

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

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Keywords: perceived value, satisfaction, usage intention, electronic vehicle (EV), electromobility.

Abstract: Nowadays, electric vehicle innovation plays an important role in the market, transportation, logistics and supply chain in the electric mobility industry, contributing to environmental protection and reducing pollution. The commercial EV launched in Thailand which has been very popular with consumers, but it is also not widely used, and there are not many market surveys about customer usage intention. Therefore, it is necessary to study seriously. This study explores the impact of the perceived value of electric vehicle (EV) features on consumer usage intention to use electric vehicles in Thailand, with the mediating effect of customer satisfaction. The results showed that perceived value from using EV, consumer satisfaction, and usage intention of EV, there is a significant direct and indirect relationship. These findings have contributions and relevant expected benefits.

1 Introduction

The global automotive industry is growing rapidly and growing and undergoing a major transition. Especially, the quality of production and distribution of electric vehicles (EVs). Electric vehicles are an efficient alternative to maintaining urban transportation through reducing dependence on oil and air pollution. It leads to significant social values, health and environmental value.

Outlook for electromobility. That use energy consumption in electromobility systems is significant. To meet the expectations and needs of customers in the global market. It not only affects the consumer electric vehicle usage context but also the market and the value chain.

International Energy Agency (IEA) (2022) report states that "the world of clean energy is as dynamic as the electric car market". Sales of EV doubled in 2021 from the previous year to a new record of 6.6 million. Compare with 2012, just 120,000 EV were sold worldwide. EV markets are expanding quickly. Europe and China accounted for more than 85% of global electric car sales in 2021, followed by the United States (10%) [1]. In addition, accelerating global demand for electric vehicles has led to the development of the electric vehicle market ecosystem, including the manufacture of automobiles and critical parts

such as electric motors, power generation, charging utilities, batteries, regulations and consumer demand [2]. Global electric vehicles are expected to grow rapidly, including in China, European countries, and the United States, which will eventually affect the automobile industry in Thailand inevitably. But despite this in comparison, consumer interest in electric vehicles in the country is still slower than the changes that have occurred abroad. Responding to global energy demand while facilitating the rapid increase in consumption in the domestic market.

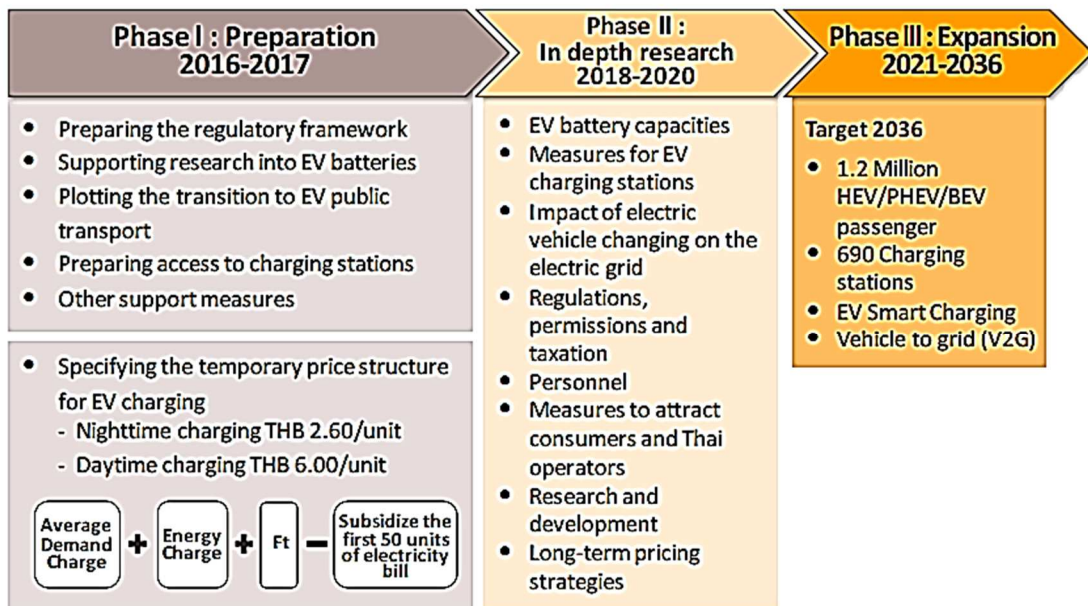
From the aforementioned literature can clearly indicate that consumers are more satisfied with the benefits of using electric vehicles in the future. This study considered that the mediating effect of satisfaction on a perceived value on electric vehicle usage intention of customer the customer value is a very useful metric for EV businesses. It can tell us how much more customers spend on products or services. That customer will have more value for business. Because a business can't grow without these customers helping to buy products or services. It also includes and driven by demanding customers, delivering superior customer value, and keen competition has become a matter of concern in sustaining competitive advantage.

