A Study on the Purchase Intention of Electric Vehicles in Taiwan: Starting from Sustainable Development

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Abstract

In Taiwan, a specific policy is to achieve 'Net-Zero' by 2050; thus, the Taiwanese government has announced a ban on the sale of gasoline-powered cars by 2030 and gasoline-powered motorcycles by 2040 to achieve this goal. With the rise of environmental awareness, the driver of governmental policy, and the introduction of the value of green consumption, we expect consumers' consumption habits to be gradually reshaped. To fill this gap, we propose a sustainability research model to assess consumers' EV purchase intention in this study. We apply the Theory of Planned Behavior (TPB) as the research framework with external cues(stimuli), such as green advertising exposure, government incentive policies, environmental concern, knowledge of electric vehicles, and perceived value. This study collected 341 valid questionnaires, and SPSS 25 software was used to analyze and confirm the validity of all hypotheses. Our findings show that governmental incentive policy is the most critical factor, following environmental concerns, on EV purchase intentions. We also examined the controlled variables of socioeconomic and demographic influences on purchase intention. Our results corresponded with previous studies in which socioeconomic status, life stages, and age show different purchase intentions. The final section proposes valuable insights for EV marketing management and a practical, sustainable policymaking reference.

Keywords: Electric Vehicle; Theory of Planned Behaviour; Cue-Utilization Theory; Sustainability

1. Introduction

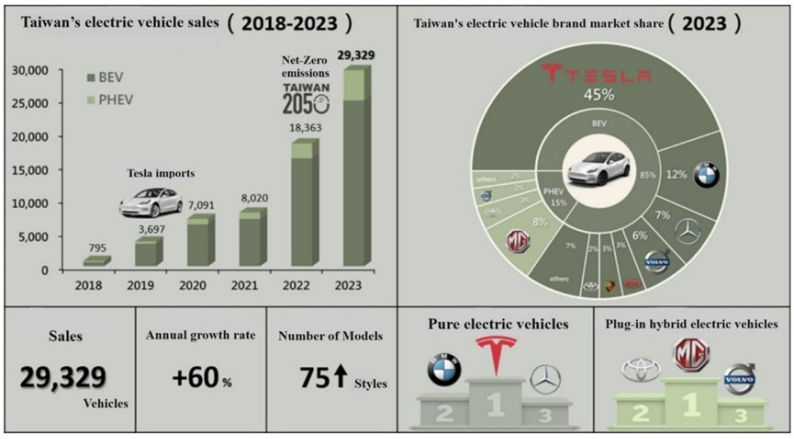
Due to the global effects of the ecological environment, no individual, enterprise, government, or nation can remain unaffected. The numerous phenomena and challenges associated with global climate change and environmental protection inevitably compel people to reconsider how to coexist with the natural environment and pursue sustainable development. Among these issues, the exhaust emissions from automobile engines significantly contribute to the global greenhouse effect. Additionally, the smog from automobile exhaust causes annual agricultural losses amounting to billions of dollars worldwide. Consequently, the adoption of electric vehicles and electric scooters has emerged as a crucial and global trend.

Different manufacturers are producing various types of EVs, such as battery electric vehicles (BEVs), hybrid electric vehicles (HEVs), Plug-in Hybrid Electric Vehicles (PHEVs), Range-Extended Electric Vehicles (REEVs), and Hydrogen Fuel Cell Vehicles (HFCVs), also known as Fuel Cell Vehicles (FCVs). The EV market has been expanding rapidly over the past decade. The global sales volume of EVs in 2023 has also approached nearly 15 million units, reflecting a significant and growing market demand for environmentally friendly transportation solutions. A recent report from the International Energy Agency (IEA) shows that the global number of EVs is projected to reach 10 million, marking a substantial 43% surge compared to figures from 2019(Zheng et al.,2023). To a peak of 6.75 million units in 2021 (Aljarash et al., 2022). In 2020, one in every 25 cars sold was electric; by 2023, this proportion had reached one in five (IEA, 2023).

