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Research Article

From the Voice of Thai User: Exploring the Influence of Battery Electric Vehicles' User Experience and Its Antecedents on Willingness to Recommend

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Abstract

Background and Objectives: Background and Objectives: Between 2022 and 2025, the number of battery electric vehicle (BEV) users in Thailand significantly increased, with the average annual growth rate of BEV registrations as high as 524.2%. The Thai government has continuously supported the expansion of the electric vehicle industry through various policies, including encouraging both domestic and foreign investments in establishing local manufacturing bases, providing subsidies to support the purchase of electric vehicles, and implementing reductions in import duties and excise taxes. These measures aim to encourage Thai consumers to transition toward greater adoption of green energy in the transportation sector. The present study thus aimed to investigate the influence of battery electric vehicle user experience (BEVUX) and BEVs' quality (BEVQUAL) affecting willingness to recommend.
Methodology: The study employed a quantitative research approach. Data were collected through an online questionnaire administered to BEV users in Thailand, aged 20 years and above, with a total sample size of 845 respondents. The statistical techniques used for data analysis included frequency and percentage, while structural equation modeling (SEM) was employed to analyze the causal relationships among the variables. A quantitative research design utilizing AMOS, which is particularly well-suited for analyzing complex structural models with multiples constructs, was used.
Main Results: 1) BEVQUAL exhibited a direct positive influence on BEVUX (β= 0.94, p < .001); 2) BEVUX exhibited a direct positive influence on continuance use intention (β= 0.76, p < .001); 3) Continuance use intention possessed a direct positive influence on willingness to recommend (β= 0.54, p < .001); 4) BEVUX exhibited a direct positive influence on willingness

to recommend (β= 0.27, p < .01); 5) BEVQUAL exhibited a positive indirect influence on continuance use intention, mediated through BEVUX (β= 0.71, p < .001); 6) BEVQUAL had a positive indirect influence on willingness to recommend, mediated through BEVUX and continuance use intention (β= 0.65, p < .001); and 7) BEVUX possessed a positive indirect influence on willingness to recommend, mediated through continuance use intention (β= 0.41, p < .001).

Conclusions: BEVQUAL, BEVUX, and continuance use intention exerted both direct and indirect influences on willingness to recommend. The structural model demonstrated consistency and good fit with the empirical data.

Practical Application: The findings of the study can be utilized as useful information for manufacturers and distributors of BEV to further improve the research and development of electric vehicle technologies, strengthen consumer confidence in after-sales services, and deliver positive user experience. As a result, users may be more willing to confidently and positively share their experiences of using BEV with others through word-of-mouth communication.

Keywords: Overall Quality of Battery Electric Vehicles (BEVQUAL), Battery Electric Vehicle User Experience (BEVUX), Continuance Use Intention, Willingness to Recommend

Introduction

The global urgency to mitigate climate change has prompted a significant shift in environmental policies, with Thailand positioning itself as a regional leader in sustainable transportation. Despite the remarkable 524.20% growth rate in BEV adoption within the country, a critical research gap remains: most existing literature examines what drives people to buy, rather than what encourages them to stay and recommend the technology. This study addresses this gap by evaluating how the interplay of BEV quality and user experience fosters long-term commitment. The electric vehicle (EV) industry is an emerging sector that, in its early stage of development, is primarily driven by government policy at both international and national levels (government-policy driven), rather than by market forces (market-driven), which remain underdeveloped. Under the United Nations Framework Convention on Climate Change (UNFCCC) in 2015, a global target was established to limit the increase in the average global temperature to no more than 2 degrees Celsius above pre-industrial levels.

Thailand ratified this agreement in 2016, leading to the formulation of a national energy framework that promotes a transition toward clean energy and sets a target of achieving net-zero carbon dioxide emissions between 2065 and 2070. As part of this transition, policies have been implemented to shift energy consumption in the transportation sector toward green energy through electric vehicle technologies. Consequently, a range of policy measures has been introduced to stimulate the growth of Thailand's electric vehicle industry, resulting in a substantial increase in domestic electric vehicle adoption in recent years. According to the Transport Statistics Report of the Department of Land Transport [1], the cumulative number of registered BEVs in Thailand reached 206,650 units, accounting for 28.92% of the total cumulative registrations of all electric vehicles. The electric vehicle (XEV) business during 2024–2026 is expected to continue growing in Thailand, in line with increasing domestic demand and supply. Key driving measures include purchase subsidies to stimulate purchasing power, continued subsidies under the EV 3.5 measure, declining electric vehicle costs, improved driving range performance, increased diversity of electric vehicle models, expansion of charging stations, implementation of Euro 5 and Euro 6 standards for internal combustion engine vehicles (ICEs), as well as increasing popularity and understanding of electric vehicle technology among Thai consumers. Environmental concerns and continuously fluctuating fuel prices are also contributing factors. These factors support the growth of the electric vehicle market and business profitability opportunities [2]. In 2023, a quantitative study was conducted to investigate the influence of trust and its antecedent factors (battery electric vehicle technology acceptance (BEVTAM), government subsidies, energy concerns, and consumers' environmental consciousness) on consumers' purchase intention toward BEVs. The objectives of the study were to examine the influences of BEVTAM, government subsidies, energy concerns, and consumers' environmental consciousness on trust, switching intention, and purchase intention toward BEVs. The sample consisted of Thai consumers aged 25–65 years who represented the target group for purchasing battery electric vehicles during 2022–2025, with a total sample size of 440 respondents. The findings revealed that battery electric vehicle technology acceptance, government support, energy concerns, and consumers' environmental consciousness had both positive and negative direct effects on trust, switching intention, and purchase intention toward battery electric vehicles among Thai consumers [3]. Extensive prior research, both domestic and international, has predominantly focused on initial purchase behavior, purchase intention, and the adoption

propensity of BEVs. [4] Financial, technical, and charging constraints significantly augment consumer doubt, which in turn exerts a substantial negative influence on the purchase intention of electric vehicles among Thai consumers. After Thai users have experienced BEVs in their daily lives, what experiences do they have after actual usage? How willing are they to recommend them to others? From a review of both domestic and international literature, the researchers found that studies concerning the experiences of battery electric vehicle users remain limited. User experience of BEVs occurs after actual use and reflects the Voice of Customer obtained from real usage. Such experiences may influence recommendations to those who have never used battery electric vehicles. Therefore, the researchers began with the variables of customer experience and antecedent factors affecting willingness to recommend battery electric vehicle usage. This research is expected to provide both academic contributions and practical benefits for battery electric vehicle manufacturers and distributors in Thailand as a guideline for improving BEV technology efficiency to better align with the needs of Thai consumers, increase confidence among current users, and encourage hesitant consumers to adopt battery electric vehicles in order to reduce air pollution and sustain environmental conservation.

Research Objectives

To investigate the influence of BEVUX, BEVQUAL and continuance use intention factors affecting willingness to recommend.

