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Innovation Acceptance and Usage Behavior of Smart Electric Vehicle Applications

Jindarat Peemanee[1], Wisaruta Kongtong[1], Kittiyanee Salangam[1], Sutana Boonlua[1,*], Ranitha Weerarathna[2]

[1]*Mahasarakham Business School, Mahasarakham University, Maha Sarakham, Thailand*

[2]*SLIIT Business School, Sri Lanka Institute of Information Technology, Sri Lanka*

**Corresponding author*: sutana.t@acc.msu.ac.th

ABSTRACT: Technology Acceptance Model (TAM) was used to look at the factors that affect people's willingness to use new technologies. The study focused on how TAM can be used in smart electric vehicle applications. The key variables examined comprised perceived performance, interface usability, and user awareness. The sample consisted of 249 owners of electric vehicles in Thailand. The results confirmed that the perceived usability of the application—which includes features such as real time charging status monitoring and the convenience of locating charging stations—positively influenced users' attitudes. Moreover, a user centric interface enhanced customer satisfaction and acceptance, thus affecting their intention to persist in using the application. It was found that user experience is very important for making new technologies work well with existing ones. The study also suggested ways to make apps that work better with users' tastes in the future. Henceforth, developers should prioritize intuitive design principles and incorporate user feedback throughout the development process to ensure that applications not only satisfy functional requirements but also elevate overall user engagement. Through this approach, they can develop methods that enhance lasting allegiance and stimulate greater uptake rates within the market.

1. Introduction

Electric vehicles (EVs) are progressively regarded as a vital technological progress for enhancing energy and environmental sustainability [1] as they assist in diminishing greenhouse gas emissions and combating air pollution, especially when paired with renewable energy sources [2]. In alignment with the aims delineated in the United Nations Sustainable Development Goals, electric vehicles significantly bolster the automotive supply chain by reducing reliance on

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fossil fuels and enhancing the employment of clean energy [3]. Nevertheless, the advancement of this sector necessitates backing from governmental, private, and public entities to establish a conducive ecosystem, alongside thorough evaluations of impacts across all dimensions, encompassing environmental, economic, and social factors, to guarantee that this transition culminates in authentic sustainability ([4], [5]). Empirical analysis shows that the global user base of electric vehicles is experiencing swift expansion, with sales rising from 3.2 million units in 2020 to 10 million units in 2022, and forecasts indicate an increase to 14 million units by 2023, of which 75% are projected to be fully electric vehicles [6]. The favorable transformation in consumer perceptions, particularly among environmentally aware demographics, serves as a significant driver of the ongoing proliferation of electric vehicle adoption [7]. Moreover, pioneering technologies such as Vehicle-to-Grid (V2G), as examined by Van Heuveln et al. [8] exhibit the capacity to augment the efficiency of energy systems; however, it is critical to explore the determinants that influence the acceptance of innovations and the utilization of associated applications within specific contexts to attain a more profound comprehension of consumer behavior.

The Theory of Technology Acceptance has undergone ongoing refinement to elucidate and forecast behaviors associated with the endorsement and utilization of emergent technologies [9]. The Technology Acceptance Model (TAM) prioritizes perceived advantages and usability as the pivotal determinants [10]. This theoretical framework is applicable within the domain of smart electric vehicle applications by incorporating perceived advantages such as energy efficiency and user-friendliness. Schmalfuss et al. [11] maintain that motivation, attitudes, and technology acceptance are vital to the efficient execution of smart charging systems, reinforcing the assertions of Al-Adwan et al. [12], who pinpointed compatibility, complexity, and perceived advantages as pivotal factors in the acceptance of innovations. Moreover, De Brauwer [13] offers a multidimensional viewpoint, proposing that the acceptance of innovations constitutes a multifaceted process shaped by diverse factors operating at individual, organizational, and environmental strata. This perspective is consistent with Ezeudoka & Fan [14], who recognized that Rogers' theory of innovation diffusion and TAM serve as fundamental theoretical constructs in scholarly inquiry. Concurrently, Tian et al. [15] underscore the significance of the Theory of Reasoned Action in elucidating acceptance behaviors.