Taiwan's net-zero policy locks in electric vehicles as the first wave. Various data show that the sales volume and number of licenses of electric vehicles in Taiwan show very positive growth figures, with an increase of 60% in 2023 compared with the previous year, and the number of licenses issued by countries around the world has also grown very positively during the same period (FedEx, 2024; China Economic News Service [CENS], 2024). This remarkable achievement highlights an impressive annual growth rate of 16.4%, setting a new high record since 2011 (CENS, 2024). This upward trend indicates that EVs' popularity and market potential in Taiwan are continuously strengthening. It demonstrates that Taiwan has made significant progress in promoting the development of EVs, and the market demand for EVs is gradually increasing. (see Figure 1)

Figure 1

Overview of Taiwan's electric vehicles market in 2023 (sales volume and market share)



**Source: Statistical Inquiry Network of the Ministry of Communications, Chunghwa Telecom Data Communication Branch, Vehicle Center*

Policy incentives and environmental concerns stimulate consumer interest in electric vehicles. Therefore, this study aims to support the goal of achieving net-zero transformation by focusing on consumer acceptance of electric cars and electric motorcycles. It analyzes the purchase intentions of first-time buyers, vehicle switchers, and commercial vehicle users, ensuring alignment with global sustainable development objectives.

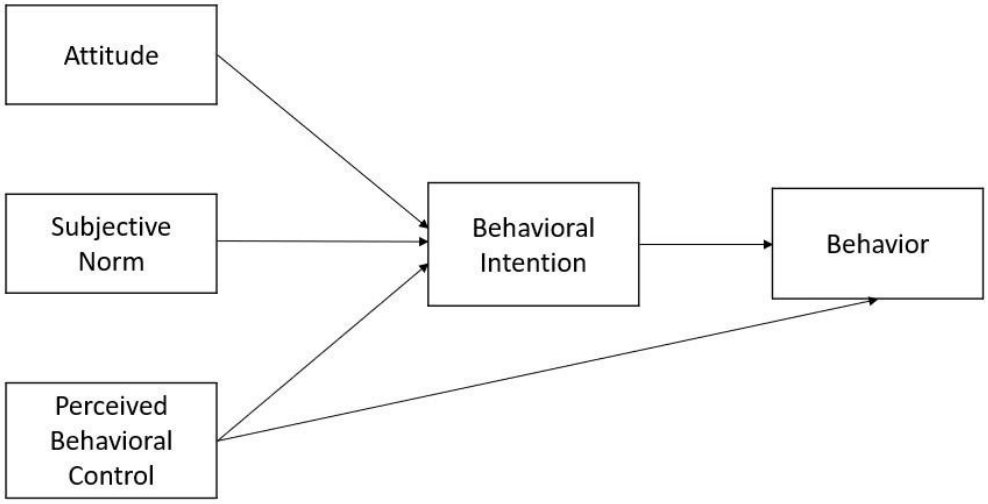
2. Literature Review

2.1 Theory of Planned Behaviour

The Theory of Planned Behavior (TPB) was proposed by Icek Ajzen in 1991(see Figure 2), building upon and extending the Theory of Reasoned Action (TRA) to predict and explain human decision-making processes. According to the foundational principles of TRA, individuals are influenced by their behavioral intentions, which are shaped by their attitudes toward the behavior (ATT) and subjective norms (SN) (Fishbein & Ajzen, 1975). However, the assumption of complete voluntary control over behavior in TRA overlooks situations where individual decision-making is insufficient when control over the behavioral goal is not fully autonomous and depends entirely on internal beliefs (Ajzen & Madden, 1986). To address this limitation, Ajzen introduced perceived behavioral control (PBC) as a third component, leading to the development of the current TPB.

Figure 2

Framework of the Theory of Planned Behavior (Ajzen, 1991)



Source: generated from Ajzen (1991)

As shown in Table 1, previous studies have applied the Theory of Planned Behavior (TPB) in the context of electric vehicles, particularly in investigating consumers' purchase intentions in the electric vehicle markets of different countries. Scholars and researchers widely use it to gain deeper insights into consumers' preferences, attitudes toward electric vehicles, and the motivations influencing their purchasing decisions. These insights are crucial for formulating effective marketing strategies and policies, thereby promoting the growth and acceptance of the electric vehicle market. This highlights the global trend of studying the impact of the TPB model on market intentions in the electric vehicle sector and emphasizes its importance in both academic and practical fields.

Table 1:
Previous Studies Using the Theory of Planned Behavior (TPB) in the EV Market

