FACTORS INFLUENCING THE PURCHASE INTENTION OF ELECTRIC VEHICLE OF THE VISITORS TO THE MOTOR EXHIBITIONS IN BANGKOK THAILAND

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Abstract

Purpose: This research aimed to examine the factors influencing the purchase intention (PI) of electric vehicles (EV) of the visitors to the 2 major motor exhibitions (i.e., Motor Expo and BIMS) held between December 2022 and April 2023) in Bangkok Thailand.

Research design, data, and methodology: Then nonprobability quota sampling was applied to decide the number of qualified respondents to be randomly selected from each dataset subgroup to form the 500 samples for this study. Confirmatory Factor Analysis and Structural Equation Model were applied to analyze and confirm the model's goodness-of-fit and hypothesis testing.

Results: The findings reveal that consumers' technological knowledge about EV has significant influence on their perceived usefulness (PU) and perceived ease (PEU) of use of EV, PEU has a significant influence on the PU of EV, and PEU of EV has a significant influence on attitude toward behavior which then significantly influences on the PI of EV. Finally, it is also confirmed that range anxiety, price sensitivity, and financial factors all have significant influence on the PI of EV.

Conclusions: This research successfully proved to confirm 10 out of 11 hypotheses in the conceptual framework which provided theoretical and practical guidance to automotive manufacturing companies, car dealers, and government agencies to better understand consumer's purchase decision-making factors so that better and more appropriate strategies and policies can be formulated and implemented accordingly and with synergy to boost consumer PI of EV in Thailand.

Keywords: Electric Vehicle, EV, Purchase Intention, Thailand, TAM, TPB, IDT, VBN

Introduction

Hanh (2022) reported that Thailand has consistently ranked first in terms of total auto production output, and 11th in the 2019 global ranking. Annually it manufactures 2 million ICE vehicles for major brands such as Toyota, Honda, and Mitsubishi. Hence, the automotive industry is one of the most important industries in Thailand. It contributes about 10% of the GDP of Thailand, employs 850,000 workers, and supports industries from iron and steel to petrochemicals and plastic. Roughly half of the cars produced in Thailand are exported to ASEAN countries (Thanthong-Knight, 2021).

In addition, a 20-year EV roadmap and national energy policy (2017-2036) were created which targets Thailand to have 1.2 million EVs by 2036 and aims to promote the development of EV industry to make Thailand become the hub of EV production in the ASEAN region, as well as to reduce energy intensity by 30% by 2035 (NXPO, 2020). But not until August 2020, the "EV Policy Paper 2023" which is the whitepaper for the promotion and development of next-generation automotive for Thailand was announced (NXPO, 2020). Strategically, the whitepaper defines the Next-Generation Automotive as Zero Emission Vehicle (ZEV) or Battery Electric Vehicle (BEV) with ACES features in which "A" stands for autonomous driving, "C" stands for connectivity, "S" stands for shared mobility service, and "E" stands for electrification (NXPO, 2021). It aims to make Thailand as ASEAN Center of Excellence on ZEV and ACES Development, the demonstration hub for Mobility as a Service (MaaS) and Mobility on Demand (MoD), and the ASEAN Leader in the Business Model of Innovation. Moreover, milestones of 3-phase targets are set mainly for the BEVs (or ZEVs) production and purchase in Thailand, which imply that 362,500 BEVs will be imported or locally produced each year by 2025, and 725,000 BEVs will be imported or locally produced each year by 2030 in Thailand.

However, according to the statistics of the "Number of new registered cars classified by fuel type 2010 - 2021 (per province)" released by the Department of Land Transport of Thailand (n. d), from 2010 to 2021, only 228,418 electric automobiles were sold in Thailand, and 211,080 (or 92%) of which are electric passenger cars which are classified as EVs in the Global EV Outlook 2022 report (IEA, 2022). In addition, 198,665 (or 94%) of the 211,080 EV passenger cars sold are hybrid EVs (HEVs). This revealed that EV adoption in Thailand was very sluggish in the past decade. Even sales of EVs have regained their momentum in year 2021 to sell more than 40,000 units which is about 100% growth compared to what was sold in 2018, such growth rate is quite unlikely to realize Thailand's short-term target to have 362,000

EVs imported or locally produced each year by 2025. Moreover, if the 725,000-unit goal set for the year 2030 is to be fulfilled, Thailand would have to work harder to motivate automakers to produce BEVs in Thailand, as well as to stimulate the purchase of BEVs.

