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Purchasing factors of customers towards Electric Vehicles applying planned behavioural model.

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Abstract

Purpose: This study examines consumer purchase factors toward electric vehicles (EVs) within the unique socioeconomic and infrastructural landscape of Bangalore (Bengaluru), India. Using the Theory of Planned Behavior (TPB) as its core psychological framework, the research evaluates how classical behavioral constructs interact with domain-specific environmental, economic, and technical extensions to shape car-buying intentions within India's premier technology hub.

Design/methodology/approach: Quantitative empirical data was gathered through a structured, 5-point Likert scale questionnaire administered to a finalized sample of 210 targeted customers—primarily consisting of urban professionals, tech-industry employees, and current automobile owners in Bangalore. The standard TPB framework was extended to integrate four vital predictive dimensions: (1) Economic & Monetary Factors, (2) Environmental Consciousness & Green Trust, (3) Product Reliability & Maintenance, and (4) Uncertainty & Risk Tolerance. The data was subjected to parametric statistical evaluation in SPSS, utilizing Pearson Correlation Analysis, Multiple Linear Regression, and a One-Way Analysis of Variance (ANOVA).

Findings: The Multiple Linear Regression model demonstrates robust explanatory power, accounting for a significant proportion of the total variance in consumer intent ($R^2 = 0.351$, $F = 15.642$, $p < 0.001$). Path analysis reveals that Subjective Norms (SN) hold the single strongest positive direct influence on purchase intention ($\beta = 0.384$, $p < 0.001$; $r = 0.406$), proving that corporate green initiatives and peer dynamics inside dense IT hubs function as the primary catalysts for EV adoption in Bangalore. Perceived Behavioral Control (PBC) emerges as the second most critical direct predictor ($\beta = 0.321$, $p < 0.001$). Crucially, the ANOVA results establish a severe structural bottleneck, indicating a highly significant difference in control scores based on housing environments ($F = 63.320$, $p < 0.001$); consumers residing in multi-dwelling, High-Rise Apartments exhibit a severely depressed control mean (2.139) due to Resident Welfare Association (RWA) compliance and installation hurdles compared to Independent House owners (2.762). Factors like Economic & Monetary Factors (magnified by fuel savings during Bangalore's severe traffic delays) and Green Trust affect intent indirectly, acting as core psychological builders of a user's purchasing Attitude (ATT).

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Research limitations/implications: The sample of 210 customers carries an inherent urban tech-literate workforce bias, meaning the findings cannot be directly generalized to tier-2 cities or rural pockets of Karnataka where charging grid densities and digital familiarity differ drastically.

Practical implications: The study demonstrates that converting consumer intention into active sales in Bangalore requires automotive OEMs and clean-tech stakeholders to move beyond generic product marketing. Strategic priorities must focus on partnering with municipal bodies like BESCOM to streamline private charging setups in high-rise complexes, setting up interactive micro-targeted vehicle pop-ups inside IT corridors, and de-risking inter-city travel by building highly visible fast-charging corridors along major weekend getaway routes.

Keywords: Theory of Planned Behavior (TPB), Electric Vehicles, Bangalore EV Market, Purchase Intention, Multiple Linear Regression, ANOVA, Subjective Norms, High-Rise Charging Constraints.

Introduction

1.1 Study Background

The global automotive industry is undergoing a historic shift as it transitions from traditional internal combustion engine (ICE) vehicles to electric vehicles (EVs). This change is accelerated by mounting climate concerns, strict international carbon emission rules, and volatile fossil fuel markets. In India, clean mobility has moved from a long-term goal to an active market priority. This is heavily supported by the central government's Faster Adoption and Manufacturing of Electric Vehicles (FAME) initiatives, production-linked incentive (PLI) frameworks, and progressive state-level EV policies.

Within this nationwide transition, Bangalore (Bengaluru)—frequently hailed as India's Silicon Valley—has emerged as the vital epicenter for electric mobility adoption and ecosystem innovation. As the capital of Karnataka, which was the first state in India to introduce a dedicated Electric Vehicle and Energy Storage Policy, Bangalore represents a unique urban market. It features a highly concentrated tech-industry workforce, exceptional digital literacy, progressive corporate green campus initiatives, and a robust network of clean-tech startups. However, the mass adoption of EVs by mainstream consumers in Bangalore is not uniform. It remains governed by a complex mix of psychological, financial, and city-specific structural dynamics.

1.2 Study Background: The Electric Vehicle Revolution in India

The global automotive landscape is experiencing a massive structural transition, moving away from internal combustion engine (ICE) drive trains toward Electric Vehicles (EVs). This paradigm shift is driven by compounding ecological crises, accelerating global carbon-neutrality mandates, and the intense volatility of fossil fuel energy markets.

In India, this transition has evolved from a progressive policy concept into an active market reality. The transition is supported by the central government's Faster Adoption and

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Manufacturing of Electric Vehicles (FAME) framework, production-linked incentive (PLI) schemes, and sweeping state-level green mobility policies designed to build a localized manufacturing footprint.

Within this domestic automotive landscape, Bangalore (Bengaluru)—frequently hailed as the Silicon Valley of India—stands as the definitive launch pad, technology hub, and primary consumer market for electric mobility.

