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柬埔寨境內普及電動車的挑戰與契機：以消費者觀點研究

Challenges and Opportunities of Electric Vehicle Adoption in Cambodia: An Investigation through Consumer Perception

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本論文係 雍真亮 君（R11749046）在國立臺灣大學企業管理碩士專班完成之碩士學位論文，於民國 113 年 6 月 25 日承下列考試委員審查通過及口試及格，特此證明

The undersigned, appointed by the Global MBA on (6/25/2024) have examined a Master's Thesis entitled above presented by YONG SREYLEAK (R11749046) candidate and hereby certify that it is worthy of acceptance.

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Abstract

This study aimed to explore the factors influencing electric vehicle adoption in Cambodia, focusing on consumer perceptions of cost, competence, charging conditions, and financing options. Despite government efforts to encourage sustainable transportation, electric vehicle consumption in Cambodia has remained low. An internet-based survey was used to gather data from a sample population to better understand Cambodian consumers' perception toward electric cars. Descriptive and logistic regression analysis were used to assess this study's obtained data and hypotheses.

The study identified electric car cost as the key barrier to adoption in Cambodia. Concerns about the cost of replacing batteries significantly impacted purchase intentions, while awareness of the long-term savings associated with electric cars could boost adoption rates. Additionally, consumers' willingness to buy electric cars was positively impacted by their perception of vehicle competence The accessibility and convenience of charging infrastructure were also considered important factors in pushing the electric vehicle adoption rate in Cambodia.

These findings suggest several important actions to increase electric car adoption in Cambodia. Financial incentives or clearer communication about the long-term savings and lower operating costs associated with EVs is crucial in shifting perceptions and increasing consumer confidence in electric vehicles.

Keywords: *Influence factors, consumer perceptions, electric vehicle adoption, purchase intention, Cambodia*

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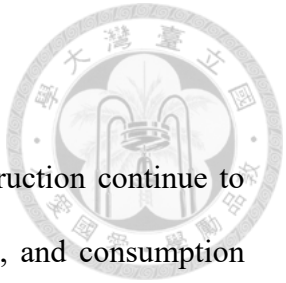

1. Introduction

As concerns about climate change and environmental destruction continue to grow, the transition to a sustainable practice in nations, businesses, and consumption becomes increasingly important. As a developing country, the Royal Government of Cambodia laced a high importance on green growth to balance the economy, environment, society, and culture. The government announced the Green Growth Policy 2013-2030 to reduce poverty, increase economic growth, protect the environment, manage natural resources, advance societal progress and safety, and uphold national cultural values.

Cambodia has vowed to become carbon neutral by 2050 to further this goal. This commitment led the Royal Government of Cambodia to develop a decarbonization strategy aimed at the electrification of 70% of motorcycles, 40% of vehicles, and urban buses by 2050, World Bank (March 28, 2024). Vehicle emissions and congested traffic significantly contributed to emissions and air pollution in Cambodia, thus using low-emissions vehicles such as electronic vehicles could help the country step toward reducing its carbon footprint. This shift demonstrated the critical necessity of electric vehicle adoption and provides a significant investment opportunity that businesses should not miss. Therefore, it is necessary to promote low-emission transportation such as electric cars, and increase the effort to minimize greenhouse emissions.

1.1. Background

1.1.1. Overview of Automotive Market in Cambodia

Over the past five years, Cambodia had witnessed an annual growth rate of 11.3% in the number of registered vehicles, Manoj (2023). Additionally, the number of vehicles registered the identification number in the nation between 1990 and 2022 was

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more than 6.7 million, including 5.7 million motorbikes, 728,294 light vehicles, and 285,271 heavy vehicles, (Manoj, 2023). Whitehead (2024) stated in his article in Khmer Time that Deputy Secretary of the Cambodian Investment Board noted new vehicle registrations in the country were predicted to hit 50,000 in 2024, a notable increase from the 7,000 registrations reported in 2016. This upward trend was expected to persist, indicating a rapidly expanding automotive sector and corresponding opportunities for the automobile industry.

In 2021, 10% of households in Cambodia owned a car, while 20% of households in Phnom Penh city owned a car, reflecting a 7% decrease from 2019/2020 due to the Covid-19 pandemic, (National Institute of Statistics, 2022), see Table 1.

Table 1. Ownership of automotive vehicles owned by households in Cambodia 2019/2020-2021 in percentage.

	2019/2020				**2021**			
	Cambodia	Phnom Penh	Other Urban Area	Rural Areas	Cambodia	Phnom Penh	Other Urban Area	Rural Areas
Motorcycle	83%	90%	87%	80%	86%	92%	88%	83%
Car	10%	27%	14%	5%	10%	20%	12%	6%
Jeep/Van	1%	1%	2%	1%	1%	1%	1%	1%

Source:(National Institute of Statistics, 2022), Report of Cambodia Socio-Economic Survey 2021

Used cars made up the majority of the vehicle market in Cambodia, accounting for about 72% of sales by the end of 2021, (Sok, 2021). The United States is Cambodia's main source of used cars; in 2022, there were 113 million cars imported into the country from the US, a 43 percent increase year-on-year, (US International Trade Administration, 2024). However, that trend is expected to change in recent years as new cars are become more popular as the nation's disposable income levels rise. Cambodia's new car market

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share is expected to rise to 50% by 2026 from about 40% in 2022 (US International Trade Administration, 2024). It is noteworthy that to own a new electric car in Cambodia, consumers need to spend approximately 29,000 US Dollars, almost double the cost of a brand-new Internal Combustion Engine vehicle (ICEs) which costs approximately 16,000 US Dollars, (Kak, 2022). Not to mention, used ICEs car cost approximately only 6,500 US dollars.

Electric Vehicle (EV) is a type of vehicle propelled by one or more electric motors powered by a battery pack; which include both battery electric cars (BEVs) and plug-in hybrid vehicles (PHEVs), which are gaining interest. Despite this growing interest in electric car in the Cambodian market, there is still a limited selection of electric cars accessible in Cambodia. The Cambodian Angkor EV, a Cambodian-made electric vehicle, was introduced in 2013, but locally manufactured automobiles have not proven to be popular. Currently, no American, European, Japanese, or Korean original equipment manufacturers (OEMs) are bringing battery-electric vehicles to the Cambodian market, with the exception of Tesla and Jaguar; the majority of electric cars available in the Cambodia market are largely limited to Chinese-made vehicles, (Ministry of Public Works and Transportation, 2023).

By 2020, electric vehicle was estimated to account for less than 0.1% of national vehicle sales (Ministry of Public Works and Transportation, 2023, p. 10). The total number of electric vehicles in Cambodia in 2023 was 604, a significant increase of new EVs registered from recent year, with a total of 63 in 2021 and 663 in 2022, as reported by (Khmer Times, 2024). This number is still low compared to the total registered vehicles across the country.

The relatively low number of electric vehicles on the road indicates that the

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secondary resale market of electric is not yet well established. Furthermore, due to the high initial cost of the electric car, the market is restricted to only wealthy individuals and elite groups that may be able to afford electric vehicles. Because of this, there is now very little of a secondary market due to the limited volume of sales of electric cars. Instead of reselling used cars, the major goal is still to expand the market for new electric automobiles. Although there is an absence of precise information about the typical length of time households in Cambodia possess a car, the length of time people possess a car in developing countries is often impacted by factors like the condition of the economy, the cost of vehicle maintenance, and the accessibility of newer models. In Cambodia, the ownership period might be influenced by the economic capacity of families to maintain and replace vehicles.

1.1.2. The Comparison of EV and ICEV Consumption in Cambodia

Despite the low consumption rate of EVs in Cambodia, using EVs can be more cost-effective than using ICEVs since EVs normally cost less to operate than ICEVs because electricity is generally cheaper than gasoline, and EVs are more efficient in converting energy into motion, resulting in reduced operating expenses, (UNESCAP, 2023). According to UNESCAP (2023) mentioned in the National Policy Framework For Electric Mobility Development in Cambodia, the fuel cost savings vary for different vehicle segments, as shown in Table 2, suggesting the economic benefits of EVs.

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Table 2. Fuel Cost Savings from EVs across vehicle segments

1 US Dollar = 4,000 Riel (KHR)

	Evs	**ICEs**	**Evs**	**ICEs**	**Cost Saving from Evs**	
	A km/kWh	B km/liter	C KHR/100km	D KHR/100km	E = D-C KHR/100km	F = E/D (%)
2 Wheels	55	40	1,211	11,610	10,489	90%
3 Wheels	10	25	6,970	20,000	13,030	65%
Cars	6.4	13	9,633	35,723	26,090	73%
Buses	1.3	6	53,615	83,333	29,718	36%

C = (1/A)x Cost of Electricity x100; D = (1/B)x Cost of Fuel x100; Petrol Price = 4,644.0 KHR/litre; Diesel Price = 5,000.0 KHR/litre; Electricity Price – Residential = 616.5 KHR/kWh; Electricity Price – Commercial = 697.0 KHR/kWh

Source: (UNESCAP, 2023), National Policy Framework For Electric Mobility Development in Cambodia.