Scholar	Country	Subject	Application variables
Mohamed, H., Ferguson, Kanaroglou (2016)	Canada	Intention to adopt EVs.	Attitude, subjective norm, perceived behavioral control, personal moral norm, environmental concern
Eccarius & Lu (2020).	Taiwan	Tertiary students' intention to use electric scooter sharing.	Attitude, subjective norm, perceived behavioral control, environmental values, perceived compatibility, awareness knowledge
Mamun, Zainol, Hayat (2020)	Malaysian	Youth willingness to purchase electric scooters.	Attitude, subjective norm, perceived behavioral control, environmental concern, knowledge, attributes of interest, monetary benefit
Murtiningrum, Darmawan, Wong (2022)	Indonesia	Intention to adopt electric motorcycles.	Attitude, subjective norm, perceived behavioral control, knowledge, environmental concern, economic benefit, perceived environmental benefit, perceived risk, perceived cost, perceived incentive policies.
Shakeel (2022)	Pakistan	Intention to buy EVs.	Attitude, subjective norm, perceived behavioral control, cognitive status, product perception, non-monetary incentive policy, monetary incentive policy
Ackaah, Kanton, Osei (2022)	Ghana	Intention to buy EVs.	Attitude, subjective norm, perceived behavioral control, transport sector
Deka, Dutta, Yazdanpanah, Komendantova (2023)	India	Intention to buy an EV.	Attitude, subjective norm, perceived behavioral control, herd behavior, incentives policy
Chang (2023)	Taiwan	EV purchase behavior and the types of personal chargers used in communities.	Attitude, subjective norm, perceived behavioral control, perceived usefulness, moral norm, government subsidies policy, green product information, environmental consciousness

Table 1:
Previous Studies Using the Theory of Planned Behavior (TPB) in the EV Market (Continue)

Scholar	Country	Subject	Application variables
Nguyen -Phuoc, Truong, Nguyen, Pham, Li, Oviedo-Trespalacios (2024)	Vietnam	Intention to use electric motorcycles.	Attitude, subjective norm, perceived behavioral control, perceived risk, knowledge
Rehman, Rehman, Bresciani, Yahiaoui, Kliestik (2024)	China	Determine adoption intention for BEVs.	Social norms, environmental concerns, price and battery cost, range confidence, financial incentives

2.2 Cue-Utilization Theory

Since its emergence, the cue-utilization theory has gradually attracted attention in academic circles and accumulated valuable research literature (Cox, 1962; Li et al., 2020). This theory explains how consumers process information and make decisions based on environmental cues or stimuli, selecting cues they consider helpful as criteria for judging quality and making purchasing decisions. It distinguishes between internal and external cues (Olson & Jacoby, 1972), where internal cues refer to fixed product characteristics, such as size, shape, and taste, that are unaffected by external factors. On the other hand, external cues relate to variable attributes associated with the product, such as price, brand name, and labeling.

Considering the inherent difficulty in modifying internal cues, this paper will primarily focus on the impact of external cues on the consumer evaluation process, emphasizing green advertising exposure and incentive policies. Additionally, three personal factors—environmental concern, knowledge about electric vehicles, and perceived value—will be incorporated to observe their roles within the Theory of Planned Behavior (TPB) and purchase intentions.

2.2.1 Green Advertising Exposure

With the rise in environmental awareness, the advertising industry has undergone significant changes, reflecting society's concern for sustainable development. This shift has led to the emergence of green advertising, which aims to satisfy the needs and desires of environmentally conscious consumers by providing information related to nature and conservation (Zinkhan & Carlson, 1995). This transformation highlights the importance of the audience in green advertising, stimulates interest in consumer culture, and influences purchasing behavior. Furthermore, it has sparked a keen interest in innovative marketing strategies (Batool, 2016). In the current ecological context, advertising and communication are valuable tools for raising awareness and encouraging sustainable behavior (Lima et al., 2024).

Previous research indicates that despite the industry's significant focus on sustainability, there is limited exploration of the application of Cue Utilization Theory in the electric vehicle market. Therefore, this study aims to integrate environmental information with electric vehicles by utilizing green cues provided by companies. This integration enables consumers to evaluate product quality, reducing uncertainty in their decision-making process.

2.2.2 Incentive Policy

Considering EVs' multiple social and environmental benefits in promoting renewable energy use, governments worldwide have implemented incentives, subsidies, and regulatory

measures to encourage the widespread adoption of EVs (Graham-Rowe et al., 2012). In Ireland, EVs receive government support through the Sustainable Energy Authority of Ireland (SEAI) subsidy program, which includes exemptions from purchase taxes, vehicle registration tax reductions, and approximately €15,000 toll fee exemptions per vehicle (IGEES, 2019; Caulfield et al., 2022). Additionally, EVs registered since 2018 are eligible for grants of up to €600 for installing home charging stations (ACEA, 2020).

Governments worldwide are committed to encouraging and promoting the widespread use of electric vehicles, reflecting their support for renewable energy use and their commitment to carbon reduction targets. These initiatives drive the growth of the electric vehicle market and foster the development of related infrastructure, pushing the entire automotive industry toward a more environmentally friendly and sustainable direction. Taiwan is also on the path to achieving net-zero carbon emissions by 2050, with "electrification and decarbonization of transportation" being one of the government's 12 critical strategies for net-zero transformation. The ultimate goal is to ban the sale of all internal combustion engine vehicles by 2040 (Chen et al., 2023).