Literature Review

Conceptual Framework of BEVQUAL

BEVQUAL refers to users' perceptions of the overall quality in comparison with their expectations, as considered through the intended purpose of use or functional characteristics of battery electric vehicles. Perceived quality is measurable but intangible and represents one of the most important tools in market positioning [5]. Garvin proposed eight dimensions of quality as fundamental components, consisting of: 1) Performance — measuring the core quality of a product and whether it can compete with competitors, determining the market level at which the product should be positioned, and ensuring consistent quality standards across all units of the product; 2) Features — referring to the specific characteristics and special attributes of a product that distinguish it from competitors; 3) Reliability — measuring the

ability of the product to function consistently and accurately as expected; 4) Conformance — measuring whether the product meets established standards; 5) Durability — referring to the product's endurance in terms of time and conditions of use; 6) Serviceability — the capability to provide services related to product use; 7) Aesthetics — the visible appearance of the product resulting from creative design; and 8) Perceived Quality — the perception of differences between expectations and the actual quality received by consumers [6]. De Giovanni [7] integrated Garvin's [6] eight quality dimensions with findings from his own study comprising an additional 21 dimensions, resulting in a total of 29 dimensions, which were classified into three major categories: 1) Utilitarian Dimensions of Quality, consisting of overall quality dimensions that deliver value to consumers and emphasize practical benefits; 2) Hedonic Dimensions of Quality, reflecting the value consumers receive from multisensory stimulation, imagination, and emotional feelings; and 3) Perceived Risk Dimensions of Quality, referring to individuals' subjective evaluations of undesirable outcomes associated with the purchase and consumption of products.

Conceptual Framework of BEVUX

BEVUX refers to users' experiences in terms of feelings and responses toward the use of electric vehicles or their systems, such as convenience, ease of use, and enjoyment during operation, which lead to the highest level of satisfaction or positive user experience. User Experience Theory is an academic framework continuously developed to explain and understand the interaction between users and systems, products, or services, particularly in the context of information technology and user-centered design. Berni et al. [8] stated that the term "user experience," proposed by Donald Norman [9], emphasizes experience-oriented design. Later, this definition was expanded to include emotional and behavioral factors underlying the "joy of use" and the "joy of ownership." Therefore, the interaction between humans and products became increasingly engaging, eventually giving rise to the concept of "user experience." Hussain et al. [10] indicated that user experience is broadly defined as users' feelings about a product, system, or service, and argued that many factors influence user experience. Merritt et al. [11] stated that a better understanding of users can validate creativity and increase innovation potential. Ultimately, user experience (UX) is one of the most important elements in the innovation process because dissatisfied customers are likely to discontinue using a product. Bellos et al. [12] argued that user experience

emphasizes attracting individuals, and that analyzing the relationships among customer experience, satisfaction, and intention helps to better understand the factors and conditions influencing customers' attitudes and behaviors. Such knowledge is valuable for developing customer-centered strategies, enabling organizations to respond effectively to customer needs and promote loyalty. A thorough understanding of these concepts and their relationships provides companies with competitive advantages and long-term growth opportunities through the creation of impressive and attractive customer experiences [12]. Positive user experience leads to several important outcomes: 1) User Satisfaction — a positive user experience increases satisfaction and loyalty, thereby promoting business success [13]; 2) Brand Engagement — a positive user experience enhances cognitive, emotional, and motivational attachment to a brand [12]; and 3) Continuance Use Intention — a positive experience directly influences users' intention to continue using products or services in the future [14]. User Experience Theory is a comprehensive and continuously evolving conceptual framework that provides in-depth understanding of interactions between users and systems. This theory is particularly important in the digital era, in which users possess high expectations and demand personalized, efficient, and satisfying experiences. Appropriate application of this theory enables organizations to create positive experiences and effectively maintain long-term relationships with users.

Conceptual Framework of Continuance Use Intention

Continuance Use Intention refers to the behavioral intent and commitment of users to continue utilizing a product over time. In the context of BEVs, it encompasses the planning and decision-making processes involved in using BEVs for daily travel. Continuance Use Intention, including repurchase or repeated use, is a central construct in post-adoption behavior theories and can provide a competitive advantage in markets where both providers and consumers have access to diverse information. Specialized studies have demonstrated that positive and negative electronic word-of-mouth can influence users' Continuance Use Intention, shaping the reasons why customers choose the same service provider or product again based on prior experiences [15]. Zeithaml et al. stated that purchase intention, or spending intention, reflects consumers' preference to select a particular product or service as their first choice, and it represents one dimension of customer loyalty [16]. Kotler further proposed that both individual attitudes and unpredictable situational factors influence purchase intention. Personal attitudes consist of satisfaction with relevant others, personal

beliefs, and expectations, while unforeseen situational conditions indicate that consumers may alter their purchase intentions due to emerging circumstances, such as when product prices exceed expectations [17]. Government support also influences Thai consumers' purchase intention toward BEVs [18].

Conceptual Framework of Willingness to Recommendation

Willingness to recommend refers to the willingness to provide recommendations to others based on one's personal experience regarding whether battery electric vehicles should or should not be used. Post-Purchase Behavior Theory is an academic framework used to explain and predict consumer behavior after the purchase decision of a product or service has been made. This theory is particularly important in the present digital era because post-purchase behavior directly affects the long-term success of businesses. The theory of Willingness to Recommend is grounded in several important theories, including the Cognitive–Affective–Behavioral Theory and Self-Congruity Theory. Suo and Huang [19] stated that the major components of willingness to recommend consist of several important factors: 1) Customer Satisfaction — this is the most fundamental factor. When customers are satisfied with products or services, they are more likely to recommend them to friends, relatives, and colleagues. Such satisfaction is regarded as the best predictor of the likelihood that customers will make repeat purchases in the future; and 2) Brand Attachment — this functions as a mediating variable between brand authenticity and willingness to recommend [20]. Such attachment arises when customers feel emotionally connected to a brand [19]. Factors influencing willingness to recommend include brand authenticity, which is an important factor affecting willingness to recommend. Brand authenticity consists of four major dimensions: continuity, integrity, credibility, and symbolism, all of which have significant positive effects on willingness to recommend, with brand credibility exerting the strongest influence [21]. Another important factor is electronic word-of-mouth (eWOM).

Research Framework

Based on a comprehensive review of relevant literature, including concepts, theories, and prior empirical studies from various sources, it is evident that research on the user experience of BEVs remains relatively limited, both in Thailand and in the international context. This underscores the need for further investigation to enhance the understanding

of the relationships and causal influences among key variables in this domain. Accordingly, the present study develops its research framework based on empirical evidence from prior studies conducted in both domestic and international contexts with similar characteristics [14]. The findings from these studies indicate that several critical factors are interrelated and exert significant influences on one another, namely overall BEVQUAL, BEVUX, Continuance Use Intention, and willingness to recommend, as illustrated in Figure 1, and the overall structure of the latent constructs is summarized in Table 1.

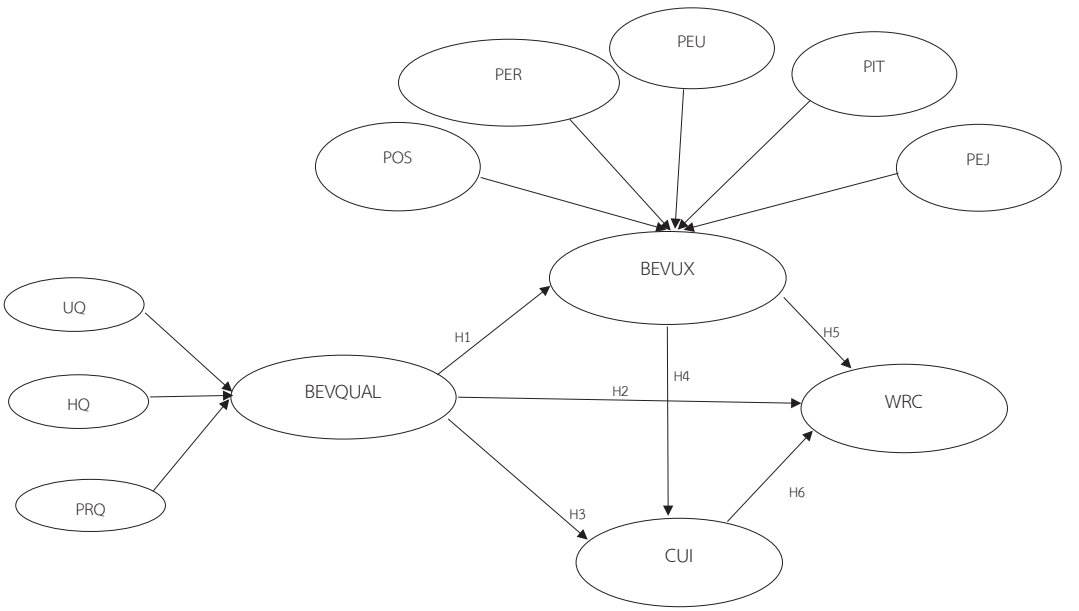


Figure 1 Conceptual Model of Exploring the Influence of Battery Electric Vehicles' User Experience and Its Antecedent on Willingness to Recommend