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

Alternative energy vehicles and EV innovations are something new for Thai consumer that have received significant attention. However, the number of EVs that are actually used on the road is still counted as a very small number. The survey and analysis of the role of consumer satisfaction as a mediating variable between the perceived values of electric vehicle consumption of domestic car users is therefore necessary to be seriously studied in order to suggest ideas readiness and needs of the population of car users in the country. In addition, the decision to adopt

and use innovative technology that is new to EVs and has not yet been widely used in the country is still a delicate matter because consumers want consumption value and having to trade with a lot of risk and money. However, and the result is to increase and improve the efficiency of transport systems, logistics and supply chains in the EV industry. The next, we explore the mediating effect of satisfaction on a perceived value on electric vehicle usage intention of consumer in Thailand.



Source: The National Innovation System Development Committee

Figure 1 EV action plan (2016-2036) [3]

Year	ICE	% YoY	Electric Vehicles (EVs)						
			HEV & PHEV	% YoY	BEV	% YoY	Total EVs	% YoY	% share of EVs
2015	550,707	-12.8	7,629	-16.2	14	133.3	7,643	-16.1	1.39
2016	897,585	63.0	9,576	25.52	2	-85.7	9,578	25.3	1.67
2017	369,685	-58.8	5,966	-37.7	10	400	5,976	-37.6	1.62
2018	694,036	87.7	19,967	234.7	57	470	20,024	235.1	2.80
2019	739,213	6.5	26,424	32.3	650	1,040.4	27,074	35.2	3.66

Note: ICE: Internal Combustion Engine

Electric Vehicles Including HEV (Hybrid Electric Vehicle), PHEV (Plug in Hybrid Vehicle) and BEV (Battery Electric Vehicle)

Source: Department of Land Transport, compiled by Krungsri Research

Figure 2 Thai new registered passenger cars (units) [3]

2 Literature review

2.1 Previous studies on Electric Vehicle (EV) usage intention and theoretical background

Rogers's Theory of Diffusion of Innovation (DOI) (2010) describes how ideas or products/services are driven and diffuse through specific populations, economic, social,

dynamic environments, innovations, and digital technologies. Affect the development of innovation over time. The concept of adopting new technologies also supports and indicates user behaviour towards the impact of its adoption and is most recognized for. In addition, TAM can also be linked to the perceived value of consumers in terms of perceived benefits and ease of use

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

of technology, and other factors can play a role through perceptions of the benefits and utilization of technology, perceived ease of use [4,5]. Finally, a theory that can be effectively used in conjunction with the above theory, for example, evolved from the theory of rational action (TRA) and planned behaviour theory (TPB) used to predict user intentions through function of attitudes, subjective norms and perceived behaviour control, and clearly explain the environmentally friendly behaviour, including the use of [6,7].

2.1.1 Electric Vehicles (EVS)

The Features of electric vehicles in terms of innovation, technology, image, and energy and environmental conservation properties affect perception and acceptance. It is also a matter of cutting-edge technology that meets the market and environment of car manufacturers, consumers, and people who focus on the conservation of the global environment today and contextual factors as shown in Table 1.

This study, we integrated the EV literature to determine the perception and acceptance of the features and market responses of EVs: (1) performance aspects such as marketing, quality standards, performance, usability, and get the benefits that are worthwhile, the devices and

controls of electric vehicles are easy to use, suitable size, easy to find parking, the battery can be charged both at home and outside, stability of the car, distance travelled per full charge of the battery pot and responsiveness in driving, sturdiness, durability, design appearance, being recognized as a modern person, (2) It also has emotional, social and environmental relevance, pollution reduction, and service centers and after-sales services, security and sustainability systems., (3) the types of electric vehicles used in the study were electric vehicle type: battery electric vehicle (BEV), hybrid electric vehicle (HEV), plug-in hybrid electric vehicle. (PHEV), and fuel cell electric vehicle (FCEV)., and (4) Key features and market responses of Evs of consumer are integrated by implementing supply chain performance evaluation guidelines to provide legality, visibility, digitalization, integration and collaboration; and which leads to improvements in productivity efficiency and effectiveness; and which leads to enhancement of improvements in productivity efficiency and effectiveness for consumers and the electric vehicle industry [8,9]. However, behavioural intentions of using EVs of consumers still have both barriers and benefits waiting to develop the key features of electric cars to be efficient and effective for transportation and logistics in the future [10].