2.2.3 Environment Concern

Environmental concern refers to an individual's awareness and consciousness of environmental issues, playing a crucial indirect role in specific environmental behaviors by influencing the generation of cognition (Bamberg, 2003). Studies have shown that environmental concern influences consumers' attitudes and is pivotal in encouraging individuals and society to adopt more environmentally friendly behaviors (Diamantopoulos et al., 2003; Kilbourne & Beckmann, 1998; Shanmugavel et al., 2022). This concern is one of the driving forces behind environmental protection and sustainable development, making it critically important for shaping the future of society.

2.2.4 Knowledge

Product knowledge is considered a key influencing factor in consumer purchasing behavior. This knowledge not only helps determine the value and purchase risks of products (Wang, Hazen 2016). On the other hand, environmental knowledge has a positive and significant effect on green purchase intention (Nita & Rina, 2024). However, also plays a crucial role in consumers' understanding of products, particularly in the EV domain (Burgess et al., 2013; Degirmenci & Breitner, 2017).

Consumer understanding of EVs is crucial for driving the development of this sector. When consumers have a higher level of awareness and understand the advantages and benefits of EVs, they are more inclined to hold positive attitudes and increase their willingness to adopt EVs (Wang et al., 2018).

2.2.5 Perceived Value

Monroe and Krishnan (1985) introduced the perceived value model to investigate the relationships among price, perceived quality, and perceived value. This model defines value as the overall evaluation by consumers of a product or service, considering the perceived benefits and their contributions (Zeithaml, 1988; Sirdeshmukh et al., 2002; Hu et al., 2023).

Previous studies have indicated that perceived value is conceptualized as a single-dimensional structure (Sánchez-Fernández et al., 2007), defined primarily based on consumers' subjective assessments of value rather than the company's operational efforts. Therefore, within market research and marketing domains, a thorough comprehension of this model is paramount for capturing consumers' perceptions of value concerning products or services, given its direct

influence on purchase intentions and brand loyalty (Lv et al., 2024).

2.2.6 Hypothesis

Numerous studies have employed the TPB to explore consumers' intentions regarding EV purchases (as depicted in Table 1). The findings of these studies reveal that three variables, attitude, subjective norm, and perceived behavioral control, significantly and positively influence consumers' inclination to purchase EVs (Mohamed et al., 2016; Mamun et al., 2020; Shakeel, 2022). Thus, within the realm of investigating EV purchase intentions, TPB provides a solid theoretical underpinning that aids in comprehending consumers' preferences and decision-making processes concerning EVs. On this basis, the following hypotheses were formulated:

H1: Attitude has a positive effect on electric vehicle purchase intention

H2: Subjective Norm has a positive effect on electric vehicle purchase intention

H3: Perceived behavioral control has a positive effect on electric vehicle purchase intention

Previous studies focused on the correlation between advertising exposure and vehicles, primarily centered on road safety warning advertisements, which differs from the commercial advertising exposure studied in this research. Based on past research, advertising exposure on online media platforms is positively correlated with consumer attitudes (Wardhani & Alif, 2019), with brand attitudes formed under high-advertising message conditions being more susceptible to influence (Kokkinaki & Lunt, 1999). Hence, it can be inferred that advertising exposure is an effective promotional tool for enterprises. Innovations in advertising and advertising media enable appropriate targeting of the intended consumer audience. Thus, based on the above literature, the following hypotheses are expected:

H4: Green advertising exposure has a positive effect on attitude

Governments have made significant efforts to encourage consumers to buy and use EVs. They have offered subsidies for purchasing them, promoted the expansion of charging infrastructure, and accelerated their commercialization (Wang et al., 2016). These broad policy measures aim to stimulate consumer adoption and purchases, thereby fueling the growth of the EV market (Coad et al., 2009; Huang & Ge, 2019; Wang et al., 2017). This illustrates the close relationship between the thriving EV market and the implementation of diverse incentive policies (Zhou et al., 2015). Additionally, these incentive policies are designed to enhance the user experience for drivers (Kumar & Alok, 2020; Wang et al., 2021), leading to improved attitudes and increased willingness to make a purchase. Thus, based on the above literature, the following hypothesis is expected:

H5a: Incentive policy has a positive effect on attitude

H5b: Incentive policy has a positive effect on electric vehicle purchase intention

In the automotive sector, relevant research also emphasizes a significant positive correlation and impact between consumers' environmental concern and their willingness to use new energy vehicles (Sang & Bekhet, 2015; Si et al., 2024). This implies that consumers' preference for environmentally friendly vehicles is closely linked to their environmental concerns, further motivating their adoption of eco-friendly vehicles. Thus, based on the above literature, the following hypothesis is expected:

H6a: Environmental concern has a positive effect on attitude

H6b: Environmental concern has a positive effect on electric vehicle purchase intention

When consumers deeply understand and are familiar with electric vehicle (EV) knowledge and information, their perception of the risks associated with EV adoption decreases, improving their attitudes and behavioral intentions toward adopting EVs (Jaiswal et al., 2022).

