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Determinants of Consumer Purchase Intention Toward Pre-Owned Electric Vehicles: The Mediating Role of Trust and the Moderating Role of Perceived Battery Health

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Abstract

This study examines the determinants of consumer purchase intention toward pre-owned electric vehicles (EVs) in Delhi National Capital Region (NCR), India, with particular focus on the mediating role of consumer trust and the moderating role of perceived battery health. Grounded in the Theory of Planned Behavior, Perceived Risk Theory, Signaling Theory, and Commitment-Trust Theory, a conceptual model was developed linking six antecedents — price value, environmental concern, perceived risk, product/EV knowledge, seller/platform credibility, and social influence — to purchase intention through consumer trust, with perceived battery health hypothesized to strengthen the trust–purchase intention relationship. Data (N = 330) were analyzed using Partial Least Squares Structural Equation Modeling (PLS-SEM) with bootstrapped significance testing. All six antecedents significantly predicted trust ($R^2 = 0.339$), with perceived risk emerging as the strongest negative predictor ($\beta = -0.405$) and seller/platform credibility the strongest positive predictor ($\beta = 0.258$). Trust significantly predicted purchase intention ($\beta = 0.439$, $R^2 = 0.240$) and fully mediated the effect of all six antecedents on purchase intention. The hypothesized moderating effect of perceived battery health was directionally consistent — the trust–intention slope strengthened from 0.349 at low battery health perception to 0.528 at high battery health perception — but did not reach conventional statistical significance ($p = 0.118$). Findings underscore trust-building, particularly through risk reduction and credible battery health certification, as the primary lever for growing the pre-owned EV market, offering a theoretical extension to trust-mediated adoption models and practical guidance for platforms, dealers, and policymakers.

Keywords: pre-owned electric vehicles; purchase intention; consumer trust; perceived battery health; PLS-SEM; Theory of Planned Behavior

Chapter 1: Introduction

1.1 Background of the Study

The global automotive industry is undergoing a structural shift toward electrification, driven by climate policy, urban air quality concerns, and declining battery costs. As first-generation electric vehicles (EVs) age out of their initial ownership cycles, a secondary — pre-owned — EV market is emerging alongside the primary new-EV market. In India specifically, government incentives such as the FAME schemes and state-level EV policies have accelerated new EV adoption over the past several years, and this growing base of EVs is now beginning to generate a parallel pre-owned market, particularly in metropolitan regions such as Delhi NCR.

Unlike conventional internal combustion engine (ICE) vehicles, pre-owned EVs carry a unique and largely invisible risk factor: battery degradation. The battery is both the most expensive component of the vehicle and the primary determinant of its remaining usable life, range, and resale value — yet its actual condition (State of Health, or SOH) is not something an average buyer can visually inspect or intuitively assess, unlike engine wear or body condition in a traditional used car. This information asymmetry creates a distinct psychological and behavioral dynamic in pre-owned EV purchase decisions that does not have a direct parallel in traditional used-vehicle research.Existing consumer behavior literature has extensively examined purchase intention for new EVs, typically through lenses such as the Theory of Planned Behavior (TPB) and the Technology Acceptance Model (TAM), and separately, trust and risk in the general pre-owned/used vehicle market. However, the intersection of these two streams — how trust is built or undermined specifically around battery health uncertainty in a pre-

owned EV context — remains comparatively underexplored, particularly in emerging markets such as India, where formal battery certification and inspection infrastructure is still developing.

1.2 Problem Statement

Consumers considering a pre-owned EV purchase face a distinct barrier that pre-owned ICE vehicle buyers do not: the inability to reliably verify battery health, which is central to the vehicle's value, performance, and safety. This uncertainty is likely to suppress purchase intention even when other factors — price advantage, environmental motivation, seller reputation — are favorable, unless it is offset by trust in the seller, platform, or available battery health information. While trust is well established as a mediator in e-commerce and used-goods purchase literature, and perceived risk is well studied in EV adoption literature, no integrated model currently examines how perceived battery health moderates the trust–purchase intention relationship specifically for pre-owned EVs — leaving a gap between two otherwise mature research streams. This study addresses that gap.