Note: battery electric vehicles' quality (BEVQUAL), utilitarian (UQ), hedonic (HQ), perceived risk (PRQ), battery electric vehicles' user experience (BEVUX), perception of savings (POS), perceived environmental responsibility (PER), perceived usefulness (PUF), perceived interactivity (PIT), perceived enjoyment (PEJ), continuance using (CUI), willingness to recommend (WRC)

Table 1 Structural Summary of Conceptual Model

Latent Construct	
BEVQUAL	Utilitarian (UQ)
	Hedonic (HQ)
	Perceived risk (PRQ)
BEVUX	Perception of saving (POS)
	Perceived environmental responsibility (PER)
	Perceived usefulness (PUF)
	Perceived interactivity (PIT)
	Perceived enjoyment (PEJ)
Continuance Use Intention (CUI)	-
Willingness to recommend (WRC)	-

Research Hypotheses

H1: BEVQUAL has a direct influence on the BEVUX

Previous studies on the influence of overall quality on user experience have consistently demonstrated significant positive influences across various contexts. In the context of daily-use products, it was found that quality and price exert a direct positive influence on Indian consumers' preferences [22]. A study on fitness service users in Turkey revealed that overall quality, comprising interaction quality, physical environment quality, outcome quality, accessibility quality, and hedonic quality, significantly influences customer satisfaction and trust among Turkish fitness customers [23]. Similarly, research conducted in the Spanish banking sector indicated that overall quality, including service quality, personnel quality, outcome quality, price quality, and social quality, exerts both direct and indirect influences on customers' emotional experience, attachment, and willingness to recommend [24]. In the hospitality sector, food and beverage quality was found to play a key role in creating positive customer experiences among Spanish customers in Michelin-starred restaurants [25]. Moreover, perceived fresh food quality has been shown to significantly influence customer satisfaction experiences among Chinese consumers [26]. Finally, outcome quality was found to have a significant influence on both customer satisfaction and attachment in the Spanish banking context [27].

H2: BEVQUAL has a direct influence on Willingness to Recommend

Previous studies on the influence of the overall quality of BEVs on willingness to recommend have provided consistent empirical evidence across various service and technology contexts. In Thailand, it was found that the overall service quality of BEV maintenance service centers significantly influences consumers' willingness to recommend [28]. In the context of service robots, performance quality was shown to exert a direct positive influence on word-of-mouth recommendations among Generation Z consumers in the Czech Republic [29]. Similarly, research on autonomous public transportation in Spain revealed that performance quality and enhanced hedonic value of use exert an indirect influence on word-of-mouth recommendations through daily service usage intention [30]. Furthermore, in the Spanish banking sector, overall quality, comprising service quality, personnel quality, outcome quality, price quality, and social quality, was found to have an indirect influence on customers' willingness to recommend through emotional experience and attachment [24].

H3: BEVQUAL has a direct influence on Continuance Use Intention

Previous studies examining the influence of the overall quality of BEVs on Continuance Use Intention have reported consistent empirical support across different consumption contexts. In Thailand, it was found that the overall quality of BEV maintenance service centers significantly influences consumers' continuance usage intention [28]. In the healthcare context, perceived quality was shown to have a significant influence on Thai consumers' purchase intention for medical products related to the treatment and prevention of COVID-19 [31]. Similarly, in the United States, perceived quality of organic products was found to positively influence consumers' purchase intention [32].

H4: The BEVUX has a direct influence on Continuance Use Intention

Previous studies on the influence of user experience on Continuance Use Intention consistently report positive influences across various consumption contexts. Specifically, customer experience was found to have a direct positive influence on repurchase intention among hotel customers in Ghana [33]. In the digital domain, gaming experience was shown to exert a direct positive influence on users' intention to continue using sports applications in Spain [14]. Similarly, online shopping experience was found to have a direct positive impact on consumers' purchase intention in Bangladesh [34].

H5: The BEVUX has a direct influence on Willingness to Recommend

A review of prior empirical studies on the influence of user experience on willingness to recommend indicates consistent positive influences across different service contexts. Specifically, user experience was found to exert a direct influence on word-of-mouth recommendation among hotel customers in Spain [35]. In addition, customer experience quality was shown to have a direct positive influence on Net Promoter Scores among consumers of sporting goods retailers in Austria [36].

H6: Continuance Use Intention has a direct influence on Willingness to Recommend

A review of prior empirical studies on the influence of Continuance Use Intention on willingness to recommend indicates that users' intention to continue using autonomous public transportation services has a significant influence on word-of-mouth recommendations in Spain [30]. Intention to use banking applications influenced word-of-mouth recommendation among consumers in Iran [37].

Tools and Research Methodologies

This study employed a quantitative research design utilizing AMOS, which is particularly well-suited for analyzing complex structural models with multiple constructs. The research was conducted in accordance with a systematic methodological framework, organized into the following sequential stages:

Research Tools

The research instrument was developed and validated through a systematic process as follows. 1) A comprehensive review of relevant literature and prior empirical studies was conducted to establish the theoretical foundations and conceptual definitions of the key constructs, namely BEVQUAL, BEVUX, Continuance Use Intention, and willingness to recommend. These insights were used to guide the construction and development of the research instrument. 2) The questionnaire items were adapted and modified based on established measurement scales from prior studies [3, 7, 21, 28, 38–45, 54]. 3) The content validity of the developed questionnaire was subsequently examined. The research instrument employed in this study was an online questionnaire. The quality of the instrument was evaluated through the following procedures:

(1) The content validity of the developed questionnaire, consisting of 50 items, was examined by three experts in business administration in terms of content, meaning, and language use. The examination found that the IOC values ranged from 0.66 to 1.00, which were not lower than 0.50, indicating that the questionnaire possessed appropriate validity and could be used before being tried out with a sample group of 40 respondents.

(2) The results of reliability analysis using Cronbach's Alpha coefficient showed that the reliability values of the question items ranged from .620 to .913. This indicated that almost all items passed the criteria and that the question items were reliable. The criterion for Cronbach's Alpha coefficient for each variable should be 0.7 or higher are considered satisfactory for each construct [46-47]. Therefore, the instrument demonstrated sufficient reliability for further data collection and analysis.

Populations and Samples

This study was quantitative research using a questionnaire as the research instrument in order to obtain broad and comprehensive data reflecting reliable results. The population used in this study consisted of battery electric vehicle users aged 20 years and above in Thailand.

The determination of sample size was based on the parameter estimation approach for SEM. According to methodological guidelines, the recommended ratio of sample size to the number of parameters (or observed variables) should be at least 10–20 times the number of variables [48-50]. The research framework of this study comprised 50 observed variables. Therefore, the minimum required sample size was calculated as 50 × 10 = 500 respondents, which is considered an appropriate and adequate sample size for SEM analysis.