Table 1 Literature Review of Key features and market responses of EVs

Key features and market responses of EVs		Literature review
Technology and innovation	context	
Performance	Cost, fuel economy, environmental credentials, lifestyle image, social influence	Knapčková [8], Oubrahim, et al. [9], Griskevicius, et al. [11], Almansour [12], Huk, et al. [13]
Performance attributes	Environmental concerns, financial benefits, government interventions, infrastructure readiness, social influence	Huk, et al. [13], Sang and Bekhet [14]
Quality and standard, epistemic value	Price, emotional value, environmental concern, reduction of emission	Knapčková [8], Oubrahim, et al. [9], Han, et al. [15]
Acceleration, range, safety charging time, low noise	Price, perceived unit, incentives, infrastructure	Knapčková [12], Higuera-Castillo, et al. [16]
Convenience, performance, produce less noise, cruise range, charging resources	Cost, environment-friendly, government policies, daily requirement, high-quality supplier services	Knapčková [8], Oubrahim, et al. [9], Yan, et al. [17]
Battery life, convenience of charging station network	Concerning symbolism, fuel prices, social and financial, fuel consumption, price, environmental concerns	Huk, et al. [13], Miranda and Delgado [18]
Performance and personal innovativeness	Price, environmental concern, facilitating condition, perceived enjoyment, social influence	Knapčková [8], Oubrahim, et al. [9], Huk, et al. [13], Khazaei and Tareq [19]
Performance, technological consciousness, usefulness and ease of use	Social influence, marketing, perceived benefits, price, perceived barriers, policy attributes	Oubrahim, et al. [9], Hegner, et al. [20], Krishnan and Koshy [21]

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

2.2 Research model and hypotheses development**2.2.1 Perceived value**

Perceived value as a strategic imperative for manufacturers and retailers in the 1990s, it will continue to be important into the 21st century [22]. Consumers decide whether to buy one type of product or service rather than one type. Otherwise, based on the perceived value of the product performance, characteristics, consequences and services that meet consumer [23]. Perceived values can be measured by one-dimensional or multidimensional structures [24]. A multidimensional structured knowledge that combines aspects (such as price, quality, benefit and sacrifice) to represent the concept of perceived value [22,25,26].

Customer satisfaction [27,28] are based on the role of customer perceived value as an antecedent of customer satisfaction. Some studies have examined service quality as an antecedent of satisfaction, which most of these models incorporate benefits [29]. The marketing executives try to estimate the value of their products in relation to their quality characteristics, such as functionality, performance, usefulness, technical characteristics, and the status proffered by owning them. In addition, focusing on service quality characteristics carries the important meaning of service, that is, the availability, support and dedication offered to the customer consumption value theory several value concepts can be measured and describe:

- Functional value perceived as a benefit derived from the expected perceived quality of a product or service. It is considered the main driver of consumer choice. This assumption supports the theory of economic utility [30,31]. For functional values of vehicle purchasing decisions can be derived from features such as reliability, durability, price, fuel economy, and maintenance. These values are contribute and independent to consumer choices in a given situation, such as functional values, conditional value or convenience value and monetary value which meet the needs and uses for physical purposes [16,26,32]. Performance value/ convenience value means a facilitation condition is defined as an individual insight into the infrastructure or technical support available for the use of a modern technological system. In terms of EVs, it is considered convenient in the ease of use of the various equipment and controls of an electric vehicle, versatility battery charging, after sales service and service centers are of high quality, and monetary value. Customers are intent on buying electric vehicles, even if they are expensive, and the government will try to reduce the price difference by using incentives. The EVs are still expensive but customers are willing and willing to buy electric cars. In spite of government support policies, trying to reduce the price

difference by using incentives, tax measures in the context of environmentally friendly products. Many scholars have found that price value is one of the biggest barriers to friendly products. However, with marketing strategies and personalization, innovative people may reduce barriers [20,33,34].

- Non-functional values such as emotional value, the product's ability to stimulate the consumer's mood, the benefit derived from the emotional state that a product or service generates. It could be a positive or a negative emotion [16,35]. Goods and services, often associated with emotional responses. Emotional values are often associated with aesthetic choices, however, products that are more tangible and seem more useful also have emotional value. [25]. Marketing and promotional variables also drive emotional responses that may be typical for the product being marketed [26,36]. The language of the manuscript is clear and understandable.

As for social value, the social benefit derived from a product or service, about the utility of the product to demonstrate social acceptance, and enhance consumer image [16,35]. Social values are also linked to social, economic and cultural stereotypes in a positive or negative way. This, as measured by alternative image profiles [26], is consistent with consumer societal norms to show others how they are when making purchases for goods and services [22]. Epistemic is the ability of products and services to arouse curiosity or desire for new experiences. Product capabilities within a specific context in situations where consumers have to [26,32,37].

Furthermore, multiple values, namely the consumption values that influence consumer choice behaviour, such as work, social values, emotional values, epistemological values, and conditional values. The decision can be influenced by the consumption values. This fulfils a high level of consumer need [26,38]. Values derived from TAM amplification [4,5], and environmental values. This is due to energy and environmental conservation and technological innovations that enhance the satisfaction of consumption of goods and services resulting in sustainable customer behaviour [9,13,39,40].