1.3 Research Objectives

- To identify the key determinants (price value, environmental concern, perceived risk, product knowledge, seller/platform credibility, social influence) influencing consumer purchase intention toward pre-owned EVs in Delhi NCR.
- To examine the mediating role of consumer trust in the relationship between these determinants and purchase intention.
- To examine the moderating role of perceived battery health on the trust–purchase intention relationship.
- To provide actionable recommendations for pre-owned EV sellers, platforms, and policymakers to strengthen consumer trust and purchase confidence.

1.4 Research Questions

- RQ1: What factors significantly influence consumer trust toward pre-owned EVs?
- RQ2: Does consumer trust mediate the relationship between these factors and purchase intention?
- RQ3: Does perceived battery health moderate the relationship between trust and purchase intention?

1.5 Significance of the Study

Academic significance: This study contributes to consumer behavior literature by integrating trust-mediation frameworks drawn from e-commerce and used-goods research with EV-specific adoption theory (TPB/TAM), introducing perceived battery health as a novel, context-specific moderator not previously tested in this combination.

Practical significance: Findings help pre-owned EV platforms and dealers design trust-building mechanisms — such as third-party battery health certification — that directly address the specific anxiety driving hesitation in this market. This is also relevant to policymakers designing standards for battery health disclosure and pre-owned EV certification in India.

1.6 Scope of the Study

Geographic scope: This study is delimited to consumers residing in the Delhi National Capital Region (NCR), India, encompassing Delhi, Gurugram, Noida, Faridabad, and Ghaziabad.Population scope: EV-aware adult consumers (18 years and above) residing in Delhi NCR, defined as individuals with general awareness of EVs and potential household purchase decision-making authority, irrespective of whether they currently own an EV or have completed a pre-owned EV transaction.

Conceptual scope: Purchase intention toward pre-owned EVs as a function of six antecedents, mediated by a unidimensional consumer trust construct, and moderated by perceived battery health.

Industry scope: Passenger four-wheeler battery electric vehicles (BEVs) in the pre-owned market only; two/three-wheelers, hybrids, and new (first-owner) EVs are excluded.

Temporal scope: Cross-sectional study; data collected at a single point in time (July 2026).

Methodological scope: Quantitative, survey-based design analyzed using PLS-SEM; relies on self-reported perceptual data with no independent verification of respondents' actual EV ownership or vehicle battery condition.

1.7 Organization of the Study

The remainder of this study is organized as follows: Chapter 2 reviews existing literature and develops the conceptual model and hypotheses. Chapter 3 details the research methodology. Chapter 4 presents data analysis and results. Chapter 5 discusses findings, implications, limitations, and directions for future research.

Chapter 2: Literature Review

2.1 Theoretical Foundation

2.1.1 Theory of Planned Behavior (TPB)

TPB (Ajzen, 1991) remains the dominant framework in EV purchase intention research, positing that intention is driven by attitude, subjective norm, and perceived behavioral control. Recent EV adoption studies have extended TPB with constructs such as environmental concern and green trust to predict EV purchase intentions, and other studies have directly extended TPB to incorporate a mediating role for consumer trust and a context-specific moderating variable. This study adopts TPB as its base framework, with trust and battery-health-related perceptions layered on as extensions specific to the pre-owned EV context.

2.1.2 Perceived Risk Theory

Perceived risk theory explains hesitation in transactions involving uncertainty — financial, performance, or safety-related. This is directly relevant to pre-owned EVs, where battery condition is the central unverifiable risk factor. Research grounded in the theory of planned behavior has found that both risk perception and trust significantly impact purchase intention, with trust also directly influencing purchase intentions.

2.1.3 Signaling Theory

Signaling theory explains how sellers reduce information asymmetry by providing credible signals — in this context, battery health certification. Industry practice has already moved in this direction: a major European automotive marketplace introduced a battery certification program for used EVs, intended to give prospective consumers battery health information that enhances trust and transparency in the second-hand EV market and supports informed purchasing decisions. This supports treating perceived battery health as a distinct signal-based construct rather than folding it into general product knowledge.