Using electric cars could offer a 73% fuel cost saving, making EVs a more economical choice over internal combustion engine vehicles. Moreover, since the Cambodian government offers tax incentives for EVs, it makes purchasing an EV more economical. Anyway, according to the total cost of ownership analysis cited in (UNESCAP, 2023), it was revealed that the the total cost of ownership of a new electric 4 wheels vehicle is 0.36 USD/KM, Which is 14% higher than new internal combustion engine vehicles (4 wheels) that spend only 0.31 USD/KM, see Figure 1.

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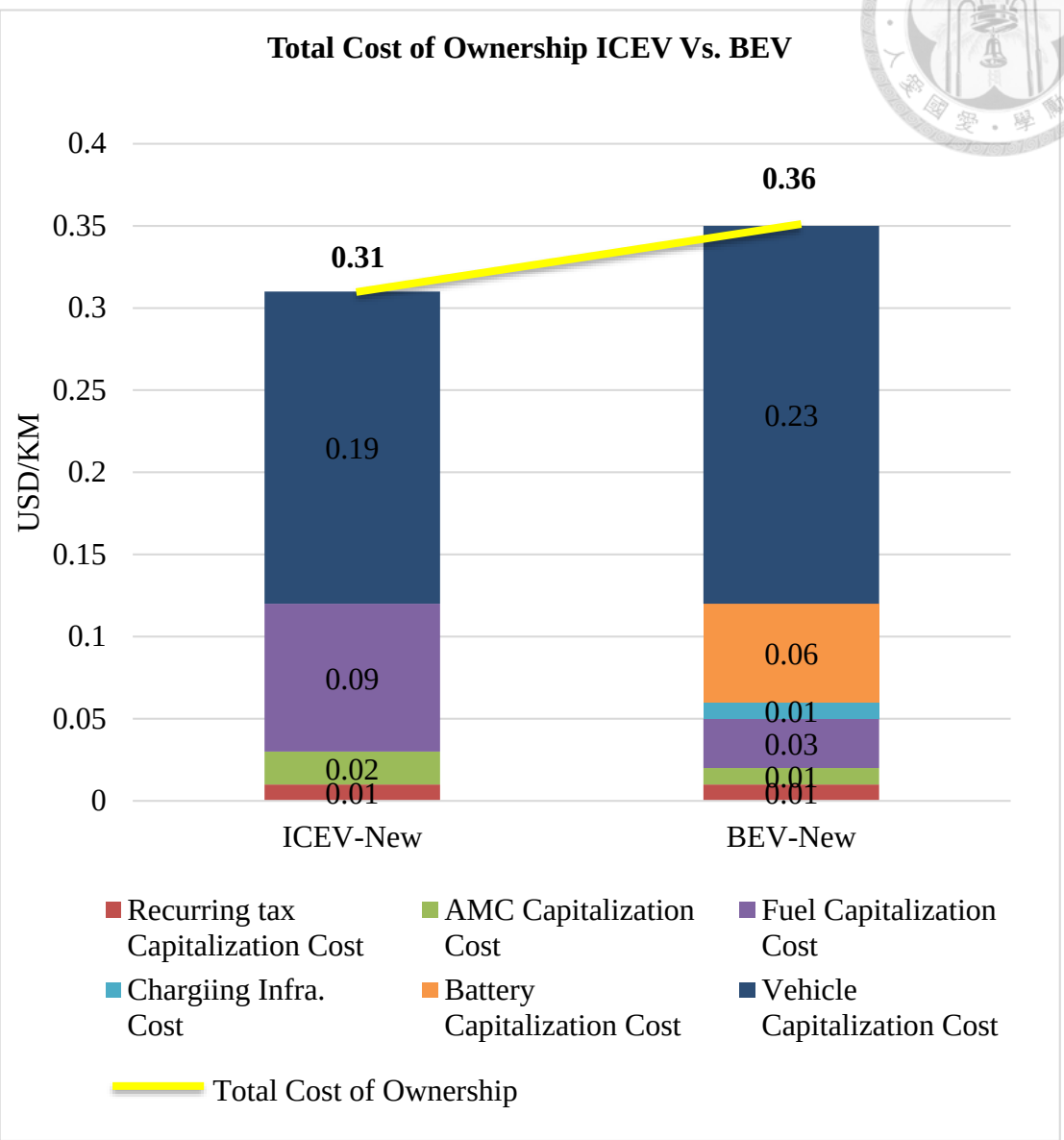
Figure 1. Total Cost of Ownership for 4 wheels Passenger - ICEV vs EV



Source: (UNESCAP, 2023), National Policy Framework For Electric Mobility Development in Cambodia.

However, UNESCAP (2023) mentioned that ICEV costs are expected to increase due to stringent emissions standards and reduced volumes, while battery costs currently account for 20-40% of EV vehicle costs. Advancements in battery technology will reduce the costs of electric cars, reducing total ownership costs for electric vehicles.

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1.1.3. Electric Vehicle Charging Infrastructure in Cambodia

The development of charging infrastructure would be a primarily electric car adoption-driven factor. But in a typical chicken-and-egg situation, more EVs are required to create market incentives for businesses to invest in more charging stations. In light of this, the Ministry of Public Works and Transport, which is in charge of managing and upgrading transportation in Cambodia, is encouraging fuel station operators in the country to build EV charging stations in strategic locations, (UNDP Cambodia, 2022). As of June 2023, there are 23 EV charging stations in Cambodia. In 2022, the Ministry of Public Works and Transportation decided to authorize BYD Auto Industry to invest in the construction of 200 EV charging kiosks around the country, and the project was scheduled to be completed by 2023, (Bor, 2022). The agreement was a signal to the private sector, particularly corporations that operate gas stations, to create additional EV charging points infrastructure, which would encourage the public to utilize EVs more generally.

1.1.4. Policies and Regulations Concerning Vehicles Consumption

Besides the efforts in enhancing Cambodia's public transportation system by investing in new infrastructure and supporting the use of low-emission vehicles, the Cambodian government’s commitment to the green vehicle transition was marked by progressive policy initiatives, tax incentives, and reducing import duties to 50% lower than taxes on traditional internal combustion engine vehicles (Khmer Times, March 2, 2024). In addition, Cambodia has enacted various energy and transportation regulations aimed at increasing sustainability and lowering greenhouse gas emissions, (UNESCAP, 2023). The National Energy Policy was established to seek to improve energy security, minimize reliance on imported fuels, and encourage sustainable energy sources,

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especially renewable energy. The E-mobility Development Roadmap is under development and aims to provide a robust policy framework for the spread of e-mobility, including private sector participation. It will inform Cambodia's energy and transport sectors, covering all areas of power generation and distribution, as well as fuel supply for transportation, mobility, enterprises, and industries.

1.2.Motivation and Purpose of Study

The electric vehicle was a relatively recent and specialized segment in Cambodia's landscape, the businesses had not yet well-understood consumer perceptions toward electric vehicle consumption. This lack of understanding is compounded by the current low rate of EV adoption in the country. Despite the government's efforts to promote sustainable transportation, the actual consumption rate of EVs remains significantly lower compared to traditional internal combustion engine vehicles (ICEVs).

Ongoing study was necessary to create a supportive environment for the adoption of electric vehicles. Therefore, this study aimed to identify the challenges and opportunities of electric vehicle adoption in Cambodia through an investigation of Cambodian consumer perception of electric vehicles. By providing insights into these perceptions, this study played an important role for businesses and served as instrumental for businesses in identifying opportunities and challenges for future product development and strategic initiatives.

The research seeks to address the following key questions:

RQ1: What are the factors that influence electric vehicle adoption in Cambodia?

RQ2: How do various factors influence on the purchase intention of electric cars in Cambodia?

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RQ3: What are the challenges in electric vehicle adoption in Cambodia? What opportunities exist for businesses in Cambodia to enhance the acceptance and uptake of electric vehicle consumption among consumers?

1.3.Research Scope and Limitations

This study focused on consumer's perspectives and the factors that influence consumers' intentions for purchasing electric vehicles in Cambodia, offering insight into how electric vehicles are perceived in the market. The research was based on survey data collected from a sample of Cambodian consumers and may not fully represent the entire population. In addition, this study is limited to the current status of the EV market and consumer perception only, which may change over time as more information becomes accessible and the market grows. Despite these limitations, the study gives useful insights into the current state of EV adoption in Cambodia and lays the groundwork for future research and policy development.

1.4. Important and Significance of Study

This study is significant because it has the potential to add to the expanding body of knowledge regarding the adoption of electric vehicles in developing nations—specifically, Cambodia. Through comprehending consumer perceptions and factors influencing their preference for purchasing, businesses may more effectively customize their approaches to satisfy market needs. The results of this study can also help policymakers by providing information on how to encourage the use of electric vehicles.

This study makes a significant contribution to the existing body of literature on electric vehicle adoption in some key ways. The majority of prior research has been on EV adoption in developing and developed countries generally. By focusing on Cambodia,

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this study closes a significant gap concerning the literature on Southeast Asian developing nations. Furthermore, this study delved extensively into the perspectives of Cambodian consumers, whereas previous studies have focused on broad market trends of EVs.

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2. Literature Review

The purpose of this literature review was to look into the important topic and research areas in electric vehicle adoption.