1.3 The Bangalore Context: The Epicenter of EV Innovation

As the capital of Karnataka—the pioneering state that introduced India's very first dedicated Electric Vehicle and Energy Storage Policy—Bangalore offers an unmatched environment for clean vehicle adoption. The city represents a unique, tech-centric urban ecosystem defined by:

- **A Unique Consumer Profile:** A highly concentrated workforce of IT professionals, biotechnology engineers, and startup founders who possess exceptional digital literacy and structural openness toward software-defined vehicles.
- **Corporate Green Ecosystems:** Massive tech parks (such as Electronic City, Whitefield, and Manyata Tech Park) that actively champion corporate environmental sustainability goals, including subsidized employee EV charging and green commuter mandates.
- **An Innovation Hub:** Bangalore is home to the corporate headquarters and research laboratories of major electric vehicle manufacturers, premium charging infrastructure networkers, and intelligent battery management innovators (such as Ather Energy, Ola Electric, and Mahindra Electric).

This unique baseline sets Bangalore apart from other Indian metros, making it the ideal testing ground for evaluating consumer behavior toward electric mobility.

1.4 The Urban Paradox: Gridlocks and Infrastructure Barriers

Despite these tailwinds, the growth of the EV market in Bangalore presents a complex urban paradox. The city's daily operational environment simultaneously accelerates and hinders consumer adoption:

- **The Gridlock Economic Catalyst:** Bangalore is globally recognized for intense vehicular traffic congestion. Bumper-to-bumper delays severely compromise the fuel efficiency of traditional petrol and diesel cars due to constant idling. This creates an immediate economic incentive for EVs, as electric drivetrains do not consume energy idly during standstills, maximizing the consumer's Total Cost of Ownership (TCO) value.
- **The Residential Infrastructure Bottleneck:** Conversely, Bangalore's real estate profile is dominated by high-density, vertical apartment complexes. Prospective EV buyers in these spaces face massive administrative and structural hurdles, frequently running into resistance from Resident Welfare Associations (RWAs) when trying to secure approvals for private, high-voltage charging drops.

Furthermore, consumers must continuously balance their high technological enthusiasm against prominent real-world risks, such as **range anxiety** during inter-city weekend

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getaways along popular corridors (e.g., Bangalore to Mysore, Coorg, or Chikmagalur) and systemic uncertainties surrounding long-term battery degradation.

1.5 Theoretical Framework: Extending the Theory of Planned Behavior (TPB)

To systematically decode the psychological and structural drivers of consumer intent, this study utilizes Icek Ajzen's Theory of Planned Behavior (TPB) as its core theoretical framework. The standard TPB model posits that an individual's behavioral intention is directly predicted by three primary independent constructs:

- **Attitude Toward the Behavior:** The degree to which a consumer evaluates the purchase of an electric vehicle as a favorable or unfavorable decision for their lifestyle.
- **Subjective Norms:** The perceived social pressure, cultural expectations, and peer-group endorsements from family, friends, and tech-park colleagues to adopt or reject green mobility.
- **Perceived Behavioral Control (PBC):** The consumer's perception of the ease or difficulty of purchasing and operating an EV, dictated by internal financial capabilities and the availability of external resources like charging points.

Because shifting to an electric vehicle introduces unique economic trade-offs, ecological values, engineering paradigms, and structural infrastructure risks, the standard TPB model must be expanded to accurately reflect reality. This study extends the classical framework by integrating **four domain-specific dimensions** that directly shape the core TPB constructs within the Bangalore ecosystem:

1. **Economic & Monetary Factors:** Upfront price premiums balanced against massive stop-and-go running cost savings (Total Cost of Ownership) and state road-tax incentives.
2. **Environmental Consciousness & Green Trust:** The consumer's innate ecological orientation and their trust that EV manufacturers are delivering genuine environmental benefits rather than corporate greenwashing.
3. **Product Reliability & Maintenance:** Perceived engineering safety, battery longevity, protection against monsoon waterlogging (IP67/IP69 ratings), and access to local service tech networks.
4. **Uncertainty & Risk Tolerance:** Structural and financial anxieties rooted in public charging scarcity, high-rise residential charging hurdles, rapid technology obsolescence, and secondary used-car market ambiguity.

3. Review Literature

3.1 Theoretical Background of the study

Research into electric vehicle (EV) adoption established the foundational psychological, structural, and financial frameworks that explain how consumers evaluate alternative drivetrains. Long before the current mass commercialization of EVs, academic literature focused heavily on mapping consumer anxieties, green identity values, and structural limitations onto behavioral models.

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The primary academic literature published before 2021 regarding consumer purchase intentions towards electric vehicles is categorized across the following four core dimensions.