Data Collection

Data collection for this study was conducted over a period of three months, from August to October 2025. The data were collected using an online questionnaire administered via Microsoft Forms. The survey link was distributed through Facebook Chat and LINE Chat, in addition to face-to-face distribution using a questionnaire link and QR code scanning to facilitate access to the survey. The target respondents were BEV users in Thailand aged 20 years and above, in alignment with the objectives of the study. The study employed a multi-stage sampling approach, combining stratified random sampling to ensure representative

distribution across defined strata with purposive sampling to target specific qualified participants. To ensure data integrity, a rigorous respondent screening process was implemented at the beginning of the online survey. The sampling methods consisted of stratified random sampling, in which the population was divided into strata, and purposive sampling, in which sample selection was based on the researchers' judgment. The researchers selected respondents who were actual users of battery electric vehicles in Thailand from 22 electric vehicle brands. From 1,200 individuals, 915 online questionnaires were returned, and 845 questionnaires were usable for actual analysis. Denis [51] proposed that a sample size of 300 or more is the minimum requirement for factor analysis; however, in cases where communalities are very low and factors are poorly determined, a sample size of 500 or more is required. The response rate from data collection through online questionnaires was 76.25%, which is considered a very good and acceptable response rate and contributes to the reliability of the research [52]. An acceptable response rate is 50%, while good to very good response rates are 60% and 70%, respectively.

Data Analysis

Quantitative data were processed and analyzed using statistical software packages commonly employed in social science research, including Jamovi version 2.6.44 and AMOS version 21.0 for SEM. The analysis procedure consisted of the following steps:

Descriptive Statistics: descriptive statistical techniques were applied to summarize and describe the characteristics of the sample and the observed variables. The statistical measures included frequency, percentage, mean, standard deviation, minimum, maximum, variance, skewness, and kurtosis for each variable examined in the study.

Inferential Statistics: inferential statistical analysis was employed to examine the measurement of multiple variables and to investigate the causal relationships among the latent constructs. SEM was used to assess the relationships among the variables and to evaluate the overall model fit. The goodness-of-fit indices applied in this study included the Chi-square (χ^2) statistic, degrees of freedom (df), relative Chi-square (χ^2/df), p-value, Root Mean Square Error of Approximation (RMSEA), Standardized Root Mean Square Residual (SRMR), Goodness-of-Fit Index (GFI), Adjusted Goodness-of-Fit Index (AGFI), and Comparative Fit Index (CFI). The model evaluation criteria were based on commonly accepted thresholds: a relative Chi-square (χ^2/df) value less than 2, a non-significant p-value, CFI and AGFI values greater than 0.90, and SRMR and RMSEA values lower than 0.05. These criteria indicate that

the proposed structural model demonstrates a good fit with the empirical data [53].

Mediation analysis is employed to elucidate the underlying mechanisms governing the relationship between independent and dependent variables. This approach bifurcates the total influence into two primary components: the direct influence, which represents the immediate impact of the independent variable on the outcome, and the indirect influence, which manifests through a mediator acting as a bridge. A statistically significant indirect influence provides a deeper explanation of the underlying processes or 'how' the causal influence occurs, offering more profound insights into the phenomena than a conventional linear relationship analysis.

As shown in Table 2, all variable measures exhibited Cronbach's alpha coefficients ranging from .620 to .913, based on a sample size of 40. The 50 questionnaire items had item means ranging from 3.24 to 4.76. Item-Objective Congruence (IOC) ranged from 0.66 to 1.00, while the average item discrimination indices ranged from .479 to .906, Certain items yielded Cronbach's alpha coefficients below the 0.70 threshold during the pilot test (tryout) with 40 participants. Consequently, the researchers refined the questionnaire items associated with low internal consistency. Following these adjustments, the finalized instrument was deployed for data collection with the actual sample group.

Table 2 Measurement of Variables in the Study

Variable	Variable Item	Coefficient alpha (α)	*M*	*SD*	IOC	Corrected-Item Total Correlation	Source
Independent Variable: BEVQUAL							
Utilitarian Dimensions of Quality (UQ)	1. The BEV demonstrates good driving performance.	.839	4.42	.690	0.66	.781	Chiu et al. (2014) [54]
	2. The BEV exhibits strength and durability.		3.73	.963	1	.816	Chiu et al. (2014) [54], De Giovanni (2024) [7]
	3. The BEV incorporates innovative technologies that enhance usability.		4.76	.609	1	.843	Chiu et al. (2014) [54]
	4. The BEV performs in actual use in accordance with expectations.		4.38	.747	1	.775	Chiu et al. (2014) [54], De Giovanni (2024) [7]
	5. The BEV is regularly updated with operating system enhancements to improve its performance.		3.98	.839	1	.813	De Giovanni (2024) [7]
Hedonic Dimensions of Quality (HQ)	6. The overall exterior design of the BEV is aesthetically pleasing and modern.	.810	4.51	.727	1	.728	De Giovanni (2024) [7]
	7. The interior design of the BEV is visually appealing and enhances usability.		4.47	.757	1	.727	Chiu et al. (2014) [54], De Giovanni (2024) [7]
	8. The BEV offers functional features that improve driving comfort and convenience.		4.56	.693	1	.793	Chiu et al. (2014) [54]
	9. The BEV is cost-effective in relation to its price		4.38	.806	1	.796	De Giovanni (2024) [7]
	10. The BEV enhances the users' positive image.		3.73	.986	1	.817	De Giovanni (2024) [7]

Table 2 Measurement of Variables in the Study (continued)

Variable	Variable Item	Coefficient alpha (α)	*M*	*SD*	IOC	Corrected-Item Total Correlation	Source
Dependent Variable: BEVUX							
Perceived Risk Dimensions of Quality (PRQ)	11. I am fully aware that having a risk management plan for the use of a BEV is always necessary.	.620	4.38	.650	1	.717	De Giovanni (2024) [7]
	12. Using a BEV is safe and reliable.		3.96	.737	1	.558	Solin and Curry (2023) [38], De Giovanni (2024) [7]
	13. BEVs are regarded as a viable alternative for promoting energy security.		4.13	-1.12	1	.495	Solin and Curry (2023) [38], De Giovanni (2024) [7]
	14. Manufacturers and distributors of BEVs demonstrate ethical responsibility toward users.		3.24	1.09	0.66	.486	Solin and Curry (2023) [38], De Giovanni (2024) [7]
	15. Manufacturers and distributors of BEVs are likely to revise their policies to remain aligned with future developments.		3.62	.960	0.66	.479	Solin and Curry (2023) [38], De Giovanni (2024) [7]
Perception of Savings (POS)	16. BEVs offer lower energy costs than conventional fuel-powered vehicles.	.701	4.56	.841	1	.609	Nanjundaswamy et al. (2023) [39]
	17. BEVs entail lower periodic maintenance costs than conventional fuel-powered vehicles.		4.11	.885	1	.613	Nanjundaswamy et al. (2023) [39]
	18. The cost per distance traveled for charging BEVs is lower than that of conventional gasoline-powered vehicles.		4.53	.786	1	.591	Nanjundaswamy et al. (2023) [39]

Table 2 Measurement of Variables in the Study (continued)