However, the concept of perceived value often differs slightly from other related structures such as value, utility, price, and quality. Its use and its worth in terms of gain can be indicated in the form of integration that can be referred to about NFV and FV such as technology, convenience, ease of use, cost savings, risks and safety. These can be explained by the TRA, TPB, TAM, the generation of people, personal beliefs and preferences, and the relationship behaviours related to readiness for adoption of new technologies.

In addition, the value gained also includes the benefit of the functionality that is more cost-effective from the use of various technologies in assistive devices compared to

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Apichon Phonsena, Opal Suwunnamek

the time spent, the efficiency of features on the device used is stable, accessible content and services, the device is efficient in navigating relevant information with ease, and Eco-friendly, technological performance, driving enjoyment benefit, worthiness for prices and cost [39,41].

We concluded that the perceived values of other relevant research studies were classified into the same functional value and non-functional values, as shown in Table 2.

Table 2 Literature review of Perceived value

Functional Value			Non-functional Values			Literature review
PEV	COV	MOV	ENV	SOV	EMV	
✓	✓	✓	✓	✓	✓	Hur, et al. [42]
✓	✓	✓	-	✓	✓	Watjatrakul [37], Chen and Lin [43]
✓	✓	✓	-	-	-	Ranaweera and Karjaluoto [44]
✓	✓	✓	✓	✓	✓	Jansri [45]
✓	✓	✓	✓	✓	✓	Kim, et al. [41]
✓	✓	✓	✓	✓	✓	Han, et al. [15], Hegner, et al. [20]
✓	-	✓	✓	✓	✓	Amin and Tarun [46]
-	✓	✓	-	-	-	Bashir, et al. [47]
✓	✓	✓	✓	✓	✓	Rasoolimanesh, et al. [48]
✓	✓	✓	✓	✓	✓	Miranda and Delgado [18]
-	-	-	-	✓	✓	Giantari, et al. [49]
✓	✓	✓	-	✓	✓	Liu, et al. [50]
✓	✓	-	-	-	✓	Uzir, et al. [51]
✓	✓	✓	✓	✓	✓	Salari [52]

Note: PEV=Performance Value; COV= Convenience Value; MOV= Monetary Value; ENV=Environmental Value; SOV= Social; Value; EMV= Emotional Value

2.2.2 Perceived value

Customer satisfaction is established concept in several areas like marketing and consumer research, psychology, and economics [53]. Satisfaction feeling is an attitude. Mixed feelings, as a consumer may have different levels of satisfaction for different parts of product or service experience [54-58]. Outcomes of satisfaction feelings may involve intent to complaints and repurchase [57]. These outcomes also are moderated by other variables. For example, extreme dissatisfaction will not necessarily generate complaint behaviour, if the consumer believes complaining will be futile [53]. In addition, trust in products/services also indicates the level of customer satisfaction with significant benefits, such as social value, emotional value, and taking advantage of functional value [46,55-57].

The value concept as a catalyst in product choice and satisfaction's relationship to it as a brief psychological reaction to a constituent of a value chain. A significant point about customer value models is the use of gross benefit with cost judgments by consumers. The association

of overall service satisfaction, encounter satisfaction, and perceived service quality takes a form of perceived quality as a separate structure and differs from satisfaction [51-53,57].

One form of intent is the degree to which consumers separate their purchases between alternatives. As with many brand loyalty, consumers may intend to show a set of acceptable alternatives. However, it is known that stated intentions without behavioural checks are highly unreliable. Consumers often exaggerate their intentions because they have a positive bias in their responses rather than using other measure of satisfaction. Intent data may be one of the best measurement methods [52,53]. Adding more unique features will increase the perceived value of the service and increase customer satisfaction [12,21]. As shown in table 3. And we make the following hypothesis:

- H1: Functional value has a direct effect on satisfaction.
- H2: Non-functional value has a direct effect on satisfaction.

Table 3 Literature review of satisfaction and usage intention

Variable	Literature review
<i>Satisfaction</i>	Khazaei and Tareq [19], Hur, et al. [42], Bashir, et al. [47], Giantari, et al. [49], Bernarto and Purwanto [59], Ashraf and Niazi [60], Hapsari, et al. [61], Rouibah, et al. [62], Sadia [63], Su, et al. [64]
<i>Usage Intention</i>	Han, et al. [15], Khazaei and Tareq [19], , Krishnan and Koshy [21], Asadi, et al. [39], Hur, et al. [42], Adnan, et al. [65], Alzahrani, et al. [66], Huang and Ge [67], Magotra, et al. [68], Tu and Yang [69], Vafaei-Zadeh, et al. [70]

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

2.2.3 Satisfaction

Consumer satisfaction in the form of expectations and confirmation of expectations [57,58], on the other hand, is believed to influence changes in attitudes and purchase intent. The outcomes of satisfaction decisions were attitudes and intentions that were modified accordingly. well reflected by the results. Satisfaction experiences influence future purchase intentions. well as later purchase attitudes, most consumer behaviorists will agree that buying dissatisfied products should reduce the inclination to purchase [56,58]. This means that the intended use will be reduced accordingly. The satisfaction and dissatisfaction characteristics were significantly correlated with positive and negative effects, respectively. and to overall satisfaction It is recommended that all dimensions be tested for complete accounting of the post-purchase response in use [27,28,58]. And we make the following hypothesis:

- H3: Satisfaction has a direct effect on usage intention.

