The Causal Relationship Model of technology acceptance affecting the intention to use electric vehicle of Bangkok

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Abstract

The objective of this research is to 1) study the causal factors affecting technology acceptance 2) Study the influence of technology acceptance on electric vehicle intentions. This research is quantitative research. To test the causal relationship and results Data were collected using a questionnaire with 320 people living in Bangkok. Statistics used in the hypothesis include structural equation analysis (SEM). The results of the research according to the hypothesis found that 1) awareness of Environmental problems have a positive direct influence on technology adoption. 2) Travel behavior has a positive direct influence on technology adoption. 3) Promoting the use of electric cars has a positive direct influence on technology adoption. 4) Technology adoption has a positive direct influence on the intention to use electric cars

The benefits of this research can be used in management to guide the management of technology awareness of electric cars. So that the industrial or government sector can use the information to promote the acceptance of electric car technology to grow steadily and be competitive. Which leads to good results with the next organization.

Keywords: technology acceptance, intention to use, electric cars

1. Introduction

Thailand is heading towards becoming a leader in the production and use of electric cars. With clear goals from national policy according to the "30@30" framework under the drive of the National Electric Vehicle Policy Committee. The government aims that by 2030, electric cars produced in the country must account for at least 30% of total production The policy does not focus only on increasing the number of electric vehicle production. but also create a comprehensive support system. From promoting domestic production Setting standards for body and control systems to setting goals for producing four-wheeled vehicles electric motorcycle and electric trucks Including expanding to public transportation such as tricycles Electric boats and rail systems as shown in the Ministry of Energy's 2021 Energy Master Plan. (Ministry of Energy. 2021)

Currently, the electric vehicle (BEV) industry in Thailand during the year Prof 2569–2571 there is a trend of continuous growth. It is expected that the number of new electric vehicle registrations will increase by approximately 125,000 vehicles per year, growing on average

3.8% per year this expansion is driven by the introduction of new models with longer running distance performance. And full enforcement of Euro 6 standards. This may cause higher costs for combustion engine cars. And the declining marketing of electric vehicle (EV) prices in the country, so internal demand may slow down after the measures Support for EV3.5 ends, while supply will increase due to compensatory production. Causing competition in the market to remain high Exports of electric cars are expected to export approximately 20,000 vehicles per year, supported by promotional measures and increased demand for BEVs around the world. But still have to face challenges from intense competition, especially from countries China and domestic production costs are still high. Due to the limited production size this may affect competitiveness in the world market. (Krungsri Research, 2025)

Electric vehicle (EV) market in Bangkok Currently, it is in the process of expanding rapidly and is worth keeping an eye on. Because there are new electric car brands launching to compete more. And there are government support measures that help stimulate consumers to be interested in switching to electric trains. Factors or obstacles that affect popularity include: 1) Confidence in Increase in technology, warranty and after-sales service Makes consumers reduce their worries about using their cars for the long term. 2) Modern technology and quiet driving. Which meets the needs of various lifestyles and 3) a view of lower long-term costs both from adjusting car prices to be easily accessible Increased and lower charging costs than oil. A survey from NIDA Poll and Great Wall Motor confirmed that cheap charging prices are an important reason why consumers choose to switch to EVs. (Rujai Insurance. 2024)

This study is extremely important. This is because Thailand has established a proactive policy to promote the transition to electric vehicles. The goal is clearly set under the "30@30" framework, which wants electric cars to have a production proportion of 30% in the country By 2030, despite the rapid growth of the Bangkok electric vehicle market through competition from new brands and state support measures, the success of such policies still depends on consumer acceptance as the main factor

Therefore, this research aims to systematically study factors affecting technology acceptance and intention to use electric cars. To gain insights that can be useful in designing marketing policies and strategies that are relevant. Effective and truly meet the needs of consumers this will be an important foundation that will help drive the goals the country's electric vehicles to achieve stable and sustainable results

1.1 Research Objectives

1. To examine the causal factors influencing technology acceptance.

2. To investigate the influence of technology acceptance on the intention to use electric vehicles.

1.2 Research Hypotheses

H1: Environmental awareness has a positive direct effect on technology acceptance.

H2: Travel behavior has a positive direct effect on technology acceptance.

