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Electric Vehicle Adoption: An Integrated Utaut and Tpb Framework Analysis Among Electric Vehicle Users in Southern Leyte, Philippines

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Index Terms:

electric vehicle adoption, UTAUT, TPB, behavioral intention, PLS-SEM, perceived risk

Abstract. This study examined electric vehicle (EV) adoption among current and potential EV users in Southern Leyte, Philippines, using an integrated theoretical framework combining the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB). Specifically, it investigated how key behavioral constructs — including performance expectancy, effort expectancy, hedonic motivation, habit, facilitating conditions, perceived behavioral control, subjective norm, and multiple dimensions of perceived risk — influence EV adoption intentions. The study also explored the moderating effects of demographic factors, namely age, income, and educational attainment, on the relationship between perceived behavioral control and the intention to adopt electric vehicles. A descriptive-correlational research design was employed, involving 120 validated respondents who own, operate, or drive registered electric tricycles and e-bikes for public or private transportation in Southern Leyte District 2. Data were gathered through a structured Likert-scale questionnaire and analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) via WarpPLS 8.0, with bootstrapping applied to validate the significance of relationships. Results revealed that the sample was predominantly male, working-age, middle-income, and married, with most operating a single electric vehicle. Among all constructs, habit recorded the highest perception rating, while facilitating conditions received the lowest, reflecting infrastructure gaps. Performance expectancy and social influence emerged as the primary drivers of adoption intention. Notably, the moderating effects of age, income, and educational attainment on perceived behavioral control were statistically non-significant. The study concludes that EV adoption in underserved rural communities is driven more by performance perceptions and social norms than by demographic factors. It recommends targeted infrastructure investments, community-centered enabling programs, and socially framed communication strategies to accelerate inclusive and equitable EV adoption in similar developing-region contexts.

Introduction

The adoption of electric vehicles (EVs) represents a pivotal global shift toward reducing fossil fuel dependence and mitigating the adverse environmental effects of conventional transportation systems. As energy-efficient alternatives to internal combustion engine (ICE) vehicles, EVs substantially reduce greenhouse gas emissions and contribute to global efforts toward sustainable mobility (Hossain et al., 2022). This transition has become increasingly urgent amid intensifying concerns over climate change, air pollution, and energy insecurity (Zhou & Zhao, 2024). Worldwide, EV adoption continues to rise, driven by declining battery costs, expanding charging infrastructure, and strong policy incentives that support the transition to low-carbon transport systems (Li et al., 2017). Despite this progress, rural and low-income communities in the Philippines remain underserved, highlighting a growing disparity in access to clean transportation technologies.

Despite promising advancements, numerous studies highlight ongoing issues in EV adoption across the transportation sector, particularly when viewed through the lens of demographic disparities. For instance, older adults often exhibit lower technology acceptance and readiness, leading to resistance toward EV adoption due to perceived complexity and unfamiliarity (Sun & Lee, 2024). Low-income households are commonly constrained by the high upfront cost of EVs and limited access to financing options, even though operational savings are documented in the long run (Rahman & Thill, 2024). Meanwhile, lower educational attainment is associated with weaker environmental awareness and limited understanding of EV benefits, further dampening the willingness to shift from internal combustion engine vehicles (Wang et al., 2023; Goswami, 2022). In transportation-reliant in the region, these demographic imbalances critically hinder sustainable mobility goals and amplify inequalities in access to clean and efficient transportation systems. Moreover, scholars have documented how these demographic variables serve as moderating factors influencing the effectiveness of EV related interventions. Fisher et al. (2019) observed that younger and more educated populations are more responsive to environmental campaigns and government incentives. Socioeconomic status, as emphasized by Rahman & Thill (2024), affects not only financial capacity but also trust in technology and the perceived utility of EVs. These persistent issues suggest that transportation sector reform must incorporate tailored strategies that align with the demographic realities of each region. Without such efforts, EV adoption risks becoming an exclusive solution, further marginalizing already disadvantaged populations (Sun & Lee, 2024).

In line with these, the study integrates the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB) to examine the influence of demographic factors on EV adoption. UTAUT helps explain how constructs like performance expectancy, effort expectancy, social influence, and facilitating conditions influence user behavior and are particularly relevant in understanding how different age groups and income levels perceive the usefulness and ease of EV technology (Alwadain et al., 2024). Despite the valuable insights provided by existing studies and theoretical frameworks, a significant gap in EV adoption research remains in the limited exploration of demographic variables and their moderating effects on behavioral constructs. Gunawan et al. (2022) emphasized the need to incorporate demographic data to enhance model accuracy and representation, particularly in geographically diverse settings. Sun and Lee (2024) found that variables such as gender and age influence EV adoption differently across population groups, while Goswami (2022) advocated for stronger integration of socioeconomic demographics to improve targeting of EV-related policies. Rahman & Thill (2024), further noted that existing models often overlook the moderating effects of demographics, limiting their capacity to predict behavior in underrepresented communities.

Due to the limited research on how demographic disparities shape electric vehicle (EV) adoption, this study aims to fill the gap by generating empirical insights that inform inclusive mobility strategies. Specifically, it investigates the moderating effects of age, income, and educational attainment on behavioral constructs influencing EV adoption. By aligning the analysis with community-specific data from Southern Leyte District 2, the study supports the formulation of tailored mobility solutions responsive to local socioeconomic profiles. This study employed a descriptive-correlational design to examine the influence of demographic factors on electric vehicle (EV) adoption in Southern Leyte District 2. A structured questionnaire was administered using stratified sampling. Data were analyzed through Partial Least Squares Structural Equation Modeling (PLS-SEM) to assess correlations and the strength of relationships among variables such as perceived risk, education, and adoption behavior. The research process covered the theoretical framework, hypothesis development, methodology, and literature review. Aligned with local context, the findings supported the Electric Vehicle Adoption and Infrastructure Development Program by offering evidence-based strategies for promoting transportation equity and demographic inclusion.

This research aimed to investigate the electric vehicle adoption factors through the lens of integrated frameworks of the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB) among electric vehicle users in Southern Leyte, Philippines during fiscal year 2024-2025 as basis for EV Adoption and Infrastructure Development Program (EVAIDP).
Specifically, this study addresses the following research questions:

1. What are the demographic profiles of Electric Vehicle Users in Southern Leyte, in terms of:
   1.1 age,
   1.2 gender,
   1.3 income,
   1.4 educational attainment,
   1.5 marital status, and

1.6 no. of vehicle in operation?

2. What is the perception of the respondents on the constructs of the integrated model explaining EV adoption as to:

   2.1 habit,
   2.2 price value,
   2.3 hedonic motivation,
   2.4 effort expectancy,
   2.5 performance expectancy,
   2.6 perceived physical risk,
   2.7. perceived function risk,
   2.8 perceived financial risk,
   2.9 perceived social risk,
   2.10 perceived time risk,
   2.11 subject norm,
   2.12 perceived behavioral control, and
   2.13 facilitating condition?

3. The moderating effect of demographics to the following relationship:

   3.1 Moderating effect of age on the relationship between perceived behavioral control and the intention to adopt electric vehicles among public transportation operators in Southern Leyte?
   3.2 Moderating effect of income on the relationship between perceived behavioral control and the intention to adopt electric vehicles among public transportation operators in Southern Leyte?
   3.3 Moderating effect of educational attainment on the relationship between perceived behavioral control and the intention to adopt electric vehicles among public transportation operators in Southern Leyte?