2.2.4 Usage Intention

The TRA, TPB, TAM were supposed to have considerable capabilities as a tool to enhance the prediction of consumers' Intention concerning environmentally friendly behaviours, including the adoption of EVs [21]. As shown in Table 4.

2.2.5 The Mediating effect of satisfaction on perceived value and usage intention

The customer value affects customer satisfaction, customer satisfaction affects customer loyalty [27,28].

Customer value is also positively related to usage intention. Theoretical justification for the mediating role can be attributed to a well-investigated framework in attitudinal literature [6,7]. Attitudes, preferences, and partitioned attitudinal antecedents, cognitive, emotional, driven, persistent intentions in innovation and technology [54,63]. Customer value indicates customers' rational trade-off between the benefits-costs of using a product/service and thus is regarded as a cognition variable. Customer satisfaction is an affect variable. Customer usage purpose concerns behaviour or a disposition to perform positively toward a product/service provider. In addition, trust in products/services also indicates the level of customer satisfaction with significant benefits, such as social value, emotional value, and taking advantage of functional value [46,54,57] and lead to increased customer loyalty [56,58,69,70]. In addition, there are studies that support the mediating of customer satisfaction to usage electric vehicles, as shown in table 4 and figure 3. Thus, the framework provides a basis for hypothesizing that satisfaction mediates the effect of functional value and non-functional value (perceived value) on usage intention. However, marketing and consumer study also suggests that perception about a product may affect purchase behaviour directly for some product categories. And we make the following hypothesis:

- H4: The mediating effect of satisfaction on functional value and usage intention.
- H5: The mediating effect of satisfaction on nonfunctional value and usage intention.

Table 4 Literature Review of The Mediating effect of satisfaction

Pperceived value	Satisfaction		Usage intention	Literature review
	Direct effect	Mediating effect		
Functional value	-	✓	✓	Abu Elsamem [71]
	✓	✓	✓	Nugroho, et al. [72]
	✓	✓	✓	Giantari, et al. [49]
	✓	✓	✓	Amin and Tarun [46]
Non-functional value	✓	✓	✓	Rasoolimanesh, et al. [48]
	✓	✓	✓	Giantari, et al. [49]
	✓	✓	✓	Amin and Tarun [46]

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Apichon Phonsena, Opal Suwunnamek

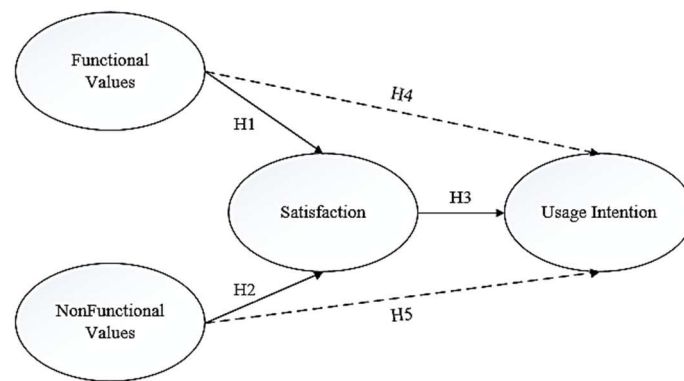


Figure 3 Research model

3 Methodology

As an empirical research, we focus on using questionnaires as a data collection tool, focusing on customers who have already used EVs. Statistical analysis uses structural equation modeling techniques to answer research objectives and research hypotheses.

3.1 Design of the questionnaire

The data collection instrument consisted of questionnaires, consisting of quantitative attitude and demographic data questionnaires, which measure 4 latent and manifest variables functional values, non-functional values, usage intention and satisfaction. The Likert scale of the 6-point scale was scored an evaluation questionnaire on the acceptance of the value obtained from the use of EV as 1= extremely unacceptable, and 6= extremely acceptable. In addition, the test results for the validity of each variable had an alpha Cronbach coefficient of .866-.928, appropriate for cognitive tests such as intelligence tests.

3.2 Data collection

Data collection was carried out using a questionnaire. The questionnaires data analysed were used to determine the size of the sample. By specifying the ratio of 10 samples to 1 variable, this equalled 18 member of observed variables= 18 x 10 = 180 cases, and used convenience sampling. Data collection period from Sep to Dec 2021 for a total of 45 days.