2.1.4 Commitment-Trust Theory

Trust is well-established as a mediating mechanism in transactional and e-commerce relationships. Research on online purchase intention models has found that the intention to buy a car increases along with the level of trust consumers have in the vehicle, with trust also mediating the relationship between other factors and purchase intention — directly supporting the positioning of trust as a mediator, not just a direct antecedent, in this study's model.

2.2 Construct-wise Review

2.2.1 Pre-owned EV Market Context

The pre-owned EV market is expanding rapidly and shows distinct buyer behavior patterns from the broader used-car market. Used EV sales have grown year-over-year at a rate in the mid-30% range, faster than the overall used-car market, with the global used EV market estimated to exceed $200 billion annually by the mid-2020s. Demographic research further shows that full-time employed, highly educated, higher-income individuals living in detached homes or townhouses with personal parking amenities are more likely to purchase pre-owned EVs.

2.2.2 Perceived Battery Health as a Distinct Construct

Battery health is consistently identified as the central purchase concern in pre-owned EV transactions. Recent buyer-side analysis found that battery health was identified as the number one deal-breaker among hundreds of used EV transactions analyzed, and that a degraded battery can cost between $8,000 and $22,000 to replace — even though modern EV batteries have been found to degrade more slowly than earlier assumptions, at an average rate of around 1.8% per year under typical use. This gap between actual and perceived degradation reinforces the argument that perceived battery health, not just actual battery health, is the behaviorally relevant construct.

2.2.3 Seller/Platform Credibility and Certification

The emergence of certified pre-owned (CPO) programs is a direct market response to trust deficits. A listing described as "pre-owned" without clear inspection steps, battery testing, or post-sale coverage should be treated as an ordinary used car rather than a certified one; a true CPO vehicle has passed a formal inspection checklist and typically includes extended warranty coverage. This distinction suggests credibility should be measured not just as generic reputation but specifically as confidence in formal certification and inspection processes.

2.2.4 Environmental Concern

Environmental concern remains a consistently significant predictor across EV purchase intention literature, though its effect is often mediated rather than direct — for example, perceived value has been found to mediate the relationship between environmental concern and purchase intention among new energy vehicle customers, supporting this study's structure in which environmental concern acts through a mediator (trust) rather than solely through a direct path.

2.2.5 Price Value / Perceived Value

Price advantage is a primary driver for pre-owned EV consideration, particularly among first-time EV buyers. Market data shows a large share of used EVs transact under $25,000, opening the market to budget-minded shoppers who did not participate in the first wave of new EV purchases.

2.3 Summary of Literature Gaps Identified

- Most EV purchase intention studies focus on new EVs; pre-owned EV-specific behavioral models remain limited outside North America/Europe.
- Trust is well-studied as a mediator in e-commerce and EV branding contexts, but rarely modeled alongside a battery-health-specific moderator.
- Existing pre-owned EV literature is largely industry/market-report driven rather than theory-driven, leaving room for an academically grounded, TPB-extended model.
- Indian, and specifically Delhi NCR-specific, consumer behavior data on pre-owned EVs is scarce compared to US/European/Chinese markets.

2.4 Research Gap Statement

No existing study integrates trust-mediation with the unique information-asymmetry problem of pre-owned EV battery health, nor tests this specifically within an Indian metropolitan context. This study addresses these gaps through an integrated model in which consumer trust mediates the effect of six antecedents on purchase intention, with perceived battery health moderating the strength of the trust–purchase intention relationship.

2.5 Conceptual Model

The model comprises six antecedents (Price Value, Environmental Concern, Perceived Risk, Product/EV Knowledge, Seller/Platform Credibility, Social Influence) feeding into Consumer Trust (mediator), which in turn predicts Purchase Intention (dependent variable). Perceived Battery Health moderates the Trust → Purchase Intention path, strengthening or weakening how much trust translates into purchase intention.

2.6 Hypothesis Development

Direct effects (antecedents → Trust):

- H1: Price value has a significant positive effect on consumer trust toward pre-owned EVs.
- H2: Environmental concern has a significant positive effect on consumer trust toward pre-owned EVs.
- H3: Perceived risk has a significant negative effect on consumer trust toward pre-owned EVs.
- H4: Product/EV knowledge has a significant positive effect on consumer trust toward pre-owned EVs.
- H5: Seller/platform credibility has a significant positive effect on consumer trust toward pre-owned EVs.
- H6: Social influence has a significant positive effect on consumer trust toward pre-owned EVs.