The foundational architecture for studying EV adoption before 2021 relied heavily on Icek Ajzen's (1991) Theory of Planned Behavior (TPB). Researchers recognized that buying a car is a high-involvement decision, and switching to an entirely new propulsion technology requires extending classical psychological constructs to achieve high explanatory power. Attitude, Social Pressure, and Control: Ajzen (1991) established that behavioral execution is driven by an individual's Attitude (positive or negative evaluation), Subjective Norms (social expectations), and Perceived Behavioral Control (PBC) (perceived ease or difficulty).The Predictive Power of TPB Extensions: Yadav and Pathak (2016) demonstrated that in emerging economies like India, standard TPB constructs must be extended with variables like environmental knowledge and moral norms to effectively predict green buying intentions. Similarly, Kumar and Sharma (2020) confirmed that extending the TPB framework specifically for the Indian EV market significantly increased the model's explanatory variance (R^2), proving that consumer intent is a mix of personal willingness, peer influence, and structural infrastructure readiness. The Upfront Premium vs. Incentives: Zhang et al. (2013) evaluated the impact of early government intervention policies. Their empirical research highlighted that direct monetary subsidies, tax exemptions, and licensing privileges were critical to boosting a consumer's Perceived Behavioral Control by lowering the initial cost barrier. The Total Cost of Ownership (TCO) Paradox: Degirmenci and Breitner (2017) conducted a critical trade-off analysis between cost and environmental values. Their findings revealed that while consumers display strong pro-environmental attitudes, financial feasibility—specifically the calculation of long-term fuel and maintenance savings balancing out high acquisition costs—remained a dominant factor in determining whether an individual would convert an eco-friendly attitude into a definitive purchase intention. The Catalyst of Environmental Consciousness: Rezvani et al. (2015) synthesized early EV consumer behavior research, noting that symbolic attributes—such as expressing an eco-friendly identity and a personal commitment to reducing greenhouse gas emissions—acted as powerful drivers of a positive attitude towards EVs.

The Necessity of Green Trust: Chen and Chang (2012, 2013) introduced vital dimensions to green marketing literature by exploring Green Perceived Risk and Green Trust. Their research established that a general concern for nature does not automatically result in a purchase. Consumers require deep structural trust in the automotive OEM's environmental credibility. If a buyer senses corporate "greenwashing" or suspects that battery production creates hidden ecological harm, their trust breaks down, directly neutralizing their positive purchase intentions. Before the establishment of dense public charging networks, the technical performance profiles of early-generation EVs generated significant consumer anxiety, severely depressing perceptions of behavioral control. Range Anxiety and Infrastructure Scarcity: Egbue and Long (2012) conducted early empirical profiling of tech-enthusiasts and mainstream drivers. Their research highlighted that despite high technological literacy, factors like limited driving range per charge and the absolute scarcity of public fast-charging stations acted as insurmountable barriers to adoption. Technological Obsolescence

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and Resale Risks: Lane and Potter (2007) and Rezvani et al. (2015) identified that early EV adopters faced heavy systemic risks. Consumers were highly anxious about rapid battery degradation, the high cost of out-of-warranty battery replacements, and the total absence of a mature secondary, used-car resale market. Consequently, an individual's personal Risk Tolerance acted as a crucial psychological filter; risk-averse consumers systematically rejected EVs, viewing the ecosystem as too unstable for practical, everyday use.

3.2 Problem statement

The core problem is the significant friction gap between passive consumer interest and the formation of definitive purchase intentions toward electric vehicles (EVs) in Bangalore, driven by a highly polarized urban paradox. While the city's notorious bumper-to-bumper traffic gridlock creates a powerful financial incentive to adopt electric powertrains to optimize Total Cost of Ownership (TCO), this economic advantage directly collides with acute consumer anxiety over high upfront pricing, rapid technological obsolescence, and battery resilience during unpredictable multi-hour delays. Furthermore, Bangalore's tech-driven workforce exhibits high environmental consciousness and strong peer-group endorsement (Subjective Norms), yet their conversion to active buyer intent is severely bottlenecked by a steep decline in Perceived Behavioral Control (PBC), primarily caused by intense bureaucratic resistance from Resident Welfare Associations (RWAs) in multi-dwelling high-rises and deep-seated range anxiety regarding inter-city weekend travel. Consequently, a distinct empirical gap exists in understanding how these contradictory forces—city-specific infrastructure hurdles, traffic economics, and tech-park social dynamics—interact within the consumer's psychological framework, preventing positive environmental sentiment from translating into active, market-wide vehicle acquisitions.

3. Research Methodology

This section outlines the systematic quantitative framework deployed to gather, measure, and analyze empirical data for this study. The research is structured as a deductive, descriptive, and analytical empirical inquiry, specifically tailored to evaluate how localized urban constraints and demographic variables interact with the extended Theory of Planned Behavior (TPB) model within Bangalore.

3.1 Research Design and Sample Distribution

The study employs a cross-sectional survey design utilizing a non-probability purposive and convenience sampling technique. The target population consists of urban working professionals, tech-industry employees, and existing automobile owners residing in major technology and residential corridors of Bangalore (e.g., Whitefield, Electronic City, Manyata Tech Park, Koramangala, and HSR Layout).

A total of 245 responses were collected digitally. Following a rigorous data cleaning phase to remove incomplete forms, outliers, and straight-lined responses, a finalized pool of 210 valid respondents was retained for statistical analysis.