H3: Promotion of electric vehicle usage has a positive direct effect on technology acceptance.

H4: Technology acceptance has a positive direct effect on the intention to use electric vehicles.

2. Literature review

2.1 Concepts related to the recognition of environmental impacts from the use of motor vehicles

This concept means the fact that people are aware and evaluate the negative effects of using vehicles. Especially those that use fuel. Which causes air pollution Greenhouse gas emissions and PM2.5 dust affect health and quality of life in urban communities. (Pollution Control Department, 2023) This perception arises from the thought process. That allows vehicle users to link their daily travel behavior with environmental impacts at the social level. Such awareness has a direct influence on the exposure and acceptance of alternative transportation systems that have less impact on the environment, the study found that those who are very aware of the dangers of gasoline cars they are often more interested in electric vehicles. Because it is believed to help reduce pollution problems and be environmentally friendly in the long run (Wang et al., 2021) In addition, this perception also has a positive effect on seeing the benefits of electric cars in many areas, such as saving energy costs. Reducing environmental impact and creating a good image for society (Li et al., 2023). Especially in the Bangkok area who often face severe traffic pollution problems Awareness is therefore an important factor that may encourage people to change their travel behavior and turn to using electric vehicles more

2.2 Concepts related to the nature of personal vehicle use

This concept means Person's personal car habits such as frequency, distance, purpose, and level of dependency in daily life. Which reflects the behavioral context that affects energy use emissions and impacts on the urban environment (Energy Policy and Planning Office, 2022).Especially those who drive a short distance and live mainly in the city. Electric cars are often viewed as suitable in terms of cost, convenience, and reducing environmental impact (Wang et al., 2021; Li et al., 2023) in the context of Bangkok Most people need to use their own vehicles for travel. The form of personal car use is therefore an important factor that helps explain the differences in acceptance of electric cars. The research indicates that Daily travel patterns can affect interest in electric cars. Through looking see the suitability and benefits of this technology (Zhang et al., 2022)

2.3 Concepts related to government support measures for electric cars

The ideas discussed here cover key government measures that provide guidelines to support the transition to electric vehicles. The goal is to reduce restrictions and create a conducive environment. These measures include providing tax benefits. Financial support Expanding the electric charging station network and Set safety regulations (Ministry of Industry, 2023) aims to reduce important obstacles such as high initial costs and unplanned infrastructure. Which is a factor that causes consumers to be hesitant in switching to electric cars (International Energy Agency, 2024). Financial measures such as tax cuts and purchase subsidies. It is a mechanism that has been confirmed to increase the market share of electric cars in many countries (Mock & Yang, 2025). In addition, expanding the network of charging stations to cover and faster is an important measure (Zhao et al., 2024) Research has found that when infrastructure support measures are combined with tax benefits, It will have a clearly positive effect on consumers' purchasing intentions and acceptance of technology (Li et al., 2023; Wang et al., 2023). In the context of Thailand Adopting comprehensive promotion measures whether it is a tax deduction measure Infrastructure support for charging including promoting the use of electric vehicles in

public transportation. It plays a huge role in alleviating consumer concerns and promoting an investment climate for entrepreneurs Industry (Ministry of Energy, 2023)

2.4 Concepts related to the acceptance of electric vehicle technology

This concept means a person's level of awareness that using electric cars can help increase travel efficiency. Reduce energy costs Reduce environmental impact and responds better to everyday use than vehicles using internal combustion engines. This concept is consistent with the Technology Acceptance framework Model: TAM), which states that perceived benefits are an important factor that directly influences consumers' attitudes and intentions to use technology (Davis, 1989) Research on electric vehicles found that Consumers who recognize that electric cars have long-term cost advantages Usage efficiency and reducing emissions There is a significant tendency to accept and express intentions to use electric cars (Li et al., 2023) Especially in large urban areas such as Bangkok. Perception of the benefits of electric cars in terms of suitability for traffic conditions and efficient use of energy. Technology plays a crucial role in developing learning, and educational institutions serve as sources for producing human resources (Chuchuoy et al., 2024). It is considered an important factor that promotes the decision to transition to the use of electric vehicles (Zhao et al., 2024).