Framework of the Study

The Unified Theory of Acceptance and Use of Technology (UTAUT) originated from the need to integrate various technology acceptance models into a cohesive framework. Dwivedi et al. (2019), UTAUT synthesizes constructs from eight prominent theories, including the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), thereby providing a comprehensive understanding of user behavior toward technology adoption (Khan & Hoque, 2022). This foundational development aimed to streamline the various predictors of technology acceptance into a structured model that could explain a significant portion of the variance in user behavior. Since its inception, UTAUT has evolved considerably in its scope and range of application. Initially focused on individual user adoption of information systems, the model was later adapted to encompass a broader array of technological contexts. For example, research has applied UTAUT to areas such as mobile payments (Khan & Hoque, 2022), home-based care technologies for older adults and app-based taxi services (Trivedi et al., 2022), demonstrating its flexibility across consumer technology sectors. The UTAUT framework incorporates key constructs, specifically performance expectancy, effort expectancy, social influence, and facilitating conditions, which together explain various user intentions and behaviors (Rahi et al., 2019). However, the model has undergone several modifications to enhance its relevance. Furthermore, specific adaptations have emerged, including extended versions that consider socio-cultural variables and situational factors influencing user behavior (Choi et al., 2008). UTAUT's strengths are evident in its comprehensive and integrative nature, which combines multiple theoretical perspectives to offer a robust analysis of technology adoption behaviors. The model's ability to elucidate direct determinants of user acceptance such as perceived benefits and ease of use allows researchers and practitioners to effectively identify barriers and enablers within technological implementations (Lee et al., 2025). The Theory of Planned Behavior (TPB) emerged from a need to refine the existing framework of the Theory of Reasoned Action (TRA), which was co-developed by Ajzen and Fishbein in 1975. Ajzen introduced TPB in 1991 to address the limitations of TRA, particularly its oversight of factors beyond individual control (Liu et al., 2023). While TRA emphasized attitudes and subjective norms as primary predictors of behavioral intentions, the inclusion of Perceived Behavioral Control (PBC) in TPB enhanced its ability to analyze decision-making processes within complex environments. This linkage emphasized how personal perceptions of control can significantly influence intentions and behaviors related to various actions (Liu et al., 2023). The integration of the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB) has established a robust framework for analyzing electric vehicle (EV) adoption in contemporary contexts. UTAUT contributes valuable insights regarding technological factors, such as performance expectancy and facilitating conditions, that shape consumer interactions with EV technology (Alwadain et al., 2024). In contrast, TPB enhances this framework by incorporating behavioral elements like attitudes and perceived behavioral control (PBC), allowing for a thorough understanding of the psychological and social determinants influencing consumer intentions (Jingyi & Ali, 2025). By combining these perspectives, the hybrid model successfully captures the multidimensional nature of EV adoption, addressing both technological readiness and societal influences, which is critical for formulating effective strategies to encourage EV uptake (Zaino et al., 2024).

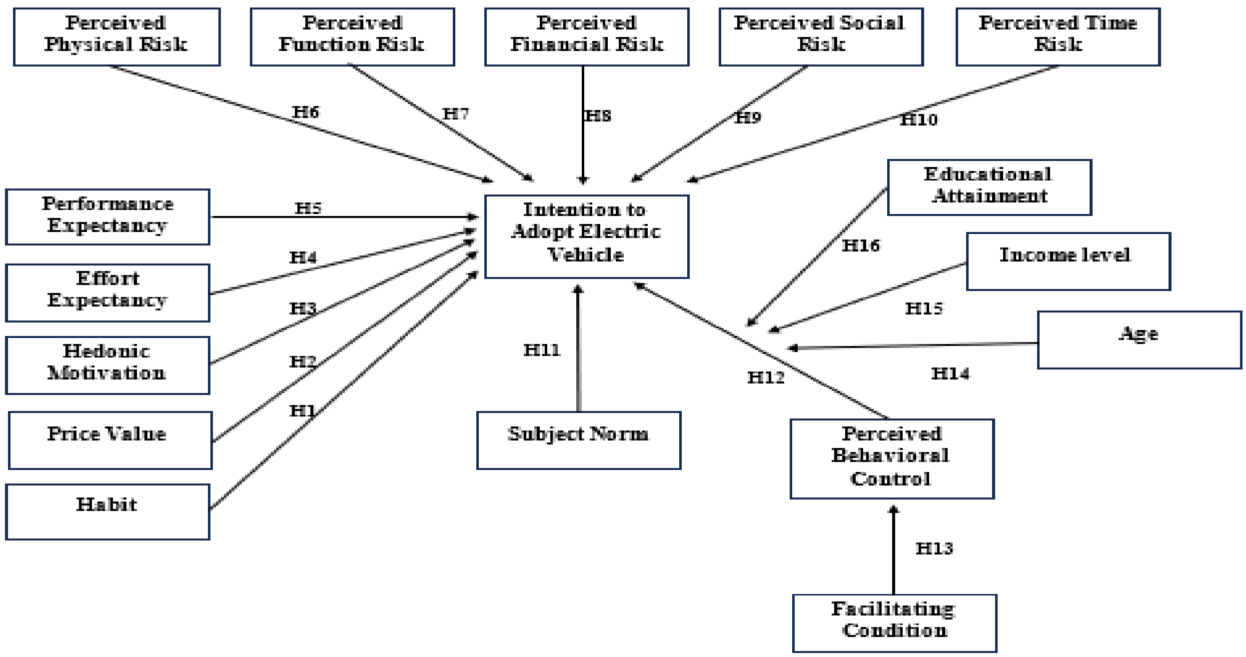

Figure 1. Integrated Framework for Electric Vehicle Adoption

Methodology

Research Design

This study employed a descriptive-correlational research design to investigate the adoption of electric vehicles (EVs) among current and potential users in Southern Leyte, Philippines. The descriptive component provided detailed insights into the demographic characteristics, adoption behavior, and perceptions of respondents regarding electric vehicle usage. Meanwhile, the correlational component aimed to determine the strength, direction, and significance of the relationships among various theoretical, psychological, contextual, and demographic factors influencing EV adoption, as outlined in the integrated UTAUT-TPB framework.

Research Locale

The study was conducted in Southern Leyte, District II, a province in Eastern Visayas, Philippines characterized by dispersed rural communities, rugged terrain, and developing transportation systems. This environment reflects many of the conditions identified in prior EV adoption research conducted in developing Asian regions, where issues such as limited charging infrastructure, affordability constraints, and evolving policy frameworks influence adoption patterns. These similarities make Southern Leyte an appropriate setting for examining how EVs are adopted in underserved and infrastructure-limited areas.

Research Respondents

The target population of this study consisted of potential electric vehicle (EV) users in Southern Leyte, specifically individuals who own, operate, or drive registered electric tricycles and e-bikes for public or private transportation.