The implementation of these theoretical frameworks across various contexts illustrates their effectiveness in forecasting and elucidating innovation acceptance. For example, Albastaki [16] illustrated that perceived advantages and usability significantly influence the acceptance of online payment mechanisms, while Wang et al. [17] asserted that attitudes and perceived advantages affect the intention to interact with e-learning platforms. These investigations highlight the paramount importance of user perception factors in the acceptance of innovations, which is particularly crucial for the advancement and proliferation of the electric vehicle sector. Moreover, Wu et al. [18] conduct an extensive examination of the operations of electric vehicle charging stations within the frameworks of smart grids, highlighting the importance of intelligent applications in managing the complex ecosystem of electric vehicles. Consequently, comprehending the usage behavior of these applications is imperative for the development and enhancement of efficient systems.

This scholarly investigation aims to elucidate the factors influencing the perceived benefits, usability, and attitudes related to the adoption of smart electric vehicle applications, which in turn impact the acceptance of innovation and the behavioral tendencies associated with the utilization of these applications. Through the application of the Technology Acceptance Model (TAM) as an analytical framework, this investigation seeks to deliver significant perspectives for electric vehicle manufacturers and their related applications, thus improving the grasp of the variables that affect consumer conduct. Such insights will provide considerable assistance in the development of products and services that are more aligned with the needs and behaviors displayed by electric vehicle users.

2. Related Literature and Research Hypotheses

This study on the acceptance of innovation and the usage behavior of smart electric vehicle applications aims to explore the factors influencing innovation acceptance that affect the behavior of utilizing these applications. The researcher has reviewed various concepts, theories, and related studies, which can be summarized as follows:

2.1 Smart Electric Vehicle Charging Systems and Intelligent Applications

The advancement of smart electric vehicle (EV) charging systems and sophisticated applications constitutes essential elements in the establishment of infrastructure for electric vehicles and the development of smart cities. Mastoi et al. [19] contend that intelligent charging systems enhance the efficiency of the charging process to correspond with user requirements and the operational conditions of the electrical grid. This assertion is corroborated by the research conducted by Yang et al. [20] who identified that such systems can alleviate pressures on the power distribution network and diminish costs for consumers. Mastoi et al. [21] and Lee et al. [22] put forth a framework tailored for flexible charging infrastructures, while concentrated on charging solutions that responded to electricity price changes. According to Teimoori et al. [23], the significance of cybersecurity within intelligent charging systems is of utmost importance. In this regard, Li et al. [24] examine the deployment of blockchain technology as a means to bolster transaction security. Concerning intelligent applications, Ghasempour [25] provides a comprehensive analysis of the role of the Internet of Things (IoT) in smart grid networks, which aligns with the perspectives of Singh et al. [26] pertaining to the function of smart service platforms within the paradigm of smart cities. Jia et al. [27] emphasize the importance of leveraging data and technology to generate additional value. Also, Dreyer et al. [28] stress the advancing movement of producing applications that respond to ever more personalized criteria. This suggests that both intelligent charging systems and smart applications are instrumental in integrating technology, data, and services to facilitate effective experiences that suitably meet user needs.

2.2 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM), conceptualized by Davis [29], constitutes a fundamentally endorsed theoretical framework employed to elucidate and forecast technology adoption. It asserts that perceived utility and user-friendliness represent the principal determinants shaping users' attitudes and their propensity to engage with technology. The work of Mugo and teammates [30] revealed the capacity of the Technology Acceptance Model to integrate novel technological breakthroughs. Concurrently, Rafique et al. [31] and Kamal et al. [32] augmented the TAM framework by integrating particular contextual elements to furnish a more holistic comprehension of technology acceptance. This augmentation signifies that TAM can be proficiently implemented across a variety of contexts, encompassing investigations into the acceptance of intelligent applications for electric vehicles.