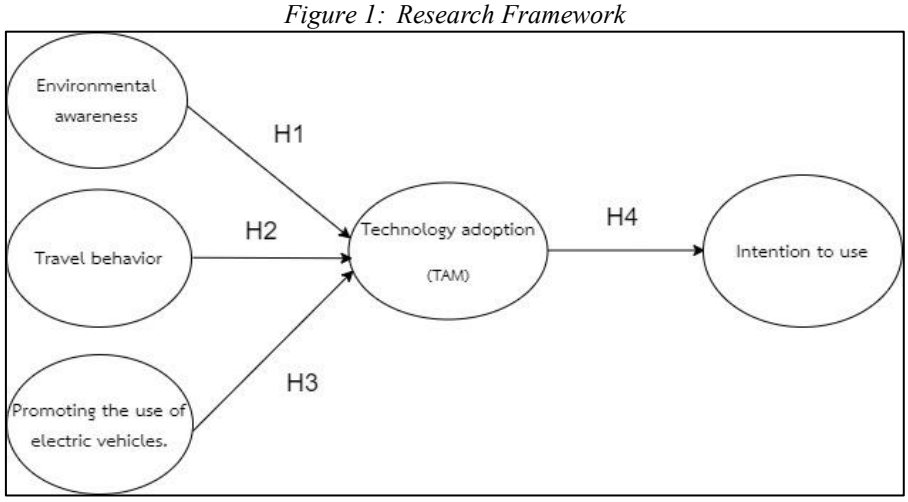
2.5 Concepts related to intentional use

Intention to use (Usage Intention or Behavioral Intention) refers to a person's intention to choose to behave in a particular behavior from many options. After going through a careful process of considering and evaluating information Intention to use involves deciding to use a product or service. Consumers play a role as buyers, payers, and users (Nungruthai Chommanee, 2019) Research indicates that intention to use is influenced by personal factors. Product characteristics, situations, costs, risks, and social influences which together determine the level of consumer intention (Nungruthai Chommanee, 2019) Intention is used as an important variable that connects attitude with actual usage behavior. Research on electric cars found that Intention is influenced by perceived benefits. Ease of use and support from society and the government (Zhang et al., 2022; Li et al., 2023) is therefore suitable to be used as a dependent variable in this research

Based on a review of theoretical concepts, literature, and related research, a research framework was created as shown in Figure 1.

Research Conceptual Framework

Figure 1: Research Framework



3. Methodology

3.1 Population and sample

This research studies the target population, which is approximately 5,455,020 people living in Bangkok (National Statistical Office, 2025) with an individual level of analysis. For collecting quantitative data the researcher aims to study consumers in Bangkok who are 20 years of age or older, which is considered an age group with potential and opportunities in the practical use of electric cars because data analysis uses advanced statistics. The researcher therefore calculated the sample size in accordance with statistical principles. Based on the general criteria that suggest samples of approximately 10 to 20 times the number of observed variables (Hair et al., 2010). Because this research has a total of 16 observation variables, the initial sample size was set to be between 160 and 320 people in order to obtain sufficient data for accurate and reliable analysis. In the data collection process the researcher used a sample of 320 people, which was considered to be within appropriate criteria and in accordance with the principles set the sample size as proposed by Hair and colleagues. This makes it possible to use the results for further analysis effectively

3.2 Research tools

The data collection tool for this research was a questionnaire. It consists entirely of closed questions. The content has been designed to be divided into 5 sections to cover topics related to the acceptance of electric vehicle technology. Each episode has the following details:

Part 1 is the basic information of the respondents. Using a multiple choice question (Check List) to collect general characteristics such as gender, age, education level and occupation

Parts 2 through 4 are used to measure opinion levels using a rating scale according to Likert's (1967) guidelines, which have evaluation levels ranging from 1 to 5

Part 2 focuses on evaluating factors affecting the acceptance of electric vehicle technology

Part 3 measures the level of technology acceptance among electric vehicle users

Part 4: evaluate the expected results from the acceptance of such technology

Part 5 is an open-ended question section. So that respondents can freely offer additional opinions or suggestions