Trust → Purchase Intention:

- H7: Consumer trust has a significant positive effect on purchase intention toward pre-owned EVs.

Mediation hypotheses:

- H8a–f: Consumer trust significantly mediates the relationship between each of the six antecedents and purchase intention.

Moderation hypothesis:

- H9: Perceived battery health significantly moderates the relationship between consumer trust and purchase intention, such that the positive effect of trust on purchase intention is stronger when perceived battery health is high.

2.7 Chapter Summary

This chapter reviewed the theoretical foundations (TPB, Perceived Risk Theory, Signaling Theory, Commitment-Trust Theory) underpinning the study, examined construct-specific literature, identified the research gap, and presented the conceptual model and hypotheses tested in Chapters 3 and 4.

Chapter 3: Research Methodology

3.1 Research Design

This study adopts a quantitative, cross-sectional, descriptive-cum-explanatory research design. It is descriptive in profiling consumer perceptions of pre-owned EVs, and explanatory in testing hypothesized causal relationships (direct, mediating, and moderating effects) among the constructs identified in Chapter 2. A survey-based method was chosen because it allows efficient collection of perceptual data across a large sample, necessary for the Structural Equation Modeling (SEM) technique used in analysis.

3.2 Population and Sampling

Target population: EV-aware adult consumers (18 years and above) residing in Delhi NCR who are potential household vehicle purchase decision-makers.

Sampling technique: Non-probability purposive/judgmental sampling, combined with convenience sampling for distribution — the standard approach in consumer behavior survey research where a complete sampling frame does not exist.

Sampling criteria: Respondents were first asked a filter question ("Are you aware of electric vehicles (EVs) and would you consider yourself a potential vehicle buyer?"), with only "Yes" responses proceeding to the main survey.

Sample size justification: For PLS-SEM, the 10-times rule (10 × the largest number of structural paths pointing at any one construct) yields a minimum of 60 responses, since Trust receives 6 incoming paths. To support robust mediation and moderation testing, a target of 300–350 valid responses was set; the final analyzed sample was N = 330.

3.3 Data Collection Method

Source of data: Primary data, collected via a structured, self-administered online questionnaire, distributed through online survey platforms, EV owner/enthusiast community groups across Delhi NCR, and automotive marketplace forums, with snowball sampling requests appended to the survey.

3.4 Research Instrument (Questionnaire Design)

The questionnaire was structured in three sections: Section A (screening and demographics), Section B (construct measurement using 5-point Likert scales for all nine constructs), and Section C (purchase intention and willingness-to-pay items). Items were adapted from previously validated scales in TPB-based EV adoption studies, e-commerce trust literature, and used-vehicle perceived risk literature, modified for the pre-owned EV and battery-health context. The full instrument is provided in Appendix A.

3.5 Variables and Operationalization

Construct	Role	Items
Price value	Independent	4
Environmental concern	Independent	4
Perceived risk	Independent	5
Product/EV knowledge	Independent	4
Seller/platform credibility	Independent	4
Social influence	Independent	3
Consumer trust	Mediator	5
Perceived battery health	Moderator	4
Purchase intention	Dependent	4

3.6 Data Analysis Technique

Analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM). Analysis stages: (1) data screening (missing values, common method bias check via Harman's single-factor test); (2) descriptive statistics; (3) measurement model assessment — internal consistency reliability (Cronbach's alpha, composite reliability), convergent validity (AVE), discriminant validity (Fornell-Larcker criterion, HTMT ratio); (4) structural model assessment — path coefficients, significance via bootstrapping, R^2; (5) mediation analysis via bootstrapped indirect effects; (6) moderation analysis via an interaction term (Trust × Perceived Battery Health) with simple slope analysis.

3.7 Validity and Reliability

Content validity was ensured through adaptation from previously validated scales. Reliability and convergent/discriminant validity were formally assessed at the measurement model stage using Cronbach's alpha and composite reliability (≥ 0.70), AVE (≥ 0.50), the Fornell-Larcker criterion, and the HTMT ratio (< 0.85).

