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Evaluating the Intention-Behavior Gap and Asset Risk Barriers in Mumbai's Electric Vehicle Market

Mayuresh Joshi[1], Prithvi Bhandare[2]

[1]Assistant Professor, Life Sciences, Kishinchand Chellaram College, HSNC University, Mumbai
[2]Post Graduate Student, Life Sciences, Kishinchand Chellaram College, HSNC University, Mumbai

Abstract:
The global shift toward sustainable transportation has positioned electric vehicles (EVs) as a cornerstone of urban decarbonization strategies; however, the transition remains uneven in emerging economies characterized by high-density urbanism. Despite ambitious national targets to achieve 30% EV penetration by 2030, India's current adoption rate stands at 7.66%, with the personal car sector showing significant stagnation. The current research work investigates the Intention-Behaviour Gap within MMR, where intersection of high real-estate costs, vertical living constraints, and opaque secondary markets creates unique barriers to adoption. Utilizing a cross-sectional survey of 300 residents, the research employs Principal Component Analysis (PCA), K-Means Clustering, and Ordinary Least Squares (OLS) Regression to isolate psychological, financial, and structural determinants of EV acceptance.
Findings uncover a "Green Marketing Fallacy" wherein though environmental concern is observed to be high (7.780/10), it lacks statistical significance (p=0.564) in predicting willingness to pay a premium. Instead, adoption intent is strictly governed by utilitarian economics such as range requirements (p=0.024) and home-charging access (p=0.036). Market segmentation reveals three distinct clusters which include Transition-Ready Enthusiasts (39.3%), Anxious Aspirants (30.0%), and Indifferent participants (30.67%). The study concludes that the Aspirant represents the primary bottleneck, ideologically supportive but physically hindered by infrastructure and Asset Risk Aversion. Comparative analysis reveals a Reality Gap, where current owners report 2.21-point higher confidence than non-owners, suggesting barriers are largely perceptual. The study recommends a strategic pivot toward financial de-risking, including Right to Charge mandates for housing societies and standardized battery health certifications to stabilize the secondary market.

Keywords: *EV*, Intention-Behavior Gap, Mumbai MMR, Green Market Fallacy

1. Introduction

The global imperative for sustainable mobility has transitioned from a peripheral environmental concern to a central tenet of urban survival and national economic strategy [1]. As nations strive to meet Paris Agreement commitments, the electrification of transport has emerged as the primary vehicle for decarbonization [2] [3]. Globally, the transition is gaining significant momentum; data from early 2026 indicates that electric vehicle (EV) sales in leading markets like Norway and China have reached critical mass, driven by a combination of mature charging networks and robust secondary markets [4] [5].

However, the trajectory in emerging economies remains starkly non-uniform [5] [6]. In India, despite a suite of aggressive policy interventions such as the FAME-II and PM E-DRIVE schemes, the market reflects a curious paradox [7]. While the nation aims for a 30% penetration rate by 2030, growth is heavily concentrated in the two- and three-wheeler segments, leaving the personal passenger car market in a state of relative stagnation [8].
The urgency of this transition is underscored by recent empirical evidence from the 2025-26 fiscal cycle, which reveals a growing infrastructure-adoption decoupling in the Indian market [9]. While public charging points in India increased by nearly 35% between 2024 and 2025, the ratio of Battery Electric Vehicles (BEVs) to chargers has simultaneously widened, suggesting that infrastructure expansion is failing to keep pace with localized urban demand [9] [10] [11]. Recent studies in comparable high-density hubs like Bengaluru have begun to identify a 'Green Illusion', where misleading marketing and a lack of transparent data on battery longevity have fostered a climate of consumer skepticism [12] [13]. Furthermore, emerging research into the Total Cost of Ownership (TCO) reveals that while operational costs are lower, the lack of a standardized secondary market for used EVs has led to a liquidity trap, where the fear of rapid asset depreciation outweighs the benefit of government subsidies [14] [15]. These findings highlight a critical shift in the research landscape wherein the primary barrier to 2030 targets is no longer a lack of consumer awareness, but rather a lack of asset confidence and systemic reliability.
This adoption lag is particularly pronounced in high-density megacities like the Mumbai Metropolitan Region (MMR) [16] [17]. Mumbai, characterized by its extreme traffic density and deteriorating air quality, represents a critical battleground for India's green transition. Despite being a hub of financial capital and technological awareness, personal transportation in the MMR remains heavily dominated by traditional internal combustion engine (ICE) vehicles. Current international studies, such as the IEA's Global EV Outlook, suggest that while cost-competitiveness is improving globally, adoption in dense urban environments is often stifled by factors unique to vertical living [18]. In cities like Mumbai, the transition is not merely a matter of consumer preference but is dictated by the complexities of urban planning, grid capacity, and the unique socio-economic pressures of a high-cost metropolitan ecosystem [18] [9] [19].
The rationale for the current study stems from a significant contextual gap observed in the existing mobility literature especially in context of Mumbai. Much of the current research focuses on national-level trends or broad technical specifications, often overlooking the granular, behavioural friction points that define the urban consumer's experience [16]. There is an urgent need to investigate why high levels of environmental awareness and existing government subsidies have not yet triggered a mass-market shift in the passenger car segment [20] [4] [16]. While consumers may express ideological support for green initiatives, the leap to ownership involves a complex calculation of long-term asset value and logistical viability [21]. Without a localized understanding of these barriers specifically how they manifest in a geography as unique as the MMR, policy interventions risk remaining broad-brush and ineffective.
Hence in the current research work, psychological, financial, and structural determinants of EV acceptance among residents of the Mumbai Metropolitan Region have been investigated through a google survey study. By employing a multi-methodological approach involving Principal Component Analysis (PCA) and regression modelling, this study seeks to deconstruct the "intention-behavior gap" that characterizes the Indian EV market. The study moves beyond general awareness surveys to pinpoint the exact economic and logistical variables that act as gatekeepers to adoption. Ultimately, the following sections will detail

