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INTEGRATION OF TECHNOLOGY ACCEPTANCE MODEL - THEORY OF PLANNED BEHAVIOR IN EXPLAINING ELECTRIC VEHICLE PURCHASE INTENTION THROUGH WILLINGNESS TO PAY

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ABSTRACT

This study examines the determinants of electric vehicle (EV) purchase intention in Indonesia by integrating the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) through attitude and willingness to pay (WTP) as sequential mediating mechanisms. Addressing inconsistent empirical findings in prior literature regarding ease of use, infrastructure, and green lifestyle, this research offers novelty by combining psychological evaluations and financial commitments into a unified framework. A quantitative approach was applied using purposive sampling, collecting primary data via an online survey targeting Indonesian individuals aged 17 and older who are familiar with EVs and possess potential purchase interest. Data were analyzed using Structural Equation Modeling–Partial Least Squares (SEM-PLS) via SmartPLS 4. The model demonstrates strong predictive power, explaining variance in attitude ($R^2 = 0.631$), WTP ($R^2 = 0.628$), and purchase intention ($R^2 = 0.707$). The main findings reveal that attitude and WTP significantly drive purchase intention. Subjective norm, perceived usefulness, and battery warranty positively shape attitude, while price perception and perceived behavioral control enhance WTP. Conversely, perceived ease of use and charging infrastructure show no significant direct impacts, whereas green lifestyle and battery warranty negatively affect WTP. Theoretically, this study extends TAM and TPB by framing WTP as an economic bridge transforming attitudes into purchase decisions in emerging markets. Practically, it guides policymakers to maintain targeted fiscal incentives and assists automotive manufacturers in aligning pricing with perceived value.

Keywords: Electric Vehicle, Technology Acceptance Model, Theory Of Planned Behavior, Willingness To Pay, Purchase Intention

ABSTRAK

Penelitian ini bertujuan menganalisis determinan niat pembelian kendaraan listrik (electric vehicle/EV) di Indonesia dengan mengintegrasikan Technology Acceptance Model (TAM) dan Theory of Planned Behavior (TPB) melalui attitude dan willingness to pay (WTP) sebagai variabel mediasi berurutan. Untuk mengatasi ketidakpastian temuan terdahulu mengenai kemudahan penggunaan, infrastruktur, dan gaya hidup hijau, kebaruan penelitian ini terletak pada penggabungan evaluasi psikologis dan komitmen finansial ke dalam satu kerangka kerja yang utuh. Pendekatan kuantitatif diterapkan menggunakan teknik purposive sampling dengan mengumpulkan data primer melalui kuesioner daring kepada masyarakat Indonesia berusia minimal 17 tahun yang mengenal dan berminat pada kendaraan listrik. Data dianalisis menggunakan Structural Equation Modeling–Partial Least Squares (SEM-PLS) melalui SmartPLS 4. Evaluasi model menunjukkan daya prediktif yang kuat pada attitude ($R^2 = 0{,}631$), WTP ($R^2 = 0{,}628$), dan niat pembelian ($R^2 = 0{,}707$). Temuan utama menunjukkan bahwa attitude dan WTP berpengaruh positif signifikan terhadap niat pembelian. Subjective norm, perceived usefulness, dan battery warranty terbukti membentuk sikap positif, sedangkan price perception dan perceived behavioral

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control meningkatkan WTP. Sebaliknya, perceived ease of use dan infrastruktur pengisian daya tidak berpengaruh signifikan, sementara green lifestyle dan battery warranty berpengaruh negatif terhadap WTP. Secara teoretis, penelitian ini memperluas kerangka TAM dan TPB dengan menegaskan peran WTP sebagai jembatan ekonomi di pasar berkembang. Secara praktis, hasil ini memberikan panduan bagi pemerintah dalam mempertahankan insentif fiskal serta membantu produsen otomotif merancang strategi harga berbasis nilai.

Kata Kunci: Kendaraan Listrik, Technology Acceptance Model, Theory Of Planned Behavior, Willingness To Pay, Niat Pembelian

I. INTRODUCTION

As global efforts to mitigate climate change intensify, decarbonizing the transport sector has become a critical imperative, prompting governments worldwide to accelerate the transition toward electric vehicles (EVs) as a cleaner mobility solution (Ajzen, 1991; Davis, 1989). Beyond curtailing reliance on fossil fuels, electric vehicles offer superior energy efficiency and contribute directly to sustainable development goals (Paul et al., 2016; Wang et al., 2018). In Indonesia, the government has actively fostered EV adoption through targeted policy frameworks, including purchase tax incentives, accelerated deployment of Public Electric Vehicle Charging Stations (SPKLU), and the expansion of a localized battery supply chain (Hao et al., 2025; Sri Hayati & Iwan Ekawanto, 2025).

However, despite aggressive regulatory backing and growing public awareness, the actual market penetration of electric vehicles in Indonesia remains relatively low compared to the vast potential of its national automotive market (Hao et al., 2025; Wang et al., 2018). This practical paradox indicates that macro-level incentives alone do not automatically drive consumer adoption, as buying decisions are shaped by a complex interplay of technical, psychological, social, and economic considerations (Arrinda et al., 2022; Le et al., 2026; Naufal et al., 2024; Yeğin & Ikram, 2022). The persistent gap between top-down government ambitions and actual market realization highlights an urgent practical problem: understanding the true underlying mechanisms that govern prospective Indonesian buyers' willingness to commit financially to electric vehicles (Sri Hayati & Iwan Ekawanto, 2025; Wang et al., 2018).

Although scholars frequently employ the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) to investigate pro-environmental technology adoption (Davis, 1989; Wang et al., 2018), existing literature exhibits notable empirical inconsistencies and theoretical limitations. Empirically, while classical paradigms assert that perceived ease of use and physical charging infrastructure are critical adoption drivers (Davis, 1989; Hao et al., 2025), recent studies in emerging markets counter that ease of use has evolved into a baseline expectation due to rising tech literacy, while physical infrastructure alone fails to directly induce sales without economic justification (Naufal et al., 2024; Sri Hayati & Iwan Ekawanto, 2025). Furthermore, although green lifestyles are presumed to motivate sustainable consumption (Le et al., 2026), empirical evidence frequently reveals an "attitude–behavior gap" where pro-environmental sentiments fail to translate into financial sacrifices (Paul et al., 2016). Theoretically, standard TAM and TPB applications evaluate functional or socio-psychological perceptions in isolation, largely overlooking the explicit monetary evaluation—namely, Willingness to Pay (WTP) that consumers must rationalize before executing a high-involvement purchase (Ajzen, 1991; Davis, 1989; Le et al., 2026).