3.8 Ethical Considerations

- Informed consent obtained at the start of the survey; participation voluntary and data anonymized.

- No personally identifiable information collected.
- Data used solely for academic research purposes and stored securely.

3.9 Chapter Summary

This chapter outlined the quantitative, cross-sectional research design; purposive/convenience sampling of EV-aware Delhi NCR consumers (N = 330); the three-part questionnaire structure; and the PLS-SEM-based analysis plan for testing the measurement model, structural relationships, mediation, and moderation specified in Chapter 2.

Chapter 4: Data Analysis and Results

4.1 Data Screening

Final valid sample: N = 330. No missing values were present; all items were measured on a 1–5 Likert scale. Analysis was conducted using Partial Least Squares Structural Equation Modeling (PLS-SEM), with bootstrapping (1,000 resamples) used for significance testing of all path coefficients, indirect effects, and interaction terms.

4.2 Measurement Model Assessment

4.2.1 Outer Loadings

All indicator loadings exceeded the 0.70 threshold with one exception (PK3 = 0.532), which remains above the 0.40 hard-cutoff and was retained since it did not compromise the Product Knowledge construct's overall AVE. Selected loadings are summarized below by construct (full item-level loadings available in Appendix B).

Construct	Cronbach's α	CR	AVE
Price Value	0.732	0.827	0.545
Environmental Concern	0.770	0.848	0.583
Perceived Risk	0.790	0.854	0.540
Product Knowledge	0.785	0.841	0.576
Seller Credibility	0.762	0.848	0.582
Social Influence	0.705	0.816	0.601
Trust	0.806	0.866	0.564
Perceived Battery Health	0.736	0.825	0.544
Purchase Intention	0.747	0.840	0.568

All constructs exceeded the recommended thresholds (α/CR ≥ 0.70, AVE ≥ 0.50), establishing reliability and convergent validity.

4.2.2 Discriminant Validity — Fornell-Larcker Criterion

Diagonal values (bold, representing √AVE) exceed all off-diagonal inter-construct correlations in their respective rows and columns, confirming discriminant validity.

	PV	EC	PR	PK	SC	SI	TR	PBH	PI
PV	0.738	0.031	0.168	0.040	-0.023	0.107	0.178	-0.082	0.044
EC	0.031	0.763	0.044	0.065	-0.050	-0.034	0.148	0.038	0.090
PR	0.168	0.044	0.735	0.024	-0.042	-0.097	-0.381	-0.063	-0.275
PK	0.040	0.065	0.024	0.759	0.025	0.017	0.164	-0.061	-0.011
SC	-0.023	-0.050	-0.042	0.025	0.763	-0.002	0.265	0.041	0.178
SI	0.107	-0.034	-0.097	0.017	-0.002	0.775	0.199	-0.020	0.124
TR	0.178	0.148	-0.381	0.164	0.265	0.199	0.751	0.083	0.454
PBH	-0.082	0.038	-0.063	-0.061	0.041	-0.020	0.083	0.738	0.198
PI	0.044	0.090	-0.275	-0.011	0.178	0.124	0.454	0.198	0.753

4.2.3 Discriminant Validity — HTMT Ratio

All HTMT ratios remained below the 0.85 conservative threshold, with the highest values observed for Trust–Purchase Intention (0.579) and Perceived Risk–Trust (0.460) — both directly hypothesized, strong structural relationships. Discriminant validity is confirmed by the HTMT criterion as well.

	PV	EC	PR	PK	SC	SI	TR	PBH	PI
PV	—	—	—	—	—	—	—	—	—
EC	0.099	—	—	—	—	—	—	—	—
PR	0.250	0.135	—	—	—	—	—	—	—
PK	0.091	0.084	0.064	—	—	—	—	—	—
SC	0.086	0.105	0.104	0.092	—	—	—	—	—
SI	0.136	0.133	0.133	0.059	0.078	—	—	—	—
TR	0.225	0.174	0.460	0.169	0.334	0.219	—	—	—
PBH	0.130	0.114	0.103	0.127	0.151	0.118	0.108	—	—
PI	0.115	0.121	0.359	0.081	0.235	0.171	0.579	0.238	—