Research objectives

The objectives of this research study aim to examine and explain the significant factors influencing the purchase intention of EV of the visitors to the 2 major motor exhibitions (i.e., Motor Expo held from 1 to 12 December 2022, and BIMS held from 22 March 2023 to 2 April 2023) in Thailand to provide both theoretical and practical guidance for the development of EV industry in Thailand.

Literature Review

Consumers' Technological Knowledge (CTK) about EV, Perceived Usefulness, and Perceived Ease of Use: Previous research has confirmed that CTK is positively correlated with the perceived usefulness, perceived ease of use, perceived, and consumer's intention to adopt EVs (Huang et al., 2021). Therefore, this study proposes the following hypotheses:

H1: *Consumers' technological knowledge about EV has a significant influence on their perceived usefulness of EV*

H2: *Consumers' technological knowledge about EV has a significant influence on their perceived ease of use of EV.*

Perceived Ease of Use and Perceived Usefulness: Perceived ease of use positively affected user's perceived usefulness of new technologies (Davis et al, 1989). Therefore, this study proposes the following hypotheses that:

H3: *Consumers' perceived ease of use of EV has significant influence on their perceived usefulness of EV.*

Perceived Usefulness of EV, Perceived Ease of Use of EV, Attitude Toward Behavior to EV, and Purchase Intention of EV: High interaction and ease of operation are the two factors that help consumers feel more engaged and interactive, hence it is believed that ease of use plays a key role in promoting EV use (Ullah et al., 2018). Tu and Yang (2019) also support that consumers' perceived ease of use of EVs has a very positive impact on their behavioral attitudes, and behavioral attitudes, subjective norms, as well as self-control have positive effects on consumers' behavioral intentions toward EVs. Moreover, Wu et. al. (2019) also found that perceived usefulness, perceived ease of use, and environmental concern attitude were positively correlated with consumers' intentions to purchase EVs. Therefore, this study proposes the following hypotheses that:

H4: *Consumers' perceived usefulness of EV has a significant influence on their attitude toward behavior to EV*

H5: *Consumers' perceived ease of use of EV has a significant influence on their attitude toward behavior to EV*

H6: *Consumers' attitude toward behavior has a significant influence on their purchase intention of EV*

Ascription of Responsibility, Personal Norms, and Purchase Intention of EV: The VBN framework argues that an individual's involvement in environmental behavior is influenced by feelings of moral obligation driven by their ascription of responsibility to avoid or respond to environmental problems (Obeng & Arguilar, 2018). Saleem et. al. (2021) proposed that the introjected norms are positively related to purchase intentions and conservation intention, and the integrated norms are positively related to purchase intentions and conservation intentions. As both introjected norms and integrated norms are categories of personal norms, it thus can be interpreted that personal norms are positively corelated with the purchase intention. Therefore, this study proposes the hypotheses that:

H7: *Consumers' ascription of responsibility has significant influence on their personal norms*

H8: *Consumers' personal norms have significant influence on their purchase intention of EV*

Range Anxiety and Purchase Intention of EV: EV Connect (2022) reported that range anxiety is real according to the results of J.D. Power surveys which show that EV range and charging infrastructure are consumers' primary concerns when choosing an electric car. Moreover, Feil (2022) revealed that there have been significant improvements with lithium-ion batteries so that the driving range of several new models of EVs has increased to capable of completing range of a driving from 200 to 334 miles and the purchased intention of EV was boosted as a result. Therefore, this study proposed that:

H9: *Consumers' range anxiety has significant influence on their purchase intention of EV*

Price Sensitivity and Purchase Intention of EV: Ul Hassan et. al. (2018) supported that price sensitivity plays an important role in developing the intention to purchase in the Pakistani context where the consumers compare prices of similar products before developing the purchase intention. The study of Ng et. al. (2018) also found that price sensitivity is positively related to purchase intention for EV. Therefore, this study proposes the hypothesis that:

H10: *Consumers' price sensitivity has a significant influence on their purchase intention of EV*

Financial Factors and Purchase Intention of EV: Many studies supported that purchase price, cost of EV ownership or the maintenance cost of EVs, the resale price of EVs, the perceived trend of oil prices, the relatively cheap and improved fuel efficiency of ICE cars, and government tax incentives are the financial factors influencing consumers' purchase

intention of EVs (Thananusak et al.; 2017). Therefore, this study proposes the hypothesis that:

H11: *Financial factors have a significant influence on consumers' purchase intention of EV*