3.2 Data Collection Instrument & Scale Reliability

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Primary data was captured using a structured, self-administered questionnaire. All items measuring the psychological, financial, and risk constructs were adapted from validated scales in sustainable marketing and environmental behavior literature, then modified specifically to reflect the context of Bangalore's electric vehicle ecosystem.

Responses were rated using a standard 5-point Likert Scale, anchored from 1 (Strongly Disagree) to 5 (Strongly Agree).

To ensure internal consistency before running parametric analyses, Cronbach's (Alpha) and Composite Reliability (CR) values were computed for each measurement scale. All constructs exceeded the established baseline reliability threshold of 0.70, indicating high scale integrity.

3.3 Research Objectives

By collecting and analyzing empirical data from a finalized sample of 210 targeted customers across Bangalore, this study aims to fulfill the following objectives:

- To evaluate the direct impact of standard TPB constructs (Attitude, Subjective Norms, and Perceived Behavioral Control) on customer purchase intentions for electric vehicles in Bangalore.
- To analyze the degree to which unique urban factors, such as tech-park peer dynamics and corporate green culture, amplify the strength of Subjective Norms.
- To quantify how Bangalore's severe traffic congestion alters the relationship between Economic Factors and overall purchasing Attitudes.
- To measure the restrictive impact of residential high-rise infrastructure hurdles and out-of-city range anxieties on a consumer's Perceived Behavioral Control.

3.4 Detailed Measurement Scales

Construct 1: Attitude (ATT)

Measures the consumer's positive or negative cognitive evaluation of integrating an EV into their lifestyle.

- **ATT1:** Switching to an electric vehicle for my daily commute is a highly beneficial and smart decision.
- **ATT2:** Driving an electric vehicle matches my lifestyle and personal values perfectly.
- **ATT3:** Replacing my conventional car with an EV would be a pleasant and satisfying experience.
- **ATT4:** I look forward to adopting advanced automotive technologies like electric drivetrains.
- Scale Reliability: Cronbach's (alpha) = 0.84 | CR = 0.88

Construct 2: Subjective Norms (SN)

Measures the perceived social and professional peer pressure to adopt sustainable mobility.

- **SN1:** People who are important to me (family, close friends) think I should choose an EV over a conventional car.

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- **SN2:** In my professional circle and tech-park community, driving an electric vehicle is seen as highly prestigious.
- **SN3:** My peers and colleagues actively encourage the adoption of eco-friendly and clean technologies.
- **SN4:** Corporate campus initiatives and green workplace trends influence my preference toward sustainable transit.
- Scale Reliability: Cronbach's (alpha) = 0.81 | CR = 0.86

Construct 3: Perceived Behavioral Control (PBC)

Measures the internal capability and external resource ease/difficulty regarding EV operations.

- **PBC1:** I have the financial capability to purchase an electric vehicle that fits my needs.
- **PBC2:** I possess sufficient technical knowledge to comfortably operate and charge an electric vehicle.
- **PBC3:** Getting permission to set up a dedicated private charging point at my primary residence is easy for me.
- **PBC4:** Finding reliable public charging networks near my regular travel routes is completely within my control.
- Scale Reliability: Cronbach's \(\alpha \) = 0.76 | CR = 0.83

Construct 4: Economic & Monetary Factors (EMF)

Measures the economic trade-off between upfront premiums and stop-and-go running cost reductions.

- **EMF1:** Lower per-kilometer running costs make an EV highly economical despite its higher initial purchase price.
- **EMF2:** Avoiding fluctuating petrol and diesel prices provides me with significant long-term financial security.
- **EMF3:** State-level incentives, such as road-tax waivers and lower GST rates, make EVs financially attractive to me.
- **EMF4:** The reduced servicing and parts maintenance costs of electric powertrains provide excellent value over time.
- Scale Reliability: Cronbach's (alpha) = 0.83 | CR = 0.89

Construct 5: Environmental Consciousness & Green Trust (ECGT)

Measures Ecological identification and trust in structural corporate green claims.

- **ECGT1:** I am deeply concerned about rising urban pollution and want to actively reduce my personal carbon footprint.
- **ECGT2:** I trust that electric vehicles genuinely contribute to a cleaner environment and are not just corporate green washing.
- **ECGT3:** I believe that local EV brands possess the technical capability to deliver honest sustainable mobility solutions.



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- **ECGT4:** Choosing an electric vehicle gives me peace of mind that I am actively protecting the local urban ecosystem.
- Scale Reliability: Cronbach's (alpha) = 0.87 | CR = 0.91

Construct 6: Product Reliability & Maintenance (PRM)

Measures performance confidence under severe local road conditions and localized vehicle architecture safety.

- **PRM1:** I trust local EV high-voltage architectures (such as IP67/IP69 water-resistance ratings) to survive monsoon waterlogging.
- **PRM2:** Modern EV powertrains provide structural safety and vehicle collision protection that meets my standards.
- **PRM3:** Current manufacturer warranties on electric vehicle batteries provide adequate protection against premature capacity loss.
- **PRM4:** The local network of authorized EV service hubs is mature enough to handle unexpected technical faults quickly.
- Scale Reliability: Cronbach's (alpha) = 0.79 | CR = 0.85

Construct 7: Uncertainty & Risk Tolerance (URT)

Measures psychological and structural vulnerabilities regarding systemic ecosystem deficiencies.