3.3 Quality monitoring of research instruments

Checking the quality of the questionnaire was carried out according to two main standard processes as follows: Step 1: Content Validity Test to make the questionnaire consistent with the research objectives. The draft questionnaire was presented to three experts with expertise in content and research methods to check the consistency of the questions with the research framework and the definition of each variable. After evaluation The researcher has improved the questions according to the words Expert advice and calculate the consistency index value (Item-Objective Congruence Index) found that every question had an index value of not less than 0.70, which was in accordance with the criteria set by (Hair,2010), thus showing that the questionnaire had sufficient content accuracy quality. Step 2: Testing the reliability of tools (Reliability) to assess the consistency and stability of tools. A trial of a questionnaire (Try Out) was conducted with a group of 30 people in Bangkok who were similar to the target group but not the actual sample. The results of the data were analyzed to determine confidence using the coefficient. Alpha (Cronbach's Alpha Coefficient) (Cronbach, 1984) The acceptance criteria

require that the confidence value of the entire questionnaire must be at least 0.70 (Hair et al., 2010) The analysis results found that The confidence value of the entire questionnaire was 0.80 and when analyzing each sub-sector Confidence values were found to be in the range of 0.810 to 0.901, which is higher than all standard criteria. Therefore, it can be concluded that the questionnaire has good accuracy and confidence. Can be used to collect data for research this time appropriately.

3.4 Statistical Analysis and Data Analysis

Statistics and data analysis in this study the collected data was analyzed using two main levels of statistical techniques as follows: (1) Descriptive Statistics Analysis: The researcher used descriptive statistics to summarize the general characteristics of the sample and basic variables, namely frequency values. (Frequency) and percentage (Percentage) for presenting categorical data Groups such as personal data, mean (Mean) and standard deviation (Standard Deviation) for describing central trends and the distribution of quantitative data in each variable measured with the Likert scale. This part of the analysis was carried out with a statistical package (2) Causal relationship analysis. To test the relationship according to Research hypothesis the researcher used Structural Equation Modeling (SEM), which covers path analysis techniques. The model was evaluated for consistency with empirical data through the following straightness index. According to the recommendations of Hair et al. (2010): x^2/df (Chi-square/Degree of Freedom is less than 2. The CFI (Comparative Fit Index) index approaches 1. The RMSEA (Root Mean Square Error of Approximation) and RMR indices are lower than 0.05. SEM analysis is performed with a statistical package that supports structural equation model analysis. Using data from a total sample of 320 people**.**

4. Research results

This research received cooperation in answering questionnaires from a total of 320 people in Bangkok aged 20 years and over, most of whom were working-age citizens. From the results of the basic data analysis of the respondents the general characteristics of the sample can be summarized as follows

The majority of the sample was male, accounting for 52.50%. Most were in the age range of 31-40 years, accounting for 38.05% of all respondents. In terms of educational level, it was found that Most graduated with a bachelor's degree (66.40%) and had a monthly income in the range of 30,001 – 40,000 baht (37.50%) Detailed data characteristics are shown in Table 1

Table 1*:* General Characteristics of the Respondents

General information	quantity	percentage
Gender		
Male	168	52.50
Female	152	47.50
Age		
20-30 years old	92	28.75
31-40 years old	122	38.13
41-50 years old	87	27.19
51-60 years old	14	4.38
Over 60 years old	5	1.56
Level of Education		
Below Bachelor's Degree	33	10.31
Bachelor's Degree	212	66.25

General information	quantity	percentage
Postgraduate	75	23.44
Monthly income		
10,000 – 20,000	64	20.00
20,001 - 30,000	87	27.19
30,001 – 40,000	120	37.50
40,000 baht and above	49	15.31
Total	**320**	**100.00**

From the analysis of the opinions of the respondents as a whole. It was found that the average score was at a high level. And when considering each of the 5 areas, which consists of 1) Environmental impact perception, 2) Usage patterns, 3) Government support measures, 4) acceptance of technology, and 5) intention to use electric cars the results show that all aspects also had a high average score. The details are as shown in Table 2

Table 2 Results of the study of overall and individual opinions of respondents

Order No	Evaluation list	$\bar{X}$	SD	Level of opinions
1	Environmental impact perception	4.02	0.70	High
2	Usage patterns	3.76	0.71	High
3	Government support measures	3.89	0.73	High
4	Technology Acceptance	4.23	0.75	High
5	Usage Intention	3.84	0.72	High
Total		**4.12**	**0.72**	**High**