2.2.1 Perceived Usefulness

Perceived usefulness represents a fundamental and critical component in the comprehensive analysis of both the acceptance and the practical application of various technologies within different contexts. As articulated by Davis [33], the notion of perceived usefulness is precisely characterized as the degree to which an individual perceives that engaging with a particular technological system would substantially augment and improve their overall job efficiency and productivity. This theoretical framework has been extensively recognized in scholarly discourse as a significant and impactful element that is instrumental in influencing the degree of acceptance of information technology among users. In a subsequent study conducted by Nortey et al. [34] the researchers undertook a thorough investigation that successfully corroborated the importance of perceived usefulness as a predictive indicator for the actual utilization of information technology, thereby illustrating a clear and positive correlation with real-world engagement and participation. Hussain et al. [35] and Kim et al. [36] meticulously examined the various factors that impact the implementation and the resultant benefits of information systems; their findings emphasized that perceived usefulness should be regarded as a vital consideration in the careful design and systematic development of these technological systems to ensure user acceptance and satisfaction.

H1: Perceived usefulness has a positive effect on the attitude toward using of smart applications.

2.2.2 Ease of Use

The concept of ease of use is pivotal in assessing factors affecting technological acceptance and application. Davis [33] articulated perceived ease of use as the understanding that operating a technology involves scant effort. His findings indicated that this perception significantly influences attitudes and intentions towards technology adoption. Research by Adams et al. [37] and Hussain et al. [35] affirmed the importance of perceived ease of use, linking it to actual technology use and perceived user benefits. Inthong et al. [38] investigated this factor in Thailand, revealing its impact on consumer acceptance, especially among older adults with varying tech familiarity. The work of Al-Adwan et al. [12] and Emon & Khan [39] enriched the conversation by suggesting a framework that pinpoints aspects like digital competence and personal assurance that affect users' attitudes towards user-friendliness.

H2: Perceived ease of use affects attitudes toward using of smart applications.

2.2.3 Attitude Toward Using

The disposition towards the utilization of applications constitutes an essential element in the exploration of technology acceptance and usage behaviors. Suwadi et al. [40] and Popova & Zagulova [41] articulated concepts pertaining to attitudes towards websites, which are extendable to applications, underscoring that such attitudes exert a considerable influence on user engagement and application utilization. Bach et al. [42] conducted research focusing on how educators view the adoption of multimedia, applying the Technology Acceptance Model (TAM) as a guiding structure, revealing that these views significantly influence their behavioral intentions. Arora and Varah [43] use TAM and TPB to examine Indian consumers' intentions to adopt energy-efficient appliances. Key factors include ease of use, attitude, norms, and control, while usefulness is insignificant. The study suggests marketing, policy, and education strategies. Within the Thai context, Manutworakit [44] and Chonsalasin et al. [45] explored the attitudes of Thai individuals towards hybrid vehicles, which serves as a pertinent framework for examining attitudes towards smart applications designed for electric vehicles. The results indicated that environmental, technological, and economic variables significantly shape consumer attitudes.

H3: Attitude Toward Usage Influences the Behavior of Using Smart Applications

2.2.4 Behavioural Intention to Use

The construct of behavioural intention to utilize technology represents a pivotal element in the domain of technology acceptance research. The framework formulated by Jackson et al. [46] connects the constructs of attitude, social norms, and perceived behavioural control. Park [47] pointed out that the way people view the usefulness and simplicity of use significantly influences their interest in e-learning platforms. In a parallel investigation, Nikou & Economides [48] demonstrated that a conducive environment, performance expectations, and social influence are influential determinants in the intention to employ mobile assessment instruments. Almaiah et al. [49] emphasized that trust in the service and perceived financial risk are critical factors influencing the intention to adopt mobile banking solutions. Within the framework of intelligent applications for electric vehicles, it is imperative to consider additional variables such as perceived environmental advantages, trust in technology, and support from governmental bodies to attain a holistic comprehension of user behavior ([50], [51]).