4.3 Structural Model Assessment

4.3.1 Path Coefficients and Hypothesis Testing

Hyp.	Path	β	t	p	Result
H1	Price Value → Trust	0.226	4.89	<0.001	Supported
H2	Environmental Concern → Trust	0.167	3.46	<0.001	Supported
H3	Perceived Risk → Trust	-0.405	-10.21	<0.001	Supported
H4	Product Knowledge → Trust	0.145	3.60	<0.001	Supported
H5	Seller Credibility → Trust	0.258	6.48	<0.001	Supported
H6	Social Influence → Trust	0.139	3.26	0.0011	Supported
H7	Trust → Purchase Intention	0.439	10.37	<0.001	Supported

R^2 (Trust) = 0.339; R^2 (Purchase Intention) = 0.240.

4.4 Mediation Analysis (H8a–H8f)

Hyp.	Indirect path	β	t	p	95% CI	Result
H8a	Price Value → Trust → PI	0.099	4.16	<0.001	[0.055, 0.147]	Supported
H8b	Environmental Concern → Trust → PI	0.073	3.30	<0.001	[0.032, 0.117]	Supported
H8c	Perceived Risk → Trust → PI	-0.178	-6.97	<0.001	[-0.229, -0.126]	Supported
H8d	Product Knowledge → Trust → PI	0.064	3.41	<0.001	[0.033, 0.103]	Supported
H8e	Seller Credibility → Trust → PI	0.113	5.46	<0.001	[0.075, 0.155]	Supported
H8f	Social Influence → Trust → PI	0.061	3.05	0.0023	[0.027, 0.103]	Supported

All bootstrap confidence intervals excluded zero, confirming trust mediates every antecedent's effect on purchase intention. Since the direct paths from antecedents to Trust and from Trust to Purchase Intention are both significant, and no direct antecedent → Purchase Intention paths were modeled, results are consistent with full mediation through Trust.

4.5 Moderation Analysis (H9)

Path	β	t	p	95% CI	Result
Trust × Perceived Battery Health → PI	0.090	1.56	0.1179	[-0.029, 0.202]	Not supported

Simple slopes of Trust → Purchase Intention by battery health level: Low (−1 SD) = 0.349; Mean = 0.439; High (+1 SD) = 0.528. The slope increases with higher perceived battery health, in the hypothesized direction, but the interaction term itself does not clear the conventional $p < 0.05$ threshold ($p = 0.118$). This is a directionally consistent but statistically inconclusive result, discussed further in Chapter 5.

4.6 Summary of Hypothesis Testing

#	Hypothesis	Result
H1–H6	Antecedents → Trust	All supported
H7	Trust → Purchase Intention	Supported
H8a–f	Trust mediates antecedents → PI	All supported (full mediation)
H9	Battery health moderates Trust → PI	Not supported at $p<0.05$ (directionally consistent)

4.7 Chapter Summary

The measurement model demonstrated strong reliability, convergent validity, and discriminant validity across all nine constructs. The structural model confirmed all six antecedent-to-trust relationships (H1–H6) and the trust-to-purchase-intention relationship (H7), with trust fully mediating each antecedent's effect on purchase intention (H8a–f). The hypothesized moderating role of perceived battery health (H9) showed the expected direction but did not reach conventional statistical significance.

Chapter 5: Discussion, Conclusion, Implications, Limitations, and Future Research

5.1 Discussion of Findings

5.1.1 Antecedents of Trust (H1–H6)

All six hypothesized antecedents significantly predicted consumer trust toward pre-owned EVs, together explaining approximately 34% of the variance in trust ($R^2 = 0.339$). Perceived risk emerged as the strongest predictor ($\beta = -0.405$) in the hypothesized negative direction, confirming that battery-related and financial risk perceptions are the largest barrier to trust formation, more influential than any of the five positive antecedents. Seller/platform credibility was the strongest positive predictor ($\beta = 0.258$), followed by price value ($\beta = 0.226$), suggesting that formal certification, inspection transparency, and price-value perception matter more to Delhi NCR consumers than social or environmental motivations, which — while still significant — carried comparatively smaller effects ($\beta = 0.139–0.167$).