4 Data analysis

4.1 Descriptive statistics

Descriptive statistics on demographic profile. Among all the respondents, only 56.08 percent are male, average of ages are 36, there are 40 respondents (27.03%) in Gen X and 104 respondents (70.27%) in Gen Y, Incomes 25,000 baht/ month, Completed a bachelor's degree 58.78 %, 1-6 months of experience in using a EV 45.27%, and the first EV in the family 75.68 %. In addition, the service quality of electric vehicle service centers (10 points) was assessed in (1) overall service quality was good with an average score of 8.22, and (2) overall service quality of the problem claim was good with an average score of 8.17, as can be seen in figure 4-5.

4.2 Structural equation model analysis results

Because of this study, a small sample size was obtained. The analysis of the Structural Equation Model (SEM) required a simple model with small samples should be held to strict fit standards [73]. We take precautions in view of the small sample size used for structural equation model analysis. The test of consistency between the goodness of fit measures in the model was found to be in harmony with the fit of the model, with result: Chi-square (χ^2) = 129.613, df = 108, CMIN/DF (χ^2/df) = 1.200, GFI = .916, CFI = .991, NF = .948, TLII = .987, and RMSEA = .024 (Figure 6). It could be concluded that the form of the structural equation of the variables effecting customer usage intention was consistent with the empirical data [56,74,75]. Accordingly, the statistics Goodness of fit as shown in Table 5.

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek



Figure 4 service quality of electric vehicle service centers

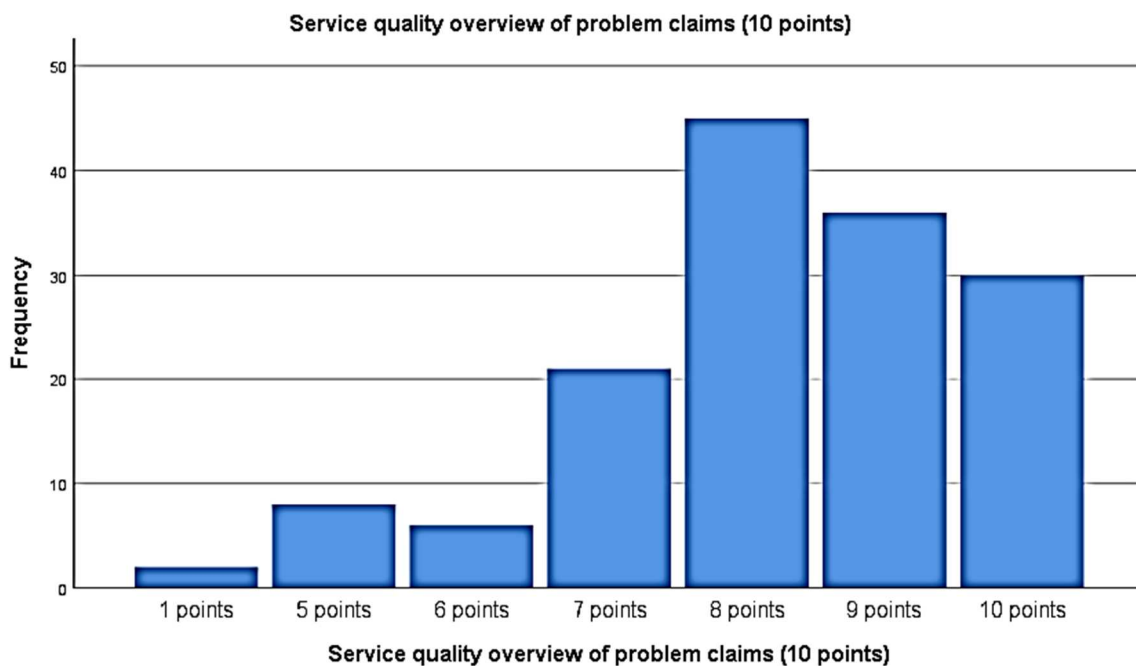


Figure 5 overall service quality of the problem claim

Table 5 Statistics Goodness of fit

Relevant Statistics	Criteria	Test Value
Relative Chi-square	$\chi^2/df < 2.00$	1.200
Goodness of Fit Index	GFI $>.95$	.916
Comparative Fit Index	CFI $>.95$	.991
Normed Fit Index	NFI $>.95$	.948
Tucker-Lewis Index	TLII $>.95$	.987
Root Mean Square Error of Approximation	RMSEA $<.05$	.024

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

4.3 Results of testing of the hypotheses

Hypothesis testing shall provide the same as the Structural Equation Modelling by considering the C.R. (t-value) and p-value used for the test of the hypothesis. The hypothesis analysis was executed using the IBM SPSS AMOS software. It indicates that values higher than 1.96 for all hypotheses of statistical significance. It can be concluded that the results support all assumptions and that the results of they are shown in table 5 and 6, and the final model Figure 6.

