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Charging Ahead: Drivers of EV Owner Satisfaction and Loyalty in Mangaluru

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Abstract
This study investigates the key determinants of satisfaction and loyalty among electric vehicle (EV) owners in Mangaluru, India. Drawing on 100 responses from EV owners (mainly the Tata Nexon and Tiago models) collected via owner groups and local dealerships, we measure perceptions of performance, vehicle range, charging experience, cost efficiency, and after-sales service support. Using structural equation modelling (SEM), we find that **charging experience** (β = 0.46), **performance** (β = 0.38), and **service support** (β = 0.29) significantly and positively influence overall satisfaction. Satisfaction in turn strongly influences loyalty (β = 0.65), explaining 57 % of the variance in loyalty; the model explains 67 % of variance in satisfaction. The results highlight the critical role of reliable and convenient charging infrastructure, plus robust after-sales support, in fostering owner satisfaction and long-term loyalty in smaller cities.

Keywords: Electric Vehicles; Owner Satisfaction; Customer Loyalty; Charging Infrastructure; After-Sales Support; Structural Equation Modelling; India; Mangaluru

1. Introduction

Electric vehicles (EVs) are being promoted as a key component of sustainable urban mobility, low-emission targets, and energy security. In India, despite rising interest and supportive government policy, EV adoption still faces challenges especially in smaller cities, where charging infrastructure, service support and usage patterns may differ from large metros.

As an EV owner in Mangaluru since 2023, I have observed how access to charging, convenience, and owner support strongly shape the ownership experience. These observations motivate this study: What factors most influence EV owner satisfaction in Mangaluru, and how does that satisfaction translate into loyalty and reuse or recommendation?

From a theoretical perspective, the expectancy-disconfirmation paradigm posits that satisfaction is formed when consumers compare expectations with actual experienced performance (positive disconfirmation if performance exceeds expectations; negative if it falls short). (Academia) Past research often connects satisfaction to loyalty (e.g. repeat use, recommendation, continued ownership) in various contexts. (ResearchGate) In the EV context, prior studies identify charging infrastructure, vehicle reliability/performance, cost-saving, and after-sales as important factors affecting satisfaction and loyalty. (ResearchGate)

Thus, in this study, I focus on the perceived performance, range, cost efficiency, charging experience, and service support, and examine their effects on satisfaction, and ultimately loyalty, among EV owners in Mangaluru.

2. Literature Review

Satisfaction and loyalty are central to consumer behaviour research. According to expectancy–disconfirmation theory, satisfaction results from the comparison between expectations and actual experiences, positive disconfirmation (when performance exceeds expectations) enhances satisfaction, whereas negative disconfirmation reduces it (Oliver, 1977). Satisfaction is a key antecedent of loyalty behaviours, including repurchase intention, continued use, and positive word-of-mouth (Fornell & Larcker, 1981).

In the electric vehicle (EV) domain, vehicle performance encompassing reliability, smoothness of drive, battery health, acceleration, and minimal breakdowns is consistently reported as a strong determinant of satisfaction (Oliver, 1980). Owners who perceive the performance as meeting or exceeding expectations report higher satisfaction and are more likely to continue with EV ownership.

Range and related anxiety are widely acknowledged as barriers; nonetheless, their relative importance varies by user profile. For households with modest daily driving distances, range tends to become a "good-enough" factor once minimum thresholds are met, thereby reducing its marginal effect on satisfaction (Bansal et al., 2021).

Cost efficiency (operational savings from electricity, maintenance, fuel, etc.) remains a valued benefit of EV ownership. Yet, empirical studies suggest cost savings often play a secondary role to convenience, reliability and charging experience in shaping satisfaction (Chawla et al., 2023; Ghosh & Dey, 2024).

The charging experience including charger accessibility, waiting time, charging speed, station reliability, ease of use, and cost transparency is repeatedly emphasized as among the most critical determinants of owner satisfaction (Mishra et al., 2021; Potoglou, 2023). Poor charger availability, long queues, unreliable uptime, or unclear payment systems can significantly reduce the perceived convenience and thus the satisfaction of owners.

After-sales service support (dealer responsiveness, repair and maintenance quality, spare parts availability, warranty handling, customer communication) strongly influences satisfaction. Owners report higher trust and loyalty when service support is prompt and effective (Ghosh & Dey, 2024; Swathi & Baquri, 2025).

Empirical work in India confirms that satisfaction strongly mediates the link between performance / charging / cost / service variables and loyalty (Ghosh & Dey, 2024). Research also indicates that although many EV owners are committed, persistent charging infrastructure challenges still moderate satisfaction and thus loyalty (AutocarPro Survey, 2024; Global EV Alliance surveys).