The researcher used a multivariate analysis method through path analysis techniques to test research hypotheses. Before analyzing structural equations (SEM), preliminary statistical agreements were examined. From testing the relationship between the 16 observation variables, it was found that the correlation coefficients of all 136 pairs of variables were related in the same direction With values in the range of 0.442 to 0.789, statistically significant at the level of 0.01, these coefficients not exceeding 0.90 indicate that there is no problem of too high correlation (Pallant, 2010; Rubin, 2012) As for testing the suitability of the variable group for element analysis, KMO (Kaiser-Meyer-Olkin) and Bartlett's Test of Sphericity were used. The results showed that the KMO value was 0.90, which is higher than the threshold of 0.80, indicating that the data is very suitable for element analysis. Bartlett's Test is statistically significant (Bartlett's Test = 4560.81, df = 118, Sig = 0.000) It can be concluded that the variable does not have a problem of polymorphism. (multicollinearity) is therefore appropriate to be used to analyze measurement models and structural equation models further (Hair et al., 2010). Details are shown in Table 3

Table 3*:* Correlation Coefficients of the Observed Variables

	ΔVE	ΔVP	PVE	PPV	ΔDU	CPV	PGP	PE	PUE	PET	TET	ΔET	IPE	ILP	CUE	IEA
X	3.97	4.03	4.07	3.70	3.83	3.74	3.93	3.84	4.33	4.30	4.19	4.37	3.80	3.83	3.85	3.93
SD	0.70	0.72	0.71	0.71	0.72	0.70	0.72	0.75	0.70	0.70	0.73	0.74	0.72	0.72	0.71	0.70
ΔVE	1	0.778**	0.736**	0.732**	0.720**	0.712**	0.576**	0.560**	0.517**	0.550**	0.511**	0.514**	0.720**	0.710**	0.681**	0.689**
ΔVP		1	0.760**	0.730**	0.734**	0.691**	0.562**	0.563**	0.528**	0.536**	0.500**	0.551**	0.692**	0.698**	0.561**	0.701**
PVE			1	0.730**	0.768**	0.692**	0.561**	0.586**	0.550**	0.662**	0.551**	0.706**	0.639**	0.660**	0.661**	0.81**
PPV				1	0.760**	0.768**	0.571**	0.512**	0.528**	0.516**	0.501**	0.512**	0.728**	0.730**	0.686**	0.721**
ΔDU					1	0.778**	0.618**	0.582**	0.583**	0.556**	0.528**	0.562**	0.732**	0.732**	0.721**	0.730**
CPV						1	0.668**	0.621**	0.534**	0.568**	0.575**	0.567**	0.718**	0.726**	0.680**	0.719**
PGP							1	0.760**	0.721**	0.728**	0.672**	0.710**	0.587**	0.626**	0.609**	0.668**
PE								1	0.729**	0.736**	0.708**	0.668**	0.610**	0.618**	0.602**	0.650**
PUE									1	0.739	0.700**	0.708**	0.687**	0.632**	0.617**	0.652**
PET										1	0.705**	0.687**	0.769**	0.674**	0.632**	0.681**
TET											1	0.658**	0.660**	0.627**	0.686**	0.658**
ΔET												1	0.610**	0.638**	0.611**	0.656**
IPE													1	0.727**	0.726**	0.781**
ILP														1	0.768**	0.752**
IUP															1	0.736**
IEA																1