Educational Attainment	Frequency	Percentage
Elementary Level	14	12%
High School Graduate/Vocational	53	44%
College Level/Graduate	53	44%
TOTAL	120	100%

Table 1. Distribution of Respondents

Research Instrument

The research instrument utilized in this study was a structured questionnaire developed through a systematic and rigorous process to ensure validity, conceptual alignment, and relevance to the study's objectives. This approach is consistent with existing EV adoption literature, where structured Likert-scale questionnaires are the dominant method for measuring behavioral constructs, perceived risks, and adoption intention (Featherman et al., 2021). Guided by an extensive review of related studies, previously validated items were adapted to reflect the theoretical foundations of the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB), both commonly used in earlier research. The finalized instrument consisted of two major sections. Part I gathered demographic information including age, gender, educational attainment, household income, and EV type. Part II measured perceptions of key constructs influencing EV adoption, including performance expectancy, effort expectancy, hedonic motivation, habit, facilitating conditions, perceived behavioral control, subjective norm, and perceived risks. This carefully refined and theoretically grounded instrument ensured the collection of valid, reliable, and contextually meaningful data essential for achieving the objectives of the study.

Data Gathering Procedures

The data for this study were collected through a structured survey questionnaire, which was personally distributed to current and potential electric vehicle (EV) users in various municipalities of Southern Leyte through on-site visits. After distribution, the completed questionnaires were manually retrieved, reviewed, and screened to ensure data quality. Responses with inconsistencies or indications of disengagement were excluded based on established criteria. The finalized dataset, consisting of 120 valid responses, was then organized and prepared for statistical analysis.

Statistical Treatment of Data

This study applied Partial Least Squares Structural Equation Modeling (PLS-SEM) as the primary statistical method to assess both the measurement and structural components of the proposed theoretical model. Data analysis was carried out using WarpPLS 8.0, a software specifically designed for advanced multivariate modeling within the PLS path modeling framework. To enhance the accuracy of parameter estimates and determine the significance of the hypothesized relationships, the study employed the bootstrapping method a resampling procedure that generates thousands of subsamples to estimate standard errors, confidence intervals, and p-values reliably. All statistical evaluations followed recognized standards to uphold the validity, reliability, and methodological rigor of both the measurement and structural models. Within the measurement model, indicator loadings were examined, with a benchmark of 0.70 or higher, indicating that each item adequately reflected its corresponding latent construct. Convergent validity was established using the Average Variance Extracted (AVE), with a minimum threshold of 0.50, signifying that indicators shared sufficient common variance. Internal consistency was confirmed through both Composite Reliability (CR) and Cronbach's Alpha, with values of 0.70 or above deemed acceptable. The structural model was evaluated using multiple indices to assess fit, explanatory power, and predictive capability. The Average Path Coefficient (APC), which gauges the statistical significance of relationships within the model, required a p-value less than 0.005. Similarly, the Average R-Squared (ARS) and Average Adjusted R-Squared (AARS) values were also expected to meet the $p < 0.005$ criterion to validate explanatory strength. Multicollinearity was assessed using the Average Block Variance Inflation Factor (AVIF) and the Average Full Collinearity VIF (AFVIF), with acceptable values being below 5, indicating no significant collinearity concerns. To assess overall model quality, the Tenenhaus Goodness-of-Fit (GOF) index was used, with values of 0.10, 0.25, and 0.36 representing small, medium, and large effect sizes, respectively. The Coefficient of Determination (R^2) indicated the degree to which endogenous variables explained the variance in endogenous constructs, with thresholds of 0.25 (weak), 0.50 (moderate), and 0.75 (strong). Finally, predictive relevance was examined using Q^2 values, where positive scores indicated that the model provided sufficient predictive accuracy for the endogenous variables.

Scoring Procedure

Scale	Range	Categorical Response	Description
5	4.21-5.00	Strongly Agree (SA)	Indicates an extremely high level of agreement or satisfaction. Respondents show a very favorable impression of the item or condition mentioned.
4	3.41-4.20	Agree (A)	Indicates a high but not extreme level of agreement or satisfaction. Respondents generally perceive the item or condition in a positive light.
3	2.61-3.40	Neutral (N)	Represents an average or undecided position regarding agreement or satisfaction. Respondents neither favor nor oppose the item or condition.
2	1.81-2.60	Disagree (D)	Represents a low level of agreement or satisfaction. Respondents usually have a negative impression of the item or condition.

Table 2. Rating Scale and Description

Ethical Consideration

This study was conducted in strict adherence to the ethical principles governing research involving human participants. Prior to data collection, informed consent was secured from all respondents, who were clearly informed of the study's purpose, their voluntary participation, and their right to withdraw at any point without consequence. To protect the privacy and confidentiality of participants, no personally identifiable information was collected; all data were recorded and reported in aggregate form to ensure anonymity.

Results and Discussion

Demographic Profile of the Respondents

Category	Frequency	Percentage
Age		
46–55	6	5%
36–45	45	38%
26–35	35	29%
18–25	34	28%
Gender		
Male	106	88%
Female	14	12%
Household Income Level Monthly:		
Php 76,669 – Php 131,484	10	8%
Php 43,828 – Php 76,669	26	22%
Php 21,194 – Php 43,828	60	50%
Php 10,957 – Php 21,194	24	20%
Educational Attainment:		
High School Graduate/Vocational	53	44%
Elementary Level	14	12%

College Level/Graduate	53	44%
Marital Status:		
Single	3	3%
Married	97	81%
Divorced	13	11%
Widowed	7	6%
Number of Vehicles in Operation:		
One	108	90%
Two	12	10%

Table 3. Demographic Information of the Respondents

Table 3 presents the demographic profile of electric vehicle users in Southern Leyte. Most of the respondents fall within the 36–45 age group (38%), followed by those aged 26–35 (29%) and 18–25 (28%), indicating that electric vehicle use is most common among young to middle-aged adults. A clear gender disparity is observed, with 88% male and 12% female users, highlighting a male-dominated EV user base in the area. Regarding household income, half of the respondents (50%) earn between Php 21,194 and Php 43,828, placing them in the middle-income range, while only a small portion (8%) belong to the higher-income bracket. Educational attainment is evenly distributed, with 44% of respondents each reporting either college level/graduate or high school graduate/vocational status, and a minority (12%) having completed only elementary level education.

A majority of users are married (81%), while the rest are divorced (11%), widowed (6%), or single (3%), suggesting that electric vehicle users in the region are primarily family-oriented. When it comes to the number of vehicles in operation, 90% of respondents operate one electric vehicle, and 10% operate two, which implies that usage is primarily for personal or small-scale operational purposes rather than for large-scale or fleet use. These demographic insights help contextualize the perspectives, attitudes, and behaviors of users toward electric vehicles and can support strategies aimed at expanding EV adoption tailored to the characteristics of the local population.

Perception of the Respondents of the Constructs of the Model

This section presents the findings related to the respondents' perceptions of the various constructs integrated into the model explaining electric vehicle (EV) adoption. Specifically, it focuses on how the respondents in Southern Leyte perceive key factors outlined in the integrated frameworks of the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB). These constructs encompass a wide range of psychological and behavioral aspects that influence EV adoption, including but not limited to habit, price value, hedonic motivation, effort expectancy, performance expectancy, and various types of perceived risks (physical, financial, functional, social, and time). Additionally, the respondents' perceptions of intention to adopt EV, subjective norm, perceived behavioral control, and facilitating conditions are explored to gain insights into the factors that shape their readiness to embrace electric vehicles. Understanding these perceptions is essential in identifying the key determinants of EV adoption and will serve as the foundation for further analysis in the context of Southern Leyte, ultimately guiding entwinement of an effective Electric Vehicle Technology Diffusion Program.

