



A STUDY ON CUSTOMER SATISFACTION TOWARDS ELECTRIC TWO-WHEELER VEHICLES: EVIDENCE FROM BALLARI CITY

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Abstracts

The present study investigates customer satisfaction toward electric two-wheeler vehicles in Ballari City, Karnataka. The study aims to measure the level of overall satisfaction and identify the key determinants influencing it. Primary data were collected from 220 electric two-wheeler users through a structured questionnaire using a five-point Likert scale. Reliability analysis confirmed strong internal consistency of the measurement scale. Descriptive statistics indicated a high overall level of satisfaction among users. Correlation and multiple regression analysis revealed that environmental satisfaction significantly and positively influences overall satisfaction, while cost satisfaction shows a significant negative effect. Performance and charging satisfaction were positively related to overall satisfaction but did not emerge as significant predictors in the regression model. The findings suggest that environmental perception plays a dominant role in shaping user evaluation, whereas financial concerns continue to influence satisfaction outcomes. The study contributes city-level empirical evidence to the growing literature on electric vehicle satisfaction and offers practical implications for policymakers, manufacturers, and local authorities aiming to strengthen the electric two-wheeler ecosystem.

Keywords: Electric Two-Wheelers, Customer Satisfaction, Electric Vehicles, Environmental Satisfaction, Charging Infrastructure, Cost Perception, Ballari City, Post-Adoption Behaviour.

1. INTRODUCTION

The global transportation sector is undergoing a structural transformation toward electrification as countries seek to reduce greenhouse gas emissions, improve urban air quality, and decrease dependence on fossil fuels. Road transport remains a major contributor to carbon emissions, and the transition to electric mobility has

emerged as a critical pathway for achieving climate and sustainability targets. According to the Global EV Outlook (2025), global electric vehicle sales increased from fewer than one million units in 2016 to nearly 18.8 million units in 2024, reflecting the rapid acceleration of electric mobility across major economies (IEA, 2025). This growth trajectory highlights the increasing maturity of electric vehicle markets worldwide.

Within the global EV ecosystem, electric two-wheelers (E2Ws) occupy a particularly significant position, especially in Asia where two-wheelers dominate urban transport systems. Their relatively lower cost, compact design, and suitability for short-distance travel make them an effective entry point for large-scale electrification in emerging economies. Technological advancements in lithium-ion battery systems, declining battery costs, and supportive regulatory frameworks have further accelerated their adoption.

India represents one of the most dynamic electric two-wheeler markets globally. In 2024, India's electric two-wheeler segment recorded more than 1.14-million-unit sales, marking a 33 percent year-on-year increase and accounting for a substantial share of total electric vehicle sales in the country (Autocar Pro, 2025). Industry projections suggest that the Indian electric two-wheeler market is expected to grow at a compound annual growth rate exceeding 60 percent through 2030 (PS Market Research, 2025). Despite this rapid expansion, electric two-wheelers still account for only about 6–8 percent of total two-wheeler sales in recent periods, indicating considerable scope for further penetration (EV Penetration Dataset, 2025). Industry reports further note that approximately 1.28 million electric two-wheeler units contributed to nearly 2.3 million total EV sales in India in 2025, underscoring the segment's central role in driving the country's electric mobility transition (Times of India/ANI, 2026).

While industry data highlight strong adoption and market growth, long-term sustainability of electric mobility depends not only on sales volume but also on post-purchase experience. Customer satisfaction plays a crucial role in influencing repeat purchase behaviour, positive word-of-mouth, and broader diffusion of innovation. Satisfaction reflects users' evaluation of whether product performance aligns with expectations across dimensions such as cost efficiency, vehicle performance, charging convenience, and environmental benefits. However, most existing studies emphasize adoption intention rather than post-adoption satisfaction, particularly at the city level.

Ballari City in Karnataka represents a growing urban centre where electric two-wheelers are increasingly visible in personal and commercial mobility. Given variations in infrastructure availability, socio-economic characteristics, and service networks across regions, localized investigation of customer satisfaction becomes important. In this context, the present study examines customer satisfaction towards electric two-wheeler vehicles in Ballari City. Specifically, it assesses satisfaction across cost, performance, charging, and environmental dimensions and identifies the determinants influencing overall satisfaction. By focusing on post-adoption evaluation in a mid-sized urban setting, the study contributes to understanding the sustainability and long-term acceptance of electric mobility in emerging Indian markets.