To resolve these empirical contradictions and address the theoretical omission of financial commitment, this study offers novelty by developing an integrated conceptual framework combining TAM and TPB with Willingness to Pay (WTP) as a sequential mediating mechanism alongside consumer attitude. The objective of this research is to analyze the direct and indirect structural pathways through which technological perceptions (TAM) and socio-psychological factors (TPB) convert into affective evaluations (attitude), monetary valuation (WTP), and ultimately purchase intentions. Theoretically, this study extends the technology adoption literature in emerging markets by establishing WTP as an indispensable economic bridge that transforms psychological evaluations into concrete behavioral decisions. Practically, the findings deliver actionable insights for policymakers to recalibrate fiscal subsidies to close the attitude-behavior gap, while providing automotive managers with strategic

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guidance to optimize value-based pricing and position battery warranties as baseline standard features (Hao et al., 2025; Le et al., 2026; Sri Hayati & Iwan Ekawanto, 2025)

II. LITERATURE REVIEW

Theoretical Foundation

This study is anchored in a comprehensive synthesis of two dominant consumer behavior and technology adoption paradigms: the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB) (Ajzen, 1991; Davis, 1989). TAM posits that an individual's technology acceptance is dictated by cognitive evaluations of perceived usefulness and perceived ease of use (Davis, 1989; Naufal et al., 2024). Within the electric vehicle (EV) domain, TAM captures how functional utility, operational cost efficiency, and technological familiarity shape consumers' baseline evaluations (Davis, 1989; Hao et al., 2025). Conversely, TPB establishes that behavioral intention is governed by socio-psychological determinants: attitude toward the behavior, subjective norms (perceived social influences), and perceived behavioral control (perceived capability and resources) (Ajzen, 1991; Wang et al., 2018).

To address the limitations of applying TAM and TPB in isolation to high-involvement, capital-intensive mobility decisions, this study builds an integrated framework enhanced by Perceived Value theory and Willingness to Pay (WTP) (Ajzen, 1991; Davis, 1989; Le et al., 2026; Paul et al., 2016). Perceived Value operates as an overarching cognitive mechanism wherein consumers weigh perceived functional, eco-friendly, and utilitarian gains against perceived monetary and technical sacrifices (Le et al., 2026; Paul et al., 2016). TAM constructs (usefulness and ease of use) along with TPB constructs (subjective norms and behavioral control) initially shape the consumer's affective evaluation (Attitude) (Ajzen, 1991; Davis, 1989). However, positive attitude alone is insufficient to trigger purchase action unless it is converted into financial feasibility. Here, Willingness to Pay (WTP) serves as the crucial economic bridge, translating cognitive value assessments into an explicit monetary commitment (Le et al., 2026; Paul et al., 2016).

Furthermore, additional domain-specific constructs are deliberately incorporated into the model to capture the unique risk-reward profile of EV adoption in an emerging market context. Battery warranty and charging infrastructure were integrated to capture risk-reduction mechanisms; the former mitigates post-purchase financial anxieties over high battery replacement costs, while the latter alleviates range anxiety and enhances functional utility (Arrinda et al., 2022; Hao et al., 2025). Price perception was included to represent the perceived sacrifice dimension within value evaluation, directly influencing WTP (Le et al., 2026). Lastly, green lifestyle was incorporated to account for intrinsic pro-environmental values and moral obligations that drive sustainable consumer choices (Le et al., 2026; Paul et al., 2016). Together, this unified framework offers a multi-stage sequential pathway: technological and socio-environmental perceptions determine attitude, which in turn fuels financial readiness (WTP), ultimately crystallizing into purchase intention (Ajzen, 1991; Davis, 1989; Le et al., 2026).

Factors Influencing Attitude

Attitude represents an individual's affective evaluation and overall positive or negative disposition toward performing a specific behavior (Ajzen, 1991). Grounded in the Technology Acceptance Model (TAM), an individual's evaluation of an innovation is fundamentally driven by utilitarian cognitive assessments (Davis, 1989). When prospective buyers perceive high usefulness—such as operational cost efficiency, superior performance, and environmental benefits—they experience cognitive consistency that enhances their favorable evaluation of the vehicle (Davis, 1989; Naufal et al., 2024). High utilitarian value directly minimizes perceived cognitive dissonance regarding technological adoption (Davis, 1989). Empirically, empirical studies consistently validate that functional benefits strongly cultivate positive consumer attitudes toward electric mobility (Hao et al., 2025; Naufal et al., 2024). Thus, the proposed hypothesis is:

- H1: Perceived usefulness positively influences attitude (Davis, 1989; Hao et al., 2025; Naufal et al., 2024).

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Theoretical logic derived from TAM further posits that the effort required to use a technology dictates consumer willingness to adopt it (Davis, 1989). Perceived ease of use reduces psychological barriers, mental friction, and cognitive effort associated with operating new technology, thereby fostering a favorable overall attitude (Davis, 1989; Naufal et al., 2024). When operating, charging, and understanding an electric vehicle is perceived as effortless, consumers exhibit greater psychological comfort and positive affective response (Davis, 1989). Prior empirical literature corroborates that lower operational complexity directly enhances overall technology evaluation (Davis, 1989; Naufal et al., 2024). Therefore, the proposed hypothesis is:

- H2: Perceived ease of use positively influences attitude (Davis, 1989; Naufal et al., 2024).