the methodology used to capture these insights and provide a thematic analysis of the findings to propose a strategic roadmap for de-risking the electric transition for the urban Indian consumer.

2. Material and Methods

2.1.Research Design and Participant Sampling

The current research work has utilized a quantitative, cross-sectional survey design to analyze the determinants of Electric Vehicle (EV) adoption within the unique urban landscape of the Mumbai Metropolitan Region (MMR). A total of 300 adult residents (N=300) were recruited through a non-probability purposive sampling strategy. This method was selected to specifically target individuals who possess the financial agency and independence required for household mobility decisions. By focusing on this cohort, the study minimizes noise from non-target demographics and focuses on the population segment where the intention - behaviour gap is most academically significant.

2.2.Parameters for Variable Measurements

The primary data collection instrument was a structured online questionnaire designed to measure 19 distinct attitudinal and behavioural variables. To ensure high granularity and sensitivity in capturing consumer sentiment, respondents rated their agreement or concern using a 10-point Likert scale, ranging from 1 (Strongly Disagree/Low Concern) to 10 (Strongly Agree/High Concern). The variables were categorized into four thematic dimensions:

- **Psychological Drivers:** Including personal value alignment, social image perception, and trust in battery technology.
- **Economic Barriers:** Measuring resale value anxiety, perceived financial risk, and upfront cost barriers.
- **Structural Logistics:** Evaluating home charging access, public infrastructure confidence, and trip-planning requirements.
- **Policy Sentiment:** Assessing satisfaction with current government incentives and the perceived effectiveness of state EV policies.

2.3.Statistical Analysis:

The survey followed a rigorous four-stage statistical analysis to move from descriptive polling to strategic inference:

- **Principal Component Analysis (PCA):** This was employed to reduce the dimensionality of the 19 rating-scale questions. PCA identified latent psychological constructs such as Confidence and Trust, Asset Risk Aversion, and Values vs. Reality analysis, allowing for a more sophisticated understanding of the consumer mindset beyond individual variable scores.
- **K-Means Cluster Analysis:** Respondents were segmented into three mutually exclusive market clusters based on their PCA factor scores i.e., Indifferent ones, Anxious probable buyers and EV Enthusiasts. This allowed the study to identify the specific demographic and psychological profile of the most viable target segments.
- **Ordinary Least Squares (OLS) Regression:** A regression model was constructed to mathematically isolate the significant predictors of the dependent variables such as Willingness to Pay (WTP) Premium. Independent variables included range requirements, charging access, and pollution concern to test the hypothesis of "Green Marketing Fallacy".

- **Significance Testing (T-Tests):** Finally, independent sample T-tests were conducted to compare existing EV owners (n=44) against non-owners (n=256). This stage was critical for identifying the Reality Gap between actual ownership experience and perceived psychological barriers.

3. Result and Discussion

3.1. Regression Analysis and the Determinants of the Price Premium

The transition from empirical data to strategic insight requires a critical examination of the factors that govern the intention-behaviour gap in emerging automobile markets [22]. By synthesizing multivariate statistical findings with the unique socio-spatial realities of the Mumbai Metropolitan Region (MMR), this analysis seeks to move beyond mere descriptive polling to uncover the structural and psychological determinants that ultimately dictate the success of the electric mobility transition.