5.1.2 Trust and Purchase Intention (H7)

Trust showed a strong, significant positive effect on purchase intention ($\beta = 0.439$, $p < 0.001$), reaffirming Commitment-Trust Theory's core proposition: trust is a central driver of purchase intention when the underlying product carries high information asymmetry, as pre-owned EVs do.

5.1.3 Mediating Role of Trust (H8a–f)

Trust fully mediated the effect of all six antecedents on purchase intention. Practically, none of the six antecedents — including price value and environmental concern — move consumers toward purchase directly; their influence operates almost entirely through the trust they generate. Marketing messages that emphasize price or sustainability without simultaneously building trust are unlikely to convert intention on their own.

5.1.4 Moderating Role of Perceived Battery Health (H9)

The interaction between trust and perceived battery health on purchase intention was directionally consistent with the hypothesis — the trust–purchase intention slope strengthened from 0.349 (low battery health perception) to 0.528 (high battery health perception) — but did not reach conventional statistical significance ($p = 0.118$). This is informative rather than a failure: it suggests the amplifying effect may be smaller or more sample-sensitive than the direct effects tested elsewhere in the model, consistent with methods literature noting that interaction effects in PLS-SEM typically require larger samples or more reliable moderator measurement to detect at conventional power.

5.2 Theoretical Implications

- Extends TPB-based EV adoption literature by empirically validating trust as a full mediator, not merely a parallel antecedent, in the pre-owned EV context.
- Provides quantitative support for treating perceived battery health as a distinct construct from general product knowledge or perceived risk.
- Offers an emerging-market (Delhi NCR) empirical test of a pre-owned-EV-specific model, addressing a geographic gap in the literature.

5.3 Practical/Managerial Implications

- For pre-owned EV platforms and dealers: Since perceived risk is the single strongest (negative) driver of trust, investment in risk-reduction mechanisms — standardized battery health certification, transparent inspection checklists, warranty coverage — will likely yield larger trust gains than price discounting alone.
- For marketers: Because trust fully mediates all antecedent effects, campaigns should visibly build trust (certification badges, verified seller programs, third-party inspection reports) rather than relying on price or sustainability messaging in isolation.
- For policymakers: The strong negative effect of perceived risk supports standardized, mandated battery State-of-Health (SOH) disclosure requirements in the used-EV market.

5.4 Limitations

- Cross-sectional design — causal claims are inferred from a theory-driven model, not established through longitudinal or experimental data.
- Self-reported intention, not actual purchase behavior; an intention–behavior gap may exist.
- General EV-aware consumer sample rather than actual pre-owned EV buyers, trading ecological validity for sample feasibility.
- Single-region sample (Delhi NCR); findings may not generalize to other regions or markets.
- The moderation effect (H9) was underpowered; the non-significant interaction may reflect true absence of moderation, insufficient sample size, or measurement limitations.

5.5 Directions for Future Research

- Replicate the model with actual pre-owned EV buyers/owners rather than general EV-aware consumers.
- Test the moderating role of battery health perception with a larger sample or an objective/verified battery health measure.
- Extend the model longitudinally to track whether stated purchase intention converts to actual purchase behavior.
- Explore cross-regional or cross-country comparisons to test generalizability.
- Incorporate willingness-to-pay-premium as a distinct outcome variable to quantify the monetary value consumers place on trust and battery certification.

5.6 Conclusion

This study examined the determinants of consumer purchase intention toward pre-owned electric vehicles in Delhi NCR, with particular attention to the mediating role of trust and the moderating role of perceived battery health. The findings confirm that trust is a central, fully mediating mechanism through which price value, environmental concern, perceived risk, product knowledge, seller credibility, and social influence translate into purchase intention — with perceived risk emerging as the most powerful negative lever and seller credibility the most powerful positive one. The hypothesized amplifying role of perceived battery health showed the expected direction but fell short of statistical significance, pointing toward a promising but not yet conclusively established extension to trust-based purchase models in this category. Collectively, these results underscore that trust-building — not price incentives alone — is the primary lever available to sellers, platforms, and policymakers seeking to grow the pre-owned EV market.