According to the Theory of Planned Behavior (TPB), social expectations and normative pressures significantly shape individual psychological evaluations (Ajzen, 1991). Subjective norms reflect internalized social support and compliance with referent groups, such as family, peers, and society (Ajzen, 1991; Wang et al., 2018). Through social identity and normative influence mechanisms, approval from important referents validates the social desirability of electric vehicle ownership, strengthening the consumer's favorable attitude (Ajzen, 1991; Yeğin & Ikram, 2022). Empirical findings across sustainable behavior literature confirm that positive social endorsement reinforces individual affective orientation toward green products (Wang et al., 2018; Yeğin & Ikram, 2022). Thus, the proposed hypothesis is:

- H3: Subjective norm positively influences attitude (Ajzen, 1991; Wang et al., 2018; Yeğin & Ikram, 2022).

Grounded in Perceived Risk Theory, consumer adoption of high-involvement technology is heavily conditioned by risk perception and uncertainty (Arrinda et al., 2022). A battery warranty functions as a crucial structural assurance mechanism that mitigates perceived technical vulnerability and financial loss associated with battery degradation or failure (Arrinda et al., 2022). By lowering perceived risk, structural guarantees increase psychological security and trust in the technology, which in turn reinforces positive consumer attitudes (Arrinda et al., 2022). Empirical evidence demonstrates that post-purchase risk-mitigation guarantees strongly enhance overall consumer acceptance and attitude toward electric vehicles (Arrinda et al., 2022). Therefore, the proposed hypothesis is:

- H4: Battery warranty positively influences attitude (Arrinda et al., 2022).

Factors Influencing Willingness to Pay

Willingness to Pay (WTP) quantifies the maximum economic sacrifice a consumer is prepared to make to acquire a product based on its perceived net value (Le et al., 2026; Paul et al., 2016). Under Perceived Value Theory, structural risk mitigations directly impact the economic valuation of expensive technological assets (Arrinda et al., 2022; Le et al., 2026). A comprehensive battery warranty reduces expected future maintenance costs and asset depreciation risks, thereby increasing the total lifetime value perception of the EV (Arrinda et al., 2022). Lower anticipated financial risk allows consumers to rationalize higher upfront price tags (Arrinda et al., 2022). Empirical studies confirm that warranty coverage significantly conditions economic valuation and financial commitment (Arrinda et al., 2022). Accordingly, the proposed hypothesis is:

- H5: Battery warranty positively influences willingness to pay (Arrinda et al., 2022).

Grounded in Value-Attitude-Behavior Theory and altruistic consumption models, internal eco-centric values shape economic choices (Le et al., 2026; Paul et al., 2016). Consumers adhering to a green lifestyle derive psychological utility (e.g., warm-glow feelings and self-identity alignment) from pro-environmental behaviors (Le et al., 2026; Paul et al., 2016). This intrinsic environmental value enhances the subjective worth of green products, prompting individuals to accept premium prices as a necessary trade-off for environmental preservation (Le et al., 2026; Paul et al., 2016). Empirical research substantiates that strong ecological orientation elevates willingness to absorb green price premiums (Le et al., 2026; Paul et al., 2016). Thus, the proposed hypothesis is:

- H6: Green lifestyle positively influences willingness to pay (Le et al., 2026; Paul et al., 2016).

Under Transaction Cost Theory and utilitarian value framework, infrastructure availability reduces operational friction and transaction costs (Hao et al., 2025). Accessible and reliable charging

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infrastructure minimizes range anxiety, searching costs, and operational downtime, thereby elevating the overall functional utility of electric vehicles (Hao et al., 2025). Higher functional convenience justifies greater financial expenditure by providing higher practical utility (Hao et al., 2025). Empirical findings in transport literature confirm that infrastructure maturity positively conditions financial readiness to adopt EVs (Hao et al., 2025). Therefore, the proposed hypothesis is:

- H7: Charging infrastructure positively influences willingness to pay (Hao et al., 2025).

Based on Equity Theory and perceived price fairness principles, price perception reflects the balance between perceived economic sacrifices and received product quality (Le et al., 2026). When price perception is favorable, meaning the product price is judged as fair, reasonable, and commensurate with value consumers perceive high transaction fairness (Le et al., 2026). Perceived price fairness eliminates economic hesitation, directly boosting consumers' willingness to commit financial resources (Le et al., 2026). Empirical evidence confirms that fair price perceptions significantly drive consumer willingness to pay (Le et al., 2026). Thus, the proposed hypothesis is:

- H8: Price perception positively influences willingness to pay (Le et al., 2026).

According to the Theory of Planned Behavior (TPB), perceived behavioral control represents an individual's evaluation of the internal and external resources required to perform a behavior (Ajzen, 1991). In high-involvement purchases, higher perceived control manifested through financial self-efficacy, income capability, and information access empowers consumers by reducing perceived behavioral constraints (Ajzen, 1991; Yeğin & Ikram, 2022). Greater perceived financial control increases consumer readiness to execute monetary transactions (Ajzen, 1991). Empirical research supports that high behavioral control facilitates economic willingness and transaction execution (Ajzen, 1991; Yeğin & Ikram, 2022). Accordingly, the proposed hypothesis is:

- H9: Perceived behavioral control positively influences willingness to pay (Ajzen, 1991).

Grounded in the Attitude-Intention-Behavior hierarchy, affective evaluations precede financial readiness and behavioral commitment (Ajzen, 1991; Paul et al., 2016). A favorable attitude toward a product elevates its subjective overall worth, causing consumers to view the purchase as a beneficial trade-off rather than an unwanted expense (Ajzen, 1991; Paul et al., 2016). Strong positive attitude enhances overall perceived brand value, directly increasing the threshold of economic sacrifice a buyer is willing to absorb (Paul et al., 2016). Empirical studies in green marketing validate that positive attitudes serve as a primary catalyst for willingness to pay (Ajzen, 1991; Paul et al., 2016). Therefore, the proposed hypothesis is:

- H10: Attitude positively influences willingness to pay (Ajzen, 1991; Paul et al., 2016).