3.1.1. Evaluating Willingness to Pay (WTP)

The quantitative assessment of consumer price sensitivity reveals a heavily skewed distribution regarding the acceptable green premium to be paid for electric vehicles in the MMR. Analysis of the primary dataset (N=300) indicates that while the "EV Enthusiast" cluster identified through K-Means segmentation based on high technology trust and adoption intent, constitutes 41% of the sample (n=123), their enthusiasm does not unilaterally translate into high price elasticity. The data shows that a dominant concentration of respondents in the 1% – 10% premium bracket, totalling 45.33% (n=136), while a critical Zero-Premium cohort i.e., those requiring absolute price parity comprises exactly 32% of the total sample (n=96). This suggests that for nearly one-third of the Mumbai population, an EV must be priced identically to its Internal Combustion Engine (ICE) counterpart to be considered a viable alternative.

he statistical distribution of WTP, as illustrated in Figure 1, further highlights a bifurcation based on household economic agency and residential infrastructure. The "High-Premium" cohort those willing to pay 20% or more is represented by just 5% of respondents (n=15) and correlates strongly with higher income deciles and stable residential assets. In contrast, the mid-to-low WTP brackets are populated by younger professionals and residents of congested urban zones where the perceived utility of an EV does not yet justify the significant upfront capital expenditure. This variation is supported by a distribution that suggests any premium exceeding the 10% threshold acts as a definitive market barrier for 77.33% of the total population (n=232 out of 300).

In the context of Mumbai's economic landscape, these results indicate that the "Total Cost of Ownership" (TCO) narrative has failed to effectively penetrate the consumer psyche. This is also true due to high interest rates for EV loans in India which end up effectively offsetting the TCO Benefits [18] [23]. Thus, the results suggests that the long-term operational savings of an EV are being heavily discounted against immediate liquidity constraints. Within the MMR, where real estate and living costs are exceptionally high, the additional capital required for an EV purchase is viewed through a lens of high opportunity cost. Consequently, the research suggests that current subsidies are perceived not as an incentive, but as a mandatory correction to bring the EV within a rational price range for the urban middle class.

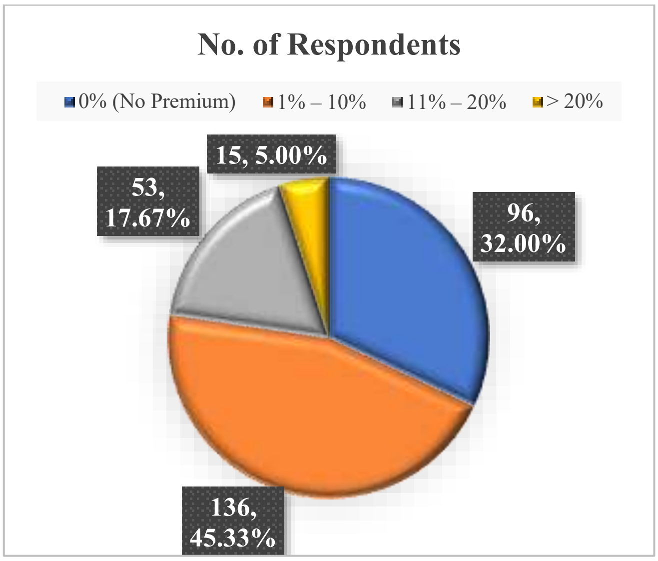

Figure 1: Statistical Distribution of WTP

3.1.2. Predictive Significance of Utilitarian vs. Ideological Variables

The core of the predictive analysis utilized an Ordinary Least Squares (OLS) regression model to isolate the specific variables that influence a consumer's financial commitment to the electric transition. By regressing attitudinal variables against the Willingness to Pay (WTP), the model produced a distinct hierarchy of significance. Range Requirements ($\beta = +0.120$, $p=0.024$) and Home-Charging Access ($\beta = +0.047$, $p=0.036$) emerged as the primary significant predictors. This statistical result demonstrates that in the MMR, the perceived value of an EV is intrinsically linked to its operational autonomy and the convenience of refuelling infrastructure.

The high significance of range and charging access ($p<0.050$) underscores a functionalist approach to adoption among Mumbai residents. For each unit of increase in the confidence of respondents regarding home-based infrastructure, there is a statistically measurable increase in their willingness to absorb a price premium. This suggests that the structural readiness of a residential complex acts as a multiplier for the economic value of the vehicle; conversely, when these utilitarian requirements are not met, the price elasticity displayed by the consumer vanishes. This is evidenced by the negligible predictive power of lifestyle features, such as Performance or Acceleration ($\beta= +0.008$, $p=0.742$), which respondents effectively deemed irrelevant to the core purchase decision compared to survival metrics.

These results reveal a shift from tech-oriented approach to a more pragmatic replacement mindset. In a geography characterized by extreme traffic density and unpredictable commute times, the Mumbai consumer views Range as an insurance policy against urban volatility [19] [24]. The predictive power of these utilitarian variables suggests that the mass-market transition in India will not be led by innovation in any abstract tech, but by the successful integration of the vehicle into the existing domestic infrastructure. Effectively, the EV is being scrutinized as a primary asset that must meet or exceed the reliability of current ICE standards to justify its acquisition.