Conceptual Framework

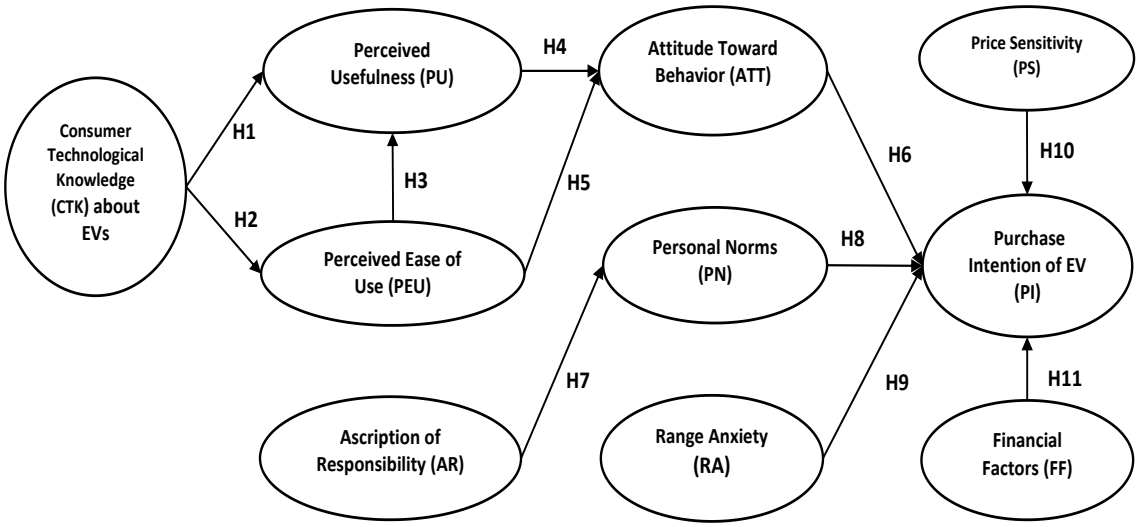

Figure 1: Conceptual Framework

Research Methods and Materials

Based on the empirical analysis and quantitative method, this study collected sample data from survey distribution. A questionnaire contains three parts which are screening questions (4), demographic information (6) including gender, nationality, age, occupation, monthly income, and education level, and the five-point Likert scale questions (37), was distributed online to the target population. Before the data collection, the index of item objective congruence (IOC) test was applied to confirm the validity of each scale item. The average score from 3 experts for each scale item is 0.50 or above thus approving the validity of all 37 scale items. Afterwards, Cronbach's Alpha coefficient values of a pilot test with 34 respondents also approved and ensured the reliability of all constructs. Afterwards, Confirmatory Factor Analysis and Structural Equation Model were used to analyze and confirm the model's goodness-of-fit and hypothesis testing.

The target population of this research is the visitors to the 2 major motor exhibitions in Bangkok Thailand, who are at least 18 years old, have driver's license, live in Thailand, and have been following the trends of EV to make purchase decisions. Number of visitors to Motor Expo is 1,335,573 (Motor Expo, n. d), and the number of visitors to BIMS is 1,620,459 (Grand Prix, 2023). 805 respondents who passed the screening questions were collected from Motor Expo, and 829 valid respondents were collected from BIMS. Quota sampling was used to determine to randomly pick 226 samples from Motor Expo valid respondents, and

274 samples from BIMS to form the 500-sample size of the study. Confirmatory Factor Analysis was applied to assess the correlations of items within the latent variables and the fitness of the measurement model, and Structural Equation Model was applied to analyze the measurement model.

As illustrated in **Table 1**, the discriminant validity of the measurement model is supported as the square root of AVE for all constructs at diagonal lines is greater than the inter-scale correlations (Fornell & Larcker,1981).

Table 1 Discriminant Validity of the Measurement Model

	CTK	PU	PEU	ATT	AR	PN	RA	PS	FF	PI
CTK	**0.771**									
PU	0.551	**0.728**								
PEU	0.574	0.597	**0.709**							
ATT	0.323	0.558	0.542	**0.714**						
AR	0.405	0.572	0.584	0.665	**0.712**					
PN	0.367	0.539	0.505	0.646	0.708	**0.737**				
RA	0.337	0.498	0.483	0.586	0.659	0.702	**0.737**			
PS	0.361	0.422	0.515	0.498	0.578	0.605	0.599	**0.758**		
FF	0.388	0.490	0.545	0.581	0.677	0.693	0.719	0.657	**0.738**	
PI	0.452	0.472	0.626	0.544	0.628	0.648	0.594	0.627	0.728	**0.760**

The magnitude of correlation among independent and dependent variables is measured by the standardized path coefficient. As presented **in Table 2 and Figure 2,** the result of the testing confirmed that, under the condition which P value must be less than 0.05, 10 out of 11 hypotheses in the model are supportive, except hypothesis 4. The standardized coefficient value of each hypothesis proves that the independent variable has a significant influence on the dependent variable.