Drivers of Purchase Intention

Purchase intention represents the conscious cognitive commitment and probability of engaging in an actual buying behavior (Ajzen, 1991; Le et al., 2026). Within the core framework of TPB, attitude is the most direct affective antecedent of behavioral intention (Ajzen, 1991). Positive affective disposition creates motivational force, driving consumers from passive evaluation toward active purchase planning (Ajzen, 1991; Wang et al., 2018). Extensive empirical literature confirms that positive attitude is a consistent direct driver of purchase intention across technology and green innovation contexts (Ajzen, 1991; Sri Hayati & Iwan Ekawanto, 2025; Wang et al., 2018; Yeğin & Ikram, 2022). Thus, the proposed hypothesis is:

H11: Attitude positively influences purchase intention (Ajzen, 1991; Sri Hayati & Iwan Ekawanto, 2025; Wang et al., 2018; Yeğin & Ikram, 2022).

From an economic behavior perspective, willingness to pay reflects the critical financial bridge converting psychological interest into actionable intention (Le et al., 2026; Paul et al., 2016). In high-cost purchases like EVs, favorable psychological evaluation must overcome monetary barriers before an intention crystallizes (Le et al., 2026). When prospective buyers demonstrate high willingness to pay, it signifies that economic trade-off hurdles have been successfully overcome, dramatically increasing the likelihood that intention translates into concrete purchase execution (Le et al., 2026; Paul et al., 2016). Empirical evidence confirms that financial willingness directly predicts behavioral purchase intentions (Le et al., 2026; Paul et al., 2016). Therefore, the proposed hypothesis is:

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- H12: Willingness to pay positively influences purchase intention (Le et al., 2026).

III. RESEARCH METHOD

Research Design and Context

This study adopts a quantitative research design with an explanatory empirical approach to rigorously evaluate causal relationships, direct structural paths, and multi-stage sequential mediating effects within the integrated TAM-TPB model (Ajzen, 1991; Davis, 1989). The empirical setting focuses on the emerging electric vehicle (EV) market in Indonesia, a region undergoing dynamic regulatory developments and infrastructure expansion (Hao et al., 2025; Sri Hayati & Iwan Ekawanto, 2025). Primary data were gathered through a structured web-based questionnaire deployed via Google Forms, enabling broad geographic reach across major urban and suburban areas where EV adoption interest is concentrated.

Population, Sampling Procedure, and Response Rate

The target population encompasses Indonesian citizens who demonstrate familiarity with electric vehicles and hold potential purchase intention as prospective adopters (Naufal et al., 2024; Wang et al., 2018). Given that the total population of potential EV buyers cannot be explicitly enumerated, a non-probability purposive sampling technique was executed (Ajzen, 1991; Yeğin & Ikram, 2022). Three mandatory screening criteria were enforced: (1) residing in Indonesia and aged 17 years or older, (2) possessing adequate awareness of EV technology, and (3) actively considering or planning an EV purchase.

To determine sample size adequacy for Structural Equation Modeling–Partial Least Squares (SEM-PLS), the minimum sample requirement was calculated based on the "10-times rule" and statistical power conventions, which dictate that the sample size must exceed ten times the maximum number of structural paths directed at any single latent variable (10 structural paths directed at WTP, requiring a minimum of 100 observations). During the two-month data collection period, a total of 320 online questionnaire submissions were recorded. Following rigorous data screening for missing values, straight-lining, and unengaged response patterns, 305 valid and fully completed questionnaires were retained, yielding an effective usable response rate of 95.3%. This sample size comfortably exceeds methodologically prescribed thresholds for SEM-PLS estimation.

Respondent Characteristics and Ethical Considerations

The final sample profile ($N = 305$) reflects a highly prospective early-adopter segment. Demographic analysis indicates that respondents are predominantly within the productive age bracket of 17–40 years (78.4%), hold a bachelor's degree or higher (69.2%), and belong to middle-to-upper income households with sufficient purchasing capability. These demographic traits align with early technology adoption profiles in emerging economies.

Ethical considerations were strictly adhered to throughout the research lifecycle. Prior to accessing the survey items, prospective participants were presented with an electronic Informed Consent Form on the landing page. The form clearly detailed the research objectives, guaranteed absolute participant anonymity, assured data confidentiality, and highlighted that participation was entirely voluntary with the right to withdraw at any stage without penalty. No sensitive personal identifiers were gathered, and data access was restricted strictly to the research team for academic research purposes.

Operationalization of Variables and Measurement Instruments

All measurement scales were adapted from established literature to ensure construct validity and content coverage (Arrinda et al., 2022; Davis, 1989; Le et al., 2026; Wang et al., 2018). Responses were captured using a 5-point Likert scale ranging from 1 ("Strongly Disagree") to 5 ("Strongly Agree").

Table 1. Operational Definitions of Variables

Variable	Operational Definition	Indicators	Scale
Perceived Usefulness (PU)	The degree of consumer belief and positive perception that using an electric vehicle provides added value, operational efficiency, technological advantages, and	PU1, PU2, PU3, PU4	Likert 1–5

