.; Warshaw, P.R. User acceptance of computer technology: A comparison of two theoretical models. *Manag. Sci.* **1989**, *35*, 982–1003. [[CrossRef](#)]
26. Holbrook, M. The nature of customer value: An axiology of services in the consumption experience. *Serv. Qual. New Dir. Theory Pract.* **1994**, *21*, 21–71.
27. Jin, N.P.; Lee, S.; Lee, H. The effect of experience quality on perceived value, satisfaction, image and behavioral intention of water park patrons: New versus repeat visitors. *Int. J. Tour. Res.* **2015**, *17*, 82–95. [[CrossRef](#)]

28. Orbell, S.; Crombie, I.; Johnston, G. Social cognition and social structure in the prediction of cervical screening uptake. *Br. J. Health Psychol.* **1996**, *1*, 35–50. [[CrossRef](#)]
29. Tsujikawa, N.; Tsuchida, S.; Shiotani, T. Changes in the factors influencing public acceptance of nuclear power generation in japan since the 2011 fukushima daiichi nuclear disaster. *Risk Anal.* **2016**, *36*, 98–113. [[CrossRef](#)]
30. Potoglou, D.; Kanaroglou, P.S. Household demand and willingness to pay for clean vehicles. *Transp. Res. Part D Transp. Environ.* **2007**, *12*, 264–274. [[CrossRef](#)]
31. Wang, S.; Fan, J.; Zhao, D.; Yang, S.; Fu, Y. Predicting consumers' intention to adopt hybrid electric vehicles: Using an extended version of the theory of planned behavior model. *Transportation* **2014**, *43*, 123–143. [[CrossRef](#)]
32. Morganti, E.; Browne, M. Technical and operational obstacles to the adoption of electric vans in france and the uk: An operator perspective. *Transp. Policy* **2018**, *63*, 90–97. [[CrossRef](#)]
33. Tu, J.-C.; Yang, C. Key factors influencing consumers' purchase of electric vehicles. *Sustainability* **2019**, *11*, 3863. [[CrossRef](#)]
34. Zhang, X.; Wang, K.; Hao, Y.; Fan, J.-L.; Wei, Y.-M. The impact of government policy on preference for nevs: The evidence from china. *Energy Policy* **2013**, *61*, 382–393. [[CrossRef](#)]
35. Dunn, M.G.; Murphy, P.E.; Skelly, G.U. Research note: The influence of perceived risk on brand preference for supermarket products. *J. Retail.* **1986**, *62*, 204–216.
36. Ho, S.S.; Leong, A.D.; Looi, J.; Chen, L.; Pang, N.; Tandoc, E. Science literacy or value predisposition? A meta-analysis of factors predicting public perceptions of benefits, risks, and acceptance of nuclear energy. *Environ. Commun.* **2018**, *13*, 457–471. [[CrossRef](#)]
37. She, Z.-Y.; Qing, S.; Ma, J.-J.; Xie, B.-C. What are the barriers to widespread adoption of battery electric vehicles? A survey of public perception in tianjin, china. *Transp. Policy* **2017**, *56*, 29–40. [[CrossRef](#)]
38. Lim, M.K.; Mak, H.-Y.; Rong, Y. Toward mass adoption of electric vehicles: Impact of the range and resale anxieties. *Manuf. Serv. Oper. Manag.* **2015**, *17*, 101–119. [[CrossRef](#)]
39. Jensen, A.F.; Cherchi, E.; Mabit, S.L. On the stability of preferences and attitudes before and after experiencing an electric vehicle. *Transp. Res. Part D Transp. Environ.* **2013**, *25*, 24–32. [[CrossRef](#)]
40. Graham-Rowe, E.; Gardner, B.; Abraham, C.; Skippon, S.; Dittmar, H.; Hutchins, R.; Stannard, J. Mainstream consumers driving plug-in battery-electric and plug-in hybrid electric cars: A qualitative analysis of responses and evaluations. *Transp. Res. Part A Policy Pract.* **2012**, *46*, 140–153. [[CrossRef](#)]
41. Wang, S.; Wang, J.; Lin, S.; Li, J. Public perceptions and acceptance of nuclear energy in china: The role of public knowledge, perceived benefit, perceived risk and public engagement. *Energy Policy* **2019**, *126*, 352–360. [[CrossRef](#)]
42. Salazar-Ordóñez, M.; Rodríguez-Entrena, M.; Cabrera, E.R.; Henseler, J. Understanding product differentiation failures: The role of product knowledge and brand credence in olive oil markets. *Food Qual. Prefer.* **2018**, *68*, 146–155. [[CrossRef](#)]
43. Ha, H.Y.; Janda, S. Predicting consumer intentions to purchase energy-efficient products. *J. Consum. Mark.* **2012**, *29*, 461–469. [[CrossRef](#)]
44. Wang, Y.; Hazen, B.T. Consumer product knowledge and intention to purchase remanufactured products. *Int. J. Prod. Econ.* **2016**, *181*, 460–469. [[CrossRef](#)]