Previous studies in this area have also yielded positive results (Wang et al., 2018; Huang et al., 2021; Jaiswal et al., 2022), confirming the crucial role of knowledge in consumer cognition. Therefore, we can infer that the level of consumer understanding of EV knowledge directly impacts their views and willingness to adopt EVs. Based on the above literature, the following hypothesis is expected:

H7a: Knowledge has a positive effect on attitude

H7b: Knowledge has a positive effect on electric vehicle purchase intention

When consumers perceive multiple dimensions of value from EVs, including personal emotions, social environment, and vehicle performance (Salehzadeh & Pool, 2017), these values reflect consumers' value perception of EVs, positively influencing their purchase intention and attitude (Chen et al., 2012; Pai et al., 2023). Numerous studies have shown that when consumers perceive high value in a product or service, they are more inclined to purchase it (Ng et al., 2018; Hu et al., 2023; Pai et al., 2023). In the EV market, perceived value is often a key factor influencing consumer decisions, directly impacting their purchase intention and loyalty. Thus, based on the above literature, the following hypothesis is expected:

H8a: Perceived value has a positive effect on attitude

H8b: Perceived value has a positive effect on electric vehicle purchase intention

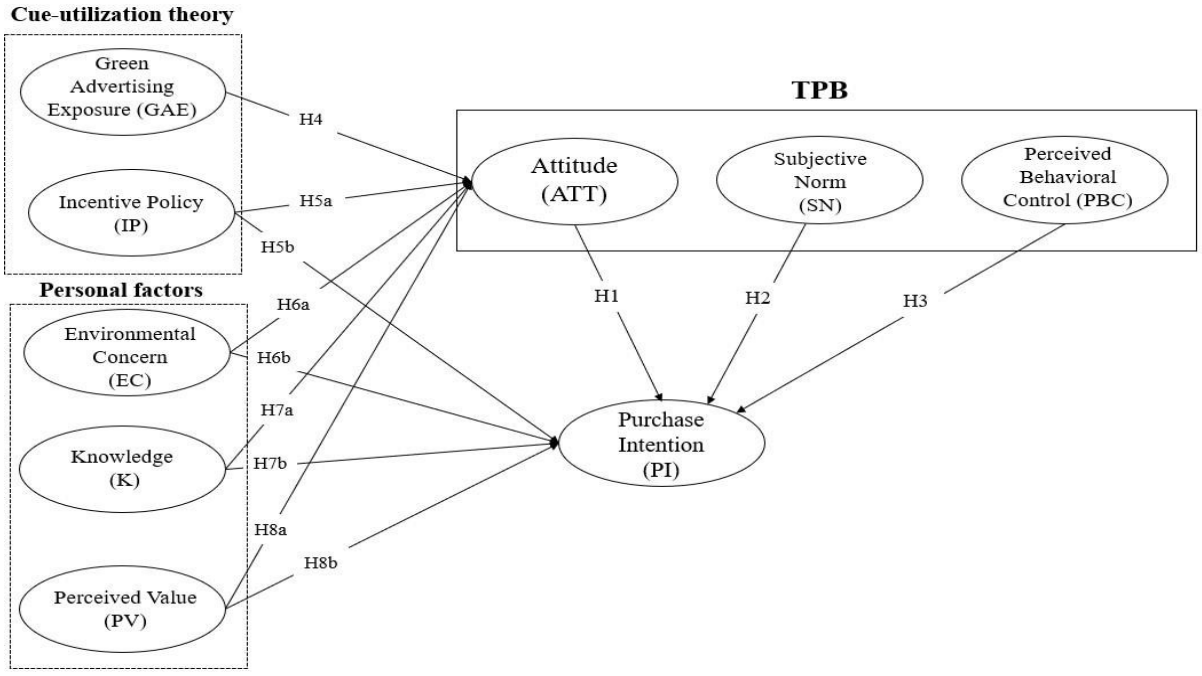
3. Methodology

3.1*Research Model*

Based on the TPB and the Cue-Utilization Theory, this study categorizes consumer issues into a structured classification, incorporating relevant literature on factors influencing the adoption of EV intentions. The independent variables in this model include attitude, subjective norm, perceived behavioral control, green advertising exposure, incentive policy, environmental concern, knowledge, and perceived value, with purchase intention as the dependent variable. The research model is depicted in Figure 3.