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Variable	Operational Definition	Indicators	Scale
	economic and environmental benefits in daily mobility (Davis, 1989; Hao et al., 2025; Naufal et al., 2024).		
Perceived Ease of Use (PEOU)	The degree of ease felt by consumers in operating, understanding, charging, and accessing EV technology without significant technical barriers (Davis, 1989; Naufal et al., 2024).	PEOU1, PEOU2, PEOU3	Likert 1–5
Subjective Norm (SN)	Consumers' perception regarding encouragement, perceptions, influence, or pressure from their surrounding social environment (family, peers, colleagues, and public figures) to adopt EVs (Ajzen, 1991; Wang et al., 2018; Yeğin & Ikram, 2022).	SN1, SN2, SN3	Likert 1–5
Battery Warranty (BW)	Consumers' perception of warranty, after-sales protection, and quality assurance for battery replacement provided by EV manufacturers (Arrinda et al., 2022).	BW1, BW2, BW3	Likert 1–5
Green Lifestyle (GL)	Lifestyle, personal values, and environmental concerns demonstrated through consumption behavior oriented toward sustainability and carbon emission reduction (Le et al., 2026; Paul et al., 2016).	GL1, GL2, GL3	Likert 1–5
Charging Infrastructure (CI)	The level of availability, convenient location access, reliability, and adequacy of Public Electric Vehicle Charging Stations (SPKLU) (Hao et al., 2025).	CI1, CI2, CI3	Likert 1–5
Price Perception (PP)	Consumers' assessment of the fairness, affordability, and appropriateness of the initial purchase price of EVs compared to the long-term benefits obtained (Le et al., 2026).	PP1, PP2, PP3	Likert 1–5
Perceived Behavioral Control (PBC)	Consumers' perception regarding the availability of financial resources, information access, and personal control supporting their ability to purchase an EV (Ajzen, 1991; Wang et al., 2018).	PBC1, PBC2, PBC3	Likert 1–5
Attitude (ATT)	Affective evaluation and overall positive or negative assessment of consumers toward the decision to purchase and use an EV (Ajzen, 1991; Sri Hayati & Iwan Ekawanto, 2025).	ATT1, ATT2, ATT3, ATT4, ATT5	Likert 1–5
Willingness to Pay (WTP)	The financial commitment or maximum price willingness that consumers are ready to expend to own an EV based on perceived value (Le et al., 2026; Paul et al., 2016).	WTP1, WTP2, WTP3, WTP4, WTP5	Likert 1–5
Purchase Intention (PI)	The level of inclination, explicit plans, or actual intentions of consumers to perform EV purchase actions in the future (Ajzen, 1991; Yeğin & Ikram, 2022).	PI1, PI2, PI3	Likert 1–5

Source: Processed Data, 2026

Analytical Strategy

Data analysis was conducted using Structural Equation Modeling–Partial Least Squares (SEM-PLS) executed via SmartPLS 4. SEM-PLS was selected for its superior capability in evaluating complex conceptual models with multi-stage sequential mediation pathways, non-normal data distributions, and predictive focus (Hao et al., 2025; Le et al., 2026). The empirical evaluation followed a two-phase analytical protocol:

1. Measurement Model Assessment (Outer Model): Evaluating convergent validity via indicator outer loadings (> 0.70) and Average Variance Extracted (AVE > 0.50), discriminant validity via Fornell-Larcker criteria, and construct reliability using Cronbach's Alpha (> 0.70) and Composite Reliability (> 0.70).

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2. Structural Model Assessment (Inner Model): Estimating model predictive power via coefficient of determination (R^2), effect sizes (f^2), and testing direct and sequential indirect hypotheses via bootstrapping procedures with 5,000 resamples to evaluate path coefficients, t-statistics (> 1.96), and p-values (< 0.05).

IV. RESULTS AND DISCUSSION

The empirical study engaged 305 valid respondents across Indonesia who met the purposive criteria: aged at least 17 years, familiar with EV technology, and holding purchase interest. The demographic profile indicates that 78.4% of respondents fall within the 17–40 productive age bracket, with 69.2% attaining higher education degrees. This early-adopter profile possesses substantial technological literacy and environmental awareness, serving as a representative segment for evaluating national EV adoption dynamics.

Outer Model Evaluation Results

a. Convergent Validity

The convergent validity test results indicate that most indicators have outer loading values above 0.70. The PBC1 indicator has an outer loading value of 0.637, but it is retained as it still meets the minimum allowable threshold for exploratory research (> 0.60) and does not degrade the model quality. The outer loading values for each indicator are presented in Table 2.

Table 2. Outer Loading Values

Variable	Indicator	Outer Loading	Description
ATT	ATT1	0,920	Valid
	ATT2	0,903	Valid
	ATT3	0,930	Valid
	ATT4	0,899	Valid
	ATT5	0,853	Valid
BW	BW1	0,924	Valid
	BW2	0,927	Valid
	BW3	0,922	Valid
CI	CI1	0,857	Valid
	CI2	0,832	Valid
	CI3	0,791	Valid
GL	GL1	0,799	Valid
	GL2	0,919	Valid
	GL3	0,898	Valid
PBC	PBC1	0,637	Retained
	PBC2	0,897	Valid
	PBC3	0,912	Valid
PEOU	PEOU1	0,856	Valid
	PEOU2	0,853	Valid
	PEOU3	0,890	Valid
PI	PI1	0,935	Valid
	PI2	0,954	Valid
	PI3	0,920	Valid
PP	PP1	0,822	Valid
	PP2	0,792	Valid
	PP3	0,858	Valid
PU	PU1	0,899	Valid
	PU2	0,886	Valid
	PU3	0,754	Valid
	PU4	0,736	Valid
SN	SN1	0,913	Valid
	SN2	0,907	Valid

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Variable	Indicator	Outer Loading	Description
	SN3	0,908	Valid
WTP	WTP1	0,783	Valid
	WTP2	0,901	Valid
	WTP3	0,918	Valid
	WTP4	0,891	Valid
	WTP5	0,914	Valid

Source: SmartPLS Data Processing, 2026

b. Discriminant Validity

Discriminant validity evaluation was conducted using the Fornell-Larcker criterion. The test results show that the square root of the AVE for each construct is higher than its correlation with other constructs, confirming that all variables meet the requirements for discriminant validity. Full results are presented in Table 3.

Table 3. Discriminant Validity Results (Fornell-Larcker)

	ATT	BW	CI	GL	PBC	PEOU	PI	PP	PU	SN	WTP
ATT	**0,90**										
BW	0,54	**0,92**									
CI	0,74	0,53	**0,82**								
GL	0,41	0,37	0,46	**0,87**							
PBC	0,64	0,48	0,59	0,33	**0,82**						
PEOU	0,56	0,44	0,57	0,51	0,55	**0,86**					
PI	0,79	0,47	0,65	0,28	0,61	0,45	**0,93**				
PP	0,69	0,54	0,77	0,49	0,54	0,59	0,65	**0,82**			
PU	0,69	0,45	0,63	0,42	0,52	0,70	0,65	0,63	**0,82**		
SN	0,68	0,41	0,55	0,32	0,59	0,47	0,69	0,51	0,61	**0,90**	
WTP	0,73	0,34	0,65	0,28	0,60	0,42	0,77	0,64	0,60	0,62	**0,88**

Source: SmartPLS Data Processing, 2026

c. AVE Evaluation and Construct Reliability Testing

The Average Variance Extracted (AVE) values for all variables range from 0.676 to 0.877, satisfying the threshold (> 0.50). The reliability test results also indicate that all constructs have Cronbach's Alpha and Composite Reliability values above 0.70, denoting very high internal consistency. Details of the AVE and reliability values are presented in Table 4 and Table 5.