Table 2 Hypothesis Testing Result of the Structural Model

Hypothesis		Standardized Path Coefficient (β)	T-Value	Test Result
H1:	CTK → PU	0.184	3.311*	Supported
H2:	CTK → PEU	0.510	8.897*	Supported
H3:	PEU → PU	0.648	8.936*	Supported
H4:	PU → ATT	0.141	1.575	Not Supported
H5:	PEU → ATT	0.601	5.559*	Supported
H6:	ATT → PI	0.276	5.378*	Supported
H7:	AR → PN	0.728	8.899*	Supported
H8:	PN → PI	0.359	6.481*	Supported
H9:	RA → PI	0.319	6.692*	Supported
H10:	PS → PI	0.153	3.992*	Supported
H11:	FF → PI	0.491	7.506*	Supported

Note: * indicates the p-value of the hypothesis is less than 0.05

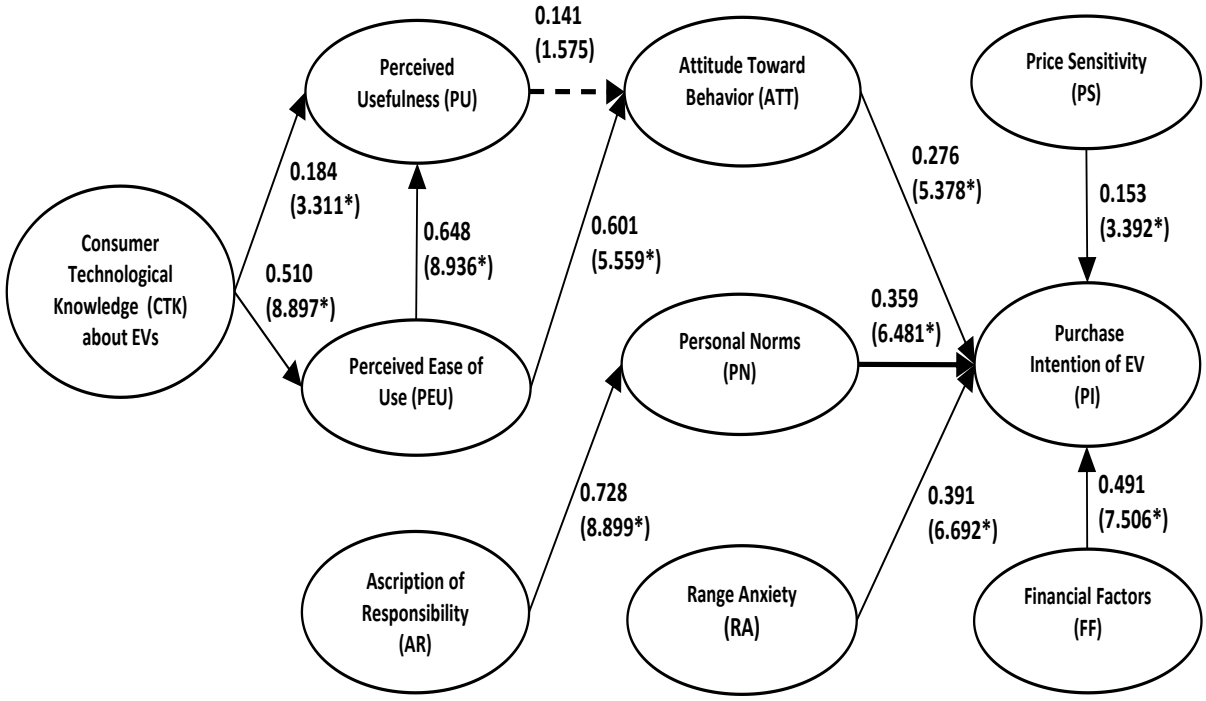

Figure 2: Hypothesis Testing Result of the Structural Model

Conclusions and Recommendations

Conclusion

The findings reveal that consumers' technological knowledge about EV has a significant influence on their perceived usefulness and perceived ease of use of EV, perceived ease of use has a significant influence on perceived usefulness of EV, and perceived ease of use of EV has a significant influence on attitude toward behavior which then significantly influences on the purchase intention of EV. However, the perceived usefulness of EV has no significant influence on attitude toward behavior. Moreover, the ascription of responsibility has a significant influence on personal norms, and personal norms have a significant influence on the purchase intention of EV. Finally, it is also confirmed that range anxiety, price sensitivity, and financial factors all have significant influence on the purchase intention of EV. In conclusion, this research has successfully proved to confirm 10 out of 11 hypotheses in the conceptual framework and thus can provide both theoretical and practical guidance to automotive manufacturing companies, car dealers, and government agencies to better understand consumer purchase decision making factors so that they better as well as more appropriate strategies and policies can be formulated and implemented with synergy to increase consumer's purchase intention of EV in Thailand.