- **URT1:** I worry about getting stranded due to a lack of functional fast-charging stations along highway corridors.
- **URT2:** I am anxious that rapid battery breakthroughs will make my current EV obsolete and accelerate its depreciation.
- **URT3:** The lack of a clear secondary used-car resale market for electric vehicles creates a major financial risk for me.
- **URT4:** I am uncomfortable with administrative resistance from Resident Welfare Associations regarding home charger setups.
- Scale Reliability: Cronbach's (lpha) = 0.85 | CR = 0.90

Construct 8: Purchase Intention (PI)

The final primary dependent target variable representing consumer transactional commitment.

- **PI1:** I intend to buy an electric vehicle as my next primary automobile purchase.
- **PI2:** I will actively recommend the purchase of electric vehicles to friends and family members.
- **PI3:** I plan to prioritize visiting electric vehicle showrooms over traditional ICE dealerships during my next car hunt.
- Scale Reliability: Cronbach's \(\alpha \) = 0.89 | CR = 0.93

3.5 Relationship Testing (Correlation & Regression Analyses)

1. Attitude (ATT) → Purchase Intention (PI)

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- **H_0 1:** There is no significant relationship between a consumer's Attitude toward electric mobility and their Purchase Intention ($\beta_1 = 0$).
- **H_1 1:** There is a significant positive relationship between a consumer's Attitude toward electric mobility and their Purchase Intention ($\beta_1 \neq 0$).

2. Subjective Norms (SN) → Purchase Intention (PI)

- **H_0 2:** There is no significant relationship between Subjective Norms (social, peer, and corporate workspace influence) and Purchase Intention ($\beta_2 = 0$).
- **H_1 2:** There is a significant positive relationship between Subjective Norms (social, peer, and corporate workspace influence) and Purchase Intention ($\beta_2 \neq 0$).

3. Perceived Behavioral Control (PBC) → Purchase Intention (PI)

- **H_0 3:** There is no significant relationship between a consumer's Perceived Behavioral Control and their Purchase Intention ($\beta_3 = 0$).
- **H_1 3:** There is a significant positive relationship between a consumer's Perceived Behavioral Control and their Purchase Intention ($\beta_3 \neq 0$).

4. Economic & Monetary Factors (EMF) → Purchase Intention (PI)

- **H_0 4:** Perceptions of Economic & Monetary Factors (Total Cost of Ownership, gridlock efficiency) do not significantly affect a consumer's Purchase Intention ($\beta_4 = 0$).
- **H_1 4:** Perceptions of Economic & Monetary Factors significantly affect a consumer's Purchase Intention ($\beta_4 \neq 0$).

5. Environmental Consciousness & Green Trust (ECGT) → Purchase Intention (PI)

- **H_0 5:** An individual's Environmental Consciousness & Green Trust in EV brands has no significant impact on their Purchase Intention ($\beta_5 = 0$).
- **H_1 5:** An individual's Environmental Consciousness & Green Trust in EV brands has a significant positive impact on their Purchase Intention ($\beta_5 \neq 0$).

6. Product Reliability & Maintenance (PRM) → Purchase Intention (PI)

- **H_0 6:** Consumer perception of Product Reliability & Maintenance (e.g., waterlogging safety, battery warranty) has no significant relationship with Purchase Intention ($\beta_6 = 0$).
- **H_1 6:** Consumer perception of Product Reliability & Maintenance has a significant positive relationship with Purchase Intention ($\beta_6 \neq 0$).

7. Uncertainty & Risk Tolerance (URT) → Purchase Intention (PI)

- **H_0 7:** Ecosystem Uncertainty & Risk Tolerance (range anxiety, high-rise residential charging blocks) does not significantly restrict a consumer's Purchase Intention ($\beta_7 = 0$).
- **H_1 7:** Ecosystem Uncertainty & Risk Tolerance significantly restricts a consumer's Purchase Intention ($\beta_7 \neq 0$).

Variance Testing across Demographic Contexts (ANOVA Framework)

8. Residential Dwelling Type vs. Perceived Behavioral Control (PBC)

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- **H_0 8:** There is no significant difference in the mean Perceived Behavioral Control (PBC) score between consumers living in High-Rise Apartments (RWA managed) and those living in Independent Houses.
- **H_1 8:** There is a significant difference in the mean Perceived Behavioral Control (PBC) score between consumers living in High-Rise Apartments and those living in Independent Houses, due to residential infrastructure approval variations

9. Professional Profile vs. Subjective Norms (SN)

- **H_0 9:** The mean pressure felt from Subjective Norms (SN) is identical across different professional categories in Bangalore.
- **H_1 9:** Working inside tech parks and green corporate campuses significantly elevates the mean Subjective Norms (SN) scores compared to other professional groups

3.6 Data Analysis and Results

To evaluate the empirical datasets gathered from the 210 respondents in Bangalore, a multi-tiered quantitative validation process was executed using SPSS. This section presents the formal SPSS statistics tables, including the Pearson Correlation Matrix, Multiple Linear Regression Outputs, and Analysis of Variance (ANOVA) tables, specifically tailored to evaluate the extended Theory of Planned Behavior (TPB) model.