Hypothesis 1: Functional value has a direct effect on satisfaction. The hypothesis testing is concerned with standardized effect =.813, that supports a statistically significant hypothesis at $p < 0.05$.

Hypothesis 2: Non-functional value has a direct effect on satisfaction. The hypothesis testing is concerned with standardized effect =.578, that supports a statistically significant hypothesis at $p < 0.001$.

Hypothesis 3: Satisfaction has a direct effect on usage intention. The hypothesis is concerned with standardized effect =.886, that supports a statistically significant hypothesis at $p < 0.001$.

Hypothesis 4: The mediating effect of satisfaction on functional value and usage intention. The hypothesis testing is concerned with standardized effect =.309, that supports a statistically significant hypothesis at $p < 0.01$.

Hypothesis 5: The mediating effect of satisfaction on non-functional value and usage intention. The hypothesis is concerned with standardized effect =.512, that supports a statistically significant hypothesis at $p < 0.001$.

The results of the Structural Equation Modeling analysis equations were formed:

$$Satisfaction = .349 \text{ Functional Value} + .578 \text{ Non Function Value}, R^2 = .821 \quad (1)$$

$$Usage \text{ Intention} = .886 \text{ Satisfaction}, R^2 = .600 \quad (2)$$

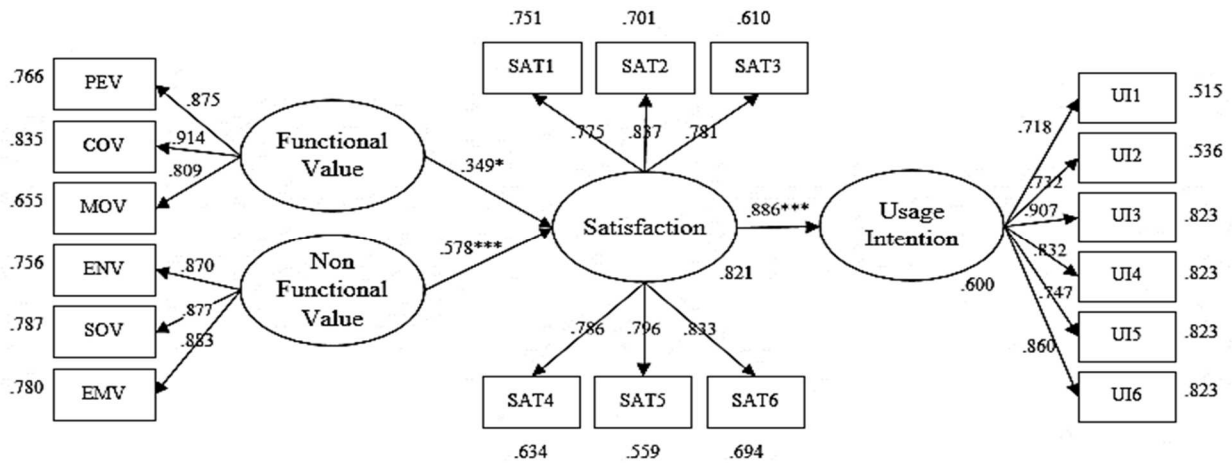


Figure 6 Final model

Table 6 Analysis on the relationship of the variables

Relationship of Variables			Standardized Regression Weights	S.E.	C.R.	p-value	Squared Multiple Correlations
Satisfaction	<---	Functional Values	.349	.156	2.484	$p < .05$	.821
Satisfaction	<---	Non Functional Values	.578	.142	3.946	$p < .001$	
Usage Intention	<---	Satisfaction	.886	.118	7.569	$p < .001$	.600
MOV	<---	Functional Values	.809	-.a	-.a	-.a	.655
COV	<---	Functional Values	.914	.079	13.579	$p < .001$	.835
PEV	<---	Functional Values	.875	.086	12.746	$p < .001$	.766
EMV	<---	Non Functional Values	.883	-.a	-.a	-.a	.780
SOV	<---	Non Functional Values	.887	.066	15.149	$p < .001$	.787
ENV	<---	Non Functional Values	.870	.078	11.990	$p < .001$	.756
SAT1	<---	Satisfaction	.755	-.a	-.a	-.a	.571
SAT2	<---	Satisfaction	.837	.113	10.561	$p < .001$	.701
SAT3	<---	Satisfaction	.781	.115	8.979	$p < .001$	.610
SAT4	<---	Satisfaction	.786	-.a	-.a	-.a	.618

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Apichon Phonsena, Opal Suwunnamek