Recommendation

First, when formulating the marketing strategy for the promotion of EV purchases, more EV technological knowledge information should be introduced and emphasized to further enhance consumers' perceived ease of use of EV to boost more potential buyers to generate favourable attitudes toward the purchase of EV.

Second, to enhance or maintain consumers' ascription of responsibility, relevant environmental pollution issues, policies and regulations should be constantly released in news and advertisements to keep them updated. More campaigns and seminars should be held to boost consumers' awareness of the domestic and worldwide environmental issues and thus can successfully drive their commitment to taking pro-environmental actions with a sense of urgency.

Third, as range anxiety has been confirmed to have a significant influence on the purchase intention of EV, more public charging stations should be installed nationwide with a clear timeframe to gain consumers' confidence for their availability and accessibility of them anywhere around the clock.

Fourth, as price sensitivity has been proven to be a significant influence factor to purchase intention of EV for consumers in Thailand, and the EV price war has been ignited starting January 2023 onwards by Tesla, all EV manufacturers and dealers should be more proactive than before to adjust price to cope with price wars rolling out from time to time by competitors. From the lessons learned from the price cut of Tesla in the first quarter of 2023, the slower the dealers or manufacturers reacted to the price cut, the more hesitate the

consumers will place their purchase orders, and the longer they will take a wait-and-see attitude because they don't want to stick with an EV losing more than 20% of the value after they just bought for less than 6 to 12 months.

Lastly, as financial factors (e.g., purchase price, cost of EV ownership or the maintenance cost of EV, the resale price of EV, the perceived trend of oil prices, the relatively cheap and improved fuel efficiency of ICE vehicles, and government tax incentives) have been confirmed as having even stronger influence on the purchase intention of EV than the price sensitivity, it is thus very crucial and critical to constantly formulate synchronized programs, campaigns, as well as incentives to stimulate the influence from these factors.

Limitation and Further Study

The purchase intention of EV of potential buyers in the target population could be abnormally high because they have been forced to postpone their purchases for 2 years during the lockdown. Second, Tesla, one of the champaign of EV manufacturers in the world didn't sell their EVs in these two major motor exhibitions during the time covered by this research study. Instead, Tesla opted to open its showroom in Paragon, a luxurious department store in Bangkok, as well as started marketing campaigns in social media groups (i.e., Line and Facebook) to interact directly with potential EV buyers on time. Such a disruptive marketing practice from Tesla in fact could have attracted some potential EV buyers who care more about brand prestige. As a result, the sample units of this research might miss this important segment of potential EV buyers who are favourable to brand prestige in Thailand. Third, Tesla started its price war in January 2023. However the Motor Expo exhibition was held in December 2022. Therefore, the degree of the effect of price sensitivity on the visitors to the BIMS exhibition which was held from 22 March to 2 April in 2023 could be significantly different from the degree of the effect to the visitors to the Motor Expo, because it is very unlikely for potential EV buyers to ignore the magnitude of 18% to 22% price cut from an EV manufacturer with brand prestige worldwide. Therefore, the researcher can conduct a further study with all the above-mentioned issues mitigated by expanding the target population to all visitors to showrooms or dealer stores of each brand, as well as narrowing down the time of the research period to only 3 months to minimize the uncertainty effect caused by the price war rolling out from time to time. Moreover, the conceptual frame of this study in fact can be further modified to accommodate the study of the leasing intention of EV of the consumers in Thailand. Given the fact that EV price war is going to be around for a couple of years, the potential EV buyers who don't want to be stuck with an EV losing 20% of its value soon after the purchase for less than 6 to 12 months, are very likely to prefer the leasing option rather than purchasing. Leasing meets with the "S" of the ACES core features of EV, which means sharing. Finally, the quantitative study can partially confirm to prove the significance from a statistical point of view. Hence, qualitative studies should be added to compare results to better explain the implications so that more solid recommendations can be made accordingly.

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