2.1.Consumer's Perception

Consumer perception plays a significant role in shaping consumers' purchase intentions, (Wang et al., 2023, p. 2). As cited by Chen and Pan (2022, p. 15), Belch and Belch (1998) defined purchase intention as the driving force behind a customer's decision to purchase an examination of a certain brand's characteristics. A customer's good intention towards a product will lead to preference generation and an increased amount of purchasing. The research studied by Zeinab et al. (2015) cited that Moons and Pelsmacker (2012) and Schuitema et al. (2013) found consumer emotions and feelings influence their attitudes and intentions to embrace electric vehicles. A similar study by Moons and Pelsmacker (2012) indicated that potential EV consumers' perceptions of happy sentiments from driving an EV were positively connected with consumer attitudes and intentions to embrace EVs.

EnergyLab Cambodia, founded in 2018, is an innovative and efficient non-profit organization dedicated to promoting the growth of clean energy in Cambodia. In June 2021, EnergyLab conducted a public study to understand Cambodians' perceptions and use of electric vehicles, (EnergyLab, 2021). The survey was conducted with 103 responses from the general public, there are 97% of which have heard of electric vehicles while only 12.5% have experienced riding them. The survey contained several questions related to electronic vehicles. Overall, respondents have a positive impression of using electric vehicles, they think that EVs are convenient and easy to use. According to the survey, 80% of respondents think that riding an EV car has a positive impact on the

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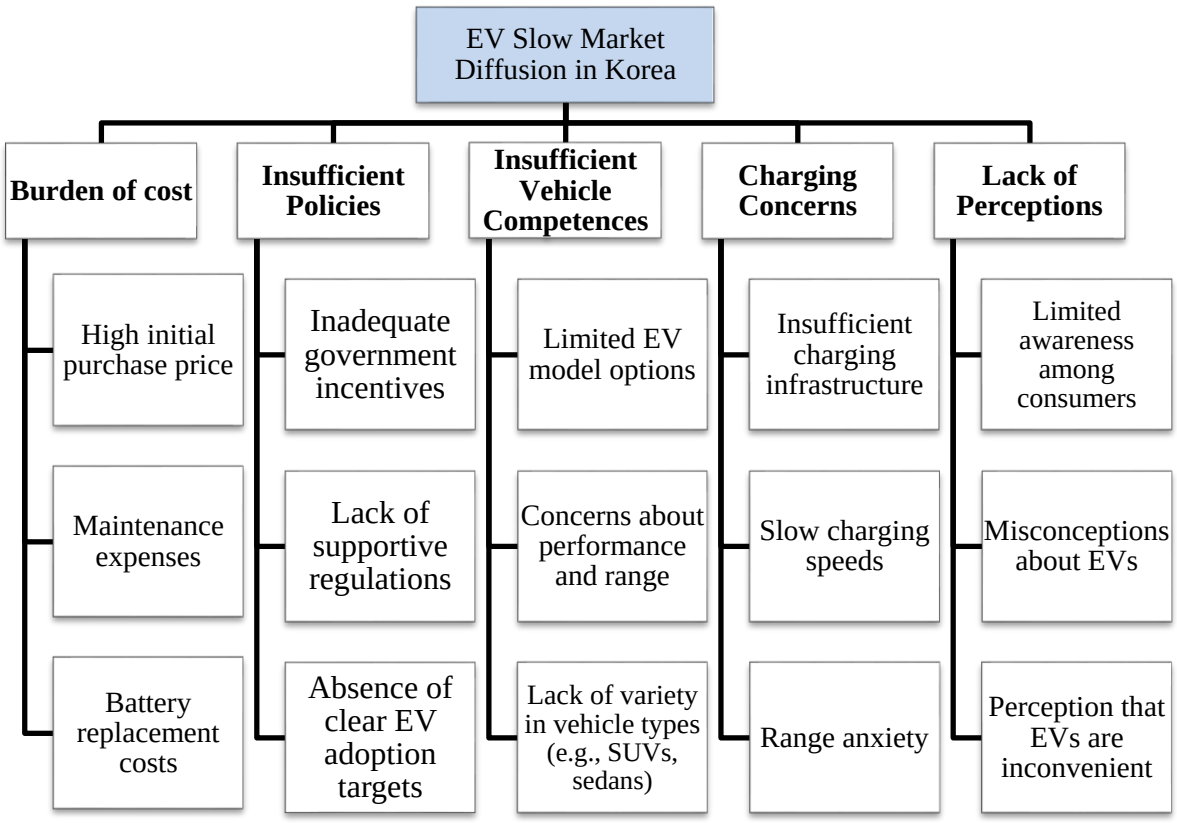
environment, and 53% said that riding an EV car saves money. However, the consumption of EVs in Cambodia remained relatively low, only 231 electric vehicles were registered as of July 2022, (Ministry of Public Works and Transportation, 2023, p. 10). This stark contrast between consumer perception and the actual number of EV car consumption underscores the sluggish growth of EV usage in Cambodia.

2.2. Factors Influencing Electric Vehicle Adoption

Due to the limited existing research on factors driving the progress of electric car adoption in Cambodia, this study incorporates insights from international research. Kim et al. (2018, p. 672) identified five main dimensions into which the factors influencing EV adoption can be grouped including costs, policies, competence, charging conditions, and perceptions (*Figure 2*).

Figure 2. Five main factors influencing EV adoption



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Source: (Kim et al., 2018), Identifying factors influencing the slow market diffusion of electric vehicles in Korea

However, customers frequently hold several misconceptions about electric cars, including that they are less powerful than internal combustion engine vehicles, have lower environmental advantages, and are inconvenient to recharge, which are contradictory with real electric cars on the market today, (Roberson, 2024, p. 12). Additionally, the same researchers discovered that most consumers have no fundamental understanding of many elements of electric cars including appearance, purchase price, acceleration performance, top speed, recharging duration, driving range, recharging operation, power expenses, and maintenance. This misconception of consumer perception of electric cars might have been a barrier to adoption. However, electric vehicles are known by most Cambodians, although few have experienced riding an electric vehicle, (EnergyLab, 2021). The event "Building the Electric Mobility Ecosystem" organized by EnergyLab, revealed that knowledge and interest in electric vehicles among Cambodian people was more widespread than anticipated. The survey found that Cambodians perceived EVs as better for the environment, effective in reducing CO2 emissions, and have good design, (EnergyLab, 2021). Therefore, it appears that Cambodian people seem to have an adequate understanding and correct perception of EVs, making the perception factor less likely to influence Cambodian consumer's purchase intention regarding EVs.

For government policy-related factors, government restrictions may have a direct impact on automotive manufacturers' production of alternative fuel vehicles. Vehicle subsidies, tax credits, fuel subsidies, and special traffic benefits such as commuter lanes, among others, may reduce the immediate and downstream adoption costs, boosting the chance of consumer acceptance, (Byrne & Polonsky, 2001). To encourage people to

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consider consuming EVs, the governments of many countries have regulated effective subsidies and tax programs for EV buyers. This indicated the important role of government policies in promoting EV consumption. Norway has one of the highest rates of electric car adoption globally, largely due to its generous tax incentives (no taxes on zero-emission vehicles), free parking, the use of bus lanes, toll exemptions, and other benefits for EV owners, (Pettitt, 2017). In Cambodia, the government has undertaken numerous initiatives to promote electric vehicle (EV) adoption. These efforts included implementing supportive policies, collaborating with the private sector, and providing tax incentives for EV consumption as discussed in the background of Chapter 1. Given these comprehensive governmental efforts to encourage EV adoption, this study will not focus on analyzing policy factors. Instead, the study concentrated on other aspects influencing EV adoption in Cambodia including cost, EV competence, charging concerns, and financial-related factors.

2.2.1. Perceived Cost

Li et al. (2017, p. 323) discussed several factors of cost that influence EV adoption including upfront purchase cost and operational cost. The following is the summary of this study's discussion. While purchasing cost has been a barrier to EV adoption, the lower operation cost of electronic cars is seen as favorable for consumers. The long-term financial benefit from reduced energy consumption and low electricity prices could offset the initial premium cost of electronic cars. However, consumers tend to prioritize current expenses over long-term savings associated with electric cars. Resale prices of EVs also have been one of the biggest hurdles to purchasing EVs, along with the high cost and short range, (Kihm & Trommer, 2014). In the context of Cambodia, economic situation and income distribution presented the challenge for electric car

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adoption, given that lower-income populations dominate Cambodia's economy, the high cost of EVs might be a significant barrier to EV adoption in Cambodia. These insights lead to the formulation of the first hypothesis:

Hypothesis 1 (H1): *The concern and perception of the cost of electric vehicles have a significant influence on the consumer willingness to purchase electric car in Cambodia.*

Electric passenger vehicles have emerged and been increasingly regarded as a response to rising climate pollution in major markets such as China, the United States, and Europe. However, the shift to e-mobility has been delayed in low and middle-income nations, in large part due to concerns over substantial upfront costs, (Garmendia et al., 2023). The result of a research study on marketing strategy and preference analysis of electric cars in a developing country determined that the cost of electric cars was the primary barrier to the purchasing intention of consumers in developing countries, (Uy et al., 2024). The same authors stated that when it comes to EVs, price sensitivity is well recognized and significant in the purchase context. A similar study conducted by Purwanto and Irawan (2023) discussed the challenges faced by developing countries in adopting electric vehicles, emphasizing that the affordability of electric cars was a significant barrier. The authors emphasized that electric vehicle expenses, including battery replacement and maintenance, maybe a substantial obstacle in developing economies. Cambodia, like many developing nations, has large number of population that has constrained financial resources. The high initial cost of EVs, along with anticipated expensive maintenance and battery replacement prices, may dissuade many potential purchasers. In addition to the hypothesis which entirely examine the cost factor, the study will comprehensively on sub-factor of cost such as concern on upfront cost, operation cost and resale price that influence the willingness to purchase electric car in

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Cambodia, which the operation cost included the concern on battery replacement cost, maintainance cost and long-term saving of operation.