Habit

	Items	Mean	Standard Deviation	Verbal Description
1.	Driving an electric vehicle for school commutes is part of my daily routine.	4.17	0.74	Agree
2.	I feel comfortable using an electric vehicle for my everyday travel.	3.99	0.78	Agree
3.	Charging my electric vehicle before traveling is a regular practice for me.	3.94	0.80	Agree

4.	I naturally choose to drive an electric vehicle when going to my office.	4.53	0.58	Strongly Agree
5.	I consistently use an electric vehicle for long-distance travel when needed.	4.62	0.64	Strongly Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 4. Perception on the Habit

Table 4 presents the respondents' perceptions of their habitual use of electric vehicles. The highest mean score was observed for the item stating that respondents consistently use EVs for long-distance travel when needed (M = 4.62, SD = 0.64), followed closely by the natural preference for driving an EV to the office (M = 4.53, SD = 0.58), suggesting that EVs are commonly relied upon for both work and travel purposes. Driving an EV for school commutes also emerged as a regular routine (M = 4.17, SD = 0.74), highlighting its role in daily household mobility. Comfort in using EVs for everyday travel (M = 3.99, SD = 0.78) and regular charging practices (M = 3.94, SD = 0.80) further indicate that EV use is well-ingrained in the lifestyle of respondents. These results collectively reflect a high level of habit formation around electric vehicle use among users in Southern Leyte.

Price Value

	Items	Mean	Standard Deviation	Verbal Description
1.	The cost of owning an electric vehicle is practical for daily transportation.	3.62	0.92	Agree
2.	Using an electric vehicle for my daily trips helps me save fuel cost over time.	3.58	0.81	Agree
3.	Price discounts make electric vehicles more attractive.	3.53	0.84	Agree
4.	The price of an electric vehicle plays a major role in my decision to purchase one for personal use.	3.68	0.86	Agree
5.	I consider the financial cost of owning an electric vehicle when making a purchase decision.	3.83	0.81	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 5. Perception on the Price Value

Table 5 presents the respondents' perceptions regarding the price value of electric vehicles. The highest mean score was recorded for the item "I consider the financial cost of owning an electric vehicle when making a purchase decision" (M = 3.83, SD = 0.81), indicating that financial considerations play a significant role in users' decisions to purchase EVs. Similarly, "The price of an electric vehicle plays a major role in my decision to purchase one for personal use" (M = 3.68, SD = 0.86) reflects the importance of cost factors in the decision-making process. Respondents also agree that owning an electric vehicle is practical for daily transportation (M = 3.62, SD = 0.92) and that using EVs for daily trips helps save fuel costs over time (M = 3.58, SD = 0.81), reinforcing the value of long-term savings. The item regarding price discounts making EVs more attractive received a slightly lower mean score (M = 3.53, SD = 0.84), yet it still suggests that financial incentives, like discounts, enhance the appeal of electric vehicles. Overall, the responses reflect a general agreement that the financial aspects of EVs, including their purchase price and savings potential, are crucial considerations for users.

Hedonic Motivation

	Items	Mean	Standard Deviation	Verbal Description
1.	Driving an electric vehicle is a pleasurable experience for me.	4.07	0.75	Agree
2.	Operating an electric vehicle gives me a sense of enjoyment.	3.94	0.79	Agree

	Items	Mean	Standard Deviation	Verbal Description
3.	The unique features of electric vehicles make my driving experience more enjoyable.	3.93	0.83	Agree
4.	Driving an electric vehicle provides me with a fun and exciting experience.	4.25	0.71	Strongly Agree
5.	Using an electric vehicle makes me happy.	4.08	0.77	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 6. Perception on the Hedonic Motivation

Table 6 presents the respondents' perceptions regarding the hedonic motivation associated with electric vehicle use. The highest mean score was recorded for the item "Driving an electric vehicle provides me with a fun and exciting experience" (M = 4.25, SD = 0.71), reflecting that EV users derive significant enjoyment and excitement from driving. Additionally, the item "Using an electric vehicle makes me happy" (M = 4.08, SD = 0.77) received a strong positive response, suggesting that EV use contributes to the respondents' overall happiness. Other items also indicated a generally positive perception of the driving experience, with respondents agreeing that driving an electric vehicle is a pleasurable experience (M = 4.07, SD = 0.75) and that it provides a sense of enjoyment (M = 3.94, SD = 0.79). Furthermore, the unique features of electric vehicles were found to enhance the driving experience (M = 3.93, SD = 0.83). Collectively, the results suggest that electric vehicle users in Southern Leyte not only view EVs as practical but also enjoy the pleasure and fun associated with their use.

Effort Expectancy

	Items	Mean	Standard Deviation	Verbal Description
1.	It is easy for me to learn how to drive an electric vehicle.	3.54	0.87	Agree
2.	I can easily navigate an electric vehicle.	3.88	0.74	Agree
3.	I find the process of maintaining an electric vehicle simple.	3.97	0.86	Agree
5.	Driving an electric vehicle requires minimal physical effort.	3.23	0.97	Neutral
6.	The technology features in electric vehicles are simple and easy to use.	3.39	0.96	Neutral

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 7. Perception on the Effort Expectancy

Table 7 presents the respondents' perceptions regarding the effort expectancy of using electric vehicles. The highest mean score was observed for the item "I find the process of maintaining an electric vehicle simple" (M = 3.97, SD = 0.86), suggesting that respondents generally perceive the maintenance of EVs as straightforward and uncomplicated. Another item, "I can easily navigate an electric vehicle" (M = 3.88, SD = 0.74), reflects the ease with which users are able to drive electric vehicles, further reinforcing the perception of EVs as user-friendly. The item "It is easy for me to learn how to drive an electric vehicle" also received a favorable score (M = 3.54, SD = 0.87), indicating that learning to drive an EV is not seen as particularly difficult. However, two items related to physical effort, "Driving an electric vehicle requires minimal physical effort" (M = 3.23, SD = 0.97) and "The technology features in electric vehicles are simple and easy to use" (M = 3.39, SD = 0.96), received neutral responses, suggesting that respondents may not have a clear consensus on the effortlessness of certain aspects of EV usage, particularly related to driving and technology features. Overall, while most respondents perceive EVs as relatively easy to use and maintain, there is some ambiguity regarding the ease of driving and technology integration.

Performance Expectancy

	Items	Mean	Standard Deviation	Verbal Description
1.	Driving an electric vehicle improves my comfort experience.	4.13	0.79	Agree
2.	An electric vehicle delivers reliable performance for daily travel.	3.79	0.92	Agree

3.	Electric vehicle technology improvements increase reliability.	3.89	0.85	Agree
4.	An electric vehicle provides a convenient driving experience.	4.21	0.73	Strongly Agree
5.	I am confident that an electric vehicle will perform well under different road conditions.	3.52	1.00	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 8. Perception on the Performance Expectancy

Table 8 presents the respondents' perceptions regarding the performance expectancy of electric vehicles. The highest mean score was recorded for the item "An electric vehicle provides a convenient driving experience" (M = 4.21, SD = 0.73), indicating that respondents strongly agree that EVs offer convenience in their daily use. Similarly, the item "Driving an electric vehicle improves my comfort experience" (M = 4.13, SD = 0.79) also received a favorable response, highlighting that users find the driving experience more comfortable. Additionally, respondents agreed that electric vehicles deliver reliable performance for daily travel (M = 3.79, SD = 0.92) and that technological improvements in EVs increase reliability (M = 3.89, SD = 0.85), suggesting confidence in the overall performance of EVs. The item "I am confident that an electric vehicle will perform well under different road conditions" (M = 3.52, SD = 1.00) received a slightly lower score but still indicates agreement with the idea that EVs can handle diverse driving conditions. Overall, the responses suggest that respondents view electric vehicles as providing a reliable, comfortable, and convenient driving experience, with some confidence in their performance across varying conditions.