**p-value < 0.01

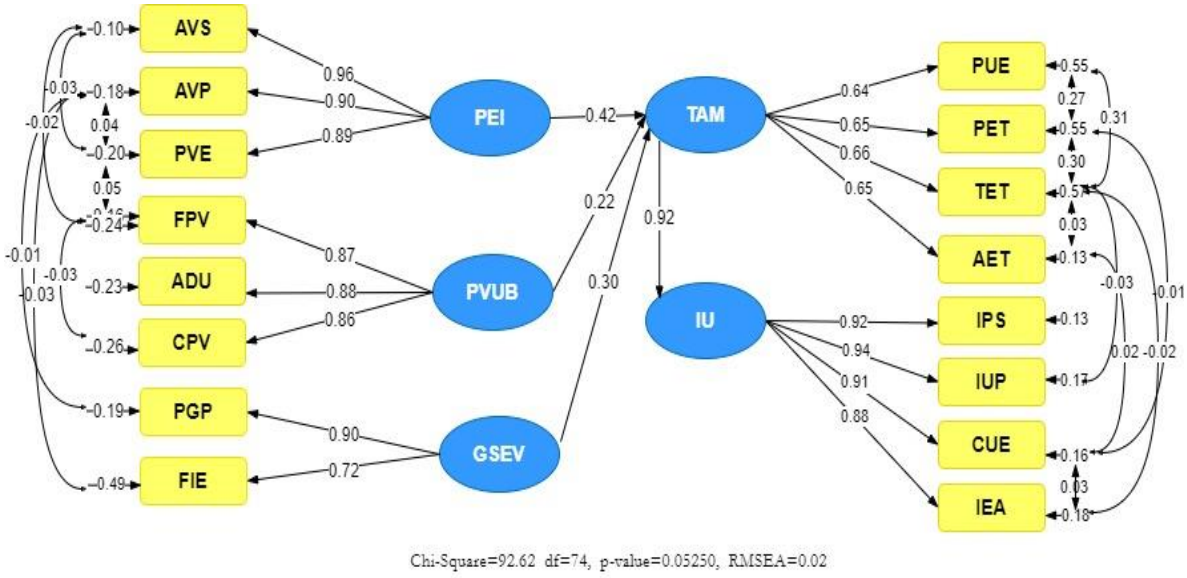
From testing the consistency of the causal relationship model. It was found that the analysis results met the statistical acceptance criteria. It has a chi-square value (χ^2) of 96.62, which has statistical significance at the level of 0.05 (p-value = 0.05). In addition, various harmony index values it also shows good consistency between Model and empirical data, that is, the CFI (Comparative Fit Index) value is equal to 1.00, the GFI (Goodness of Fit Index) value is equal to 0.96, and the AGFI (Adjusted Goodness of Fit Index) index is equal to 0.93, which all indices are consistent with the criteria. Accepted according to academic principles (Hair et al., 2010) shows that the developed model is in harmony with the studied data. The detailed analysis results are shown as Table 4

Table 4 Results of checking the consistency of the empirical model with the theoretical model. (prototype model)

tatistics Used for Model Evaluation	Calculated Values	Interpretation
Chi-square	96.62	Meets the criteria
Chi-square/df	1.25	Meets the criteria
df	74	Meets the criteria
p-value	0.05	Meets the criteria
CFI	1.00	Meets the criteria
GFI	0.96	Meets the criteria
AGFI	0.93	Meets the criteria
RMSEA	0.02	Meets the criteria

The results of the model consistency analysis showed that all indices were within acceptable criteria, reflecting that this model was properly consistent with empirical data, details of which can be found in Figure 2

Figure 2: Results of the Analysis of Causal Relationships among the Causal Factors of Technology Acceptance Affecting the Intention to Use Electric Vehicles



Results of analysis of the influence of factors according to research assumptions. It was found that the component variables, both the causes and results of technology acceptance, affect the intention to use electric cars. There are direct, indirect, and total influence values. As shown in detail in Table 3

Table 3 Direct influence (DE) Indirect influence (IE) and total influence (TE) of causal factors on electric vehicle intentions

Causal variables	Outcome variable					
	Technology Acceptance (TAM)			Usage intention (IU)		
	DE	IE	TE	DE	IE	TE
Environmental impact perception (PEI)	.42**		42**	.		0.39**
Usage patterns (PVUB)	.22*		.22*	.		0.21*
Government support measures (GSEV)	.30**		.30**	.		0.28**
Technology Acceptance (TAM)	.		.	0.92**		0.92**

**p<0.01, *p<0.05

Referring to Figure 2 and Table 3, the analysis results show that

(1) Environmental impact perception (PEI) has a significant direct and positive influence on technology acceptance (TAM) at the level of 0.01 (β = 0.42), thus accepting hypothesis 1

(2) Usage patterns (PVUB) has a significant positive direct influence on technology acceptance (TAM) at the level of 0.05 (β = 0.22), thus accepting hypothesis 2

(3) Government support measures (GSEV)has a significant direct and positive influence on technology acceptance (TAM) at the level of 0.01 (β = 0.30), thus accepting hypothesis 3