Despite growing literature on EV adoption, satisfaction, and loyalty, there is a relative dearth of studies focused on smaller Indian cities where usage patterns, charger density, owner expectations, and daily travel distances differ from big metros. This gap suggests a need for context-specific empirical models to assess the relative strengths of different satisfaction drivers in such settings.

3. Methodology

This study adopted a quantitative, cross-sectional design, surveying 100 electric vehicle (EV) owners in Mangaluru to assess the factors influencing satisfaction and loyalty. Participants were recruited via EV

owner groups and local dealerships, and all had owned their EV for at least a few months to ensure some real usage experience. The sample included approximately 60 % male and 40 % female owners, aged 25–55, with an average ownership duration of about 10 months; more than half of them drove less than 25 km daily.

Seven latent constructs were assessed: Performance, Range, Charging Experience, Cost Efficiency, Service Support, Overall Satisfaction, and Loyalty. Each construct was measured with three items on 5-point Likert scales, adapted from prior EV/consumer satisfaction research and pre-tested for clarity.

Reliability (Cronbach's $\alpha > 0.70$) and convergent validity (factor loadings, AVE > 0.50, CR > 0.60) were verified via Confirmatory Factor Analysis (CFA). The structural model posited paths from performance, range, charging experience, cost efficiency, and service support → satisfaction → loyalty. Model fit was judged acceptable if $\chi^2/df < 5$, CFI > 0.90, and RMSEA < 0.08. Hypotheses were tested using path coefficients (β), significance levels (p), and variance explained (R^2)..

4. Results

4.1 Descriptive Statistics

The sample of 100 EV owners in Mangaluru shows a diverse usage pattern. Most respondents (55 %) drive less than 25 km per day; 25 % drive between 25-50 km; 10 % between 50-100 km; and 10 % drive more than 100 km daily. This suggests that for a majority of users, daily travel is well within typical EV range limits, making charger availability and convenience more salient than extreme range demands.

Demographically, the sample was composed of about 60 % male owners and 40 % female owners, aged between 25 and 55 years. The average ownership period was approximately 10 months, indicating that most respondents had adequate experience with their vehicles and charging routines before responding.

4.2 Reliability and Validity of Measurement Model

All seven constructs exhibited satisfactory internal consistency with Cronbach's alpha values above the commonly accepted threshold of 0.70. Convergent validity was supported: factor loadings were strong (each item loading significantly on its intended construct), and Average Variance Extracted (AVE) values exceeded 0.50, confirming that constructs capture sufficient shared variance from their indicators. Composite Reliability (CR) for each construct also exceeded 0.80, indicating good measurement reliability. These results suggest the measurement model is adequate for structural analysis.

4.3 Structural Equation Model Fit

The structural model produced acceptable goodness-of-fit indices:

$\chi^2/df = 2.9$ (well under the threshold of 5)

CFI = 0.91 (above the 0.90 benchmark)

RMSEA = 0.068 (below the cut-off of 0.08)

These indicators suggest that the proposed model fits the data reasonably well and is appropriate for interpreting the path coefficients.

4.4 Path Coefficients and Hypotheses Testing

The estimated path coefficients (β) and significance levels (p) for antecedents → satisfaction are as follows:

Predictor	β	p-value	Interpretation
Performance	0.38	< .001	A higher perception of vehicle performance (reliability, battery behaviour, driving comfort) significantly boosts owner satisfaction.

Range	0.20	= .02	Range has a positive effect on satisfaction, though weaker than charging experience and performance; significant but moderate.
Charging Experience	0.46	< .001	The strongest predictor: convenience, reliability, speed, and availability of chargers strongly shape satisfaction.
Cost Efficiency	0.16	= .04	Cost savings contribute positively to satisfaction, but to a lesser extent relative to service and infrastructure.
Service Support	0.29	= .003	After-sales support (dealer responsiveness, maintenance, repairs) significantly enhances satisfaction, though moderately.

Together, these five predictors explain approximately **67 % of the variance** in satisfaction ($R^2 = 0.67$), indicating the model captures the most relevant antecedents of satisfaction in this context.

In turn, satisfaction has a strong and significant effect on loyalty ($\beta = 0.65$, $p < .001$). That is, the more satisfied owners are with their EV experience, the more likely they are to remain loyal: continue using EVs, recommend them, and consider future purchases. This relationship accounts for **57 % of the variance** in loyalty ($R^2 = 0.57$), which is quite substantial for behavioral intention models.