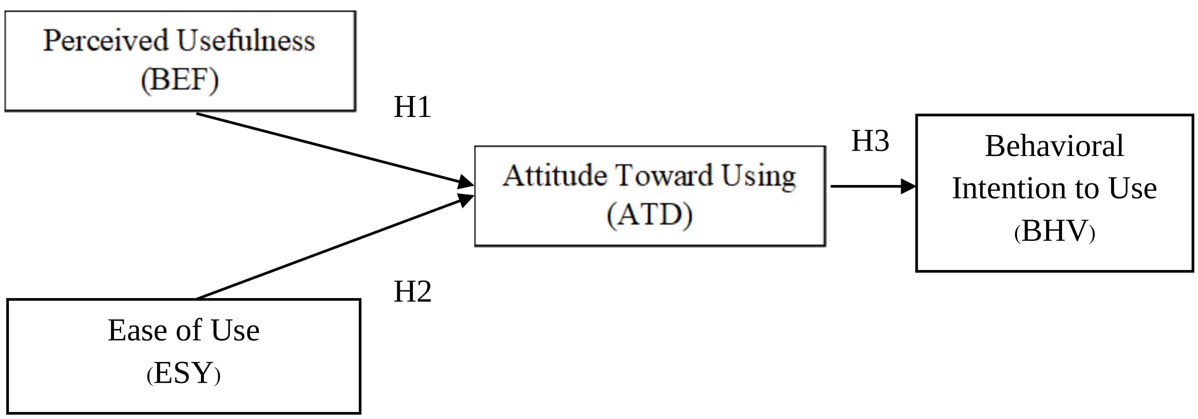

Figure 1. Conceptual framework

(Source: Author's work)

3. Research Methodology

3.1 Population and Sample

This quantitative research targets the population of electric vehicle users and smart electric vehicle application users in Thailand. The cumulative total of electric vehicles registered from 2020 to 2024 is 209,810 cars [6].

The current investigation determined its sample by utilizing a formula designed for calculating sample sizes. In this investigation, the sample is comprised of individuals utilizing electric vehicles and associated smart electric vehicle applications. By employing the Yamane, T. [52] formula at a 95% confidence level, the derived sample size amounts to 400 participants. In the realm of data collection, the researcher executed a sampling methodology recognized for its use of snowball sampling. This methodology entailed the identification of users of electric vehicles and smart electric vehicle applications, subsequently utilizing these initial participants to uncover additional subjects pertinent to the study.

3.2 Data Collection

The investigator executed an online survey (utilizing Google Forms) by disseminating it through multiple digital platforms, such as Facebook (pertaining to electric vehicle user cohorts), Line, and Instagram, throughout the timeframe spanning from August to October 2024. A cumulative total of 400 surveys were circulated, yielding 249 completed responses from participants. The duration of the data collection phase extended over 34 days, culminating in a response rate of 62.25% relative to the total sample size. The response rate of 62.25% meets expectations and is viewed positively for data evaluation, given that a standard minimum of 20% is often seen as enough for survey research [53].

Table 1 Variables and Measurement Item

Variables	Items	Factor loading	Cronbach's Alpha	**AVE**
Usefulness (BEF)	BEF1 BEF2 BEF3 BEF4 BEF5	0.518 0.577 0.649 0.597 0.563	0.787	0.384
Ease of use (ESY)	EST1 ESY2 ESY3 ESY4 ESY5	0.684 0.692 0.619 0.633 0.640	0.866	0.453
Attitude Toward Using (ATD)	ATD1 ATD2 ATD3 ATD4 ATD5	0.590 0.606 0.608 0.653 0.677	0.897	0.382
Behavioral Intention to Use (BHV)	BHV1 BHV2 BHV3 BHV4 BHV5	0.606 0.607 0.671 0.586 0.586	0.858	0.373

Source: Authors' research

The investigator performed an assessment of response bias to determine the presence of any potential bias in the replies submitted by the participants. This was accomplished through the application of the general information variable pertaining to the usage attributes of electric vehicle charging stations, which was evaluated utilizing an Independent Samples t-test. The findings revealed a p-value that surpassed 0.05, indicating that there were no substantial concerns associated with response bias. This implies that the participants' responses did not vary significantly, aligning with the theoretical framework proposed by Armstrong & Overton [54].