(4) Technology acceptance (TAM) has a significant positive direct influence on electric vehicle (BIU) intentions at the level of 0.01 (β = 0.92), thus accepting hypothesis 4

5. Conclusion and discussion

The research results can be summarized and discussed in connection with related theories and research as follows

5.1. Effects of perceived environmental impacts on technology adoption Studies confirm that perceived environmental impacts have a significant positive influence on the acceptance of electric vehicle technology. It reflects that consumers in Bangkok are becoming aware of the environmental impacts of using general cars. And view electric cars as an option that can help reduce air pollution problems. This result is consistent with research by Sunirat Pinturong (2020) who found that recognizing environmental impacts has a positive effect on purchasing intentions for environmentally friendly products. It shows that environmental protection incentives play an important role in pushing Push for acceptance of green innovation

5.2. Effects of personal vehicle usage characteristics on technology acceptance the daily use of personal vehicles also has a positive influence on the acceptance of electric vehicle technology significantly, that is, people who have urban travel patterns or have regular travel needs. Often see consistency and readiness to Use more electric cars especially when infrastructure such as charging stations is available on routes or areas that are regularly used. This result is consistent with the study of Thananon Ngernsungnoen and Jaruwisok Prabnasak (2023) and information from the Electrification Coalition (2022) indicating that ease of use is an important factor in the decision to switch to electric vehicles

5.3. The effect of public sector support measures on technology acceptance, public and private sector support measures such as tax reduction measures, price support and the development of charging stations have had a significant positive influence on the acceptance of electric vehicle technology, showing that clear policies and enabling infrastructure contribute to reducing barriers and increasing forcesMotivate consumers to consider switching to electric cars. The results of this study are consistent with the work of Jessadaporn Bunnag and colleagues (2023), who pointed out that government promotion measures play an important role in driving technological change

5.4. Effects of technology acceptance on electric vehicle intentions. The adoption of electric vehicle technology has a significant positive influence on the intention to use electric vehicles. This is in line with the Technology Acceptance Model, where factors of perceived benefit and ease of use play an important role in consumer decision-making. Results this research is in line with the work of Warittha Dinudom (2019) found that technology acceptance is an important predictor of intentions and behavior in using new systems in daily life.

Suggestions from research

1. Policy recommendations

1.1 The industrial sector and entrepreneurs should create plans and communicative content that focus on creating awareness of the benefits of electric cars. Especially in terms of reducing environmental problems, such as helping reduce air pollution and noise. As well as saving energy costs in the long run such information will help strengthen awareness of things Environment and stimulate the demand for better use of electric cars

1.2 Entrepreneurs should focus on communication to enhance awareness of the benefits (Perceived Usefulness) and ease of use (Perceived Ease of Use) of electric cars. So that consumers can see the clear value and feel confident in using it without feeling too complicated

1.3 The government sector should accelerate the development of electric vehicle charging technology to be as fast as refueling. As well as expanding the charging station network to be more comprehensive and accessible. So that consumers view electric vehicle charging as easy and not an obstacle to everyday use

2. Suggestions for future research

2.1 Because this research studies at the individual level. Further research should expand the scope of study to the organizational level. Both the private and public sectors including multi-level analysis (Multi-Level Analysis) that considers factors from many layers, such as individual, team or organizational levels. To gain a more comprehensive and complex understanding of Technology acceptance

2.2 There should be a study to monitor the satisfaction of electric car users in the long term. By comparing feelings and attitudes before and after actual use. To assess the development of technology acceptance and examine how experience factors affect technology acceptance models (TAMs)

References

Bunnag, J., Kalyanamitra, K., Niyomyaht, S., & Lakkhanapichonchat, T. (2023). Implementation of electric vehicle promotion policies in Thailand. *Journal of Graduate MCU Khon Kaen Campus, 10*(3), 187–202.

Chommanee, N. (2019). *Consumer behavior and purchase decision process*. Business Administration Journal, 9(2), 33–48.

Chuchuoy, K., Srima, S., & Noichun, N. (2024). The Development of a Web-based Lessonto

EnhanceDigital Technology Competency for Pre-Service TeachersatSuan Sunandha

Rajabhat University. *SSRU Academic Journal of Education, 8*(2), 44-54.