Figure 3

Research Model



3.2 Research Method

3.2.1 Measurement Development

According to the above research hypotheses, this study aims to comprehend various dimensions by creating a questionnaire to measure eight constructs. The questionnaire was developed by examining each item from various established measurement scales. The operational definition of this study is modified based on the original definition.

3.2.2 Questionnaire Design

The questionnaire is divided into three main parts. The first part consists of basic personal information, including seven demographic questions. The second part is an analysis of the willingness to purchase EVs, which includes nine questions related to the usage and purchase intentions. The results of this section will be used to compare purchase intentions among different demographics. The third part consists of scale questionnaire content, comprising 33 questions related to respondents' self-perceived behavior regarding EVs.

The demographic data in the first part of this questionnaire does not differ significantly from that used in other studies on EV purchase intentions, indicating its representativeness. Therefore, we can reasonably compare and analyze the results of this study with other relevant research to derive more comprehensive conclusions and insights.

3.2.3 Data Collection and Sample

The online questionnaire for this study was created via the SurveyCake cloud platform, with the survey period running from January 27, 2024, to April 10, 2024. The target respondents were individuals aged 18 and over 50 in Taiwan with experience with EVs (renting or owning). Most of the statements in the questionnaire were the same as those used in previous scales designed to measure the variables above. The questionnaire was distributed through Instagram, Facebook, and Line. Most of these platforms are forward, and the total number of questionnaires cannot be counted, but after review, there are 341 valid questionnaires, and the number of such samples is sufficient.

3.2.4 Data Analysis Method

The data analysis for this research primarily utilized SPSS version 25.0 as the primary analytical tool. An explanatory research method will be employed to address the issue of causal relationships between the dependent and independent variables. In addition, the contents of the questionnaire will be measured using a 5-point Likert scale, utilizing an interval scale to obtain participants' quick and sincere responses. The scale ranges from 5 = Totally agree, 4 = Mostly agree, 3 = Neutral, 2 = Mostly disagree, to 1 = disagree.

The pre-test was conducted with 30 samples and assessed the reliability of each item using Cronbach's α reliability coefficients, with all constructs exceeding the standard of 0.7, indicating high reliability (Devellis, Robert, 1991). This suggests that the questionnaire tools used in this study exhibit good reliability and validity.

4. Data Analysis and Results

4.1 Research Model

4.1.1 Descriptive Statistical Analysis

The first part of this study includes questions related to demographic statistics, encompassing gender, age, highest education level, profession, annual income, nationality, and residential area. The survey analysis reveals that males constitute 43.3%, while females represent 56.6% in the gender distribution. The age bracket of 18-29 years exhibits the highest

prevalence at 40.8%, followed by those aged 50 years and above at 35.9%. Individuals holding a bachelor's degree or equivalent constitute the majority at 54.3% regarding educational levels. The profession segment predominantly comprises students or other categories, comprising 66.3% of the respondents. In terms of annual income, the majority falls below 560,000 NT dollars, accounting for 51.3%. Taiwanese nationals constitute the overwhelming majority at 97.9%. Residentially, metropolitan living areas are the most represented, at 70.1%.

4.1.2 Reliability and Validity Analysis

4.1.2.1 Reliability Analysis

Reliability analysis determines measurement instruments' stability, consistency, and repeatability in assessing the concepts under research. It is typically assessed using Cronbach's α and Composite Reliability (CR), with CR being calculated based on the factor loading between observed variables and their corresponding constructs. A Cronbach's α value exceeding 0.7 indicates high reliability, and CR should exceed 0.6 (Devellis, Robert, 1991). Moreover, individual item factor loadings should surpass 0.45 (Hair et al., 2006). All constructions in this study met these criteria.

4.1.2.2 Validity Analysis

Validity analysis was conducted to assess the appropriateness of the measurement model in accurately capturing the underlying constructs. Convergent validity examines the degree of correlation between observed variables and their corresponding constructs to ensure the measurement tools adequately reflect the constructs. Average Variance Extracted (AVE) is a critical structural equation modeling indicator for convergent validity. It indicates the average proportion of variance explained by observed variables about the constructs. A value exceeding 0.5 signifies good validity, while a value above 0.36 is considered a minimally acceptable standard (Fornell & Larcker, 1981). All constructs in this study met or exceeded these validity criteria.