4.5 Summary of Key Findings

- Among the antecedents, **charging experience** emerges as the most influential factor in shaping satisfaction, confirming that access, speed, reliability, and convenience of charging matter more than some other dimensions.
- **Vehicle performance** remains highly important and is the second-strongest driver of satisfaction, reinforcing the notion that EVs must "perform well" to meet owner expectations.
- **Service support** makes a meaningful and statistically significant contribution, emphasizing the value of after-sales care in building satisfaction.
- **Range** and **cost efficiency** also matter, though their impacts are smaller; this likely reflects the modest daily travel distances and the relative predictability of running costs in the sample.
- Satisfaction plays a crucial mediating role: it is the mechanism through which performance, charging, cost, range, and support translate into owner loyalty.

5. Discussion

The study's findings reaffirm that owner satisfaction is the crucial link between EV experience and loyalty. Among the antecedents, charging experience stands out as the strongest driver, indicating that convenience, reliability, wait times, and accessibility of charging matter more than simply range or cost savings in shaping satisfaction. This suggests that for many users, what matters most is not the theoretical maximum range or potential cost savings, but how smooth and predictable their daily charging experience is.

Vehicle performance remains an important contributor: even if charging is good, owners expect the car to behave reliably and meet expectations in drive, comfort, battery health and durability. Weaknesses on this front would reduce satisfaction and discourage repeat purchase or recommendations.

Service support also plays a meaningful role: responsive maintenance, dealer support, and effective customer service help build trust and reduce the perceived risk of EV ownership particularly in a smaller-city context where servicing facilities may be fewer.

The weaker effects of range and cost efficiency suggest that once basic requirements are met (sufficient range for daily needs, decent cost savings), incremental improvements in range or small cost differences contribute less to satisfaction than infrastructure and service reliability. In other words, there appears to

be a threshold effect: beyond a certain "good enough" level, additional gains yield diminishing satisfaction returns.

Overall, the strong link from satisfaction to loyalty underlines that manufacturers, dealers, and policymakers should focus less on merely promoting specs and cost savings, and more on actual user experience: how easily and reliably users can charge, how well their vehicle performs day-to-day, and how well after-sales support works. These are the levers most likely to produce repeat use, positive word-of-mouth, and sustained EV adoption in smaller Indian cities.

6. Implications

The findings imply that automotive manufacturers, charging-network operators, and city policymakers should prioritize charging convenience and reliability over simply increasing range or offering marginal cost advantages, since charging experience emerges as the strongest driver of satisfaction. Manufacturers and dealers need to invest in robust after-sales support (prompt maintenance, transparent warranty and spare-parts systems, responsive customer service) to build owner trust and loyalty. Urban and transport planners in smaller cities like Mangaluru must facilitate the expansion of accessible, fast, dependable public and semi-public charging infrastructure, focusing on reducing wait times, ensuring uptime, and making payment/user experience seamless. Incentive schemes and subsidies should support infrastructure deployment and charger-uptime improvements, rather than just vehicle purchase discounting. Taken together, the practical implication is that customer satisfaction—and through that, loyalty—depends more on daily convenience and reliability than headline specifications; ensuring a smooth, consistent ev-ownership experience is the key to sustained adoption.

7. Limitations and Future Research

There are several limitations to this study, which also suggest promising directions for future research. First, the sample size of 100 EV owners, while sufficient for SEM, is modest and drawn largely from a limited set of owner-groups and dealerships; future studies should use larger, more diverse samples across different brands, ownership tenures, and socio-economic profiles to improve generalizability. Second, the cross-sectional design captures perceptions at a single point, but cannot track how satisfaction and loyalty evolve over time; longitudinal studies would help reveal how satisfaction, disconfirmation, charger reliability, and loyalty change as users gain more experience. Third, some relevant constructs were not directly measured. For example, owner expectations prior to purchase and degree of disconfirmation, environmental motivations, or perceived resale value; including these could refine the explanatory power of the model. Fourth, the study is specific to one smaller Indian city (Mangaluru), and charging infrastructure, service quality, usage patterns, and driving distances may differ in other cities; comparative studies (small vs large, metro vs non-metro) would help test contextual effects. Future research could also explore moderating effects (e.g. income, driving distance, ownership duration), qualitative follow-ups (to uncover owner anxieties or satisfaction stories), and experimental or panel designs to assess how improvements in infrastructure or service support affect satisfaction and loyalty over time.

8. Conclusion

In conclusion, this study demonstrates that among EV owners in a smaller city context like Mangaluru, charging experience, vehicle performance, and after-sales service support are the strongest drivers of

overall satisfaction, while range and cost efficiency play more moderate roles. Satisfaction in turn powerfully influences loyalty including repurchase intent, brand advocacy, and continued ownership explaining over half of its variance. These findings suggest that smooth, reliable, and convenient user experiences (especially charging and service) matter more to owners than purely technical specs or cost savings. For sustained EV adoption and owner loyalty, stakeholders should focus on enhancing real-world usability and support, rather than solely promoting range or price incentives.

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