Perceived Physical Risk

	Items	Mean	Standard Deviation	Verbal Description
1.	I am concerned about potential injuries if an electric vehicle is involved in a crash.	4.26	0.74	Strongly Agree
2.	I am concerned about battery risks such as overheating during operation.	4.23	0.80	Strongly Agree
3.	I fear the potential risk of electric shock when charging an electric vehicle.	4.07	0.81	Agree
4.	I worry about the security of an electric vehicle while driving.	4.25	0.74	Strongly Agree
5.	I am concerned about the risk of malfunction due to poor road conditions or weather.	4.20	0.74	Strongly Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 9. Perception on the Physical Risk

Table 9 presents the respondents' perceptions regarding the physical risk associated with electric vehicles. The highest mean scores were observed for the items related to safety concerns, with respondents strongly agreeing that they are worried about the potential for injuries in the event of a crash involving an electric vehicle (M = 4.26, SD = 0.74), battery risks such as overheating during operation (M = 4.23, SD = 0.80), and the security of an electric vehicle while driving (M = 4.25, SD = 0.74). These findings suggest that safety and security are major concerns among EV users. Additionally, respondents also expressed strong concerns about the risk of malfunction due to poor road conditions or adverse weather (M = 4.20, SD = 0.74). There was also significant agreement regarding fears of electric shock during charging (M = 4.07, SD = 0.81). Collectively, these results indicate that while electric vehicles are generally favored for their benefits, there is a high level of concern regarding the physical risks associated with their use, particularly in terms of safety, battery risks, and operational reliability.

Perceived Functional Risk

	Items	Mean	Standard Deviation	Verbal Description
1.	I worry that an electric vehicle's battery life may not be reliable over time.	3.83	0.83	Agree
2.	I am uncertain about how well an electric vehicle will perform on long-distance trips.	4.13	0.72	Agree
3.	I have concerns about the long-term durability of an electric vehicle.	3.69	0.84	Agree
4.	I am not sure about the long-term durability of an electric vehicle.	3.52	0.88	Agree
5.	I worry that an electric vehicle may not provide a stable driving experience.	3.94	0.76	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 10. Perception on the Perceived Functional Risk

Table 10 presents the respondents' perceptions regarding the functional risk of electric vehicles. The respondents expressed agreement with several concerns about the functionality and long-term performance of electric vehicles. The highest mean score was recorded for the item "I am uncertain about how well an electric vehicle will perform on long-distance trips" (M = 4.13, SD = 0.72), suggesting significant uncertainty about the ability of EVs to perform over extended distances. Respondents also agreed that they worry about the reliability of an electric vehicle's battery life over time (M = 3.83, SD = 0.83), indicating concerns about battery longevity. Additionally, there were concerns about the long-term durability of electric vehicles, as reflected in the items "I have concerns about the long-term durability of an electric vehicle" (M = 3.69, SD = 0.84) and "I am not sure about the long-term durability of an electric vehicle" (M = 3.52, SD = 0.88). Lastly, the item "I worry that an electric vehicle may not provide a stable driving experience" (M = 3.94, SD = 0.76) showed agreement, indicating concerns about the overall reliability of the EV's performance. These results suggest that functional risks are a significant concern for users, particularly regarding battery life, long-distance performance, and durability.

Perceived Financial Risk

	Items	Mean	Standard Deviation	Verbal Description
1.	I hesitate to purchase an electric vehicle because of its high initial cost.	4.09	0.86	Agree
2.	I worry about the expense of replacing an electric vehicle's parts after years of use.	3.96	0.91	Agree
3.	I worry about unexpected repair costs for an electric vehicle.	3.89	0.95	Agree
4.	I'm worried about how much it costs to own an electric vehicle compared to a gasoline car.	3.92	0.86	Agree
5.	I worry that higher electricity rates will increase the cost of charging an electric vehicle.	3.83	0.96	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 11. Perception on the Perceived Financial Risk

Table 11 highlights the respondents' perceptions of financial risk associated with owning and operating an electric vehicle. The results indicate a general agreement across all items, reflecting widespread financial apprehension among respondents. The highest mean score was observed in the item "I hesitate to purchase an electric vehicle because of its high initial cost" (M = 4.09, SD = 0.86), suggesting that the upfront price is a significant barrier. Concerns also emerged regarding long-term expenses, such as replacing parts (M = 3.96, SD = 0.91), unexpected repairs (M = 3.89, SD = 0.95), and the ongoing cost of ownership compared to gasoline vehicles (M = 3.92, SD = 0.86). Additionally, respondents were wary of the potential impact of rising electricity rates on charging costs (M = 3.83, SD = 0.96). Collectively, these findings underscore those financial considerations, both immediate and future-related, significantly influence consumer perceptions and decisions surrounding electric vehicle adoption.

Perceived Social Risk

	Items	Mean	Standard Deviation	Verbal Description
1.	I am concerned that driving an electric vehicle may negatively affect my social status.	3.97	0.89	Agree
2.	I worry that my friends might disapprove of my decision to use an electric vehicle.	3.93	0.83	Agree
3.	I feel that people might judge me based on my choice to use an electric vehicle.	3.96	0.79	Agree
4.	I worry that people may view my decision to purchase an electric vehicle as unusual.	3.88	0.86	Agree
5.	I fear that using an electric vehicle might not align with societal expectations	3.69	0.87	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 12. Perception on the Perceived Social Risk

Table 12 presents respondents' perceptions of social risk associated with electric vehicle (EV) usage. The results reveal a consistent level of agreement across all items, indicating that social perceptions play a noteworthy role in shaping attitudes toward EV adoption. The item "I am concerned that driving an electric vehicle may negatively affect my social status" received the highest mean score (M = 3.97, SD = 0.89), highlighting apprehensions about the potential impact on social image. Similarly, concerns were evident regarding peer disapproval (M = 3.93, SD = 0.83), being judged (M = 3.96, SD = 0.79), and perceptions of being unconventional for choosing an EV (M = 3.88, SD = 0.86). Even broader social alignment was questioned, as shown by the item "I fear that using an electric vehicle might not align with societal expectations" (M = 3.69, SD = 0.87). These findings indicate that despite the environmental and functional advantages of EVs, social acceptance remains a potential barrier, influencing personal comfort and decisions related to EV ownership.