The discriminant validity assesses the differences between different constructs to ensure that the measurement tool can distinguish between various constructs. Fornell & Larcker (1981) indicated that the average variance extracted (AVE) of individual items should have square root values greater than those of other constructs in discriminant validity. The discriminant validity of each construct meets the standard, as shown in Table 2.

Table 2
Discriminate validity analysis of each construct

	ATT	SN	PBC	EC	IP	K	PV	GAE
ATT	0.67							
SN	0.51	0.67						
PBC	0.64	0.38	0.71					
EC	0.69	0.43	0.52	0.72				
IP	0.35	0.31	0.40	0.27	0.73			
K	0.48	0.46	0.46	0.49	0.47	0.76		
PV	0.53	0.31	0.56	0.65	0.36	0.50	0.62	
GAE	**0.50**	**0.42**	**0.42**	**0.42**	**0.48**	**0.51**	**0.35**	**0.8**

4.1.4 Hypothesis Testing Results

Based on the data analysis of respondents, all hypotheses in this study demonstrate significant effects, indicating that the hypotheses are supported and confirmed. Significance levels (two-tailed) are smaller than 0.05 are denoted by *, smaller than 0.01 by **, and smaller than 0.001 by ***, as shown in Table 3.

Table 3
The Results of All Hypothesis Testing

Hypothesis	Hypothesis Content	Significance	Decision
H1	Attitude has a positive effect on electric vehicle purchase intention	0.001***	Supported
H2	Subjective Norm has a positive effect on electric vehicle purchase intention	0.001***	Supported
H3	Perceived behavioral control has a positive effect on electric vehicle purchase intention	0.001***	Supported
H4	Green advertising exposure has a positive effect on attitude	0.001***	Supported
H5a	Incentive policy has a positive effect on attitude	0.001***	Supported

Table 3
The Results of All Hypothesis Testing (Continue)

Hypothesis	Hypothesis Content	Significance	Decision
H5b	Incentive policy has a positive effect on electric vehicle purchase intention	0.001***	Supported
H6a	Environmental concern has a positive effect on attitude	0.001***	Supported
H6b	Environmental concern has a positive effect on electric vehicle purchase intention	0.001***	Supported
H7a	Knowledge has a positive effect on attitude	0.001***	Supported
H7b	Knowledge has a positive effect on electric vehicle purchase intention	0.001***	Supported
H8a	Perceived value has a positive effect on attitude	0.001***	Supported
H8b	Perceived value has a positive effect on electric vehicle purchase intention	0.001***	Supported

**: P < 0.05 (significant), **: P < 0.01 (highly significant); ***: P < 0.001 (extremely significant)*

4.1.5 Cluster Analysis

This study conducts two clustering analyses to understand the factors of concern to respondents better. The first analysis divides respondents into two groups according to their willingness to purchase EVs, aiming to discern their varying degrees of emphasis on different factors. The second analysis focuses on the two age groups with the most respondents (18-29 years old and 50 years old and above) to explore differences in factors of concern and preferences between these two extreme groups.

4.2 Discussion

4.2.1 Hypothesis and Research Results

From the results in Table 3, it can be concluded that there are significant differences among all hypotheses. Further analysis shows that five constructs—green advertisement exposure, concern for sustainable environment, knowledge about EVs, incentive policies, and perceived value— positively impact individuals' attitudes towards EVs (H4, H5a, H6a, H7a, H8a). This indicates that consumers shape their attitudes towards EVs through these external factors, reflecting their concern for sustainability and environmental friendliness, advanced technology awareness, and policy promotion acceptance. These findings validate our research hypotheses and offer critical insights into understanding how individuals' attitudes toward EVs are formed. In addition, regarding the various dimensions of purchase intention, it is evident that the TPB variables - attitude, subjective norm, perceived behavioral control, and external factors -

environmental concern, incentive policy, knowledge, perceived value, and green advertising exposure - significantly influence purchase intention (H1, H2, H3, H5b, H6b, H7b, H8b), aligning with findings from the literature.