Relationship of Variables			Standardized Regression Weights	S.E.	C.R.	p-value	Squared Multiple Correlations
Satisfaction	<---	Functional Values	.349	.156	2.484	p<.05	.821
Satisfaction	<---	Non Functional Values	.578	.142	3.946	p<.001	
Usage Intention	<---	Satisfaction	.886	.118	7.569	p<.001	.600
MOV	<---	Functional Values	.809	_ ^a	_ ^a	_ ^a	.655
SAT5	<---	Satisfaction	.796	.087	11.055	p<.001	.634
SAT6	<---	Satisfaction	.833	.124	10.707	p<.001	.694
UI1	<---	Usage Intention	.718	_ ^a	_ ^a	_ ^a	.515
UI2	<---	Usage Intention	.732	.087	11.055	p<.001	.536
UI3	<---	Usage Intention	.907	.124	10.707	p<.001	.823
UI4	<---	Usage Intention	.832	.101	11.536	p<.001	.693
UI5	<---	Usage Intention	.747	.101	10.044	p<.001	.558
UI6	<---	Usage Intention	.860	.125	10.276	p<.001	.740

Note: ^a; Fixed parameter does not display the Standard Error (S.E.), Critical Ratio (C.R.)

Table 7 Hypothesis test results

Hypothesis	coef.	Results
H1: Satisfaction <-- Functional Value	.349*	Supported
H2: Satisfaction <-- Nonfunctional Value	.578***	Supported
H3: Usage Intention <-- Satisfaction	.886***	Supported
H4: Usage Intention <-- Satisfaction <-- Functional Value	.309*	Supported
H5: Usage Intention <-- Satisfaction <-- Non-functional Value	.512***	Supported

Note: * = p<.05; ** = p<.01; *** = p<.001

Table 8 Standardized direct, indirect, and total effects of the factors test results

Effects Variables	Total			direct			Indirect		
	FV	NFV	SAT	FV	NFV	SAT	FV	NFV	SAT
SAT	.349	.578	-	.349	.578	-	-	-	-
UI	.309	.512	.886	-	-	.886	.309	.512	-

Note: Functional Value (FV), Nonfunctional Value (NFV), Satisfaction (SAT), Usage Intention (UI), - as .000

5 Discussion and implementation

5.1 Management implications

The findings of this study may assist the marketing business and organizations of the automotive industry with the understanding of consumer behaviour in using electric vehicles, and develop business strategies designed to meet consumer needs issues. Marketers should attach importance to products and service non-functional benefits as well as social value, environmental value and emotional value. Marketers should prioritize the mediating effect of satisfaction, because it can lead to a loyal customer base in the future. This phenomenon can be explained by the theory of planned behaviour (TPB), technology acceptance model (TAM), and theory of reasoned action (TRA) on predicting customers' usage intention, and concluded that three theories could explain intention quite well, and TAM is better when measuring the general satisfaction level. In addition, the results suggest that emotional value is the most important value for the selection of EVs by consumers. It can be used as triggers to improve the

potential and assist them form more positive satisfaction towards usage intention EVs.

5.2 Research implications

This research is a cross-sectional study. Therefore, first longitudinal studies should be conducted so that changes can be more accurate and their application in studies to look for other predictors, second precaution is concerned with the small sample size used for multivariate statistics analysis, and finally the sample size should be collected in consistency with the parameters in the research model [73].

6 Conclusions

The analysis also showed that the functional value and non-functional value as demonstrated performance value (PEV), convenience value (COV), monetary value (MOV), environmental value (ENV), social value (SOV), and emotional value (EMV) may have less influence in fulfilling customers need, satisfaction, and the intention to use electric vehicles significantly. In addition, the analysis

Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

also showed that the non-functional value of electric vehicle users was more influential than the functional value, indicating that the social value intent (SOV) was first followed by the Thai customer, followed by environmental value (ENV) and emotional value (EMV), respectively. It may be relevant to the perceived utility that consumers derive from their association with specific groups in society. Personal norms can explain the perceived social pressures of Thai customers that influence product adoption and decision-making processes. This may affect the customer's decision-making process [20,13,27,58].

Studies have shown the limitations of different approaches to the complexity and multidimensional nature of perceived values. The decision to buy and use EVs [16,65], has to go through credibility to increase the level of consumer satisfaction that has been used goods and services [29,31,46,57,58,63,74].

The results of this study may help organizations and marketing businesses of the automotive industry understand Thai consumers' behaviour in using electric vehicles. And develop innovative business strategies designed to meet the needs of consumers in early adopters and expansion markets [29,75-77]. And enhance in direction and continuous improvements in market response and consumer EV attributes are consolidated through the use of automotive supply chain performance [8,9,13].

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Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Apichon Phonsena, Opal Suwunnamek

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Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

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Exploring the effects of perceived values on consumer usage intention for electric vehicle in Thailand: the mediating effect of satisfaction

Surasidh Boonchunone, Mariam Nami, Atchari Krommuang, Aphichon Phonsena, Opal Suwunnamek

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Review process

Single-blind peer review process.