Table 2 The Measurement of Variables

Variables	Number of Items	Scale	Sample Questions
1. Usefulness	5	5-point Likert scale	1. The use of smart electric vehicle applications facilitates time savings in locating electric vehicle charging stations. 2. Users can monitor the charging status of their electric vehicles in real- time through the utilization of smart electric vehicle applications.
2. Ease of use	5	5-point Likert scale	1. Users can easily and straightforwardly learn to use the smart electric vehicle application. 2. The functionalities of the smart electric vehicle application are user- friendly and uncomplicated.
3. Attitude Toward Using	5	5-point Likert scale	1. You accept the improvements of the smart electric vehicle application for its development. 2. You have confidence in and accept the functionality of the smart electric vehicle application.
4. Behavioral Intention to Use	5	5-point Likert scale	1. You use the smart electric vehicle application every time you travel long distances with an electric vehicle. 2. You intend to use this application continuously in the future. 3. You will use this application again on future occasions to navigate to electric vehicle charging stations.

Source: Authors' research

3.3 Research Instruments

This investigation employs a quantitative methodological framework through the implementation of a survey technique, utilizing a structured questionnaire to elicit responses from 249 participants. The questionnaire is organized into three distinct sections: the initial section gathers demographic information comprising 8 items, which include variables such as gender, age, educational attainment, monthly income, prior experience with electric vehicles, frequency of application utilization, characteristics related to charging station usage, and geographic location. The subsequent section examines the acceptance of innovation through 15 items, concentrating on perceived advantages, usability, and attitudes pertaining to the application, and adopts a closed-ended format utilizing a 5-point Likert scale. Finally, the concluding section evaluates the behavioural intention to utilize smart electric vehicle applications through 5 items, which are similarly assessed using a 5-point Likert scale.

3.3.1 Validity Analysis

To check the legitimacy of the questionnaire, it was put through a detailed assessment by two knowledgeable professionals to ascertain that all items correspond with the defined research purposes. To be considered acceptable for the questionnaire, items must have IOC scores that fall within 0.5 to 1. Upon conducting the calculations, the findings revealed that the IOC scores surpassed 0.5 for all items, thereby affirming their suitability for inclusion. Essential modifications were implemented to the questions prior to the commencement of the actual data collection.

3.3.2 Reliability and Construct validity

In reviewing the model's manifestation of reliability and construct validity, as presented in Table 1, it is initially clear that the factor loadings for the latent variables varied from 0.518 to 0.692, thereby exceeding the recommended cut-off value of 0.40, which implies a statistically relevant level of acceptability as outlined by Stevens [55]. Furthermore, the evaluated Cronbach's alpha (CA) metrics, spanning from 0.787 to 0.897, were recognized to surpass the baseline threshold of 0.70, as outlined by Hair et al. [56] illustrating a notable standard of reliability. In addition, the measurement of convergent validity, analysed through the average variance extracted (AVE), corresponds with the benchmarks established by Hair et al. [56] which maintains that each criterion ought to achieve an AVE value of at least 0.3; all AVE results were observed within the span of 0.373 to 0.453, thus going beyond the 0.3 threshold, showcasing that the model maintains adequate levels of convergent validity. The AVE values were considered to reflect an acceptable level of validity.

4. Research Findings and Discussion

4.1 Research Findings

4.1.1 The analysis of general data revealed that the majority of respondents were aged between 31 and 40 years (28.9%), predominantly female (52.2%), and held a bachelor's degree (73.1%). Monthly income was primarily in the range of 21,000 to 30,000 Thai Baht (34.9%), with nearly half (48.8%) having less than one year of experience using electric vehicles. Most respondents reported using the application daily (41.8%) and indicated that they utilized charging stations through a walk-in method (51.8%). Additionally, 39.0% of respondents resided in Bangkok and its vicinity, totaling 97 individuals.

4.1.2 The analysis of respondents' opinions on innovation acceptance indicated that the perceived benefits of using the application scored an average of 4.07 (S.D. = 0.498), while the ease of use of the application also received an average score of 4.01 (S.D. = 0.546). Similarly, attitudes towards using the application were rated at an average of 4.01 (S.D. = 0.546), and the behavior regarding the use of smart electric vehicle applications was rated at an average of 4.02 (S.D. = 0.540).