Table 4. Average Variance Extracted (AVE) Values

Variable	AVE	Description
ATT	0,813	Valid
BW	0,855	Valid
CI	0,685	Valid
GL	0,763	Valid
PBC	0,681	Valid
PEOU	0,751	Valid
PI	0,877	Valid
PP	0,680	Valid
PU	0,676	Valid
SN	0,827	Valid
WTP	0,780	Valid

Source: SmartPLS Data Processing, 2026

Table 5. Construct Reliability Test Results

Variable	*Cronbach's Alpha*	*Composite Reliability*	Keterangan
ATT	0,942	0,944	**Reliable**

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Variable	*Cronbach's Alpha*	*Composite Reliability*	Keterangan
BW	0,915	0,916	**Reliable**
CI	0,774	0,793	**Reliable**
GL	0,846	0,880	**Reliable**
PBC	0,764	0,843	**Reliable**
PEOU	0,835	0,848	**Reliable**
PI	0,930	0,932	**Reliable**
PP	0,769	0,785	**Reliable**
PU	0,837	0,851	**Reliable**
SN	0,896	0,901	**Reliable**
WTP	0,928	0,930	**Reliable**

Source: SmartPLS Data Processing, 2026

Structural Model Evaluation (Inner Model), Fit Indices, and Predictive Power

Evaluating the structural inner model involves assessing the model's predictive power using the coefficient of determination (R^2), effect sizes (f^2), and predictive relevance (Q^2).

The empirical model demonstrates robust explanatory power, explaining 63.1% of the variance in Attitude ($R^2 = 0.631$, Adjusted $R^2 = 0.624$), 62.8% in Willingness to Pay ($R^2 = 0.628$, Adjusted $R^2 = 0.618$), and 70.7% in Purchase Intention ($R^2 = 0.707$, Adjusted $R^2 = 0.704$). According to Hair et al. (2022) guidelines, R^2 values exceeding 0.50 reflect moderate-to-strong predictive accuracy. Furthermore, predictive relevance evaluated through blindfolding yields Q^2 values well above zero for all endogenous constructs ($\text{ATT} = 0.512$, $\text{WTP} = 0.489$, $\text{PI} = 0.584$), confirming strong out-of-sample predictive capacity.

Table 6. Coefficient of Determination (R^2)

Endogenous Variable	R^2	R^2 Adjusted	Q^2_predict	Interpretation
ATT	0,631	0,624	0,512	Moderate
WTP	0,628	0,618	0,489	Moderate
PI	0,707	0,704	0,584	Strong

Source: SmartPLS Data Processing, 2026

To complement statistical significance, effect sizes (f^2) were systematically evaluated to assess the practical importance of each direct pathway. Attitude exerts the largest direct effect on Purchase Intention ($f^2 = 0.368$, Large Effect), followed by Willingness to Pay on Purchase Intention ($f^2 = 0.272$, Medium Effect) and Attitude on Willingness to Pay ($f^2 = 0.206$, Medium Effect). Among antecedents, Subjective Norm exhibits the strongest practical influence on Attitude ($f^2 = 0.203$, Medium Effect).

Table 7. Effect Sizes (f^2) and Practical Significance

Inter-variable Relationship	f^2	Interpretation
ATT → PI	**0,368**	**Large Effect** Primary catalyst of buying interest
WTP → PI	**0,272**	**Medium Effect** Critical economic commitment hurdle
ATT → WTP	**0,206**	**Medium Effect** Favorable disposition elevates price readiness
SN → ATT	**0,203**	**Medium Effect** Strong socio-cultural influence
PU → ATT	**0,115**	**Small Effect** Functional efficiency shapes attitude
BW → ATT	**0,089**	**Small Effect** Risk reduction builds confidence
PBC → WTP	**0,057**	**Small Effect**

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		Resource control facilitates payment readiness
BW → WTP	**0,056**	**Small Negative Effect** Warranty expected as standard feature
PP → WTP	**0,055**	**Small Effect** Price fairness mitigates sacrifice perception
GL → WTP	**0,020**	**Small Negative Effect** Presence of attitude–behavior gap
CI → WTP	**0,019**	**Very Small / Non-Significant** Infrastructure seen as institutional duty
PEOU → ATT	**0,008**	**Very Small / Non-Significant** Tech familiarity renders ease a baseline

Source:SmartPLS Data Processing, 2026

Table 8. Direct Effect Hypothesis Testing Results

Hyphothesis	Structural Path	Path Coefficient (β)	t-statistic	p-value	Decision
H1	ATT → PI	0,485	8,341	0,000	Supported
H2	ATT → WTP	0,468	7,230	0,000	Supported
H3	BW → ATT	0,211	3,964	0,000	Supported
H4	BW → WTP	-0,183	3,208	0,001	Supported (Negative)
H5	CI → WTP	0,151	1,940	0,052	Not Supported
H6	GL → WTP	-0,102	1,988	0,047	Supported (Negative)
H7	PBC → WTP	0,199	3,630	0,000	Supported
H8	PEOU → ATT	0,077	1,304	0,192	Not Supported
H9	PP → WTP	0,243	3,204	0,001	Supported
H10	PU → ATT	0,329	4,552	0,000	Supported
H11	SN → ATT	0,355	5,902	0,000	Supported
H12	WTP → PI	0,417	7,115	0,000	Supported

Source:SmartPLS Data Processing, 2026

Based on the empirical results presented in Table 8, the detailed statistical explanations for each proposed direct hypothesis are as follows:

1. **Attitude on Purchase Intention (H1):** Attitude exerts a positive and statistically significant direct effect on Purchase Intention ($\beta = 0.485, t = 8.341, p < 0.001$), supporting H1. Higher positive consumer evaluation directly increases buying intention.
2. **Attitude on Willingness to Pay (H2):** Attitude significantly and positively influences Willingness to Pay ($\beta = 0.468, t = 7.230, p < 0.001$), supporting H2. A favorable disposition enhances price readiness.
3. **Battery Warranty on Attitude (H3):** Battery warranty displays a positive and significant effect on Attitude ($\beta = 0.211, t = 3.964, p < 0.001$), supporting H3. Structural risk mitigation successfully builds positive brand perception.
4. **Battery Warranty on Willingness to Pay (H4):** Battery warranty shows a statistically significant *negative* effect on Willingness to Pay ($\beta = -0.183, t = 3.208, p = 0.001$), supporting H4. Consumers view warranties as a baseline safety feature rather than a premium justification.
5. **Charging Infrastructure on Willingness to Pay (H5):** Charging infrastructure does not exhibit a statistically significant direct impact on Willingness to Pay ($\beta = 0.151, t = 1.940, p = 0.052$), failing to support H5.
6. **Green Lifestyle on Willingness to Pay (H6):** Green lifestyle exerts a significant *negative* direct influence on Willingness to Pay ($\beta = -0.102, t = 1.988, p = 0.047$), supporting H6. This

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highlights an attitude–behavior gap where environmental concern does not translate into monetary sacrifices.

7. **Perceived Behavioral Control on Willingness to Pay (H7):** Perceived behavioral control positively and significantly affects Willingness to Pay ($\beta = 0.199, t = 3.630, p < 0.001$), supporting H7. Greater resource and financial capability facilitate payment readiness.
8. **Perceived Ease of Use on Attitude (H8):** Perceived ease of use does not significantly influence Attitude ($\beta = 0.077, t = 1.304, p = 0.192$), failing to support H8. Technological familiarity renders operational ease a baseline expectation.
9. **Price Perception on Willingness to Pay (H9):** Price perception positively and significantly impacts Willingness to Pay ($\beta = 0.243, t = 3.204, p = 0.001$), supporting H9. Perceived price fairness reduces economic sacrifice friction.
10. **Perceived Usefulness on Attitude (H10):** Perceived usefulness significantly and positively drives Attitude ($\beta = 0.329, t = 4.552, p < 0.001$), supporting H10. Operational cost savings and functional utility reinforce brand evaluations.
11. **Subjective Norm on Attitude (H11):** Subjective norm exerts a strong positive effect on Attitude ($\beta = 0.355, t = 5.902, p < 0.001$), supporting H11. Social endorsement from key referents strongly validates EV desirability.
12. **Willingness to Pay on Purchase Intention (H12):** Willingness to pay positively and significantly influences Purchase Intention ($\beta = 0.417, t = 7.115, p < 0.001$), supporting H12. Financial readiness acts as a critical hurdle converting interest into purchase planning.

Mediation analysis confirms that Attitude and Willingness to Pay operate as vital sequential mediators. Key indirect pathways prove significant, including PU → ATT → WTP → PI ($\beta = 0.064, p = 0.001$) and SN → ATT → WTP → PI ($\beta = 0.069, p < 0.001$). Similarly, WTP successfully bridges Price Perception ($\beta = 0.101, p = 0.006$) and Perceived Behavioral Control ($\beta = 0.083, p = 0.001$) to Purchase Intention. Conversely, mediation chains involving Perceived Ease of Use remain non-significant due to the absence of a direct link to Attitude.

Table 9. Indirect Effect Test Results

Mediation Path	Coefficient	*t-statistic*	*p-value*	Decision
PP → WTP → PI	0,101	2,761	0,006	Significant
PU → ATT → WTP → PI	0,064	3,319	0,001	Significant
BW → ATT → PI	0,103	3,790	0,000	Significant
SN → ATT → WTP → PI	0,069	4,072	0,000	Significant
PEOU → ATT → WTP → PI	0,015	1,303	0,193	Not Significant
BW → ATT → WTP	0,099	3,304	0,001	Significant
PEOU → ATT → PI	0,037	1,305	0,192	Not Significant
PU → ATT → PI	0,159	3,746	0,000	Significant
PEOU → ATT → WTP	0,036	1,346	0,179	Not Significant
SN → ATT → PI	0,172	4,628	0,000	Significant
PU → ATT → WTP	0,154	3,545	0,000	Significant
BW → ATT → WTP → PI	0,041	2,869	0,004	Significant
SN → ATT → WTP	0,166	4,719	0,000	Significant
ATT → WTP → PI	0,195	5,227	0,000	Significant
BW → WTP → PI	-0,076	2,966	0,003	Significant
CI → WTP → PI	0,063	1,865	0,062	Not Significant
GL → WTP → PI	-0,042	1,828	0,068	Not Significant
PBC → WTP → PI	0,083	3,221	0,001	Significant

Source: SmartPLS Data Processing, 2026

The empirical findings establish that Attitude ($\beta = 0.485, p < 0.001, f^2 = 0.368$) and Willingness to Pay ($\beta = 0.417, p < 0.001, f^2 = 0.272$) act as core mechanisms converting

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psychological appraisals into behavioral execution. This validates the integration of TPB and Perceived Value Theory. In high-cost mobility choices, cognitive usefulness and social endorsement do not directly prompt purchases; rather, they foster favorable brand evaluations (Attitude), which then translate into financial readiness (WTP) before triggering concrete purchase intentions.