Variable	Variable Item	Coefficient alpha (α)	*M*	*SD*	IOC	Corrected-Item Total Correlation	Source
Dependent Variable: BEVUX							
Perception of Savings (POS)	19. Government policies have led to lower annual taxation for BEVs than for conventional gasoline-powered vehicles.		3.84	1.09	1	.680	Nanjundaswamy et al. (2023) [39]
	20. Government price subsidy policies for BEVs contribute to reducing the purchase cost of electric vehicles.		4.00	1.04	1	.719	Nanjundaswamy et al. (2023) [39]
Perceived environmental responsibility (PER)	21. Environmental protection is one of the reasons for my decision to use a BEV.	.840	4.07	1.03	1	.804	Hamzah and Tanwir (2021) [40] Hoang and Tung (2024) [41]
	22. Switching to BEVs can help reduce PM2.5 air pollution on the roads.		4.60	.751	1	.809	Hamzah and Tanwir (2021) [40] Hoang and Tung (2024) [41]
	23. Using electric vehicles is considered to contribute to environmental protection and conservation		4.40	.837	1	.768	Hamzah and Tanwir (2021) [40] Hoang and Tung (2024) [41]
	24. I am willing to reduce the use of fossil fuels that cause environmental pollution.		4.51	.727	1	.766	Hamzah and Tanwir (2021) [40] Hoang and Tung (2024) [41]
	25. I feel comfortable remaining parked in my electric vehicle with the air conditioning on without concern about contributing to air pollution.		4.64	.802	0.66	.877	Hamzah and Tanwir (2021) [40] Hoang and Tung (2024) [41]
Perceived Usefulness (PUF)	26. The functional features of the BEV electric vehicle are highly useful for driving.	.897	4.47	.726	1	.877	Chomchark (2023) [3], Ooi and Tan (2016) [42]

Table 2 Measurement of Variables in the Study (continued)

Variable	Variable Item	Coefficient alpha (α)	*M*	*SD*	IOC	Corrected-Item Total Correlation	Source
Dependent Variable: BEVUX							
Perceived Usefulness (PUF)	27. Using a BEV electric vehicle improves my quality of life.		4.29	.815	1	.854	Chomchark (2023) [3], Ooi and Tan (2016) [42]
	28. I feel safe in using a BEV electric vehicle.		3.84	.878	1	.899	Chomchark (2023) [3], Ooi and Tan (2016) [42]
	29. The use of a BEV electric vehicle effectively meets my daily transportation needs.		4.62	.747	1	.871	Chomchark (2023) [3], Ooi and Tan (2016) [42]
	30. The use of a BEV electric vehicle enables me to travel comfortably and conveniently.		4.38	.886	1	.868	Chomchark (2023) [3], Ooi and Tan (2016) [42]
Perceived Interactivity (PIT)	31. The voice command system in a BEV electric vehicle functions like having a personal driving assistant.	.863	3.49	1.16	1	.857	Joo and Yang (2023) [43], Nandi, Nandi and Khandker, (2021) [44]
	32. I can control the display of information in the BEV vehicle system according to my preferences.		3.98	.657	1	.827	Joo and Yang (2023) [43], Nandi, Nandi and Khandker, (2021) [44]
	33. The operating system of the BEV is stable, accurate, and can directly interact with the driver.		3.96	.796	1	.832	Joo and Yang (2023) [43], Nandi, Nandi and Khandker, (2021) [44]
	34. The BEV's voice command system delivers immediate feedback or results in response to user interactions.		3.69	1.06	1	.821	Joo and Yang (2023) [43], Nandi, Nandi and Khandker, (2021) [44]

Table 2 Measurement of Variables in the Study (continued)

Variable	Variable Item	Coefficient alpha (α)	*M*	*SD*	IOC	Corrected-Item Total Correlation	Source
Dependent Variable: BEVUX							
Perceived Enjoyment (PEJ)	35. The BEV's operating system is capable of adapting its display based on my usage patterns.		3.96	.878	1	.837	Joo and Yang (2023) [43], Nandi, Nandi and Khandker, (2021) [44]
	36. The BEV offers comfort, making me feel pleasure while driving.	.889	4.33	.769	1	.874	Joo and Yang (2023) [43]
	37. The BEV has good acceleration, which makes driving enjoyable for me.		4.42	.892	1	.862	Joo and Yang (2023) [43]
	38. Driving a BEV helps reduce fatigue more effectively compared to driving a conventional gasoline-powered car.		4.13	.944	1	.878	Joo and Yang (2023) [43]
	39. Using a BEV contributes to a positive experience for me.		4.38	.886	1	.861	Joo and Yang (2023) [43]
	40. Operating a BEV induces a sense of relaxation and comfort.		4.42	.753	1	.851	Joo and Yang (2023) [43]
Dependent Variable							
Continuance Using Intention (CUI)	41. If I need to travel by vehicle, I would choose to use a BEV.	.913	4.40	.780	0.66	.899	Chomchark (2022) [45]
	42. When deciding between gasoline-powered cars and electric vehicles, I consistently prefer a BEV as my primary choice.		4.24	.933	1	.906	Chomchark (2022) [45]
	43. I intend to continue using a BEV consistently.		4.38	.716	1	.885	Chomchark (2022) [45]
	44. If I were to purchase my next car, I would still choose a BEV.		4.20	1.12	1	.895	Chomchark (2022) [45]

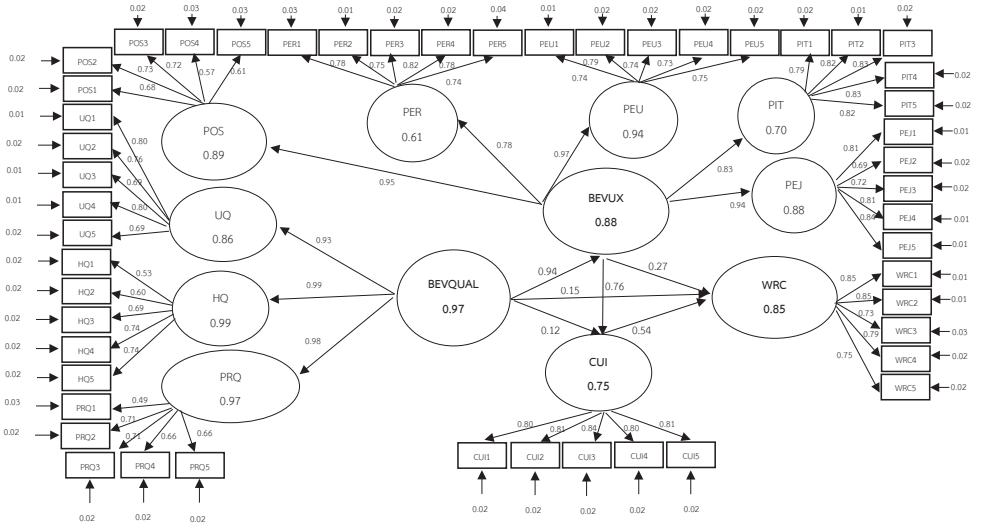
Table 2 Measurement of Variables in the Study (continued)

Variable	Variable Item	Coefficient alpha (α)	*M*	*SD*	IOC	Corrected-Item Total Correlation	Source
Dependent Variable							
Willingness to Recommend (WRC)	45. I feel accustomed to the changes in my behavior when using a BEV, to the extent that it has become part of my daily routine.		4.33	1.00	1	.882	Chomchark (2022) [45]
	46. I am willing to recommend the use of a BEV to my friends or acquaintances.	.831	4.38	.806	1	.801	Anastasiei et al. (2024) [21], Lapyen and Darawong (2025) [28]
	47. I am pleased to share my positive experiences with BEVs with others.		4.40	.863	1	.778	Anastasiei et al. (2024) [21], Lapyen and Darawong (2025) [28]
	48. If given the opportunity, I would recommend BEVs on social media to allow others to learn the factual experiences based on my own usage.		4.09	.996	1	.843	Anastasiei et al. (2024) [21], Lapyen and Darawong (2025) [28]
	49. I would recommend BEVs to others even without receiving any form of reward.		4.44	.725	1	.764	Anastasiei et al. (2024) [21], Lapyen and Darawong (2025) [28]
	50. I am willing to recommend BEVs to others without hesitation if I believe they are appropriate for their use.		4.24	.957	1	.802	Anastasiei et al. (2024) [21], Lapyen and Darawong (2025) [28]

Results

General Profile of the Respondents, the analysis of general respondent characteristics was conducted based on a total sample of 845 participants. The majority of the respondents were male (50.70%), aged between 20 and 29 years (44.50%), and held a bachelor's degree (70.70%). Most respondents reported a monthly income ranging from 15,000 to 40,000 THB (40.70%) and were employed in the private sector (37.80%). The average daily travel distance using BEVs was 15–30 kilometers (27.70%). Regarding BEV usage experience, most respondents had been using BEVs for 4–11 months (31.10%). The cumulative driving distance (based on the current odometer reading) was predominantly between 5,000 and 30,000 kilometers (52.50%).