Hypothesis 1a (H1a): *The concern of the upfront purchasing cost of electric vehicles significantly influences the consumer willingness to purchase electric cars in Cambodia.*

Hypothesis 1b (H1b): *The concern of the operation cost of electric vehicles significantly influences the consumer willingness to purchase electric cars in Cambodia.*

Hypothesis 1c (H1c): *The concern of the resale price of electric vehicles significantly influences the consumer willingness to purchase electric cars in Cambodia.*

2.2.2. Perceived Electric Vehicle Competence

Byrne and Polonsky (2001) stated that some performance characteristics of alternative fuel vehicles including speed, acceleration, and driving range before refueling, have been concerns for consumers. The driving range of EVs was a key hurdle to consumer acceptance, (Ona & Long, 2012). The limited selection of electric car models on the market presented another difficulty in meeting the demands and preferences of EV consumers by providing a range of features and purchase costs, a wider range of options in terms of design, functionality, variety, and enticing features would draw more prospective buyers to EV marketplaces, (Haddadian et al., 2015). The lack of accessible electric car models in the Cambodian market might be a barrier to EV adoption. Potential consumers might not discover an EV that meets their ideal requirements for performance, functionality, or design including important features like safety feature and driving range, due to the lack of diversity in EV models. In light of these revelations, the following hypothesis was put forth:

Hypothesis 2 (H2): *The competence of electric vehicles have a significant influence on the consumer willingness to purchase electric car in Cambodia.*

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2.2.3. Charging Concerns

Among other dimensions, Kim et al. (2018) identified charging concerns which included lacking charging infrastructures, a limited driving range, and long charging time, as a core dimension with the highest impact on low electric vehicle diffusion in the Korea market compared to other dimensions. Similarly, Fuad et al. (2017) found that the rising popularity of electric vehicles (EVs) was heavily influenced by various evolving factors, such as the accessibility of charging infrastructure, charging durations, and associated costs. However, the battery life is also a main area of concern in EV adoption, as limited range per charging causes "range anxiety" among the users. According to Neaimeh et al. (2015), to lower range anxiety and encourage EV adoption, charging station accessibility and visibility are essential. With the present state of charging infrastructure in Cambodia, these concerns are especially pertinent. Customers may be discouraged from switching to electric vehicles due to range anxiety caused by this lack of charging infrastructure. Furthermore, a major obstacle is the lengthy charging durations in contrast to the speedy refilling of conventional automobiles, as many Cambodian consumers would not be able to wait for prolonged periods of time to recharge their vehicles. These observations prompt the following hypothesis to be put forth:

Hypothesis 3 (H3): *The concern and perception of the charging conditions of electric vehicles have a significant influence on the consumer willingness to purchase electric car in Cambodia.*

2.3.Role of Financial System and Emergence of Green Vehicle Loan

Financing is critical to achieving the global and individual nations' sustainable development goals; as it was discussed in 2015 during the Addis Ababa Action Agenda of the United Nations' third International Conference on Financing for Development,

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(United Nation, 2015). National Council for Sustainable Development (2020, p. 16) stated in its report that Cambodia needs roughly US$ 5.8 billion for climate mitigation action, which included reducing emissions. This emphasized the critical role of the financial industry in developing a sustainable nation.

"Green financing" was defined as innovative financial mechanisms and instruments, such as green bonds, loans, insurance, securities, taxes, and Environmental Social and Governance ratings, to encourage investments in sustainable sectors that protect the environment, promote positive social purposes, and align with sustainable development goals, as cited in (Shah et al., 2023). A green car loan is categorized as the green financial product under retail banking categories. A green vehicle loan is a type of financing that allows people to acquire eco-friendly cars or cars with lower average emissions. Green auto loans encourage customers to select environmentally friendly automobiles by providing interest rate discounts, longer repayment terms, and other benefits. These loans can help borrowers afford green vehicles.

A study by Choi and Ji (2024, p. 2) discussed about effectiveness of EV financial subsidies in disadvantaged communities, given California accounted for 40% of total EV sales in the United States. However, customers with low or moderate incomes account for just 0.6% of new PHEV and BEV purchasers, and 1.8% of new hybrid electric vehicle (HEV) buyers despite California's Clean Vehicle Assistance (CVA) program which offers up to $7500 in incentives and affordable financing options with interest rates around 8%.

Many customers may have trouble obtaining traditional forms of credit to purchase electric car Cambodia, mainly because these vehicles are new to the market, financial institutions concern about credit risks. By offering good terms and reasonable

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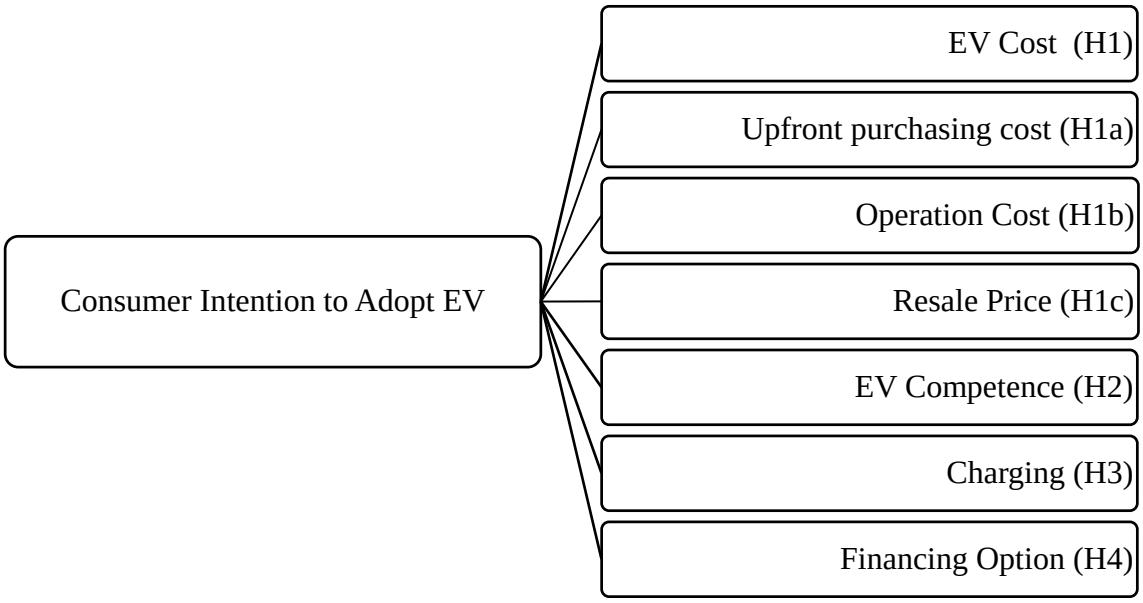
interest rates through green vehicle financing solutions, might facilitate consumer adoption of EVs and reduce their financial hurdles. In light of the financial difficulties encountered by customers in Cambodia, the following hypothesis was put forth:

Hypothesis 4 (H4): *The availability of special financing options for electric vehicle purchases significantly influences the consumer's willingness to purchase electric cars in Cambodia.*

The entire study hypotheses are shown in *Figure 3.*

Figure 3.Hypothesis for the current study



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3. Research Methodology

3.1.Research Design

The study incorporated both exploratory and descriptive research designs. Exploratory research is meant to get insights into the aspects that influence customers' perception of EV car consumption. As part of a descriptive research project, a single cross-sectional research design was developed to collect data from a selected sample of the target population. By evaluating the correlations between the factors, this knowledge assisted in making a clear judgment. Primary data was collected to present relevant information and to achieve study objectives. To collect primary data, a structured questionnaire was distributed using survey methods.

3.2. Survey Questionnaire Design

Data is collected by survey methods and distributed by Microsoft Forms. This study utilized an internet-based survey to reach the maximum number of respondents and collect data from a sample population to get better understanding of consumer's perception on green vehicle consumption in Cambodia. The questionnaire was divided into 2 sections, each section contained several questions (see Appendix I). The first part was multiple choice questionnaires which consisted of demographic information of respondents such as age, gender, marital status, family size, residence, occupation, income range and education. Transportation experience, willingness to purchase EVs and knowledge of EV and green financing were also included in the first section of questionnaires. Meanwhile, the second section contained the discussed 4 dimensions that influence EV adoption as hypothesess (Cost, competence, charging, and financing options). It tended to dig down more for real perceptions of Cambodian vehicle consumer

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on smaller factors that existed under thess four dimensions. The 5-point Likert scale of itemized rating scale was used in section 2 of questionnaires and respondents were asked to rate their agreement level ranging from “1=Strongly Disagree”, “2=Disagree”, “3=Neutral(Neither Agree nor Disagree)”, “4=Agree” to “5=Strongly Agree”. This scale enabled individuals to offer varied feedback and allow a deeper analysis of their perceptions of EVs.