3.1.3. The Intention-Behavior Gap and the Green Marketing Fallacy

The most provocative outcome of the regression analysis lies in the variables that failed to achieve statistical significance. Despite the sample reporting an exceptionally high mean for Environmental Concern (7.780/10), this sentiment yielded a p-value of 0.564, indicating it has no predictive power over the consumer's willingness to pay a premium. Similarly, Social Image and Status ($\beta=-0.002$, $p=0.619$)

showed no correlation with financial commitment. This disconnect represents a profound "Green Marketing Fallacy," where ideological approval of sustainability does not translate into economic action at the point of sale.

Statistically, the gap between the high descriptive mean for "Green Values" and the low predictive significance in the OLS model suggests a state of Ethical Neutrality during the purchase process. While respondents are concerned citizens who acknowledge the deteriorating air quality in the MMR, they remain rational economic in approach and refuse to internalize the cost of environmental externalities. The data indicates that the "Green" label provides a sense of moral satisfaction but carries zero weight in the financial trade-offs required for a significant automotive investment.

This finding necessitates a radical departure from traditional EV marketing narratives that prioritize ecological benefits. The Intention-Behaviour Gap identified here proves that Awareness is no longer the bottleneck for adoption in Mumbai; but Asset Value is. To bridge this gap, the value proposition must be decoupled from environmental ethics and re-anchored in the superior economic and performance utility of the electric drivetrain. The research concludes that for the electric transition to scale in India, the EV must be sold as a Better Car that happens to be green, rather than a Green Car that asks the consumer to compromise on utility or price.

3.2.Dimensionality Reduction and Latent Consumer Mindsets

While regression identifies specific drivers of cost, it does not capture the broader psychological profiles of the market; thus, a PCA was employed to uncover latent consumer mindsets. To move beyond individual survey responses and uncover the underlying psychological constructs driving the Mumbai EV market, a Principal Component Analysis (PCA) was performed on 19 attitudinal variables which include ordinal data to reflect respondent's attitudes, beliefs and perceptions.

Using Varimax rotation, the analysis successfully reduced the data into three primary components that explain approximately 64.2% of the total variance. These factors represent the latent mindsets that dictate how different segments of the MMR population perceive the transition to electric mobility.

The psychological structure of these mindsets is visualized in Figure 2, which presents the rotated component matrix heatmap. In this visualization, the colour intensity and numerical values represent the factor loadings essentially the degree of correlation between specific survey variables and the underlying latent factor.

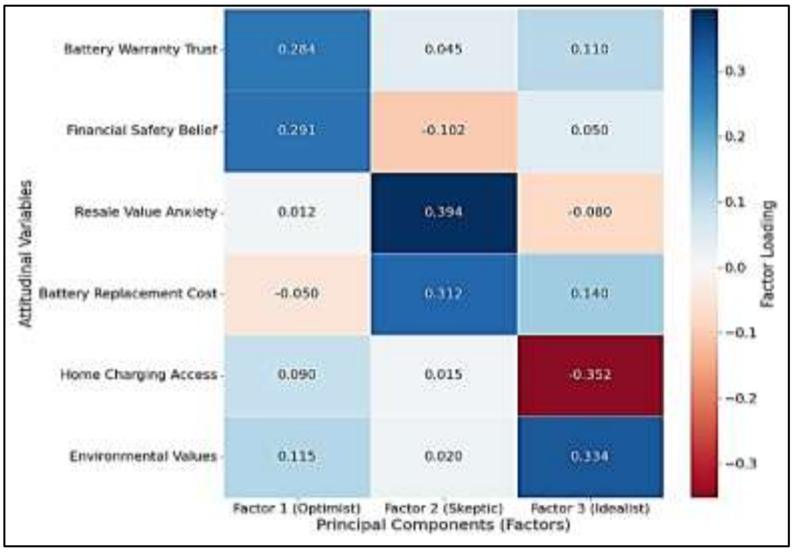

Figure 2: Rotated Component Matrix Heatmap: Latent EV Mindsets in MMR

3.2.1. Factor 1: The Component of Systemic Trust (The Optimist)

As illustrated in the first column of Figure 2, the Dimension of Systemic Trust accounts for the largest portion of explained variance. This factor is characterized by strong positive loadings for Stated Battery Warranty Trust (0.284) and Belief in EV Financial Safety (0.291). For respondents scoring high on this factor, the EV is not viewed as a collection of separate risks, but as a holistic, reliable technology stack. This mindset is fundamentally driven by Systemic Confidence, a belief that the promises made by the manufacturer regarding longevity and safety are empirically valid.

Statistically, the Optimist mindset correlates with higher scores in performance satisfaction, suggesting that positive physical experience with the technology reinforces psychological trust. In the context of a city like Mumbai, this segment represents the intent for adoption. However, even within this trusting group, the data indicates that their optimism is contingent upon the presence of formalized protections, such as the multi-year warranty, which acts as the primary anchor for their technical belief.