Contextual Analysis of Unexpected and Counter-Intuitive Findings

1. Perceived Ease of Use → Attitude (Not Significant: $\beta = 0.077, p = 0.192, f^2 = 0.008$):
   Contrasting traditional Technology Acceptance Model (TAM) assumptions (Davis, 1989), ease of operation fails to significantly shape attitude. In Indonesia's urban market, rapid digital adoption has elevated baseline technology literacy (Naufal et al., 2024). Consumers view digital interfaces, automatic driving modes, and vehicle charging as standard expectations rather than novel differentiators that enhance brand evaluation (Wang et al., 2018). Operational ease functions as a basic hygiene factor rather than a strategic value driver.
2. Charging Infrastructure → Willingness to Pay (Not Significant: $\beta = 0.151, p = 0.052, f^2 = 0.019$):
   Public charging station (SPKLU) availability does not directly boost WTP. Contextually, prospective EV owners in Indonesia rely heavily on private home-charging setups for daily commuting (Hao et al., 2025). Furthermore, consumers perceive public charging infrastructure as an institutional responsibility of state electricity providers (PLN) and the government, rather than an added product feature that justifies paying a higher vehicle premium (Arrinda et al., 2022).
3. Green Lifestyle → Willingness to Pay (Negative Significant: $\beta = -0.102, p = 0.047, f^2 = 0.020$):
   This result highlights a pronounced "attitude–behavior gap" in sustainable consumer behavior literature (Paul et al., 2016). Although eco-conscious individuals hold positive environmental views, high price sensitivity in an emerging economy prevents these sentiments from translating into monetary sacrifices (Le et al., 2026; Paul et al., 2016). Pro-environmental consumers evaluate purchases through practical economic utility, rejecting premium price surcharges despite their green orientation.
4. Battery Warranty → Willingness to Pay (Negative Significant: $\beta = -0.183, p = 0.001, f^2 = 0.056$):
   While battery warranty builds brand attitude ($\beta = 0.211, p < 0.001$), it exhibits a negative direct effect on WTP. Indonesian consumers view long battery warranties as a fundamental manufacturer obligation required to offset technological lifespan risks (Arrinda et al., 2022). When manufacturers heavily promote long warranties, price-sensitive buyers infer higher underlying technical risks, expecting lower vehicle prices rather than paying a premium. Warranty coverage is treated as a baseline safety net, not a premium add-on.

V. CONCLUSION

This study investigated the structural determinants of electric vehicle (EV) purchase intention in Indonesia by integrating the Technology Acceptance Model (TAM) and the Theory of Planned Behavior (TPB), with Attitude and Willingness to Pay (WTP) positioned as core mediating mechanisms. The empirical findings demonstrate that Purchase Intention is strongly driven by Attitude ($\beta = 0.485, p < 0.001$) and Willingness to Pay ($\beta = 0.417, p < 0.001$), accounting for 70.7% of the variance in overall buying interest ($R^2 = 0.707$). Consumer attitude is primarily cultivated by Subjective Norm ($\beta = 0.355, p < 0.001$), Perceived Usefulness ($\beta = 0.329, p < 0.001$), and Battery Warranty ($\beta = 0.211, p < 0.001$). Meanwhile, Willingness to Pay is positively influenced by Attitude ($\beta = 0.468, p < 0.001$), Price Perception ($\beta = 0.243, p = 0.001$), and Perceived Behavioral Control ($\beta = 0.199, p < 0.001$).

Conversely, Perceived Ease of Use and Charging Infrastructure do not directly determine purchase willingness, whereas Green Lifestyle ($\beta = -0.102, p = 0.047$) and Battery Warranty ($\beta = -0.183, p = 0.001$) exhibit counter-intuitive negative direct effects on Willingness to Pay. Overall, EV adoption decisions in an emerging market are predominantly driven by practical utility, social validation,

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perceived value-for-money, and economic capacity, rather than operational ease or public infrastructure availability.

Theoretical Implications

This study substantially expands the theoretical boundaries of green technology adoption frameworks in several impactful ways:

13. Dual-Stage Sequential Mediation Architecture: Classical TAM and TPB paradigms primarily map cognitive evaluations directly onto behavioral intentions. By introducing Willingness to Pay as a sequential mediator following AttitudCognitive/Social Factors → Attitude → Willingness to Pay → Purchase Intention), this study resolves a key conceptual gap regarding how psychological dispositions are transformed into economic financial commitments before shaping actual buying behavior.
14. Boundary Conditions of Classical TAM Factors: The non-significant impact of Perceived Ease of Use indicates that in contemporary digitalized markets, operational ease serves as a baseline hygiene expectation rather than a strategic value driver. This provides nuance to classical TAM assumptions by demonstrating that technology maturity weakens the explanatory power of ease-of-use in high-involvement consumer decisions.
15. Elucidating the Attitude–Behavior Gap via Economic Surcharges: The negative direct effect of Green Lifestyle on WTP empirically validates the "attitude–behavior gap" in emerging economies. While eco-conscious consumers hold favorable views toward sustainability, high price sensitivity leads them to reject monetary price surcharges, proving that altruistic values are subordinate to personal economic utility during capital-intensive adoption decisions.
16. Re-conceptualizing Structural Risk Mitigators: The dual role of Battery Warranty—positively driving brand Attitude while negatively impacting WTP—contributes to Perceived Risk and Equity Theories. It demonstrates that consumers view structural guarantees as mandatory baseline obligations to offset lifespan risks rather than premium features commanding price surcharges.

Practical and Managerial Implications

From a managerial perspective, EV manufacturers and automotive marketers should reorient communication strategies from highlighting basic vehicle operation toward demonstrating long-term financial value. Marketing campaigns should emphasize Total Cost of Ownership (TCO) efficiency, daily fuel cost savings, and lifetime economic benefits to elevate consumer price perception and willingness to pay. Furthermore, battery warranties must be packaged as standard, transparent baseline protections rather than costly add-ons that trigger consumer skepticism regarding technology reliability.

For policymakers and government agencies, maintaining fiscal incentives, purchase subsidies, and tax reductions remains essential to bridge the attitude–behavior gap. Because public charging infrastructure does not directly command purchase price premiums, public sector investments should focus on building reliable charging networks as a foundational public utility, thereby lowering entry barriers and strengthening overall consumer behavioral control.

Limitations and Future Research

This study carries certain methodological limitations that provide avenues for future inquiry. First, the cross-sectional survey design and geographic concentration within urban centers constrain overall population generalizability across heterogeneous regions of Indonesia. Future studies should expand sampling across broader geographical regions and diverse socio-economic tiers. Second, future frameworks could incorporate contextual moderators such as government subsidy policies, brand equity, perceived functional risk, or multi-group demographic invariance analysis to provide deeper empirical insights into the evolving dynamics of sustainable transportation adoption.

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