Perceived Time Risk

	Items	Mean	Standard Deviation	Verbal Description
1.	I worry that charging an electric vehicle takes too much time.	3.62	0.78	Agree
2.	I am concerned about the potential time it might take to find an available charging station.	3.63	0.74	Agree
3.	I am worried that long trips using an electric vehicle could lead to unexpected delays.	3.48	0.81	Agree
4.	I worry that unavailable charging stations will cause unexpected delays in my activities.	3.67	0.81	Agree
5.	I fear that using an electric vehicle on long trips will result in unexpected time delays.	3.73	0.84	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 13. Perception on the Perceived Time Risk

Table 13 outlines respondents' perceptions regarding perceived time risk related to the use of electric vehicles (EVs). Across all five items, the respondents consistently expressed agreement, indicating notable concerns about time-related inconveniences associated with EV usage. The highest mean was noted in the item "I fear that using an electric vehicle on long trips will result in unexpected time delays" (M = 3.73, SD = 0.84), followed closely by "I worry that unavailable charging stations will cause unexpected delays in my activities" (M = 3.67, SD = 0.81). These concerns underscore a common anxiety surrounding infrastructure limitations and the availability of charging stations. Furthermore, items such as "I worry that charging an electric vehicle takes too much time" (M = 3.62, SD = 0.78), "I am concerned about the potential time it might take to find an available charging station" (M = 3.63, SD = 0.74) suggest that charging duration and accessibility are viewed as potential obstacles to seamless travel and item "I am worried that long trips using an electric vehicle could lead to unexpected delays" (M=3.48, SD=0.81) agreed that they worried using EV in long trips. Overall, the findings reflect a general caution among users about potential time inefficiencies, particularly during long-distance trips or in scenarios with limited charging infrastructure.

Intention to Adopt Electric Vehicle

Items	Mean	Standard Deviation	Verbal Description
1. I have a positive view of using an electric vehicle for daily transportation.	3.66	0.86	Agree
2. I believe using an electric vehicle is a smart decision.	3.62	0.84	Agree
3. I would feel proud to own an electric vehicle.	3.63	0.87	Agree
4. I think using an electric vehicle would make my daily life more convenient.	3.53	0.90	Agree
5. I feel excited about switching to an electric vehicle for its environmental benefits.	3.72	0.85	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 14. Perception on the Intention to Adopt Electric Vehicle

Table 14 presents the respondents' perception of their intention to adopt electric vehicles, revealing a generally favorable outlook. All items received a verbal description of "Agree," indicating a positive disposition toward transitioning to electric mobility. The highest mean score was observed in the item "I feel excited about switching to an electric vehicle for its environmental benefits" (M = 3.72, SD = 0.85), highlighting the respondents' appreciation for sustainability and eco-conscious decision-making. Other closely rated items, such as "I have a positive view of using an electric vehicle for daily transportation" (M = 3.66, SD = 0.86) and "I would feel proud to own an electric vehicle" (M = 3.63, SD = 0.87), underscore a strong sense of personal and social satisfaction associated with EV ownership. Additionally, responses to "I believe using an electric vehicle is a smart decision" (M = 3.62, SD = 0.84) and "I think using an electric vehicle would make my daily life more convenient" (M = 3.53, SD = 0.90) reflect perceived practicality and rationality in adopting EVs. Overall, the data indicates that respondents are inclined toward adopting electric vehicles, motivated by environmental consciousness, personal pride, and perceived utility.

Subject Norm

Items	Mean	Standard Deviation	Verbal Description
1. My friends believe that I should drive an electric vehicle.	3.79	0.87	Agree
2. My family supports my decision to drive an electric vehicle.	3.78	0.84	Agree
3. Social norms influence my choice to switch to an electric vehicle.	3.80	0.92	Agree
4. I feel influenced by my friends' opinions when deciding whether to buy an electric vehicle.	3.71	0.89	Agree
5. My family recommends that I use an electric vehicle.	3.70	0.91	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 15. Perception on the Subject Norm

Table 15 outlines respondents' perceptions regarding subjective norms related to the adoption of electric vehicles, with all five items receiving a verbal description of "Agree." This suggests that social influence plays a considerable role in shaping individuals' decisions to consider electric vehicles. The item "Social norms influence my choice to switch to an electric vehicle" garnered the highest mean (M = 3.80, SD = 0.92), emphasizing the broader societal pressure or expectations perceived by the respondents. Close behind are "My friends believe that I should drive an electric vehicle" (M = 3.79, SD = 0.87) and "My family supports my decision to drive an electric vehicle" (M = 3.78, SD = 0.84), indicating a strong influence from both peer and familial circles. Meanwhile, the items "I feel influenced by my friends' opinions when deciding whether to buy an electric vehicle" (M = 3.71, SD = 0.89) and "My family recommends that I use an electric vehicle" (M = 3.70, SD = 0.91) further reinforce the notion that personal networks are significant in shaping the intention to adopt EVs. Overall, these findings reflect that the opinions and endorsements from friends and family are key factors in respondents' openness to electric vehicle adoption.

Perceived Behavioral Control

Items	Mean	Standard Deviation	Verbal Description
1. I can afford the costs of purchasing an electric vehicle for daily use.	3.42	0.84	Agree
2. I know how to operate an electric vehicle for commuting long-distance travel.	3.55	0.85	Agree
3. I can manage the charging process at home and public charging stations.	3.54	0.83	Agree
4. I can easily adapt to using an electric vehicle on various road conditions.	3.47	0.87	Agree
5. I have control over my decision to switch from a gasoline car to an electric vehicle.	3.53	0.81	Agree

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 16. Perception on the Perceived Behavioral Control

Table 16 presents the respondents' perception of Perceived Behavioral Control in relation to adopting electric vehicles, with all five items receiving a verbal description of "Agree." This indicates that participants generally feel confident in their ability to adopt and use electric vehicles. The highest-rated statement was "I know how to operate an electric vehicle for commuting long-distance travel" (M = 3.55, SD = 0.85), suggesting a solid level of competence and familiarity with EV operation among respondents. This is closely followed by "I can manage the charging process at home and public charging stations" (M = 3.54, SD = 0.83) and "I have control over my decision to switch from a gasoline car to an electric vehicle" (M = 3.53, SD = 0.81), indicating perceived ease in managing logistical and personal autonomy aspects of EV adoption. Meanwhile, "I can easily adapt to using an electric vehicle on various road conditions" (M = 3.47, SD = 0.87) and "I can afford the costs of purchasing an electric vehicle for daily use" (M = 3.42, SD = 0.84) had slightly lower but still favorable means, reflecting moderate confidence in financial feasibility and road adaptability. Collectively, these results highlight that while there are varying degrees of confidence, respondents generally believe they have the necessary resources, knowledge, and control to transition to electric vehicle use.