4.1.3 As shown in Table 3, the correlation coefficients range from 0.709 to 0.776, which are all below the threshold of 0.8 (Hair et al., 2010). Therefore, there is no indication of multicollinearity, allowing the data to be suitable for further analysis using Structural Equation Modeling (SEM). The analysis of the correlation between the independent variables and the dependent variable—behavior in using smart electric vehicle applications—reveals a significant positive relationship, with coefficients ranging from 0.718 to 0.751. This indicates that the independent variables have a causal relationship with the dependent variable, making the data appropriate for subsequent regression analysis.

Table 3 The Correlations Between Constructs

Variable	$\bar{x}$	S.D.	BEF	ESY	ATD	BHV
Usefulness (BEF)	4.07	0.498				
Ease of use (ESY)	4.01	0.546	0.712**			
Attitude Toward Using (ATD)	4.01	0.546	0.709**	0.776**		
Behavioral Intention to Use (BHV)	4.02	0.540	0.718**	0.751**	0.737**	

Note. **p < 0.05, **Source: Authors' research**

Table 4 The Results of the Structural Model Fit Analyses

Goodness of Fit	Recommended Values	Structural Model (result)
CFI	≥0.900 [57]	0.985
RMSEA	≤0.080 [58]	0.026
TLI	≥0.900 [58]	0.982
SRMR	≤ 0.080 [59]	0.036

4.2 Assessment of the Hypothesized Testing

4.2.1 Hypothesis Testing Structural Equation Modelling (SEM)

Table 4 presents a summary of the structural model fit. The structural model validation was evaluated by the criteria of the main fit indices. The values of the goodness of fit indexes were higher than .90 (i.e., CFI = 0.985, TLI = 0.982). In addition, the RMSEA value equals .026 which is lower than .08 (Schumacker and Lomax, 2010), while the SRMR value was .036, less than .080 (Diamantopoulos & Siguaw, 2000). The outcomes of the Jamovi output confirm that the model has a comparatively good goodness of fit. At this point the hypothesized model was assessed to verify the structural relationships. The t-value for the .05 significance level was used for analyzing and testing all hypotheses.

4.2.2 The Results of the Hypothesis Testing Structural Equation Modeling

Table 5 provides a comprehensive overview of the results derived from hypothesis testing regarding the acceptance of innovation and the utilization of smart electric vehicle applications. The assessment executed via Structural Equation Modeling (SEM) indicates that the perceived merits tied to the use of the application and its convenience serve as substantial indicators of attitudes concerning its deployment at a significance level of 0.05. In particular, these two determinants account for 96.70% of the variance in attitudes toward the application, also reaching a noteworthy significance level of 0.05. The beta coefficients reveal that the aspect of usability has a significantly larger effect on attitudes towards the application (H1: $\beta = 0.716$, $p < 0.001$) compared to the perceived benefits of employing the application (H2: $\beta = 0.297$, $p = 0.035$). In addition, attitudes toward the application exert a positive influence on the behavior of employing smart electric vehicle applications, elucidating 96% of the variance in this behavior at a significance level of 0.05. The beta coefficient illustrates that attitudes toward the application have a significant impact on the behavior of utilizing smart electric vehicle applications (H3: $\beta = 0.980$, $p < 0.001$).

Table 5 Path Coefficient and Hypothesis Testing

Hypotheses	Hypothesis Test	Beta	T-values	P-values	**Results**
H1	BEF→ATD	0.297	2.11	0.035*	**S**
H2	ESY→ATD	0.716	4.48	<0.001*	**S**
H3	ATD→BHV	0.980	7.91	<0.001*	**S**

Notes. * = p< 0.05; S: supported, NS: not supported

4.3 Discussion

This section delineates the outcomes derived from the investigation concerning the acceptance of innovation and behavioral patterns associated with smart electric vehicle applications. The ensuing discourse will underscore significant insights obtained from the data, establishing correlations between the theoretical framework and the empirical findings, while clarifying the manner in which these outcomes enhance the prevailing body of literature regarding innovation acceptance within the realm of electric vehicles.