45. Degirmenci, K.; Breitner, M.H. Consumer purchase intentions for electric vehicles: Is green more important than price and range? *Transp. Res. Part D Transp. Environ.* **2017**, *51*, 250–260. [[CrossRef](#)]
46. Wang, S.; Wang, J.; Li, J.; Wang, J.; Liang, L. Policy implications for promoting the adoption of electric vehicles: Do consumer's knowledge, perceived risk and financial incentive policy matter? *Transp. Res. Part A Policy Pract.* **2018**, *117*, 58–69. [[CrossRef](#)]
47. Liu, Y.; Hong, Z.; Zhu, J.; Yan, J.; Qi, J.; Liu, P. Promoting green residential buildings: Residents' environmental attitude, subjective knowledge, and social trust matter. *Energy Policy* **2018**, *112*, 152–161. [[CrossRef](#)]
48. Li, W.; Long, R.; Chen, H.; Geng, J. Household factors and adopting intention of battery electric vehicles: A multi-group structural equation model analysis among consumers in Jiangsu province, China. *Nat. Hazards* **2017**, *87*, 945–960. [[CrossRef](#)]
49. Nepomuceno, M.V.; Laroche, M.; Richard, M.-O. How to reduce perceived risk when buying online: The interactions between intangibility, product knowledge, brand familiarity, privacy and security concerns. *J. Retail. Consum. Serv.* **2014**, *21*, 619–629. [[CrossRef](#)]

50. Hartmann, M.; Klink, J.; Simons, J. Cause related marketing in the german retail sector: Exploring the role of consumers' trust. *Food Policy* **2015**, *52*, 108–114. [[CrossRef](#)]
51. Xie, Y.; Batra, R.; Peng, S. An extended model of preference formation between global and local brands: The roles of identity expressiveness, trust, and affect. *J. Int. Mark.* **2015**, *23*, 50–71. [[CrossRef](#)]
52. Lassoued, R.; Hobbs, J.E. Consumer confidence in credence attributes: The role of brand trust. *Food Policy* **2015**, *52*, 99–107. [[CrossRef](#)]
53. Zhao, W.; Sun, R.; Kakuda, N. Institutionalized place branding strategy, interfirm trust, and place branding performance: Evidence from china. *J. Bus. Res.* **2017**, *78*, 261–267. [[CrossRef](#)]
54. Han, S.H.; Nguyen, B.; Lee, T.J. Consumer-based chain restaurant brand equity, brand reputation, and brand trust. *Int. J. Hosp. Manag.* **2015**, *50*, 84–93. [[CrossRef](#)]
55. Laroche, M.; Habibi, M.R.; Richard, M.-O.; Sankaranarayanan, R. The effects of social media based brand communities on brand community markers, value creation practices, brand trust and brand loyalty. *Comput. Hum. Behav.* **2012**, *28*, 1755–1767. [[CrossRef](#)]
56. Pentina, I.; Zhang, L.; Basmanova, O. Antecedents and consequences of trust in a social media brand: A cross-cultural study of twitter. *Comput. Hum. Behav.* **2013**, *29*, 1546–1555. [[CrossRef](#)]
57. Jin, S.V.; Phua, J. The moderating effect of computer users' autotelic need for touch on brand trust, perceived brand excitement, and brand placement awareness in haptic games and in-game advertising (iga). *Comput. Hum. Behav.* **2015**, *43*, 58–67. [[CrossRef](#)]
58. Han, H.; Yu, J.; Kim, W. An electric airplane: Assessing the effect of travelers' perceived risk, attitude, and new product knowledge. *J. Air Transp. Manag.* **2019**, *78*, 33–42. [[CrossRef](#)]
59. Kim, D.J.; Ferrin, D.L.; Rao, H.R. Trust and satisfaction, two stepping stones for successful e-commerce relationships: A longitudinal exploration. *Inf. Syst. Res.* **2009**, *20*, 237–257. [[CrossRef](#)]
60. Kim, G.; Shin, B.; Lee, H.G. Understanding dynamics between initial trust and usage intentions of mobile banking. *Inf. Syst. J.* **2009**, *19*, 283–311. [[CrossRef](#)]
61. Jackson, D.L. Revisiting sample size and number of parameter estimates: Some support for the n:Q hypothesis. *Struct. Equ. Model.* **2003**, *10*, 128–141. [[CrossRef](#)]
62. Anderson, J.C.; Gerbing, D.W. Structural equation modeling in practice: A review and recommended two-step approach. *Psychol. Bull.* **1988**, *103*, 411–423. [[CrossRef](#)]
63. Hair, J.F.; Black, W.C.; Babin, B.J.; Anderson, R.E.; Tatham, R.L. *Multivariate Data Analysis*; Prentice hall: Upper Saddle River, NJ, USA, 1998; Volume 5.