3.3.Sampling

The target population primarily consisted of individuals who are prospective customers of EVs and banks. This encompassed both genders and included potential consumers who were aware of EV and EV financing presence. The survey was conducted exclusively in Cambodia, to capture opinions, perceptions, and attitudes related to EV adoption and financing.

The sampling design type used in this study is a combination of purposive sampling and snowball sampling to reach out to survey participants. In snowball sampling, initial participants have been selected from personal networks or contacts of the researchers who expressed interest in this topic. Purposive sampling techniques were used to reach out to respondents and through social media Facebook group to collect the survey. Purposive sampling involves selecting participants based on specific criteria relevant to the research objectives. In this case, we reached out to active members of specific car consumer groups such as "Talking About Car(TAC)", “Cambodia Pruis Team” and “Camry Cambodia” in Facebook which is the popular social media platform in Cambodia. Boasting a vast membership of car enthusiasts numbering in the thousands, this group serves as a hub for vibrant discussions, recommendations, and the sharing of extensive automotive knowledge. This approach allowed for targeted recruitment of

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participants who meet specific criteria, enhancing the relevance and depth of the research findings. Participants filled out the survey voluntarily. To protect privacy, this research on individual behaviors and awareness was completed anonymously and with confidentiality. As a result, 70 valid responses were collected from both sampling techniques.

3.4.Data Analysis

In this study, “Descriptive Analysis” and “Logistic Regression” were utilized to examine the hypotheses of this research. Initially, the study used descriptive analysis to explore the basic characteristics of the data set, identify patterns or trends, and gain initial insights into variables. Secondly, logistic regression, also known as logit regression, is a statistical method used for modeling the relationship between binary response variables, for which the response outcome for each subject is a success or a failure, with one or more independent variables, using a logistic function to ensure that the estimated probabilities lie between 0 and 1, (Agresti, 2019).

In this study, the logistic regression was used to provide valuable insights into the probability of binary outcomes of willingness to purchase EVs based on predictor variables. The predictor variables were specifically the four factors discussed in the literature review that influence EV adoption including cost, competence, charging conditions, and financing factors. Table 3 presented the independent and dependent variables.

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Table 3. Research variables

Variable Type	Label of variable	Statement
Dependent	Purchase Intention	Are you willing to purchase EV?
	Cost	
Independent (Predictors)	Cost_1	I am concerned that the potential costs of battery replacement for EVs would be expensive.
	Cost_2	I perceive that EVs are expensive.
	Cost_3	I believe that the long-term savings from reduced energy consumption and low electricity prices could offset the initial premium cost of electronic cars, if compared with traditional fuel vehicles.
	Cost_4	The resale price of EVs compared to traditional vehicles is a concern for me.
	Cost_5	I am concerned about the future maintenance costs of EVs being higher than traditional fuel vehicles.
	Cost_6	I prioritize vehicles with lower upfront costs over potential long-term savings from operations, such as those associated with EVs, due to uncertainties.
	EVs' Competence	
	Competence_1	The safety features of EVs are a significant consideration for me when comparing them to traditional fuel vehicles.
	Competence_2	The availability of different EV models affects my likelihood of purchasing one.
	Competence_3	The design and appearance of EVs influence my decision to consider purchasing one.
	Competence_4	I believe that EVs offer comparable performance to traditional fuel vehicles.
	Charging conditions	
	Charging_1	The availability of public charging stations in my area affects my consideration of purchasing an EV.
	Charging_2	I am concerned about the time it takes to charge an EV compared to refueling a traditional fuel vehicle.
	Charging_3	The affordability of EVs' home chargers affects my consideration in purchasing an EV.
	Charging_4	The driving range per charging associated with electric car is a significant concern for me.
	Financing Options	
	Financing_1	Lower interest rates offered by financial institutions for EV loans would make me more likely to consider purchasing an EV.
	Financing_2	The availability of flexible loan terms and repayment schedules for EV purchases would positively influence my decision to buy an EV.
	Financing_3	I would consider financing options that include additional benefits such as insurance packages or warranty extensions for EV purchases.

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Based on the literature review, each influence factor comprised multiple sub-factors. The study developed scale variables for each factor to apply these factors to the logistic regression to explore hypotheses. These scale variables were utilized as predictors in the logistic regression analysis. This technique allowed for the investigation of how each factor, represented by its constituent sub-factors, contributes to forecasting the result of interest. Age, gender, occupation, income, education, and awareness of green vehicle loans were included as control variables in the study to limit the possible impact of extraneous factors on the relationship between the independent and dependent variables. They were critical in ensuring that observed effects were correctly assigned to the factors of interest rather than other confounding variables. In addition, Pr(>|z|) represents the probability of obtaining a z-value is a crucial value in statistical testing, for determining the significance of predictor variables. It helped the researcher understand whether the observed data provided sufficient evidence to reject the null hypothesis. If the p-value is low (typically < 0.05), it suggests that the observed data is unlikely under the null hypothesis, leading to the rejection of the null hypothesis. High p-value (typically > 0.05), suggests that the observed data is consistent with the null hypothesis, leading to the failure to reject the null hypothesis.

To fully investigate the factors that influence of Cambodian consumer willingness to acquire electric vehicles, a variety of regression techniques were utilized. Each regression model had a distinct function that contributes to the overall strength and comprehensiveness of the results. The initial logistic regression analysis was conducted to evaluate the impact of all variables on the purchase intention, including cost, cost sub-factors, competence, charge, and financing factors, alongside with control variables. Stepwise methods was employed to simplify models and minimize overfitting,

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especially in studies with multiple predictors, (Derksen & Keselman, 1992). Finally, bootstrap estimation was employed to validate the stability and reliability of the logistic regression coefficients. Bootstrap techniques are especially helpful in situations involving small sample sizes or potentially anomalous data, as they offer reliable estimates and help ensure the findings are not unduly influenced by outliers. This method is highly respected for increasing the precision and reliability of parameter estimations, (Mooney & Duval, 1993). A thorough, reliable, and focused analysis of the factors influencing EV purchase intention in Cambodia was made possible by the use of these several regression methods.

Data collected in this study was analyzed by IBM SPSS Statistics and R, the software platforms which were developed for advanced statistical analysis. IBM SPSS was mainly used to generate the descriptive analysis of the data set, test the reliability of variables, and create scale variables. While R was utilized to run logistic regression analysis to examine the whole study's hypotheses.

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4. Result

4.1.Descriptive Statistic of Sample

70 responses were collected from the survey with the details in *Appendix 2*. The sample is mostly composed of respondents between the ages of 20 and 30 (59%), with a considerable presence from the 31-40 age range (31%). However, fewer older age range respondents are also included in the sample. The sample has primarily a higher representation of females (57%) compared to males (43%). The family size of respondents varies, with 53% belonging to medium family size (4-6 members), while 86% reside in Phnom Penh city which is the capital city of Cambodia and the remaining 14% reside in other provinces of Cambodia. Although some respondents decided not to identify their income (16%), the majority of respondents (37%) fell between the $500–$1,000 income range, with a significant portion (19%) earning less than $500 per month, while 13% reported earning between $1,001 and $1,500 and 7% earning between $1,501 to $2,000 per month.

When taken as a whole, these demographic traits offer a thorough overview of the sample group and reflect the varied socioeconomic backgrounds of Cambodian consumers. Detailed sample population demographics are presented in *Table 4.*

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Table 4.Demographic of the sample population

Sample Demographic	n	%
Age		
Below 20 years old	2	3%
Between 20-30 years old	41	59%
Between 31-40 years old	22	31%
Between 41-50 years old	3	4%
Above 50 years old	2	3%
Gender		
Male	30	43%
Female	40	57%
Family Size		
Between 1-3 members	22	31%
Between 4-6 members	37	53%
More than 7 members	11	16%
Residence		
Other Provinces in Cambodia	10	14%
Capital City (Phnom Penh)	60	86%
Monthly Income		
Less than $500	13	19%
Between $500-$1,000	26	37%
Between $1,001-1,500	9	13%
Between $1,501-2,000	5	7%
Above $2,000	6	9%
Prefer not to say	11	16%

The research also included questionnaires to determine respondents' behavior regarding vehicle consumption and willingness to purchase EVs as indicated in *Table 5*. In terms of vehicle ownership, over half of the respondents (53%) possess their cars, with gasoline-powered cars accounting for the majority of them (73%). It was worthnoting that 84% of respondents said they would be eager to buy electric vehicles, while none of them are using electric cars now. In addition, only 30% of respondents were aware of the existence of green vehicle loans.

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Table 5. Behavior in transportation and willingness to purchase EVs

Behavior and willingness	n	%
Owned a car		
Yes	37	53%
No	33	47%
Type of Vehicle Owned		
Hybrid	8	22%
Diesel-powered	2	5%
Gasoline-powered	27	73%
Willing to purchase EV		
Yes	59	84%
No	11	16%
Aware of Green Vehicle Loan		
Yes	21	30%
No	49	70%

4.2. Reliability Test

Cronbach's alpha was used to verify the model's reliability and assess its internal consistency. According to (Cheung et al., 2023), Cronbach's alpha values of 0.7 or above are often considered reliable. However, in some circumstances, Cronbach's alpha levels beyond 0.6 or even 0.5 could be regarded as acceptable. The study utilized IBM SPSS to run reliability statistics across the influence factors and exclude items that significantly lowered the reliability value. Table 6 indicated that Cronbach's alpha for each factor varied from 0.559 to 0.950 which were higher than the recommended value. As a result, this suggested reliability.