4.2.2 Cluster Analysis and Research Results

4.2.2.1 Correlation-Willingness Cluster Analysis Results

Based on the analysis, females comprise the majority, constituting 38.7% with willingness and 17.9% with unwillingness. Age-wise, two brackets stand out: 18-29 years and 50 years and above, with respective willingness rates of 27.9% and 21.7% and unwillingness rates of 12.9% and 13.5%. The highest educational level is commonly at the bachelor's or equivalent level, with willingness and unwillingness rates of 35.5% and 18.8%. Occupationally, students and other professionals outside the academic realm are prominent, showing willingness rates of 42.2% and unwillingness rates of 24%. Annual income distribution around two brackets: below $560,000 and between $560,001 and $1,260,000, with willingness rates of 32.3% and 28.2% and unwillingness rates of 19.1% and 11.1%. Taiwanese nationals constitute the primary sample, with willingness and unwillingness rates of 65.1% and 32.8%. Metropolitan living areas dominate, with willingness and unwillingness rates of 49.6% and 20.5%.

4.2.2.2 Correlation-Age Cluster Analysis Results

The analysis results for the 18-29 age group show that the majority are female, accounting for 36.3%. The highest level of education is generally a bachelor's degree or equivalent, accounting for 32.4%. Regarding occupation, students and other workers are the most prominent, reaching 40.5%. Annual income is distributed mainly across two ranges: below $560,000 and between $560,000 and $1,260,000, accounting for 43.2% and 10.4%, respectively.

The analysis results for the 50 and above age group show a nearly even gender distribution, with males at 25.5% and females at 20.9%. The highest level of education is generally a bachelor's degree or equivalent, accounting for 20.5%. Students and other workers are the most prominent in terms of occupation, reaching 29.7%, followed by military and civil servants at 12.4%. Annual income is also distributed across two ranges: below $560,000 and between $560,000 and $1,260,000, accounting for 13.9% and 24.3%, respectively.

Research findings indicate that compared to the 18-29 age group, the 50 and above age group has a relatively lower acceptance of electric vehicles.

5. Conclusion and Recommendations

5.1 Conclusion

This study contributes significantly to several theoretical aspects. Firstly, we utilized the widely adopted TPB to effectively understand and predict consumers' behavioral intentions toward purchasing EVs. Secondly, we applied the cue-utilization theory and incorporated external factors, which significantly influence consumers' purchase intentions. This research contributes to the academic understanding of how external stimuli, such as advertising and policy incentives, can shape consumer behavior and attitudes toward sustainable EV options. Thirdly, this study integrates the TPB and Cue-Utilization Theory, providing new insights into consumer behavior regarding EVs. Fourth, this research introduced three personal factors - environmental concerns, knowledge about EVs, and perceived value to delve deeper into consumers' adoption and purchase intentions. Lastly, we analyzed demographic variables, including gender, age, highest education level, profession, annual income, and residential area, to understand Taiwanese consumers' willingness to purchase.

To summarize, this study effectively explores the formation process of consumers' purchase intentions towards electric vehicles, enriching the understanding of the psychological mechanisms underlying purchasing behavior. Furthermore, we present a broader perspective on consumers' attitudes and purchase intentions regarding electric vehicles, which aligns with the United Nations Sustainable Development Goal (SDGs) 12, 'Ensure Sustainable Consumption and Production Patterns.' This alignment provides valuable reference points for industry stakeholders and policymakers.

5.2 Managerial Implications

The EV market is currently regarded as an essential area of development globally. Although many countries and regions have invested significant resources to promote the development and adoption of EVs, this market still faces a range of challenges and potential areas for development. Based on the results of this study, it is found that there are different values among the public regarding the adoption of EVs. However, incentive policies and environmental concern are their primary concerns.

Therefore, by adopting a comprehensive approach that combines regulatory measures, incentive policies, and various support integration, the government can effectively reduce carbon emissions, enhance environmental benefits, and contribute to the stable growth and sustainability of the electric vehicle market. Such collective efforts are crucial for achieving the ambitious goal of net-zero transformation by 2050. Furthermore, companies must pay special attention to sustainability, as they can meet the expectations of ESG investors and attract environmentally conscious consumers. This approach can enhance trust and recognition among both investors and consumers.

5.3 Research Limitations and Future Research Directions

In terms of limitations, the demographic data of the questionnaire sample (e.g., gender, age, education level, profession, annual income, and location of residence) does not comprehensively represent the entire Taiwanese population. Moreover, the focus of the study is on exploring the purchase intentions of Taiwanese consumers regarding EVs.

In terms of future research directions, it is crucial to delve deeper into the impact of government subsidies and related regulations and policies on consumers' purchase intentions, as prioritized by consumers in this study. These regulations and policies may encompass aspects such as the ease of EV registration procedures, the establishment of related insurance costs, and potential environmental taxes or exemptions. Through a more comprehensive analysis and investigation, we can better understand how these factors influence consumers' decision-making regarding EV purchases, providing more specific recommendations and policy directions.

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