The structural relationships of the proposed model were analyzed using statistical software to evaluate the goodness of fit between the empirical data and the theoretically specified structural equation model (SEM), as well as to test the research hypotheses based on the conceptual framework. The results of the structural equation modeling analysis are presented in Figure 2.



Note: battery electric vehicles' quality (BEVQUAL), utilitarian (UQ), hedonic (HQ), perceived risk (PRQ), battery electric vehicles' user experience (BEVUX), perception of savings (POS), perceived environmental responsibility (PER), perceived usefulness (PUF), perceived interactivity (PIT), perceived enjoyment (PEJ), continuance using (CUI), willingness to recommend (WRC)

$\chi 2$ = 954.634, df = 895, $\chi 2$/df = 1.067, CFI = 0.998, RMSEA = 0.009

Figure 2 Model to Predict Influence of Battery Electric Vehicles' User Experience and Its Antecedent on Willingness to Recommend

As shown in Figure 2, the overall structural equation model exhibited a chi-square value (χ^2) of 954.634 with 895 degrees of freedom (df), resulting in a relative chi-square (χ^2/df) of 1.067, which is below the recommended threshold of 2 and thus indicates a good model fit. With respect to the goodness-of-fit indices, the comparative fit index (CFI) was 0.998, and the root mean square error of approximation (RMSEA) was 0.009. These fit statistics demonstrate that the empirical data are highly consistent with the proposed theoretical model.

Accordingly, the researcher conducted an analysis of the factors influencing willingness to recommendation in accordance with the research hypotheses. The results are presented in terms of direct influences (DE), indirect influences (IE), and total influences (TE), as reported in Table 3.

Table 3 Path Coefficients among Variables in terms of Direct and Indirect Influences

Independent Variable	BEVUX			CUI			WRC		
Dependent Variable	DE	IE	TE	DE	IE	TE	DE	IE	TE
BEVQUAL	0.94***	-	0.94***	0.12	0.71***	0.83***	0.15	0.65***	0.80***
BEVUX	-	-	-	0.76***	-	0.76***	0.27**	0.41***	0.68***
CUI	-	-	-	-	-	-	0.54***	-	0.54***

**p < .05 **p < .01 *** p < .001*

Note: DE = Direct Influence, IE = Indirect Influence, TE = Total Influence

Analysis of Direct Causal Influences among Variables

Based on the results presented in Table 3, the direct causal influences among the study variables can be summarized as follows:

1. BEVQUAL has a positive and statistically significant direct influence on BEVUX at the .001 significance level, with a path coefficient of 0.94.

2. BEVUX exerts a positive and statistically significant direct influence on CUI at the .001 significance level, with a path coefficient of 0.76.

3. CUI has a positive and statistically significant direct influence on WRC at the .001 significance level, with a path coefficient of 0.54.

4. BEVUX also demonstrates a positive and statistically significant direct influence on WRC at the .01 significance level, with a path coefficient of 0.27.

5. BEVQUAL does not exhibit a statistically significant direct influence on WRC at the .001 significance level.

6. BEVQUAL does not exhibit a statistically significant direct influence on CUI at the .001 significance level.

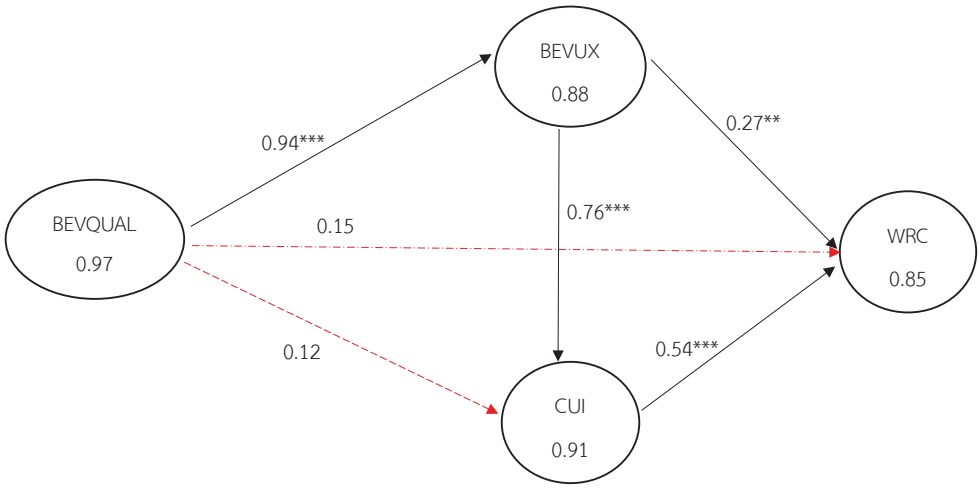
Analysis of Indirect Influences among Variables

Based on the results illustrated in Figure 3, the indirect influences among the study variables are summarized as follows:

BEVQUAL exerts a positive and statistically significant indirect influence on CUI at the .001 significance level, with a path coefficient of 0.71, mediated by BEVUX.

BEVQUAL also demonstrates a positive and statistically significant indirect influence on WRC at the .001 significance level, with a path coefficient of 0.65, mediated by both BEVUX and CUI.

BEVUX shows a positive and statistically significant indirect influence on WRC at the .001 significance level, with a path coefficient of 0.41, mediated by CUI.



$\chi 2$ = 954.63, df = 895, $\chi 2$/df = 1.067, CFI = 0.998, RMSEA = 0.009

Figure 3 Summary of Influence of Battery Electric Vehicles' User Experience and Its Antecedent on Willingness to Recommend

Table 4 Summary of Direct Influences from Hypothesis Testing

Hypothesis Testing	Direct Influence	Supported/Non-supported
H1: BEVQUAL has a direct influence on BEVUX	DE= 0.94***	Supported
H2: BEVQUAL has a direct influence on Willingness to Recommend	DE= 0.15	Non-supported
H3: BEVQUAL has a direct influence on Continuance Use Intention	DE= 0.12	Non-supported
H4: The BEVUX has a direct influence on Continuance Use Intention	DE= 0.76***	Supported
H5: The BEVUX has a direct influence on Willingness to Recommend	DE= 0.27**	Supported
H6: Continuance Use Intention has a direct influence on Willingness to Recommend	DE= 0.54***	Supported

*$p < .05$ **$p < .01$ *** $p < .001$

Discussion

Based on the research findings, the discussion is conducted through hypothesis testing and consistency with the results presented in Table 3, and summary of direct influences from hypothesis testing in Table 4, ranked from the highest to the lowest influence. The results indicate that:

BEVQUAL exerts the strongest positive direct influence on BEVUX, ranking first with an influence size of 0.94. BEVQUAL comprises three distinct dimensions. First, the Utilitarian Dimensions of Quality (α = .839) reflect consumer priorities regarding technological innovation, driving performance, and practical functionality that meets expectations. Second, the Hedonic Dimensions of Quality (α = .810) pertain to features that enhance driving comfort, as well as aesthetic and modern interior and exterior designs. Lastly, the Perceived Risk Dimensions of Quality (α = .620) involve the necessity for users to study and plan vehicle usage and charging routines, while also positioning BEVs as a viable alternative for enhancing energy security. These dimensions collectively exert a positive direct influence on BEVUX, which consists of five dimensions: BEVUX is categorized into five distinct dimensions. First, Perception of Savings (α = .701) reflects users' views on economic efficiency, noting

that BEVs offer lower energy, charging, and maintenance costs compared to ICE vehicles. Second, Perceived Environmental Responsibility (α = .840) indicates that users value BEVs for reducing air pollution and PM 2.5 emissions, while expressing personal satisfaction in contributing to environmental preservation. Third, Perceived Usefulness (α = .897) suggests that BEVs effectively meet daily requirements through functional features that enhance driving convenience. Fourth, Perceived Interactivity (α = .863) highlights the stability and precision of the operating system, which provides real-time feedback and enables users to customize vehicle settings. Finally, Perceived Enjoyment (α = .889) reveals that driving a BEV fosters a sense of relaxation and pleasure, surpassing the driving experience offered by traditional ICE vehicles. This finding is consistent with Bahety et al. [22], who reported that quality and price have a significant positive direct influence on Indian consumers' preferences in the context of everyday products. It is also supported by Ali et al. [23], who found that overall quality comprising interaction quality, physical environment quality, outcome quality, accessibility quality, and enjoyment quality significantly influences the customer experience of Turkish fitness service users. Furthermore, Arguello et al. [24] indicated that overall quality, consisting of service quality, personnel quality, outcome quality, price quality, and social quality, has both direct and indirect influences on the emotional experiences of Spanish banking customers. In addition, Barrera-Barrera [25] demonstrated that food and beverage quality plays a crucial role in creating positive dining experiences among Spanish customers in Michelin-starred restaurants. Similarly, Zhang et al. [26] reported that perceived freshness quality of food significantly influences customer satisfaction experiences in China, while Monferrer Tirado et al. [27] found that outcome quality significantly affects both customer satisfaction experience and customer engagement in the Spanish banking sector.

BEVUX exerts the second strongest positive direct influence on CUI, with an influence size of 0.76. BEVUX is categorized into five distinct dimensions. First, Perception of Savings (α = .701) reflects users' views on economic efficiency, noting that BEVs offer lower energy, charging, and maintenance costs compared to ICE vehicles. Second, Perceived Environmental Responsibility (α = .840) indicates that users value BEVs for reducing air pollution and PM 2.5 emissions, while expressing personal satisfaction in contributing to environmental preservation. Third, Perceived Usefulness (α = .897) suggests that BEVs effectively meet daily requirements through functional features that enhance driving convenience. Fourth, Perceived Interactivity (α = .863) highlights the stability and precision

of the operating system, which provides real-time feedback and enables users to customize vehicle settings. Finally, Perceived Enjoyment (α = .889) reveals that driving a BEV fosters a sense of relaxation and pleasure, surpassing the driving experience offered by traditional ICE vehicles. all of which exert significant positive direct influences on CUI indicates a strong commitment to long-term usage. Users expressed that even when multiple vehicles are available, the BEV remains their primary choice for travel. Furthermore, they intend to persist in using BEVs for the foreseeable future, specifying that their next vehicle purchase would also be a BEV. Most notably, users demonstrated a firm disinclination to return to traditional ICE vehicles. BEV users tend to consistently choose BEVs for their daily mobility and express a strong intention to continue using them. In addition, users are willing to repurchase BEVs when acquiring a new vehicle and have become accustomed to their usage behavior to the extent that it has become part of their daily routine. This finding is consistent with Amoako et al. [33], who reported that customer experience has a significant positive direct influence on hotel customers' repurchase intention in Ghana. Similarly, Habachi et al. [14] found that gaming experience has a significant positive direct influence on the intention to use sports applications in Spain, while Awal et al. [34] demonstrated that online shopping experience positively and directly influences consumers' purchase intention in Bangladesh.

CUI (α = .913) indicates a strong commitment to long-term usage. Users expressed that even when multiple vehicles are available, the BEV remains their primary choice for travel. Furthermore, they intend to persist in using BEVs for the foreseeable future, specifying that their next vehicle purchase would also be a BEV. Most notably, users demonstrated a firm disinclination to return to traditional ICE vehicles. Exerts the third strongest positive direct influence on WRC (α = .831) demonstrates users' readiness to advocate for BEVs to their acquaintances and the public. Users expressed a strong inclination to share factual information and their positive experiences to educate those who remain hesitant about the benefits of BEVs. Significantly, this advocacy occurs voluntarily, with users willing to promote BEV adoption without any expectation of external rewards or incentives, with an influence size of 0.54. BEV users consistently choose BEVs for their daily travel and demonstrate a strong intention to continue using them. When considering the purchase of a new vehicle, they intend to repurchase a BEV. Moreover, users have become familiar with and accustomed to their usage behavior to the extent that it has become part of their normal daily routine. This sustained usage intention subsequently drives their willingness to engage

in positive word-of-mouth recommendations. Specifically, users are willing to recommend BEVs to friends and acquaintances, share their real usage experiences both in face-to-face interactions and through social media channels to provide factual information based on actual use, even without receiving any incentives. They are also willing to recommend BEVs without hesitation when they perceive that the technology aligns well with the lifestyle of others. These findings are consistent with Quinones et al. [30], who reported that intention to use autonomous public transportation services significantly influences users' word-of-mouth recommendations in Spain, and with Farzin et al. [37], who found that mobile banking application usage intention positively affects consumers' word-of-mouth communication in Iran.

User experience with BEVs exerts the fourth strongest positive direct influence on WRC, with an influence size of 0.27. BEVUX is categorized into five distinct dimensions. First, Perception of Savings (α = .701) reflects users' views on economic efficiency, noting that BEVs offer lower energy, charging, and maintenance costs compared to ICE vehicles. Second, Perceived Environmental Responsibility (α = .840) indicates that users value BEVs for reducing air pollution and PM 2.5 emissions, while expressing personal satisfaction in contributing to environmental preservation. Third, Perceived Usefulness (α = .897) suggests that BEVs effectively meet daily requirements through functional features that enhance driving convenience. Fourth, Perceived Interactivity (α = .863) highlights the stability and precision of the operating system, which provides real-time feedback and enables users to customize vehicle settings. Finally, Perceived Enjoyment (α = .889) reveals that driving a BEV fosters a sense of relaxation and pleasure, surpassing the driving experience offered by traditional ICE vehicles, all of which positively and directly influence on WRC. Demonstrates users' readiness to advocate for BEVs to their acquaintances and the public. Users expressed a strong inclination to share factual information and their positive experiences to educate those who remain hesitant about the benefits of BEVs. Significantly, this advocacy occurs voluntarily, with users willing to promote BEV adoption without any expectation of external rewards or incentives, These findings are consistent with Gómez-Suárez and Veloso [35], who found that customer experience has a significant direct influence on word-of-mouth recommendations among hotel customers in Spain, and with Happ et al. [36], who reported that customer experience quality directly influences customers' net promoter scores in sporting goods retail stores in Austria.