Table 6. Reliability Test of independent variables

Factor	Cronbach's Alpha	Cronbach's Alpha if Item Deleted	
		Deleted items	Cronbach's Alpha
Cost	0.690	Cost_3	0.715
Competence	0.561	Comptence_4	0.559
Charging	0.735	Charging_1	0.745
Financing	0.868	Financing_3	0.950

After verified the model's reliability and assess its internal consistency, scale

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variable of each factor (cost scale, competence scale, charging scale and financing scale) were created for further statistical analysis through logistic regression model.

4.3. Logistic Regression Analysis on the Factors that Influence on Intention to Purchase Electric Cars

4.3.1. Logistic Regression Analysis (Model 1)

In the first model, logistic regression analysis was conducted to assess the effects of all variables on purchase intention. The predictors included scale variables of cost, competence, charging, and financing factors. In addition, the control variables such as age, gender, occupation, income, and education were also included in the model. Table 7 presented the results of the logistic regression analysis of Model 1.

Table 7. Logistic Regression Analysis (Model 1)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	2.50542	5.68406	0.441	0.6594	
Age	1.51953	1.21536	1.25	0.2112	
Gender	-3.0764	1.55493	-1.978	0.0479	*
Occupation	-0.1349	0.2643	-0.51	0.6097	
Income	-0.0591	0.35855	-0.165	0.869	
Education	0.52777	0.98837	0.534	0.5934	
Cost_Scale	-0.6458	0.66606	-0.97	0.3323	
Competence_Scale	1.54698	0.80461	1.923	0.0545	.
Charging_Scale	-1.436	0.80391	-1.786	0.0741	.
Financing_ Scale	0.8551	0.53621	1.595	0.1108	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The intercept and the variables age, occupation, income, education, cost scale, and financing scale did not show statistically significant effects on purchase intention ($p > 0.05$). However, gender was a significant predictor, with negative coefficient of -3.0764 ($p = 0.0479$). Since gender was coded as male = 1 and female = 2 to run statistical analysis in R, indicated that males have a higher purchase intention on election car, while females

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were significantly less likely to intend to purchase an electric vehicle compared to males. Scale variables of EV competence and concern about charging approached significance level. The coefficient for the scale variable of electric car competence was 1.54698 ($p = 0.0545$), suggesting a positive, though borderline significant, effect on purchase intention. This implied that consumers who perceive electric vehicles as competent are more likely to purchase them.The coefficient of scale variables of charging concerns was -1.436 ($p = 0.0741$), suggesting a negative relationship with purchase intention, marginally significant. This suggested that concerns about charging infrastructure may deter consumers from purchasing electric vehicles. All other predictors were not statistically significant in this model.

This model suggested that while the logistic regression model did not achieve statistical significance in the overall model, gender was a significant predictor of the purchase intention of EVs, while competence and charging factors emerged as marginal significant factors. It highlighted the importance of addressing gender-specific barriers and improving perceptions of EV competence and charging infrastructure to boost EV adoption in Cambodia.

4.3.2. Stepwise Logistic Regression Analysis (Model 2)

To further investigate the factors influence on purchase intention, a stepwise logistic regression analysis, which was the regression model 2 of this study, was conducted to refine the model and identify the most significant predictors. The stepwise approach was justified by its ability to enhance model efficiency and interpretability. By focusing on the most significant predictors, the study can better understand the key factors influencing EV purchase intention, which is critical for developing targeted strategies to

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promote EV adoption. The research used R to perform stepwise logistic regression with both forward and backward selection, which was known as "Bidirectional Elimination" of stepwise regression to explore the significant predictors. At each step, a predictor is added if it improves the model significantly, or removed if it does not. Table 8 summarized the results of the stepwise logistic regression analysis of Model 2.

Table 8. Stepwise Logistic Regression Analysis (Model 2)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	-0.6124	4.126	-0.148	0.882	
Age	1.9376	1.01	1.918	0.0551	.
Gender	-2.7022	1.3047	-2.071	0.0383	*
Competence_ Scale	1.4708	0.7227	2.035	0.0418	*
Charging_ Scale	-1.3729	0.7233	-1.898	0.0577	.
Financing_ Scale	0.8182	0.5028	1.627	0.1037	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The result of the stepwise logistic regression model included predictors of age, gender, cost, and financing. Gender and EV competence achieved statistical significance at the conventional 0.05 level, indicating that these two factors had potential influences on purchase intention. The positive coefficient of EV competence suggested a positive relationship with purchase intention. This result implied that people with a higher awareness of electric car competence such as safety features, variety of different models, design, and appearance of electric, were more likely to purchase electric cars. Additionally, age and charging factors approached statistically significant levels. The positive coefficient for age indicated a positive relationship with purchase intention, with marginal significance. As the age range was encoded from younger to older with lower to higher numbers, this result suggested that people with an older age range were more likely to purchase electric cars. In conclusion, the stepwise logistic regression model

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revealed that gender and EV competence factors were significant predictors of purchase intention. Age and charging factors also approached marginal significance. These results suggested that besides gender and competence factors, age and charging factors were also important factors to consider when predicting the purchase intention of consumers toward electric cars, though further investigation and potential model refinements are needed to achieve stronger statistical significance.

4.3.3. Bootstrap Estimation of Logistic Regression Analysis (Model 3)

In the following model, bootstrap estimation was performed to assess the stability and variability of the logistic regression model coefficients. Bootstrapping is a method of statistics that employs resampling with replacement from a dataset to generate a large number of simulated samples. This approach is useful for estimating a statistic's distribution (such as the mean, median, or standard deviation) as well as determining its variability or confidence intervals. Bootstrap estimation was particularly useful in this study due to the relatively small sample size. It provided robust estimates of the model parameters, ensuring that the findings are not unduly influenced by outliers or peculiarities in the sample. In this study, a total of 1000 bootstrap samples were generated, and logistic regression models were fit for each sample. A logistic regression model was fit to the resampled data with purchase intention as the dependent variable and predictors. Bootstrap estimation was conducted to reassess the coefficients' confidence intervals in the logistic regression model predicting purchase intention after excluding influential observations. After excluding influential observations identified in the influence plot, the model was refitted using the cleaned dataset. The results of the logistic regression analysis are summarized in Table 9.

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Table 9. Logistic Regression Coefficients after attempted bootstrap and remove outliers

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	9.7298	3.5185	2.765	0.00569	**
Cost_ Scale	-2.0014	0.8643	-2.316	0.02058	*

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The cleaned logistic regression model suggested that the overall model was significant log-transformed cost mean was marginally significant in predicting purchase intention (B = -2.0014, SE = 0.8643, z = -2.316, p = .0205). The negative coefficient of cost suggested a negative relationship between cost and purchase intention. The cost factor appeared to have a notable influence on purchase intention, the higher the concern of people on electric car cost-related factors, the lower their intention to purchase electric cars.

4.4.Logistic Regression Analysis of Cost Factor's Variables

4.4.1. Logistic Regression Analysis of Cost Factor (Model 4)

Given the significant role of cost in consumer decision-making, detailed examination of cost factors is essential. The examination of the sub-factors of cost factor allowed us to identify which specific cost-related aspects (initial purchase cost, maintenance costs and resale) most significantly impact EV adoption in Cambodia. The study employed logistic regression analysis on the variables of cost factors by including the perception of consumer perceived that EV is expensive, awareness of long-term saving of electric car, concern about battery replacement, resale price, maintainance cost and the preference of lower upfront into model 4 as predictors of purchase intention. Control variables such age, gender, education, income, family size and the awareness of green vehicle loan were also included in the model as predictors. The result of logistic regression analysis of cost factor was presented in Table 10.

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Table 10. Logistic Regression Analysis of Cost Factors (Model 4)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	4.3261	5.5865	0.774	0.4387	
Age	2.0804	1.203	1.729	0.0838	.
Gender	-3.2099	1.8312	-1.753	0.0796	.
Education	-0.2283	1.1614	-0.197	0.8442	
Income	0.2869	0.3874	0.741	0.459	
Family Size	-0.6937	0.7667	-0.905	0.3655	
Green Loan Awareness	1.0564	1.2351	0.855	0.3924	
Battery Replacement	-3.154	1.3577	-2.323	0.0202	*
Peceive EV is expensive	0.2149	0.5975	0.36	0.719	
Long-term saving	1.7597	0.9101	1.934	0.0532	.
Resale Price	0.4454	0.9364	0.476	0.6343	
Maintainance Cost	0.8165	1.2824	0.637	0.5243	
Prefer low upfront cost	-0.6657	0.5824	-1.143	0.253	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

The overall logistic regression model was not statistically significant. However, the concern of battery replacement cost achieved statistical significance at the conventional 0.05 level. The negative coefficient of the predictor suggested that higher concern about battery replacement costs is associated with lower purchase intention. In addition, the awareness of long-term saving approached significance at the 0.10 level, with a positive coefficient. This suggested that the more consumers are aware of the long-term savings of electric cars, the higher their purchase intention, although this effect was not statistically significant at the conventional 0.05 level. Age and gender which were the control variables of this model also had marginal significance on purchase intention. Other predictors, including gender, education, income, family size, green loan awareness, and cost sub-factors such as the perception that EV is expensive, concern about resale price, maintainance cost and the preference of lower upfront cost were not statistically significant predictors of purchase intention in this model.