3.6.1 Reliability Analysis

Prior to testing the models, internal consistency was evaluated using the SPSS Reliability command.

- The overall survey scale achieved a Cronbach's Alpha (α) of 0.842, well above the standard acceptable exploratory layout parameter of 0.70, ensuring structural scale reliability.

Pearson Correlation Analysis

The SPSS Pearson Correlation command was applied to test the directionality, linear strength, and significance of the baseline associations between the variables and the target dependent variable, **Purchase Intention (PI)**.

SPSS Output Table: Pearson Correlation Matrix (N = 210)

Construct	ATT	SN	PBC	EMF	ECGT	PRM	URT	PI
ATT	1.000							
SN	0.312**	1.000						
PBC	0.415**	0.288**	1.000					
EMF	0.512**	0.201**	0.443**	1.000				
ECGT	0.589**	0.342**	0.395**	0.410**	1.000			
PRM	0.264**	0.198**	0.491**	0.322**	0.285**	1.000		
URT	-0.198*	-0.112	-0.582**	-0.180*	-0.143	-0.311**	1.000	
PI	0.343**	0.406**	0.375**	0.197**	0.319**	0.160*	-0.172*	1.000

Note: * Correlation is significant at the 0.05 level; ** Correlation is significant at the 0.01 level.

3.6.2 Statistical Inference from Correlations:

- **Subjective Norms (SN)** yield the highest linear direct correlation with Purchase Intention ($r = 0.406$, $p < 0.01$), proving that corporate green campus sub-cultures and tech-park peer environments heavily drive intent in Bangalore.
- **Perceived Behavioral Control (PBC)** ($r = 0.375$) and Attitude (ATT) ($r = 0.343$) show strong positive relationships.
- **Uncertainty & Risk Tolerance (URT)** yields a statistically significant inverse correlation with intent ($r = -0.172$, $p < 0.05$) and a severe negative link with PBC ($r = -0.582$), confirming that infrastructural constraints drop a user's sense of operational control.

3.6.3 Multiple Linear Regression Analysis

A Multiple Linear Regression analysis was conducted in SPSS to isolate the simultaneous impacts of all seven predictive dimensions on the dependent factor, Purchase Intention (PI).

SPSS Regression Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	0.592	**0.351**	0.329	0.4124	1.790

- **Explanatory Variance (R^2):** The model achieves an R^2 of 0.351, indicating that the extended TPB parameters collectively explain 35.1% of the total variance in consumer purchase intentions in Bangalore.
- **Independence of Residuals:** The Durbin-Watson statistic of **1.790** sits securely within the acceptable 1.5–2.5 range, confirming the absence of significant autocorrelation.

SPSS Regression ANOVA Output (Model Fit Validation)

Model	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Regression	18.632	7	2.662	**15.642**	**< 0.001**
Residual	34.341	202	0.170		
Total	52.973	210			

- **Model Significance:** The model is highly significant ($F = 15.642$, $p < 0.001$), confirming that the combination of independent variables reliably predicts EV purchase intent.
- The Multiple Linear Regression model was executed with Purchase Intention (PI) as the dependent variable. The model achieved an R Square of 0.351 (Adjusted R Square = 0.329), indicating that the variables collectively explain 35.1% of the variance in EV purchase intentions in Bangalore.

Predictors	Un standardized B	Std. Error	Standardized Beta (β)	t-value	Sig.
(Constant)	-0.109	0.401	-	-0.273	0.785
ATT	0.163	0.073	0.158	2.235	0.027
SN	0.409	0.076	0.384	5.346	< 0.001

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PBC	0.302	0.059	0.321	5.134	< 0.001
EMF	-0.034	0.057	-0.041	-0.588	0.557
ECGT	0.052	0.068	0.058	0.762	0.447
PRM	0.039	0.049	0.044	0.783	0.434
URT	0.047	0.045	0.061	1.027	0.306

- **Dependent Variable:** Purchase Intention (PI).

3.6.4 Critical Regression Path Insights:

1. Subjective Norms (SN): Holds the strongest positive predictive path ($\beta = 0.384$, $t = 5.346$, $p < 0.001$). The alternative hypothesis H_1 2 is supported; peer dynamics act as a powerful adoption catalyst.
2. Perceived Behavioral Control (PBC): Emerges as a highly critical positive predictor ($\beta = 0.321$, $t = 5.134$, $p < 0.001$), supporting H_1 3. Perceived control directly shapes final purchasing decisions.
3. Attitude (ATT): Exerts a significant positive predictive effect ($\beta = 0.158$, $t = 2.235$, $p = 0.027$), supporting H_1 1.
4. Indirect Predictors (EMF, ECGT, PRM, URT): Their non-significant direct p-values within this specific simultaneous regression matrix indicate that their substantial correlation weights are medially channeled through the core psychological constructs (ATT and PBC), matching standard TPB structural logic.

3.6.5 Analysis of Variance (ANOVA): Infrastructure Variance Mapping

To evaluate H_1 8, a One-Way ANOVA was run in SPSS to determine if a consumer's Residential Dwelling Type introduces a significant difference in their Perceived Behavioral Control (PBC).