BEVQUAL does not exert a significant direct influence on WRC, with an influence size of 0.15. BEVQUAL comprises three distinct dimensions. First, the Utilitarian Dimensions of

Quality (α = .839) reflect consumer priorities regarding technological innovation, driving performance, and practical functionality that meets expectations. Second, the Hedonic Dimensions of Quality (α = .810) pertain to features that enhance driving comfort, as well as aesthetic and modern interior and exterior designs. Lastly, the Perceived Risk Dimensions of Quality (α = .620) involve the necessity for users to study and plan vehicle usage and charging routines, while also positioning BEVs as a viable alternative for enhancing energy security, does not directly influence on WRC demonstrates users' readiness to advocate for BEVs to their acquaintances and the public. Users expressed a strong inclination to share factual information and their positive experiences to educate those who remain hesitant about the benefits of BEVs. Significantly, this advocacy occurs voluntarily, with users willing to promote BEV adoption without any expectation of external rewards or incentives. Nevertheless, users are willing to recommend BEVs to friends and acquaintances, share their real-life experiences both face-to-face and through social media channels to provide factual information based on actual usage, even without receiving any incentives. Moreover, they are willing to recommend BEVs without hesitation when they perceive that BEVs are well aligned with the lifestyle of the recipients. However, this finding is inconsistent with prior studies. Lapyen and Darawong [28] reported that the overall service quality of electric vehicle maintenance service centers significantly influences Thai consumers' willingness to recommend. Osakwe et al. [29] found that the performance dimension of quality has a significant positive direct influence on willingness to recommend among Generation Z users of service robots in the Czech Republic. Quinones et al. [30] indicated that the performance quality and enhanced emotional enjoyment of autonomous public transportation indirectly influence word-of-mouth through daily usage intention among Spanish citizens. Furthermore, Arguello et al. [31] demonstrated that overall quality including service quality, personnel quality, outcome quality, price quality, and social quality exerts an indirect influence on word-of-mouth among Spanish bank customers through emotional experience and customer engagement.

BEVQUAL does not exert a statistically significant direct influence on CUI, with an influence size of 0.12. BEVQUAL comprises three distinct dimensions. First, the Utilitarian Dimensions of Quality (α = .839) reflect consumer priorities regarding technological innovation, driving performance, and practical functionality that meets expectations. Second, the Hedonic Dimensions of Quality (α = .810) pertain to features that enhance driving comfort, as well as aesthetic and modern interior and exterior designs. Lastly, the Perceived Risk Dimensions

of Quality (α = .620) involve the necessity for users to study and plan vehicle usage and charging routines, while also positioning BEVs as a viable alternative for enhancing energy security, does not directly influence Continuance Use Intention. Indicates a strong commitment to long-term usage. Users expressed that even when multiple vehicles are available, the BEV remains their primary choice for travel. Furthermore, they intend to persist in using BEVs for the foreseeable future, specifying that their next vehicle purchase would also be a BEV. Most notably, users demonstrated a firm disinclination to return to traditional ICE vehicles. However, this finding contradicts prior empirical evidence. Lapyen and Darawong [28] reported that the overall service quality of electric vehicle maintenance centers significantly influences Thai consumers' continuous service usage intention. Kim and Yeo [31] found that perceived quality significantly affects purchase intention toward medical products for COVID-19 treatment and prevention among Thai consumers. Similarly, Lunardo et al. [32] demonstrated that perceived quality of organic products leads to consumers' purchase intentions in the United States.

Research Findings

This study contributes to the body of knowledge regarding the antecedent factors influencing willingness to recommend the use of BEVs in Thailand. The findings revealed the following:

The measurement scale of BEVQUAL consisted of three dimensions, namely Utilitarian Dimensions of Quality, Hedonic Dimensions of Quality, and Perceived Risk Dimensions of Quality. These dimensions served as the components for measuring BEVQUAL within the Thai context and demonstrated consistency and appropriateness with the empirical data. Furthermore, they exerted substantial direct and indirect positive influences on BEVUX, continuance use intention, and willingness to recommend.

The measurement scale of BEVUX consisted of five dimensions, namely Perception of Savings, Perceived Environmental Responsibility, Perceived Usefulness, Perceived Interactivity, and Perceived Enjoyment. These dimensions served as the components for measuring BEVUX among Thai electric vehicle users and demonstrated consistency and appropriateness with the empirical data. In addition, they exerted substantial direct and indirect positive influences on continuance use intention and willingness to recommend

Suggestions from Research

Policy Recommendations

The government and relevant public agencies should encourage citizens to adopt electric vehicles or environmentally friendly clean-energy vehicles, whereby purchasers of BEVs receive direct benefits, including reductions in value-added tax, annual electric vehicle tax reductions, negotiations with financial institutions for special hire-purchase interest rates, purchase subsidies for BEVs, or first BEV vehicle incentive measures. Such policies would provide direct benefits to vehicle purchasers and serve as incentives for citizens to transition from fuel-powered vehicles to BEVs, thereby contributing seriously to environmental improvement in accordance with the government's objectives.

The government and relevant public agencies should accelerate the development of personnel in technical and electric vehicle maintenance occupations in order to accommodate the continuously increasing number of users. In addition, support should be provided for the electric vehicle parts manufacturing industry and related sectors, such as the insurance industry, energy business, and electric vehicle charging station services, to ensure alignment with the increasing behavioral patterns and usage demands of citizens in the future.

Practical Implications

Continuance use intention and willingness to recommend are influenced by: (1) BEVQUAL, consisting of Utilitarian Dimensions of Quality, Hedonic Dimensions of Quality, and Perceived Risk Dimensions of Quality; and (2) BEVUX, consisting of Perception of Savings, Perceived Environmental Responsibility, Perceived Usefulness, Perceived Interactivity, and Perceived Enjoyment.

Based on the research findings, the researchers propose the following recommendations:

BEV manufacturers should devote greater effort to research and development of battery technologies to improve efficiency, increase electricity storage capacity and driving range, enable faster charging, reduce battery weight, and lower production costs. Such improvements would allow BEVs to be used in daily life with performance comparable to, or better than, conventional fuel-powered vehicles.

Manufacturers and distributors of BEVs should strengthen consumer confidence in after-sales services by emphasizing personnel development to ensure professional expertise in after-sales service delivery. Particular attention should be given to skilled maintenance and repair services,

sufficient spare parts inventory, and immediate replacement services for customers when required.

Manufacturers and distributors of BEVs should develop battery protection systems to reduce the risk of severe battery damage caused by accidents, flooding, or other high-risk events that may significantly damage electric vehicle batteries. Since EV batteries are highly expensive, concerns regarding potential battery damage may create anxiety among users, particularly in areas frequently affected by recurrent flooding.

Theoretical Implications and Recommendations for Future Research

The findings of this study contribute new knowledge regarding the conceptual framework of BEVUX, which represents an interesting variable that has not been extensively studied within this context, either in Thailand or internationally. If applied to studies of different products or services, the dimensions used to measure user experience may vary according to the specific context. Based on the findings of this study, the researchers propose the following recommendations for future research:

Future studies should continue applying this conceptual framework, as electric vehicle and battery technologies are expected to advance rapidly and become increasingly sophisticated. Furthermore, the number of automobile manufacturers producing BEVs in Thailand is expected to increase. The quality of BEVs will likely continue to improve, with enhanced features better suited to the needs of Thai users. Such developments may contribute to broader user experiences and encourage users of internal combustion engine vehicles to transition to BEVs for greater energy sustainability and environmental improvement.

The research model developed in this study should be adapted for investigating other technology- or innovation-based products and services of academic interest, such as software or applications, artificial intelligence (AI), smart robots, smart appliances, and Internet of Things (IoT) devices, among others.

Limitations of Research

This study was entirely self-funded by the researchers, which required limitations on travel expenses for data collection.

Battery electric vehicles currently available in Thailand still face certain issues requiring further improvement, and substantial research and development budgets and time are needed. In addition, natural disasters and energy security challenges may arise at any

time, potentially affecting users' attitudes and perceptions toward battery electric vehicles (BEVs), causing such perceptions to change according to those circumstances.

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