3.2.2. Factor 2: Asset Risk and Resale Vulnerability (The Skeptic)

The second column of Figure 2 highlights the Skeptic mindset, dominated by a preoccupation with Asset Risk Aversion. The defining characteristic of this factor is the exceptionally high loading of Resale Value Anxiety (0.394) and the Uncertainty of Battery Replacement Costs (0.312). Unlike factor 1, the factor 2 respondents view the EV through the lens of a depreciating tech gadget rather than a long-term automotive asset. This mindset acts as a critical market inhibitor as it suggests that even if the vehicle performs perfectly today, the lack of a transparent secondary market creates a state of financial paralysis.

The intensity of this concern is reflected in descriptive statistics, where the worry about the resale difficulty of used EVs has scored a mean of 7.7/10 across the sample. Statistically, this factor also acts as a "veto" over adoption intent. A respondent may score high on environmental values, but if they load heavily onto Factor 2 as shown in the heatmap, their willingness to pay a premium drops to near zero, as the vehicle is no longer perceived as a stable store of value.

The data suggests, however, that this skepticism is not immutable; rather, it is a function of information asymmetry that can be corrected through institutional intervention. A significant majority of the sample expressed high trust in the implementation of a standardized, third-party battery health certificate, yielding a mean score of 7.120/10 (SD=±2.145). Furthermore, the OLS model indicates that while current resale anxiety is a high-loading inhibitor, it is negatively correlated with Trust in Government Policy ($p=0.041$). This indicates that while resale vulnerability is a primary latent inhibitor, the introduction of transparent diagnostic protocols and a more robust regulatory framework could effectively neutralize the factor 2 mindset. By providing better information for battery health, the perceived risk of the EV as a depreciating asset is significantly mitigated, stabilizing its value in the secondary market and lowering the barrier for risk-averse consumers.

3.2.3. Factor 3: Structural Constraints in High-Density Urbanism (The Idealist)

The third factor in Figure 2 reveals the "Idealist" mindset. This is a segment of respondents that is ideologically ready but physically hindered. This factor is uniquely defined by a significant negative loading for Home Charging Access (-0.352) contrasted with a high positive loading for Environmental Values (0.334). This creates a profile of a consumer who deeply values sustainability but is trapped by the vertical living challenges of Mumbai.

The statistical reality for this group is of forced indifference. Despite high scores for sustainability alignment, their actual adoption readiness is suppressed by the logistical friction of high-rise residence. The negative loading on home charging confirms that for the MMR, infrastructure is not just a convenience factor but a gatekeeper. This suggests that without a Right to Charge policy framework in Mumbai's residential complexes, this segment which is the most ideologically willing to adopt, will remain excluded from the electric transition regardless of price or vehicle performance.