The perceived advantages associated with the utilization of the application substantially impact users' dispositions regarding its employment. Users acknowledge the benefits of utilizing smart electric vehicle applications, including the efficiency gained in identifying charging stations and the capacity to observe the charging status in real-time. These elements foster a favorable disposition toward the application's utilization. This observation is consistent with Davis [33] who articulated perceived usefulness as the degree to which an individual perceives that the application of a particular system enhances their occupational performance, thus identifying it as a fundamental determinant influencing technology acceptance. Moreover, Díez and McIntosh [60] conducted a review of the determinants affecting system usage and its advantages, underscoring that perceived usefulness constitutes a crucial factor in the design and development of information systems. Furthermore, the perception of augmented benefits exerts a positive influence on consumers' overall dispositions toward the utilization of the application [61].

The perceived simplicity associated with the application exerts a favorable influence on users' attitudes towards its deployment. Users acknowledge the ease with which they can operate the smart electric vehicle application, facilitating a seamless and uncomplicated learning process. The functionalities of the application are designed to be straightforward and unambiguous, thereby fostering positive attitudes towards its utilization. This insight corresponds with the studies of Davis [33] who explained perceived ease of use as the measure of how much a user thinks that using a specific system would involve minimal effort, accentuating its direct influence on attitudes and intentions pertaining to technology adoption. Moreover, Islami et al. [62] observed that perceived ease of use exerts a positive and statistically significant effect on users' attitudes towards the application of online teaching platforms. This revelation resonates with the research by Emon & Khan (2025), who constructed a model that elucidates the causal relationships affecting perceived ease of use, identifying variables such as previous computer usage, self-efficacy, and anxiety linked to computers as pivotal factors in shaping perceived ease of use.

A smart electric car application Users' behavior is positively impacted by their impression of the program's usefulness. The users' assurance and trust in the application's usability, as well as the safe and private handling of personal information, may be used to explain this study's findings. These elements are crucial in evaluating whether or not users plan to keep using the program. According to Weng et al. (2018), who used the Technology Acceptance Model (TAM) to study educators' perceptions of multimedia apps, attitudes have a direct impact on behavioral intentions. Additionally, the perceived benefits had a significant influence on customers' behavioral intention toward electric automobiles, suggesting that consumers were more inclined to utilize the smart EV application when they had a positive perception of the program's benefits [63] which highlighted the need to evaluate attitudes in a methodical manner while examining technology adoption in Thailand. Additionally, the attitudes are significant determinants of behavioral intents and use patterns in the context of technology [64]. Understanding users' attitudes towards technology can provide valuable insights into their behaviors and preferences when it comes to adopting new technologies and usage practices.

5. Suggestions and Contributions

5.1 Suggestions

5.1.1 Future study should examine how social and cultural factors affect technology acceptance in Thailand's smart electric vehicle app usage. Convenience, technological familiarity, and application confidence are these aspects. The findings of this study will assist develop consumer-friendly applications.

5.1.2 Although this study employs a quantitative research methodology, qualitative research methods like focus groups, in-depth interviews, or observation techniques would be beneficial for gaining more detailed and comprehensive insights can be another choice for future research. The qualitative technique will give application developers valuable data to improve the apps for users' demands for more convenience, usability, and time-saving.

5.2 Contribution

The research findings underscore that perceived advantages, user-friendliness, and individual attitudes exert a substantial impact on the utilization of smart electric vehicle applications. Both public and private entities ought to prioritize these elements when formulating applications that are conducive to user engagement. The upgrades must involve making the registration process easier, establishing strong promotional methods, and integrating functionalities such as finding charging stations and tracking vehicle condition instantly. Attending to user feedback is imperative for optimizing functionality, thereby fostering the adoption of sustainable electric vehicle practices in the foreseeable future.

6. Conclusion

This study aims to study the acceptance of innovation and the usage behavior of smart electric vehicle applications, primarily applying the Technology Acceptance Model (TAM) alongside relevant theories and previous research to establish a conceptual framework for the study. The findings indicate that the perceived benefits, ease of use, and attitudes toward using the application significantly influence the usage behavior of electric vehicle users concerning smart electric vehicle applications, with statistical significance at the 0.01 and 0.05 levels, respectively.

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