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Appendix A: Survey Questionnaire

Determinants of Consumer Purchase Intention toward Pre-Owned Electric Vehicles: The Mediating Role of Trust and the Moderating Role of Perceived Battery Health

All items rated on a 5-point scale: 1 = Strongly Disagree, 2 = Disagree, 3 = Neutral, 4 = Agree, 5 = Strongly Agree, unless otherwise specified.

Section A: Screening and Demographics

- A1. Are you aware of electric vehicles (EVs) and would you consider yourself a potential vehicle buyer? (Yes / No — "No" ends survey)
- A2. Age: (18–24 / 25–34 / 35–44 / 45–54 / 55+)
- A3. Gender: (Male / Female / Prefer not to say / Other)
- A4. City/area of residence within Delhi NCR: (Delhi / Gurugram / Noida / Faridabad / Ghaziabad / Other)
- A5. Occupation: (Salaried / Self-employed / Business owner / Student / Other)
- A6. Monthly household income: (<₹50,000 / ₹50,000–1,00,000 / ₹1,00,000–2,00,000 / >₹2,00,000)
- A7. Do you currently own an EV (new or pre-owned)? (Yes, new / Yes, pre-owned / No, but considering / No)
- A8. Have you ever purchased or seriously shopped for a pre-owned EV? (Yes / No)

Section B: Construct Measurement

Price Value (PV)

- 1. A pre-owned EV offers better value for money than a new EV.
- 2. The price of pre-owned EVs is reasonable compared to their benefits.
- 3. Buying a pre-owned EV helps me save money compared to buying new.
- 4. I believe pre-owned EVs are priced fairly relative to pre-owned petrol/diesel vehicles.

Environmental Concern (EC)

- 1. I am concerned about the environmental impact of my vehicle choice.
- 2. Buying an EV (new or pre-owned) helps reduce carbon emissions.
- 3. I feel a personal responsibility to choose environmentally friendly transportation.

- 4. My concern for the environment influences my vehicle purchase decisions.

Perceived Risk (PR)

- 1. I am worried about hidden defects in a pre-owned EV's battery.
- 2. Buying a pre-owned EV feels financially riskier than buying a pre-owned petrol/diesel car.
- 3. I am concerned that a pre-owned EV's actual range may be lower than advertised.
- 4. I am uncertain whether a pre-owned EV will perform reliably over time.
- 5. The lack of standardized inspection for pre-owned EVs concerns me.

Product/EV Knowledge (PK)

- 1. I understand how EV batteries degrade over time.
- 2. I am familiar with how to check an EV's battery health before buying.
- 3. I know what to look for when evaluating a pre-owned EV.
- 4. I am knowledgeable about EV technology in general.

Seller/Platform Credibility (SC)

- 1. I trust dealers/platforms that offer certified pre-owned EV programs.
- 2. A formal inspection checklist would increase my confidence in a seller.
- 3. I trust sellers who provide a battery health report with the vehicle.
- 4. Reputed platforms/dealerships make me more comfortable buying a pre-owned EV.

Social Influence (SI)

- 1. My family/friends' opinions influence my decision to buy a pre-owned EV.
- 2. People whose opinions I value would approve of me buying a pre-owned EV.
- 3. Positive reviews from other pre-owned EV buyers influence my decision.

Consumer Trust (TR)

- 1. I trust that a certified pre-owned EV will perform as described.
- 2. I feel confident relying on seller-provided information about a pre-owned EV.
- 3. Overall, I trust the pre-owned EV market in Delhi NCR.
- 4. I believe sellers of pre-owned EVs are honest about the vehicle's condition.
- 5. I trust that pre-owned EV platforms act in the buyer's best interest.

Perceived Battery Health (PBH)

- 1. I am confident in assessing a pre-owned EV's battery condition before purchase.
- 2. I trust State-of-Health (SOH) certification/reports when available.
- 3. I believe the battery in a well-maintained pre-owned EV retains sufficient capacity for my needs.
- 4. My purchase decision would change significantly based on the battery health information provided.

Section C: Purchase Intention (PI) and Willingness to Pay

- 1. I intend to purchase a pre-owned EV in the near future.
- 2. I would consider a pre-owned EV over a new ICE vehicle.

- 3. I would recommend a pre-owned EV to others.
- 4. I am willing to pay a premium for a pre-owned EV with a verified battery health certificate. (secondary/optional item)