3.3.Market Segmentation and Behavioural Cluster Profiles

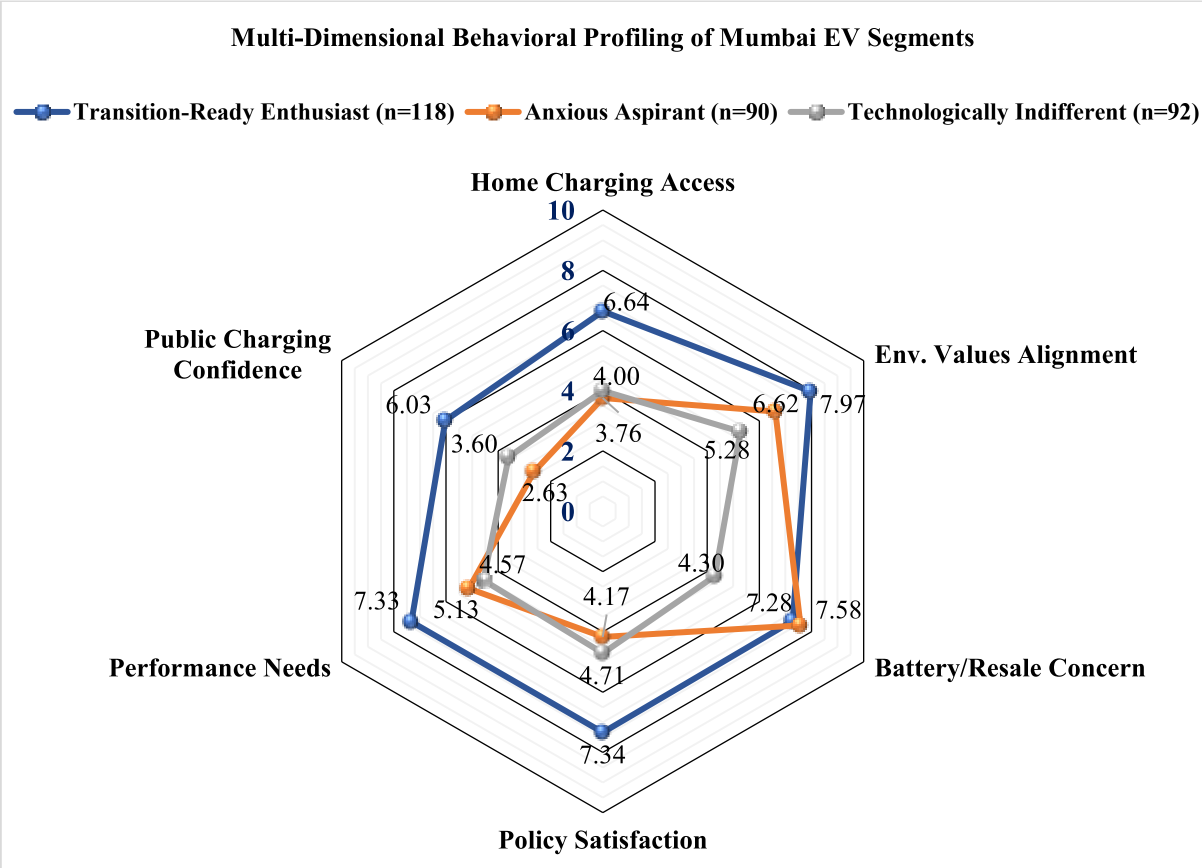

Figure 3: Multi-Dimensional Behavioral Profiling of Mumbai EV Segments

To provide actionable insights for manufacturers and policymakers, a K-Means clustering algorithm was applied to the dataset. This process categorized the 300 respondents into three distinct behavioural segments based on their scores across trust, infrastructure access, and price sensitivity. This segmentation moves beyond simple demographics to reveal the actual readiness of the Mumbai Metropolitan Region (MMR).

The multidimensional characteristics of these segments are visualized in Figure 3, which utilizes a radar chart to contrast the clusters across six key attitudinal and structural dimensions. This visual representation highlights how specific barriers, such as charging access and battery anxiety, fluctuate across the different consumer profiles.

3.3.1. The Transition Ready Enthusiasts (39.3%)

The largest identified segment, comprising 39.3% of the sample (n=118), represents the primary target for immediate EV adoption. As depicted by the expansive blue perimeter in Figure 3, the MMR Enthusiast profile is defined by a high level of readiness across all variables. These individuals possess significantly higher Home Charging Access scores (Mean: 6.636/10) compared to other segments, which acts as the foundational enabler for their positive outlook. Their adoption intent is driven by a combination of high technological trust and the practical convenience of existing residential infrastructure.

Statistically, this group exhibits the highest tolerance for the green premium, with over 25.4% of its members willing to pay a premium exceeding 15.0%. Their satisfaction with current Government Incentives (Mean: 7.339/10), clearly visible in the policy quadrant of Figure 3, indicates that for this plurality of the market, the current regulatory framework is functioning effectively as a catalyst for purchase.

3.3.2. The Anxious Aspirants (30.0%)

Representing the Anxious Middle Cross-section of the study, this segment accounts for 30.0% of the sample (n=90). These consumers exhibit a unique pinched profile in Figure 3, where high Environmental Values Alignment (Mean: 6.622/10) is sharply contradicted by extreme Battery or Resale Concerns (Mean: 7.578/10) and a critical lack of Home Charging Access (Mean: 3.756/10).

Hence, this group represents the Intention-Behavior Gap in its purest form. While they do not dismiss the technology, evidenced by their moderate scores in performance needs, they do view the EV as a risky financial investment due to Mumbai's unique living challenges and the lack of a transparent used-car market. For these respondents, adoption is not hindered by a lack of will, but by the structural and financial vulnerabilities visualized by the inward contractions in Figure 3.

3.3.3. The Technologically Indifferent Faction (30.67%)

The final segment constitutes 30.67% of the sample (n=92). This group is defined by the lowest overall engagement with the electric transition, represented by the smallest footprint in Figure 3. They score only 5.283/10 on Personal Values Alignment and hence show an overall passive stance toward current EV developments.

The data for this group suggests they are primarily price and utility focused, with little interest in the innovation aspects of EVs. Their low satisfaction with Government Policy (Mean: 4.167/10) and Public Charging Confidence (Mean: 3.598/10) suggests that current market narratives are failing to penetrate their risk-averse mindset. To reach this 30.67%, the transition must move from an incentivized choice to an economic inevitability, likely requiring total price parity and a significant expansion of the secondary EV market to prove long-term asset reliability.

3.4. Comparative Analysis of Ownership Experience: The Reality Gap

To understand the impact of first-hand experience on consumer sentiment, an Independent Samples T-test was conducted to compare the attitudes of current EV Owners (n=44) against non-Owners (n=256). This analysis revealed a profound Reality Gap, wherein the psychological barriers cited by non-owners significantly diminish once the transition to electric mobility occurred. As illustrated in Figure 4, there is a consistent experience uplift across all critical metrics of adoption, suggesting that apprehension is largely a product of non-usage.