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4.4.2. Stepwise Logistic Regression Analysis of Cost Factor (Model 5)

Stepwise regression in Model 5 further refines this analysis by isolating the most critical cost factors. The analysis began with a full model that included all demographic and cost predictors and used a stepwise approach to refine the model. The final model included age, gender, family size, concern on battery replacement, perceived EV as the long-term saving vehicle, concern on maintenance cost, and the preference of low upfront cost. Table 11 summarized the result of the stepwise logistic regression analysis of cost factors.

Table 11. Stepwise Logistic Regression Analysis of Cost Factors (Model 5)

	Estimate	Std. Error	z value	Pr(>|z|)	
(Intercept)	4.0923	4.4559	0.918	0.35842	
Age	2.0905	1.0983	1.903	0.05699	.
Gender	-3.4908	1.7274	-2.021	0.04329	*
Family Size	-0.9812	0.7043	-1.393	0.16358	
Battery Replacement	-2.684	1.1414	-2.351	0.0187	*
Long term saving	1.9658	0.7431	2.645	0.00816	**
Maintainance Cost	1.1317	0.7926	1.428	0.15336	
Prefer low upfront cost	-0.7619	0.5217	-1.46	0.14418	

Signif. codes: 0 '***' 0.001 '**' 0.01 '*' 0.05 '.' 0.1 ' ' 1

Gender (B = -3.49, p = 0.04) was statistically significance with negative coefficient, indicating that male are more likely to intend to purchase electric car in Cambodia. Concern on battery replacement cost (B = -2.68, p = 0.02) was a significant negative predictor of purchase intention, suggesting that higher concern of battery replacement cost would decrease the likelihood of purchase intention. The perception on EV as long-term saving vehicle (B = 1.96, p = 0.008) , also had significance influence on purchase intention with positive coefficient, indicated that higher awareness of long-term saving of electric car positively influence purchase intention. Additionally, age

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shows a marginal significance in this model, suggesting that age could be a potential predictor of purchase intention

This result revealed that perceived cost factors related to concern about battery replacement and awareness of long-term savings of electric cars along with gender factors played critical roles in influencing purchase intention for electric car adoption in Cambodia. Furthermore, age was particularly noteworthy as it approached significance, suggesting that older age more willing to purchase electric cars. These findings highlight important considerations for policymakers and marketers aiming to promote EV adoption in a developing country like Cambodia,

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5. Discussion

In this section, the researcher discussed the results of the statistical analyses performed in Chapter 4 and evaluated the hypotheses discussed in the literature review related to factors influencing Cambodian consumers' willingness to purchase electric vehicles (EVs). The statistical methods employed included descriptive analysis and logistic regression analysis, which were essential in identifying the significant predictors of EV purchase intentions and exploring the hypotheses. The findings of the hypotheses tests were presented in Table 12.

Table 12. Result of hypotheses testing

Hypothesis	**Hypothesis Test Results**
Hypothesis 1 (H1): *The concern and perception of the cost of electric vehicles have a significant influence on the consumer's willingness to purchase electric cars in Cambodia.*	Supported
Hypothesis 1a (H1a): *The concern about the upfront purchasing cost of electric vehicles significantly influences the consumer's willingness to purchase electric cars in Cambodia.*	Rejected
Hypothesis 1b (H1b): *The concern about the operation cost of electric vehicles significantly influences the consumer's willingness to purchase electric cars in Cambodia.*	Supported
Hypothesis 1c (H1c): *The concern about the resale price of electric vehicles significantly influences the consumer's willingness to purchase electric cars in Cambodia.*	Rejected
Hypothesis 2 (H2): *The competence of electric vehicles has a significant influence on the consumer's willingness to purchase electric cars in Cambodia.*	Supported
Hypothesis 3 (H3): *The concern and perception of the charging conditions of electric vehicles have a significant influence on the consumer's willingness to purchase electric cars in Cambodia.*	Supported (marginally significant)
Hypothesis 4 (H6): *The availability of special financing options for electric vehicle purchasing has a significant influence on the consumer's willingness to purchase electric cars in Cambodia.*	Rejected

Hypothesis 1 (H1) posited that concerns about the cost of electric vehicles (EVs) significantly influence Cambodian consumers' willingness to purchase them, was supported by results of analysis. The result of bootstrapping model revealed that the cost

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factor was significant in predicting the intention to purchase EVs. The negative coefficient suggested that higher concerns of cos were associated with a lower willingness to purchase electric cars. This suggested that cost concerns played a considerable role in consumer decision-making on purchasing EVs.

Hypothesis 1b (H1b)**,** which specifically examined the operational costs of EVs, was supported by this study analysis. The logistic regression analysis models 4 and 5 indicated that the concern of battery replacement cost and awareness of long-term savings of electric cars were significant predictors of purchase intention. The negative coefficient of concern about battery replacement cost suggested that higher concerns about the battery replacement cost could reduce the likelihood of consumers intending to purchase electric vehicles. Conversely, the awareness of consumers on the long-term saving cost of electric cars had a positive influence on purchase intention as it had a positive coefficient in the analysis result. Hypotheses 1a (H1a) and 1c (H1c)**,** which focused on the concern about upfront purchasing cost and resale price of electric cars, respectively, were rejected, suggesting these factors are less influential in the Cambodian context compared to operational costs.

These results were consistent with prior studies indicating that operation costs were a major barrier to EV adoption. Since concerns about battery replacement costs significantly influence purchase intention, policymakers and manufacturers should focus on reducing these costs. Possible strategies include providing subsidies for battery replacement, offering extended warranties, or implementing leasing options that cover battery costs. Educating consumers about advancements in battery technology that improve lifespan and reduce costs can also help mitigate concerns. Addressing these cost concerns through financial incentives such as subsidies, tax rebates, or clearer

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communication about the long-term savings associated with EVs could enhance the adoption rates of EVs in Cambodia.

Hypothesis 2 (H2) suggested that the competence of electric vehicles, including factors like model variety, design, appearance, and safety features, significantly influences consumer willingness to purchase EVs in Cambodia. The study's findings supported this hypothesis with statistically significant results of regression. The positive coefficient suggested that better perceptions of EV competence correlate with a higher willingness to purchase. This result aligned with broader research indicating that perceptions of EV performance and the variety of models were pivotal in shaping consumer preferences toward EV adoption. These results emphasize the importance of enhancing consumer perceptions of EV competence through education and commercial promotion to accelerate EV adoption rates in Cambodia. To generate interest and trust among prospective customers, it may be beneficial to plan events, test drives, and exhibits that highlight the competence, efficiency, and range of EV models offered.

Other hypotheses, including assessments of charging conditions **(**H3**)** and financing options **(**H4**),** showed varied results. While the study found a marginally significant effect of charging conditions on purchase intentions, suggesting that issues with charging infrastructure and accessibility may still be substantial hurdles, H4 regarding financing options was rejected. This result indicated that electric car charging infrastructure and accessibility might be a significant hurdles in the current survey. In addition, the availability of green vehicle financing option did not significantly influence purchase intentions in the logistic regression models. This indicated that, in the Cambodian context, the affordability of EV operational costs might be more critical than the availability of special financing options such as green vehicle financing in driving

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consumer decisions. Policymakers and industry stakeholders should thus prioritize improving charging infrastructure while also considering other influential factors in promoting EV adoption.

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6. Conclusion and Recommendation

6.1.Conclusions and Recommendations of the Thesis

The current study investigates the critical factors influencing consumers' intention to purchase electric vehicles in Cambodia. It employed logistic regression analysis to explore the intention to purchase electric vehicles and its predictors such as cost, competence, charging condition, perception, government policy, and financing options. The current study mainly identified cost as a significant factor in adopting electric cars in Cambodia. Results showed that the concern about the cost of electric cars negatively influenced to EVs adoption, specifically, the concern about battery replacement cost and resale price of electric cars played important barriers to consumers. In addition, the competence of electric cars also had significant influences on electric car adoption in Cambodia as well and positively helped to boost electric car adoption in Cambodia. Addressing these through targeted policies and consumer education could enhance EV adoption in Cambodia.

The sample used in this study may not represent the entire Cambodian consumer population due to demographic differences and respondents' awareness of electric vehicles, but it provided useful insights into consumer behavior and perception on consumption EV, emphasizing the roles of cost concerns and competence of electric cars in adopting election car in Cambodia. These findings offer a foundation for policymakers, industry stakeholders, and researchers to develop targeted strategies that address key barriers and accelerate the transition towards sustainable transportation solutions in Cambodia.

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6.2.Recommendations for Follow-Research

The study faced limitations such as sample size and demographic skew towards urban and younger respondents. Future research could benefit from a larger, more diverse sample and explore additional factors like environmental awareness and infrastructure development.