64. Nunnally, J.C. *Psychometric Theory 3e*; Tata McGraw-Hill Education: New York, NY, USA, 1994.
65. Fornell, C.; Larcker, D.F. Evaluating structural equation models with unobservable variables and measurement error. *J. Mark. Res.* **2018**, *18*, 39–50. [[CrossRef](#)]
66. Chin, W.W. *Commentary: Issues and Opinion on Structural Equation Modeling*; Journal Storage: New York, NY, USA, 1998.
67. Hooper, D.; Coughlan, J.; Mullen, M.R. Structural equation modelling: Guidelines for determining model fit. *Electron. J. Bus. Res. Methods* **2008**, *6*, 53–60.
68. Jackson, D.L.; Gillaspy, J.A., Jr.; Purc-Stephenson, R. Reporting practices in confirmatory factor analysis: An overview and some recommendations. *Psychol. Methods* **2009**, *14*, 6. [[CrossRef](#)]
69. Kline, R.B. *Principles and Practice of Structural Equation Modeling*; Guilford Publications: New York, NY, USA, 2015.
70. Whittaker, T.A. *A Beginner's Guide to Structural Equation Modeling*; Taylor & Francis: Milton Park, UK, 2011.
71. Hu, L.T.; Bentler, P.M. Cutoff criteria for fit indexes in covariance structure analysis: Conventional criteria versus new alternatives. *Struct. Equ. Model. Multidiscip. J.* **1999**, *6*, 1–55. [[CrossRef](#)]
72. Satorra, A.; Bentler, P.M. Corrections to test statistics and standard errors in covariance structure analysis. In *Latent Variables Analysis: Applications for Developmental Research*; Sage Publications, Inc.: Thousand Oaks, CA, USA, 1994.
73. Satorra, A. *Scaling Corrections for Chi-Square Statistics in Covariance Structure Analysis*; American Statistical Association 1988 Proceedings of Business and Economics Sections, 1988; American Statistical Association: Alexandria, VA, USA, 1988; pp. 308–313.
74. Huang, X.; Ge, J. Electric vehicle development in beijing: An analysis of consumer purchase intention. *J. Clean. Prod.* **2019**, *216*, 361–372. [[CrossRef](#)]

75. Taufique, K.M.R.; Vaithianathan, S. A fresh look at understanding green consumer behavior among young urban Indian consumers through the lens of theory of planned behavior. *J. Clean. Prod.* **2018**, *183*, 46–55. [[CrossRef](#)]
76. Chen, Y.-S. The drivers of green brand equity: Green brand image, green satisfaction, and green trust. *J. Bus. Ethics* **2009**, *93*, 307–319. [[CrossRef](#)]
77. Jahn, S.; Tsalis, G.; Lähteenmäki, L. How attitude towards food fortification can lead to purchase intention. *Appetite* **2019**, *133*, 370–377. [[CrossRef](#)]
78. Caulfield, B.; Farrell, S.; McMahon, B. Examining individuals preferences for hybrid electric and alternatively fuelled vehicles. *Transp. Policy* **2010**, *17*, 381–387. [[CrossRef](#)]
79. Li, W.; Yang, M.; Sandu, S. Electric vehicles in China: A review of current policies. *Energy Environ.* **2018**, *29*, 1512–1524. [[CrossRef](#)]
80. Kim, M.-K.; Oh, J.; Park, J.-H.; Joo, C. Perceived value and adoption intention for electric vehicles in Korea: Moderating effects of environmental traits and government supports. *Energy* **2018**, *159*, 799–809. [[CrossRef](#)]
81. Messagie, M.; Boureima, F.-S.; Coosemans, T.; Macharis, C.; Mierlo, J.V. A range-based vehicle life cycle assessment incorporating variability in the environmental assessment of different vehicle technologies and fuels. *Energies* **2014**, *7*, 1467–1482. [[CrossRef](#)]
82. Hoen, A.; Koetse, M.J. A choice experiment on alternative fuel vehicle preferences of private car owners in the Netherlands. *Transp. Res. Part A Policy Pract.* **2014**, *61*, 199–215. [[CrossRef](#)]
83. Zethmayr, J.; Kolata, D. Charge for less: An analysis of hourly electricity pricing for electric vehicles. *World Electr. Veh. J.* **2019**, *10*. [[CrossRef](#)]
84. Yang, S.; Zhang, D.; Fu, J.; Fan, S.; Ji, Y. Market cultivation of electric vehicles in China: A survey based on consumer behavior. *Sustainability* **2018**, *10*, 4056. [[CrossRef](#)]
85. Erdem, T.; Swait, J. Brand credibility, brand consideration, and choice. *J. Consum. Res.* **2004**, *31*, 191–198. [[CrossRef](#)]
86. Egbue, O.; Long, S. Barriers to widespread adoption of electric vehicles: An analysis of consumer attitudes and perceptions. *Energy Policy* **2012**, *48*, 717–729. [[CrossRef](#)]
87. Rieck, F.; Machielse, K.; van Duin, R. Will automotive be the future of mobility? Striving for six zeros. *World Electr. Veh. J.* **2020**, *11*, 10. [[CrossRef](#)]



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