Cronbach, L. J. (1984). *Essentials of psychological testing* (4th ed.). Harper & Row.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly, 13*(3), 319–340.

Dinudom, W. (2019). *Technology acceptance and intention to use electric vehicles among consumers in Bangkok and metropolitan areas* (Master's thesis). Thammasat University, Thailand.

Electrification Coalition. (2022). *Electric vehicles in rural and urban communities: Moving beyond traditional transportation systems*. Electrification Coalition, Washington, DC.

Energy Policy and Planning Office. (2022). *Thailand transportation energy consumption situation report*. Ministry of Energy, Thailand.

Hair, J., Black, W. C., Babin, B. J., & Anderson, R. E. (2010). *Multivariate data analysis*

(7th ed.). Upper saddle River, New Jersey: Pearson Education International.

International Energy Agency. (2024). *Global EV outlook 2024: Accelerating electric vehicle deployment* (pp. 1–200). International Energy Agency.

Krungsri Research. (2025). *Industrial business trends 2026-2028: Electric vehicle industry*, Retrieved December 23, 2025, from; https://www.krungsri.com/th/research/industry/industry-outlook/hi-tech-industries/electric-vehicle/io/electric-vehicle-bev-2026-2028

Li, W., Long, R., & Chen, H. (2023). Factors influencing consumers' intention to use electric vehicles: An integrated perspective. *Transportation Research Part D: Transport and Environment, 114*, 103566.

Ministry of Industry, Thailand. (2021). *Electric vehicle (EV) policy and incentives: BEV 3.5 measures to promote EV use and manufacturing in Thailand*. Government of Thailand.

Mock, P., & Yang, Z. (2025). *Electric vehicle market and policy review 2025*. International Council on Clean Transportation.

National Statistical Office. (2025). *Population statistics of Bangkok metropolitan area*. National Statistical Office, Thailand. Retrieved December 23, 2025, from; https://www.nso.go.th

Ngernsungnoen, T., & Prabnasak, J. (2023). Household characteristics, travel behavior, and potential for electric vehicle use in regional cities of Thailand: A case study of Khon Kaen City. *Proceedings of the 28th National Convention on Civil Engineering*, 21–28.

Pallant, J. (2010). *SPSS survival manual: A step by step guide to data analysis using*

SPSS. Maidenhead. Open University Press/McGraw-Hill.

Pinturong, S. (2020). *Attitudes and behaviors toward green marketing among Thai consumers* (Master's thesis). Mahidol University, Thailand.

Pollution Control Department. (2023). *Thailand state of pollution report 2023*. Ministry of Natural Resources and Environment, Thailand.

Roojai Insurance. (2024). *Analysis of opportunities and challenges Thailand faces in becoming an EV production base*. Retrieved December 23, 2025, from; https://www.roojai.com/article/car-news/challenges-of-thailand-to-be-ev-production/

Rubin, A. (2012). *Statistics for evidence-based practice and evaluation*. US: Cengage Learning.

Wang, N., & Li, S. (2023). Government support, industrial ecosystem, and electric vehicle market development in emerging economies. *Sustainable Production and Consumption, 39*, 450–460.

Wang, S., Wang, J., Li, J., Wang, J., & Liang, L. (2021). Policy implications for promoting the adoption of electric vehicles: Do consumer preferences matter? *Energy Policy, 149*, 112024.

Wang, Y., Wang, J., & Li, J. (2021). Travel behavior, urban form, and electric vehicle adoption: Evidence from metropolitan areas. *Transportation Research Part D: Transport and Environment, 93*, 102776.

Zhang, Y., Wang, Z., & Zhou, G. (2022). Environmental awareness, attitude, and adoption intention of electric vehicles in urban areas. *Sustainable Cities and Society, 80*, 103765.

Zhao, H., et al. (2024). *Charging infrastructure development and electric vehicle adoption: A comparative analysis*. *Journal of Sustainable Transportation, 12*(3), 255–272.

Zhao, H., Zhang, Y., & Wang, S. (2024). Perceived benefits, urban mobility conditions, and electric vehicle adoption intention in metropolitan areas. *Sustainable Cities and Society, 101*, 105218.