While concern about electric car's charging conditions was found to be a marginally significant factor in the current study, their investigation lays the groundwork for future research and strategic activities. Future research should consider a broader geographic scope to include rural and urban areas, as charging infrastructure accessibility may vary significantly. Incorporate qualitative research methods, such as interviews and focus groups, to gain deeper insights into consumer concerns and perceptions about charging infrastructure might be beneficial for future charging infrastructure development.

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Annex I: Survey Questionnaires

Section 1:Basic Information

Please choose the answers that best respresent you.

Demographic and Transportataion Information

1. Age:

   □ Below 20 years old

   □ Between 20-30 years old

   □ Between 31-40 years old

   □ Between 41-50 years old

   □ Above 50

2. Gender:

   □ Male

   □ Female

3. Family Size:

   □ Between 1-3 members

   □ Between 4-6 members

   □ More than 7 members

4. Where is your current residence?

   □ Provinces

   □ Capital City (Phnom Penh)

5. Monthly Income (not required)

   □Less than $500

   □ Between $500-$1,000

   □ Between $1,001-1,500

   □Between $1,501-2,000

   □ Above $2,000

   □ Prefer not to say

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6. Do you own car?

   □ No (If no, skip question 13)

   □ Yes

7. Type of Vehicle Owned (if applicable):

   □ Gasoline-powered

   □ Diesel-powered

   □ Hybrid

   □ Electric

   □ Others

8. Are you willing to purchase an EV in the future?

   □ No

   □ Yes

9. Have you ever heard about green vehicle loan? (Green vehicle loan is a type of loan that allows people to acquire eco-friendly cars or cars with lower average emissions such as electric car, hybrid…etc)

   □ No

   □ Yes

Section 2: Factors influence EV car adoption and financing

Please rate each statement on a scale from 1-5

1 = Strongly Disagree

2= Disagree

3= Neutral (Neither Agree nor Disagree)

4= Agree

5= Strongly Agree

A. Cost

10. I am concerned about the potential costs of battery replacement for EVs would be expensive.

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11. I perceive that EVs are expensive.
12. I believe that the long-term savings from reduced energy consumption and low electricity price could offset the initial premium cost of electronic car, if compare with traditional fuel vehicles.
13. The resale price of EVs compared to traditional vehicles is a concerns for me.
14. I am concerned about the future maintenance costs of EVs being higher than traditional fuel vehicles.
15. I prioritize vehicles with lower upfront costs over potential long-term savings from operations, such as those associated with EVs, due to uncertainties.

B. EVs' Competence

16. The safety features of EVs are a significant consideration for me when comparing them to traditional fuel vehicles.
17. The availability of different EV models affects my likelihood of purchasing one.
18. The design and appearance of EVs influence my decision to consider purchasing one.
19. I believe that EVs offer comparable performance to traditional fuel vehicles.

C. Charging conditions

20. The availability of public charging stations in my area affects my consideration of purchasing an EV.
21. I am concerned about the time it takes to charge an EV compared to refueling a traditional fuel vehicle.
22. The affordability of EVs' home chargers affects my consideration in purchasing an EV.
23. The driving range per charging associated with electric car is a significant concern for me.

F. Financing and Loan Options

24. Lower interest rates offered by financial institutions for EV loans would make me more likely to consider purchasing an EV.

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25. The availability of flexible loan terms and repayment schedules for EV purchases would positively influence my decision to buy an EV.

26. I would consider financing options that include additional benefits such as insurance packages or warranty extensions for EV purchases.

Thank you for completing the survey.

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Appendix II: Summary of Survey Responses

	n	%
1. Age		
Below 20 years old	2	2.9
Between 20-30 years old	41	58.6
Between 31-40 years old	22	31.4
Between 41-50 years old	3	4.3
Above 50 years old	2	2.9
Total	70	100.0
2. Gender		
Male	30	42.9
Female	40	57.1
Total	70	100.0
3. Family Size		
Between 1-3 members	22	31.4
Between 4-6 members	37	52.9
More than 7 members	11	15.7
Total	70	100.0
4. Where is your current residence?		
Provinces	10	14.3
Capital City (Phnom Penh)	60	85.7
Total	70	100.0
5. Monthly Income		
Less than $500	13	18.6
Between $500-$1,000	26	37.1
Between $1,001-1,500	9	12.9
Between $1,501-2,000	5	7.1
Above $2,000	6	8.6
Prefer not to say	11	15.7
Total	70	100.0
6. Do you own car?		
No	33	47.1
Yes	37	52.9
Total	70	100.0
7. Type of Vehicle Owned (if applicable):		
N/A	33	47.1
Gasoline-powered	27	38.6
Diesel-powered	2	2.9
Hybrid	8	11.4
Total	70	100.0
8. Are you willing to purchase an EV in the future?		
No	11	15.7
Yes	59	84.3
Total	70	100.0
9. Have you ever heard Green Vehicle Loan before?		
No	49	70.0
Yes	21	30.0

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Total	70	100.0
10. I am concerned about the potential costs of battery replacement for EVs would be expensive.		
Disagree	4	5.7
Neutral	8	11.4
Agree	41	58.6
Strongly Agree	17	24.3
Total	70	100.0
11. I perceive that EVs are expensive		
Strongly Disagree	1	1.4
Disagree	16	22.9
Neutral	19	27.1
Agree	29	41.4
Strongly Agree	5	7.1
Total	70	100.0
12. I believe that the long-term savings from reduced energy consumption and low electricity price could offset the initial premium cost of electronic car, if compare with traditional fuel vehicles.		
Strongly Disagree	1	1.4
Disagree	3	4.3
Neutral	17	24.3
Agree	42	60.0
Strongly Agree	7	10.0
Total	70	100.0
13. The resale price of EVs compared to traditional vehicles is a concerns for me.		
Strongly Disagree	1	1.4
Disagree	3	4.3
Neutral	16	22.9
Agree	40	57.1
Strongly Agree	10	14.3
Total	70	100.0
14. I am concerned about the future maintenance costs of EVs being higher than traditional fuel vehicel.		
Disagree	6	8.6
Neutral	6	8.6
Agree	42	60.0
Strongly Agree	16	22.9
Total	70	100.0
15. I prioritize vehicles with lower upfront costs over potential long-term savings from operations, such as those associated with EVs, due to uncertainties.		
Strongly Disagree	4	5.7
Disagree	8	11.4
Neutral	27	38.6
Agree	26	37.1
Strongly Agree	5	7.1
Total	70	100.0

16. The safety features of EVs are a significant consideration for me when comparing them to traditional fuel vehicles.

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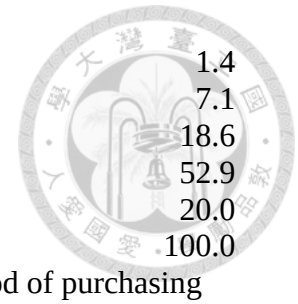

Strongly Disagree	1	1.4
Disagree	5	7.1
Neutral	13	18.6
Agree	37	52.9
Strongly Agree	14	20.0
Total	70	100.0

17. The availability of different EV models affects my likelihood of purchasing one.

Strongly Disagree	3	4.3
Disagree	9	12.9
Neutral	24	34.3
Agree	28	40.0
Strongly Agree	6	8.6
Total	70	100.0

18. The design and appearance of EVs influence my decision to consider purchasing one.

Strongly Disagree	1	1.4
Disagree	1	1.4
Neutral	19	27.1
Agree	37	52.9
Strongly Agree	12	17.1
Total	70	100.0

19. I believe that EVs offer comparable performance to traditional fuel vehicles.

Strongly Disagree	1	1.4
Disagree	8	11.4
Neutral	28	40.0
Agree	30	42.9
Strongly Agree	3	4.3
Total	70	100.0

20. The availability of public charging stations in my area affects my consideration of purchasing an EV.

Strongly Disagree	8	11.4
Disagree	9	12.9
Neutral	14	20.0
Agree	19	27.1
Strongly Agree	20	28.6
Total	70	100.0

21. I am concerned about the time it takes to charge an EV compared to refueling a traditional fuel vehicle.

Strongly Disagree	2	2.9
Disagree	2	2.9
Neutral	15	21.4
Agree	31	44.3
Strongly Agree	20	28.6
Total	70	100.0

22. The affordability of EVs' home charger affects my consideration in purchasing an EV.

Disagree	5	7.1

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Neutral	16	22.9
Agree	33	47.1
Strongly Agree	16	22.9
Total	70	100.0

23. The driving range per charging associated with electric car is a significant concern for me.

Disagree	4	5.7
Neutral	9	12.9
Agree	32	45.7
Strongly Agree	25	35.7
Total	70	100.0

24. Lower interest rates offered by financial institutions for EV loans would make me more likely to consider purchasing an EV.

Strongly Disagree	2	2.9
Disagree	6	8.6
Neutral	14	20.0
Agree	33	47.1
Strongly Agree	15	21.4
Total	70	100.0

25. The availability of flexible loan terms and repayment schedules for EV purchases would positively influence my decision to buy an EV.

Strongly Disagree	2	2.9
Disagree	3	4.3
Neutral	19	27.1
Agree	32	45.7
Strongly Agree	14	20.0
Total	70	100.0

26. I would consider financing options that include additional benefits such as insurance packages or warranty extensions for EV purchases.

Strongly Disagree	1	1.4
Disagree	3	4.3
Neutral	14	20.0
Agree	37	52.9
Strongly Agree	15	21.4
Total	70	100.0

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