Facilitating Condition

Items	Mean	Standard Deviation	Verbal Description
1. I can easily find charging stations near my home.	3.26	0.98	Neutral
2. Government programs support the availability of public charging stations.	3.24	0.96	Neutral
3. I have access to reliable infrastructure for maintaining my electric vehicle.	3.02	0.97	Neutral
4. Charging stations along main routes make electric vehicle use more convenient.	3.18	0.98	Neutral

5.	I can rely on available maintenance services for my electric vehicle during repair.	3.14	0.95	Neutral

Legend:4.21-5.00=Strongly Agree; 3.41-4.20=Agree; 2.61-3.40=Neutral; 1.81-2.60=Disagree; 1.00-1.80=Strongly Disagree

Table 17. Perception on the Facilitating Condition

Table 17 outlines the respondents' perception of Facilitating Condition—factors that support the use and maintenance of electric vehicles. All five items received a verbal description of "Neutral," indicating a lack of strong agreement or disagreement about the adequacy of support systems and infrastructure. The item "I can easily find charging stations near my home" received the highest mean score (M = 3.26, SD = 0.98), closely followed by "Government programs support the availability of public charging stations" (M = 3.24, SD = 0.96). "Charging stations along main routes make electric vehicle use more convenient" also scored relatively high (M = 3.18, SD = 0.98), suggesting that while main-route accessibility may be acknowledged, the level of convenience still falls short of strong user confidence. Meanwhile, "I can rely on available maintenance services for my electric vehicle during repair" received a moderate score (M = 3.14, SD = 0.95), reflecting continued uncertainty about the reliability and availability of technical support. The lowest-rated item, "I have access to reliable infrastructure for maintaining my electric vehicle" (M = 3.02, SD = 0.97), underscores a concern over the adequacy of after-sales and maintenance infrastructure. Collectively, the neutral ratings across all items suggest that respondents neither feel completely supported nor entirely unsupported by the existing infrastructure and policies. This reveals a critical gap in facilitating conditions particularly in areas such as roadside charging availability, dependable maintenance services, and visible government-backed programs. Such gaps may hinder wider adoption and consistent use of electric vehicles, emphasizing the need for targeted infrastructure investments and awareness campaigns to enhance user confidence and experience.

Overall Perception of the Constructs in the Model

	Items	Mean	Standard Deviation	Verbal Description
1.	Habit	4.25	0.71	Strongly Agree
2.	Price Value	3.65	0.85	Agree
3.	Hedonic Motivation	4.05	0.77	Agree
4.	Effort Expectancy	3.60	0.88	Agree
5.	Performance Expectancy	3.91	0.86	Agree
6.	Perceived Physical Risk	4.20	0.76	Strongly Agree
7.	Perceived Function Risk	3.82	0.80	Agree
8.	Perceived Financial Risk	3.94	0.91	Agree
9.	Perceived Social Risk	3.89	0.85	Agree
10.	Perceived Time Risk	3.63	0.80	Agree
11.	Intention to Adopt Electric Vehicle	3.63	0.87	Agree
12.	Subject Norm	3.76	0.89	Agree
13.	Perceived Behavioral Control	3.50	0.84	Agree
14.	Facilitating Condition	3.17	0.97	Neutral

Table 18. Overall Perception of the Constructs in the Model

Moderately rated constructs such as Performance Expectancy (M = 3.91, SD = 0.86), Perceived Financial Risk (M = 3.94, SD = 0.91), and Perceived Social Risk (M = 3.89, SD = 0.85) suggest that while users recognize EVs' potential benefits in performance and sustainability, there remain financial concerns and societal pressures influencing adoption decisions. Similarly, Effort Expectancy (M = 3.60, SD = 0.88) and Perceived Behavioral Control (M = 3.50, SD = 0.84) indicate that although EVs are perceived as relatively easy to use, users may still lack full confidence in their ability to shift away from conventional vehicles. The Intention to Adopt Electric Vehicle (M = 3.63, SD = 0.87) reflects a moderately positive attitude toward adoption, tempered by lingering concerns. Notably, Facilitating Condition (M = 3.17, SD = 0.97) was the lowest-rated construct with the highest variability, indicating a lack of agreement and uncertainty about the adequacy of charging infrastructure, government incentives, and other enabling factors. Addressing these infrastructural and policy gaps is essential to improving public confidence and accelerating EV adoption on a larger scale.

Moderating effect of age on the relationship between perceived behavioral control and the intention to adopt electric vehicles

Predicted that the connection between the intention to adopt electric cars (ITAEV) and perceived behavioral control (PBC) would be considerably moderated by age. However, age did not significantly mitigate this link, according to the study's empirical results ($\beta = 0.036$, p-value = 0.345, $f^2 = 0.007$). These figures demonstrate that people's perceptions of behavioral control, such as their perceived capacity, confidence, or ease of adopting EVs, do not significantly increase or decrease with age in Southern Leyte. This implies that age does not significantly change this behavioral mechanism and that the impact of PBC on EV adoption plans is rather consistent among younger and older respondents. Supporting studies align with this finding by suggesting that age differences do not always translate into meaningful variations in perceived control. Zaino et al. (2024) similarly noted that sustained engagement tends to reduce generational gaps in technological capability. Conversely, several studies contradict these findings by reporting that age can significantly shape how perceived behavioral control influences adoption intentions. Featherman et al. (2021), found that younger consumers often exhibit stronger PBC–intention relationships due to higher confidence in handling new technologies.

The finding that age moderates the PBC-ITAEV relationship, although with a small effect size, implies that older individuals in Southern Leyte feel more dependent on external factors like availability of charging stations, ease of use, and reliability when deciding to adopt EVs. Younger individuals, possibly more adaptable or tech-savvy, may not heavily weigh these constraints. This suggests that interventions promoting EV adoption should not adopt a "one-size-fits-all" model but instead tailor messages and support systems according to age groups. Younger consumers might respond more to incentives and innovation-driven campaigns, while older consumers might prioritize training, reliability, and tangible support services. Overall, age-based segmentation appears to be a subtle yet meaningful strategic consideration in promoting EVs locally. Theoretically, this finding strengthens the argument for integrating demographic moderators like age into technology acceptance models, particularly the Theory of Planned Behavior (Ajzen, 1991). Khan & Hoque (2022), argued that socio-demographic factors, especially age, can significantly alter the weight of TPB constructs in EV adoption, validating the moderating role identified here. Incorporating age helps refine predictions of intention-behavior gaps, highlighting that perceived behavioral control does not operate uniformly across all population segments. This suggests that existing models should move beyond generalized constructs and account for demographic nuances when applied to emerging technologies like EVs. Recognizing age differences enhances model applicability in real-world, diverse socio-economic contexts, particularly in developing regions.

In the Philippine context, the rollout of electric jeepneys (e-jeepneys) in Iloilo City provides a fitting example. Gumasing et al., (2024) documented that while younger drivers quickly adapted to the e-jeepneys, older drivers initially expressed hesitations due to unfamiliarity with the technology and operational concerns. However, after training sessions, demonstration drives, and dedicated support lines were established, older drivers gradually embraced the new system. This mirrors the study's finding that increasing perceived behavioral control among older age groups effectively enhances adoption intention. Structured support, patient education, and easing technical barriers proved vital in bridging the generational gap in technology acceptance. Applying similar strategies to Southern Leyte's EV promotion would likely yield comparable results.

Moderating effect of income on the relationship between perceived behavioral control and the intention to adopt electric vehicles

Predicted that household monthly income level (HILM) would significantly moderate the relationship between perceived behavioral control (PBC) and the intention to adopt electric vehicles (ITAEV). However, the empirical results from this study show no significant moderating effect of income on this relationship ($\beta = 0.066$, p-value = 0.233, $f^2 = 0.010$). These values indicate that income level does not meaningfully strengthen or weaken how individuals perceived behavioral control such as beliefs about affordability, access, and ease of operating EVs influences their intention to adopt electric vehicles in Southern Leyte. Whether households have higher or lower income, their sense of control exerts a similar influence on EV adoption intentions, suggesting that financial capacity does not substantially alter the role of PBC in this context. Supporting studies provide insights consistent with this outcome.