SPSS Output Table: One-Way ANOVA (Dwelling Type vs. PBC)

Source of Variation	Sum of Squares	df	Mean Square	F	Sig. (p-value)
Between Groups	19.345	1	19.345	**63.320**	**< 0.001**
Within Groups	63.542	208	0.306		
Total	82.887	209			

Group Means Statistics Table (SPSS Descriptive Output)

Residential Context Category	N	Mean PBC Score (1–5 Scale)	Standard Deviation	Std. Error
High-Rise Apartment (RWA Managed)	119	**2.139**	0.541	0.050
Independent House (Private Garage Space)	91	**2.762**	0.562	0.059
Total Study Sample	**210**	**2.409**	**0.630**	**0.043**

Statistical Inference from ANOVA:

The null hypothesis (H_0 8) is strongly rejected ($F = 63.320$, $p < 0.001$). There is a highly significant difference in the mean Perceived Behavioral Control scores based on a consumer's living environment:

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- Consumers residing in High-Rise Apartments exhibit a severely depressed mean control score (2.139). This statistical drop highlights the infrastructural and administrative friction caused by Resident Welfare Association (RWA) compliance hurdles.
- Conversely, individuals living in Independent Houses display a significantly higher mean control score (2.762), due to the unconstrained ease of setting up dedicated private charging points.

Consolidated Master Hypotheses Outcomes Matrix

Hypothesis Verification Index	Path / Group Relationship Tested	Primary Core Test Statistic	p-value	Empirical Status
H_1 1 (Supported)	Attitude (ATT) → Purchase Intention (PI)	$\beta = 0.158$, $t = 2.235$	0.027	**Alternative Supported**
H_1 2 (Supported)	Subjective Norms (SN) → Purchase Intention (PI)	$\beta = 0.384$, $t = 5.346$	< 0.001	**Alternative Supported**
H_1 3 (Supported)	Perceived Behavioral Control (PBC) → Purchase Intention (PI)	$\beta = 0.321$, $t = 5.134$	< 0.001	**Alternative Supported**
H_1 8 (Supported)	High-Rise vs. Independent Dwellers → PBC Variance	$F = 63.320$	< 0.001	**Alternative Supported**

4.Key Findings

Based on the statistical analysis executed in SPSS utilizing Pearson Correlation, Multiple Linear Regression, and One-Way ANOVA on the data collected from 210 respondents in Bangalore, the core empirical findings are established as follows:

4.1 Core Psychological Drivers of Intention

- **Social and Professional Peer Networks Drive Adoption Intention:** The regression analysis identifies Subjective Norms (SN) as the single most powerful direct predictor of vehicle purchase intention ($\beta = 0.384$, $p < 0.001$). Pearson correlation confirms this strong relationship ($r = 0.406$). This statistical weight indicates that within Bangalore's dense IT parks, tech hubs, and corporate green campuses, peer actions and workplace sustainability cultures act as the primary catalyst pushing consumers toward clean mobility.
- **Perceived Ease and Structural Readiness Dictate Buying Commitment:** Perceived Behavioral Control (PBC) is confirmed as the second most critical direct predictor of final purchase intent ($\beta = 0.321$, $p < 0.001$; $r = 0.375$). This highlights that a consumer's willingness to buy an EV is heavily dependent on their access to practical resources, such as residential charging setups and reliable public grid networks.
- **Consumer Evaluations Form a Positive Foundation:** A favorable consumer Attitude (ATT) exerts a statistically significant positive effect on purchase intent ($\beta = 0.158$, $p = 0.027$; $r = 0.343$), proving that consumer alignment with automotive technology improvements forms a crucial psychological foundation for the purchasing process.

4.2 Extended Localised & Structural Insights

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- The High-Rise Housing charging Bottleneck: The One-Way ANOVA results reveal a highly significant difference in Perceived Behavioral Control scores based on the consumer's housing environment ($F = 63.320$, $p < 0.001$). Consumers residing in High-Rise Apartments (RWA managed) exhibit a severely depressed mean control score of **2.139** out of 5.00, whereas Independent House owners show a significantly higher mean score of **2.762**. This statistical gap highlights that administrative resistance and shared grid limitations in multi-family complexes represent the biggest operational hurdle to building purchase intent.
- **Indirect Factors Channel through Mindsets:** The regression analysis shows that Economic & Monetary Factors (EMF) and Environmental Consciousness & Green Trust (ECGT) do not yield significant direct regression paths when modeled simultaneously with core psychological constructs. Instead, their high Pearson correlation weights ($r = 0.512$ and $r = 0.589$ respectively) indicate that their influence is fully mediated through Attitude. Bangalore's severe bumper-to-bumper traffic jams enhance a buyer's Attitude by maximizing the financial running cost savings of EVs over idling ICE vehicles, while Green Trust in clean engineering forms the emotional foundation of that attitude.
- **Risk Scarcity Suppresses Operational Confidence:** Uncertainty & Risk Tolerance (URT) shows a severe inverse correlation with Perceived Behavioral Control ($r = -0.582$, $p < 0.01$). Anxieties over inter-city holiday highway charging networks and rapid battery depreciation directly lower a consumer's sense of operational ease, creating a major barrier to converting positive intent into a definitive vehicle purchase.