3.4.1. Infrastructure Perception versus Empirical Reality

The most striking finding of the comparative analysis is the 2.21-point Confidence Gap regarding charging infrastructure. As shown in Figure 4, non-owners reported a mean confidence score of only 3.560/10 when asked about the ease of finding public charging (Q4), reflecting a state of high infrastructural illiteracy. In contrast, current EV owners, who interact with the network daily, reported a significantly higher mean of 5.77/10 points on the likert scale ($t_{(298)} = -5.42$, $p < 0.001$).

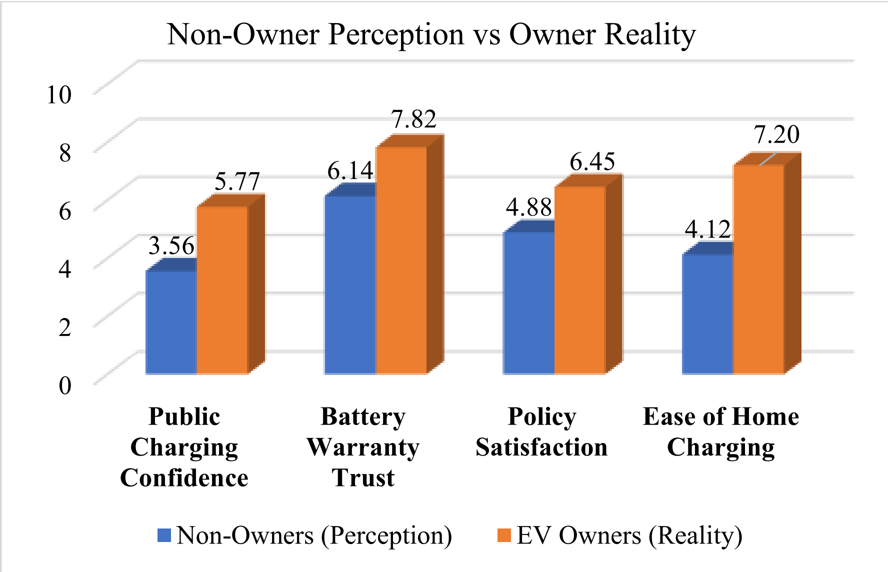

Figure 4: Non-Owner Perception vs Owner Reality

This statistical significance ($p<0.001$) demonstrates that the lack of chargers is a perceived barrier that loses its intensity through practical usage. While the non-owner perceives the charging network as a sparse and unreliable utility, the owner's experience with charging apps and established local nodes creates a more manageable operational reality. Figure 4 highlights this disparity, suggesting that the primary challenge for the MMR is not just the physical installation of hardware, but the visibility and information transparency of the existing network to the general public.

3.4.2. The Experience Effect on Range Anxiety

Actual usage shifts the consumer mindset from a Fear of the Unknown to Operational Confidence. This transition is statistically evident in the shift of Battery Warranty Trust (Q17) visualized in Figure 4. While non-owners maintain a cautious stance with a mean of 6.140/10, owners exhibit significantly higher confidence at 7.820/10.

This 1.68-point increase in trust indicates that daily reliability effectively de-risks the technology in the mind of the consumer. The anxiety regarding battery degradation and thermal failure, which loads heavily for the Skeptic mindset identified in the PCA, is largely neutralized by the empirical evidence of trouble-free daily commuting in the stop-and-go traffic of Mumbai Metropolitan.

Furthermore, Figure 4 also demonstrates a similar uplift in Policy Satisfaction and Home Charging Ease, reinforcing the conclusion that first-hand experience is the most effective variable in lowering psychological resistance. Consequently, the research suggests that Experience Centers and long-term test-drive programs could be more effective than traditional advertising in converting the Anxious Aspirant segment into active buyers.

3.5.Geographic Variability and Policy Sentiment in the MMR

The final layer of analysis considers the spatial and institutional environment of the Mumbai Metropolitan Region (MMR). The transition to electric mobility is not geographically uniform; rather, it is dictated by the varying urban morphologies of different zones and the perceived efficacy of the current regulatory framework. As shown in Figure 5, the disparity between regional infrastructure readiness and policy trust reveals that geographic location is a primary determinant of adoption feasibility in the MMR.

3.5.1. Spatial Analysis of Infrastructure Readiness

A localized analysis of infrastructure confidence reveals a significant disparity between the planned urbanism of satellite cities and the organic, high-density growth of the core city. Respondents from Navi Mumbai reported the highest Public Infrastructure Rating (Mean: 6.420/10), likely due to the presence of wider arterial roads and modern residential complexes designed with integrated electrical provisioning. Conversely, the Western Suburbs and South Mumbai reported the lowest Home Charging Access scores (Mean: 4.150/10), reflecting the physical constraints of older architectural footprints.