Theoretically, this result supports the idea that in early-stage EV markets, perceived behavioral control is a primary determinant of adoption, relatively independent of socio-economic factors like income. Lee et al. (2025) emphasized that in developing contexts, PBC holds more predictive power than demographic moderators. Therefore, in theoretical models like the Theory of Planned Behavior (TPB), the direct relationship between PBC and behavioral intention should be prioritized over socio-economic moderators, particularly in emerging markets where systemic barriers (e.g., infrastructure) dominate individual financial capability considerations. Practically, efforts should focus on enabling conditions rather than differentiated subsidies or marketing programs based on income levels. Wang et al., (2023) showed that enhancing accessibility (e.g., test drive availability, charging station expansion) universally improved adoption rates. In Southern Leyte, providing affordable and accessible EV-related facilities and programs would create a sense of feasibility across both lower- and higher-income households, bypassing the need for income-specific interventions.

Moderating effect of educational attainment on the relationship between perceived behavioral control and the intention to adopt electric vehicles

Proposed that educational attainment (EA) would moderate the relationship between perceived behavioral control (PBC) and the intention to adopt electric vehicles (ITAEV). However, the empirical results from this study show that educational attainment does not significantly influence this relationship ($\beta = 0.023$, p-value = 0.402, $f^2 = 0.003$). These findings indicate that education level does not strengthen or weaken how individuals perceived control such as affordability, ease of use, or accessibility of EVs shapes their intention to adopt electric vehicles in Southern Leyte. Regardless of whether respondents have higher or lower educational backgrounds, their sense of behavioral control similarly influences their likelihood of considering EV adoption. Supporting studies align with these results by suggesting that education does not automatically translate into increased perceived control. Featherman et al. (2021), observed that psychological barriers can diminish the positive effects of education on adoption-related judgments.

The result suggests that educational attainment is not a decisive factor in strengthening the relationship between perceived behavioral control and the intention to adopt EVs. Whether highly educated or not, individuals rely more on tangible factors such as affordability, access to charging infrastructure, and maintenance ease. This reflects that in Southern Leyte, educational achievements do not necessarily translate into higher capacity or confidence to overcome adoption barriers. It highlights a practical reality where logistical and economic conditions outweigh cognitive or informational advantages brought by education. In areas with underdeveloped EV ecosystems, tangible enablers matter more than demographic attributes like education level. Therefore, educational attainment alone is insufficient to foster higher EV adoption unless accompanied by systemic support. Theoretically, the findings suggest that traditional models like TPB or TAM (Technology Acceptance Model) might overstate the role of socio-demographic factors like education in emerging economies. Lee et al. (2025) suggested that education could boost behavioral control and adoption; however, the current study indicates that contextual barriers neutralize this effect. Thus, theoretical frameworks must account for situational constraints such as infrastructure, cost, and technology access, which can overpower individual characteristics. Scholars should consider integrating socio-structural variables (e.g., regional development, market readiness) into behavioral intention models. This challenges the universality of demographic moderators in technology adoption models, calling for more context-sensitive adaptations.

An illustrative case in the Philippine setting is the Quezon City e-vehicle program, where even residents with lower educational backgrounds successfully adopted electric tricycles (e-trikes) after supportive measures were introduced. This mirrors the current finding: educational attainment did not significantly influence adoption once perceived control and external support were adequately addressed. Similarly, Gumasing et al. (2024) observed that familiarity with the technology, hands-on demonstrations, and practical benefits mattered more than formal education levels. This suggests that in Southern Leyte, public programs should focus more on enabling mechanisms and direct support rather than relying on educational profiles.

Findings of the Study

This study involved 120 validated respondents from Southern Leyte, Philippines, selected through rigorous quality control procedures including standard deviation screening and sincerity checks. Demographically, the sample was predominantly male (88%), with the largest age group being 36–45 years old (38%), followed by those aged 26–35 (29%) and 18–25 (28%), indicating that EV usage is prevalent among working-age adults. Educational levels were equally distributed, with 44% having completed college or graduate education and another 44% having completed high school or vocational training. A significant portion (81%) were married, and 90% operated a single EV, reflecting mostly personal use. Half of the respondents reported monthly incomes between Php 21,194 and Php 43,828, pointing to middle-income adoption behavior. Perceived Behavioral Control ($\beta = 0.321$, $p = 0.361$) and Facilitating Conditions ($\beta = 0.679$, $p < 0.001$) also failed to show significant direct effects on intention, despite theoretical expectations. Additionally, moderating effects of age ($\beta = -0.036$, $p = 0.345$), income ($\beta = 0.066$, $p = 0.233$), and educational attainment ($\beta = 0.023$, $p = 0.402$) on the relationship between perceived behavioral control and intention were statistically unsupported. Overall, these findings highlight that performance perception and social influence are the primary drivers of EV adoption in Southern Leyte. Psychological factors such as enjoyment and habit, along with risk perceptions and demographic characteristics, played limited roles. Addressing infrastructural and policy gaps may enhance adoption further, but targeted efforts should focus on leveraging social norms and demonstrating the performance benefits of EVs to encourage broader uptake.

Conclusion and Recommendations

This study examined the adoption of electric vehicles among users in Southern Leyte, Philippines, through the integrated framework of the Unified Theory of Acceptance and Use of Technology (UTAUT) and the Theory of Planned Behavior (TPB). The findings reveal that habit and perceived physical risk were the most prominently rated constructs, reflecting that while EV use has become a routine practice among respondents, safety concerns surrounding battery overheating, crash risks, and operational reliability remain deeply felt. Performance expectancy and subjective norms emerged as the principal drivers of adoption intention, confirming that users are most motivated to adopt EVs when they perceive clear functional advantages and when their immediate social environment — family, peers, and community — actively endorses the decision. In contrast, facilitating conditions received the lowest rating of all constructs, with respondents expressing only neutral perceptions regarding the availability of charging stations, government support programs, and maintenance services, underscoring a critical infrastructure gap that continues to constrain broader EV uptake in the region. Equally significant is the finding that the demographic variables of age, income, and educational attainment did not significantly moderate the relationship between perceived behavioral control and the intention to adopt electric vehicles. This outcome challenges common theoretical assumptions that socio-demographic factors substantially reshape behavioral constructs in technology adoption models. Instead, the study demonstrates that in a rural, infrastructure-limited context such as Southern Leyte, adoption behavior is governed more by situational and systemic factors — particularly the adequacy of facilitating conditions and the weight of social influence — than by individual demographic characteristics. In light of these conclusions, the following recommendations are advanced. Local government units and national agencies should prioritize the expansion of EV-supportive infrastructure, including strategically located charging stations along major routes, accessible maintenance hubs, and transparent financing programs that lower the barrier of high upfront costs for all income groups. EV adoption campaigns should be community-centered and socially framed, leveraging the strong influence of family and peer networks by incorporating testimonials, live demonstrations, and endorsements from trusted community figures to build confidence and normalize EV use. Finally, future research should explore additional moderating variables such as geographic remoteness, cultural values, and prior technology familiarity, and should consider longitudinal designs to track how adoption behavior evolves as infrastructure and policy support in Southern Leyte continue to mature.

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Data sharing is not applicable to this article as no new data were created or analyzed in this study; all data used were obtained from previously published sources as cited in the reference list.

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Appendices

No appendices are attached to this study.