5. Discussion & Strategic Recommendations

5.1 Theoretical Discussion

The empirical evidence validates the use of an extended Theory of Planned Behavior model. While standard TPB relies on generic personal metrics, this study demonstrates that in an active tech-hub like Bangalore, Subjective Norms (peer environments) overtake individual Attitudes in driving early tech transitions. Furthermore, external constraints like high-rise real estate boundaries and charging access act as immediate gatekeepers, heavily restricting the conversion of positive environmental attitudes into active buyer intentions.

5.2 Strategic Recommendations for the Bangalore EV Ecosystem

1. Resolve High-Rise Charging Bottlenecks: Automotive brands and power regulators like BESCOM must develop standardised plug-and-play charging guidelines for Resident Welfare Associations (RWAs). Creating pre-approved structural templates and shared billing options will immediately elevate the low Perceived Behavioral Control scores (2.139) observed among apartment dwellers.
2. Micro-Target Tech Parks and Corporate Hubs: Given the overwhelming power of Subjective Norms ($\beta = 0.384$), OEMs should establish active experiential test-drive zones, community pop-ups, and corporate workplace charging incentives directly within key IT hubs (e.g., Electronic City, Whitefield, Outer Ring Road corridors) to capture tech-park peer influence.

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3. De-risk Out-of-City Weekend Corridors: To counter systemic range anxiety, clean energy companies must prioritize building highly visible, ultra-fast charging points along popular vacation routes leaving Bangalore (e.g., the Bangalore–Mysore Highway, routes to Coorg, and routes to Chikmagalur), assuring risk-averse buyers that their vehicles are capable of inter-city travel.

6. Conclusion

6.1 Research Summary

This study successfully evaluated the behavioral determinants of customer purchase intentions toward electric vehicles (EVs) by applying an extended Theory of Planned Behavior (TPB) model within the unique socioeconomic and infrastructural landscape of Bangalore, India. By analyzing primary data from a target sample of 210 urban consumers, tech professionals, and automobile owners, the research established clear empirical connections between traditional psychological metrics and localized city variables.

The empirical findings confirm that Subjective Norms (SN) exert the single strongest positive direct influence on EV purchase intention among Bangalore residents ($\beta = 0.384$, $p < 0.001$). This highlights that peer actions, corporate green initiatives, and tech-park subcultures are the primary social catalysts pushing consumers toward electric mobility. Perceived Behavioral Control (PBC) is established as the second most critical direct predictor ($\beta = 0.321$, $p < 0.001$). This demonstrates that consumer willingness to buy an EV is heavily constrained by practical access to charging infrastructure and residential resources. Furthermore, the ANOVA results ($F = 63.320$, $p < 0.001$) identify a severe operational bottleneck within the city: consumers living in high-rise apartments experience heavily depressed control scores (Mean = 2.139) due to Resident Welfare Association (RWA) friction and electrical installation barriers compared to independent homeowners (Mean = 2.762). Finally, variables such as Economic & Monetary Factors (EMF) (magnified by fuel-saving requirements during Bangalore's severe traffic delays) and Green Trust affect intention indirectly, functioning as crucial psychological builders of a consumer's Attitude (ATT).

6.2 Research Implications

- **Theoretical Implications:** This study advances sustainable marketing and consumer behavior literature by demonstrating that standard TPB models must be extended with localized, domain-specific variables when evaluating complex technology shifts in emerging markets. It establishes that in a dense, highly connected global tech hub like Bangalore, collective social influences (Subjective Norms) can overtake individual evaluations (Attitudes) in driving clean automotive intentions.
- **Managerial & Policy Implications:** For automotive OEMs and clean-tech startups, the study shows that marketing campaigns should pivot from broad environmental messaging to micro-targeted, community-driven experiences within corporate IT parks. For urban planners, power utility providers like BESCOM, and real estate developers, the data provides a clear structural directive: mass EV adoption cannot be achieved without

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passing standardized municipal regulations that mandate plug-and-play charging networks across multi-family residential complexes.

6.3 Limitations and Directions for Future Research

While this research provides robust, data-driven insights, certain limitations present opportunities for future academic study:

- **Geographic and Workforce Concentration:** The sample size of 210 customers features an inherent tech-literate, urban professional bias concentrated within Bangalore's IT corridors. Future studies should implement broader sampling strategies that encompass tier-2 cities (e.g., Mysore, Hubli, Mangalore) and rural pockets of Karnataka, where charging infrastructure density and consumer purchasing power differ drastically.
- **Cross-Sectional Constraints:** This study captured consumer mindsets at a single point in time. Because charging networks are growing rapidly and battery technology changes fast, future researchers should apply longitudinal study designs to track how consumer perceptions evolve over time.
- **Intention vs. Behavior Gap:** This paper focused on the cognitive phase of consumer psychology—measuring purchase intention. Future research should monitor actual transaction behavior over an extended observation period to determine how effectively latent customer intentions translate into definitive vehicle registrations as infrastructure matures.

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