The regional data highlights a clear divide, while Navi Mumbai and parts of Thane are emerging as EV-ready hubs due to newer construction standards, the administrative heart of the Western Suburbs remains infrastructurally inadequate for EV owners. In these struggling high-density nodes, the primary barrier is the vertical living constraint including the logistical and legal difficulty of securing society approvals for private charging. To bridge this gap, it can be recommended that the Municipal Corporation of Greater Mumbai (MCGM) need to implement zone-specific mandates for charging retrofits in older housing societies. Specifically for the struggling Western and Central Suburbs, a "Right to Charge" policy may be essential to strip Housing Societies of their veto power over individual charger installations, thereby aligning these regions with the readiness levels seen in Navi Mumbai.

3.5.2. Evaluation of Current Policy Efficacy

Despite the presence of the Maharashtra EV Policy and national incentives, the sample reported a relatively low satisfaction score for current government incentives (Mean: 5.580/10). This lukewarm sentiment, visualized in the Policy Trust bars of Figure 5, indicates that the current subsidy-first approach is reaching a point of diminishing returns.

The statistical data reveals that for 68% of respondents, the current financial incentives do not sufficiently bridge the gap created by the Upfront Price Barrier (Q14). Furthermore, the analysis of policy sentiment suggests a need for a structural pivot. The mean satisfaction score of 5.580/10 serves as a critical warning for policymakers that without addressing the soft barriers of infrastructure access in high-density regions and asset risk, financial doles alone will not be enough to move the Anxious Aspirant or the Indifferent respondents into the active buyer category.

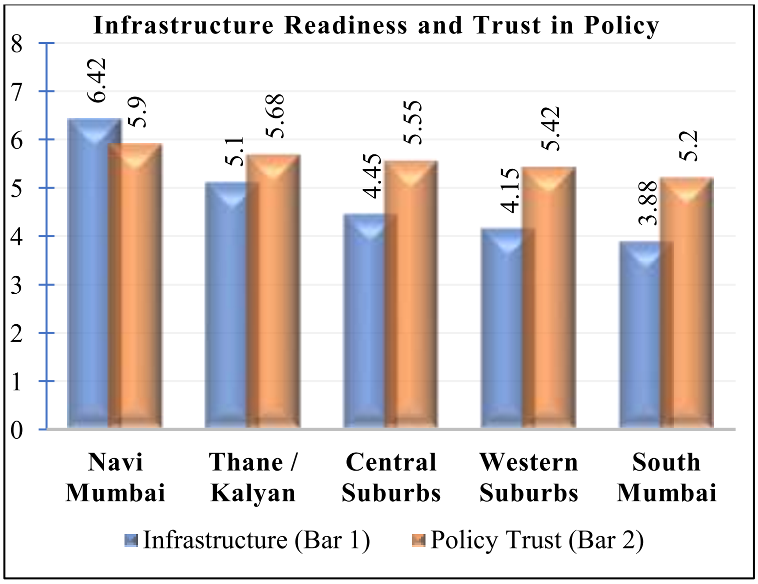

Figure 5: Infrastructure Readiness and Trust in Policy

4. Conclusion

The transition to electric mobility in the Mumbai Metropolitan Region is currently governed by a functionalist paradox. While environmental concern is at an all-time high, it remains statistically impotent in driving financial commitment [17]. The identified Green Marketing Fallacy proves that sustainability is a secondary motivator, surpassed by the utilitarian mandates of home-charging access and range security. Through PCA and K-Means clustering, this study has localized the primary bottleneck to the Aspirant segment that would be ready for EVs but physically and financially paralyzed by infrastructure constraints and the financial risks of an opaque secondary market. To bridge the gap between India's 2030 targets and current adoption rates, stakeholders must execute a strategic pivot from marginal vehicle subsidies to structural de-risking.

This transformation would require government funding to transition into infrastructure upgradation grants designed to offset the high wiring and installation costs within older cooperative housing societies, effectively removing the logistical veto power of residential associations. Furthermore, to cure the secondary market liquidity crisis, policymakers must mandate standardized, third-party battery health certifications, a move supported by the significant majority of surveyed consumers. Finally, Original Equipment Manufacturers (OEMs) may need to introduce financial safety nets, such as assured buy-back guarantees or Battery-as-a-Service (BaaS) models, to neutralize the paralyzing fear of battery depreciation. By decoupling the EV from abstract environmentalism and re-anchoring it as a superior, low-risk urban asset, the MMR can successfully bridge the intention-behaviour gap and secure its path toward a sustainable automotive future.

5. Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

6. Funding declaration

The authors declare that no funding has been received for this research work from any funding institutions in any kind.

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