2. LITERATURE REVIEW

Electric vehicle (EV) research has grown significantly over the past decade, primarily focusing on adoption determinants such as cost, environmental concern, infrastructure availability, and policy incentives. The Technology Acceptance Model proposed by (Davis, 1989) explains that perceived usefulness and perceived ease of use shape technology adoption, and this framework has been widely applied in EV studies. (Kumar & Alok, 2020; Rezvani et al., 2015) synthesized EV adoption research and emphasized economic incentives, charging infrastructure, and environmental awareness as central predictors of acceptance. In the Indian context, (Chakraborty & Chakravarty, 2023; Jayasingh et al., 2021; Pandey, 2025) reported that environmental concern, affordability, charging infrastructure, and social influence significantly influence electric two-wheeler adoption intention.

Beyond adoption, satisfaction research is theoretically grounded in Expectation–Confirmation Theory (Oliver, 1980), which posits that satisfaction arises when actual performance confirms or exceeds expectations. Empirical studies on electric two-wheelers in Indian cities reveal that operational cost savings and environmental perception positively influence satisfaction, while charging time, battery reliability, spare parts availability, and service support remain key concerns (Kumar Ravi, 2024; OK, 2024; Patel, 2025; Shelke & Prakash Bholane, 2025; Yaraddi et al., 2024). International studies provide deeper analytical insights; (Zhao et al., 2023, 2024) found that performance satisfaction, driving range, charging convenience, and purchase price significantly influence overall satisfaction, with some attributes showing asymmetric effects. (Liang et al., 2024; Rehman et al., 2024) further highlighted the roles of government support, status symbolism, and functional attributes in shaping post-purchase evaluation.

Although existing studies identify multiple determinants of EV adoption and satisfaction, several gaps remain. Many studies emphasize purchase intention rather than post-adoption satisfaction (Davis, 1989; Jayasingh et al., 2021). Indian city-level research often relies on descriptive analysis rather than multivariate regression to examine the relative influence of cost, performance, charging, and environmental dimensions simultaneously (Kumar Ravi, 2024; Yaraddi et al., 2024). Furthermore, empirical evidence from mid-sized emerging urban centres remains limited. Therefore, a structured analytical investigation of electric two-wheeler customer satisfaction in a city-level context is necessary to advance understanding of determinant relationships and contribute to the evolving EV satisfaction literature.

3. RESEARCH GAP

Existing research on electric vehicles has largely concentrated on understanding factors that influence adoption intention, such as environmental concern, cost perception, and infrastructure availability. However, comparatively limited attention has been given to post-adoption customer satisfaction, particularly among electric two-wheeler users. Many available studies are descriptive in nature and focus on metropolitan or specific regional contexts, with limited use of comprehensive regression-based analysis to identify the relative contribution of different satisfaction dimensions.

Moreover, empirical evidence from mid-sized emerging urban centers remains scarce. Cities like Ballari, where electric two-wheelers are increasingly visible but infrastructure and service ecosystems are still evolving, have not been sufficiently examined in the literature. Differences in local infrastructure, socio-economic conditions, and usage patterns may significantly influence customer satisfaction outcomes. Therefore, there is a clear need for a structured analytical study that evaluates the determinants of customer satisfaction among electric two-wheeler users in Ballari City and identifies the factors that significantly influence overall satisfaction.

4. OBJECTIVES & HYPOTHESES

Research Objectives

The present study aims to examine customer satisfaction towards electric two-wheeler vehicles in Ballari City. The specific objectives of the study are:

1. To measure the overall level of customer satisfaction among electric two-wheeler users in Ballari City.
2. To examine the relationship between selected satisfaction dimensions and overall customer satisfaction among electric two-wheeler users.
3. To identify the significant determinants influencing overall customer satisfaction towards electric two-wheeler vehicles through regression analysis.

Research Hypotheses

Based on the objectives and the conceptual framework of the study, the following hypotheses are formulated:

H₀₁: Cost satisfaction has no significant relationship with overall customer satisfaction towards electric two-wheeler vehicles.

H₀₂: Performance satisfaction has no significant relationship with overall customer satisfaction towards electric two-wheeler vehicles.

H₀₃: Charging satisfaction has no significant relationship with overall customer satisfaction towards electric two-wheeler vehicles.

H₀₄: Environmental satisfaction has no significant relationship with overall customer satisfaction towards electric two-wheeler vehicles.

5. METHODOLOGY

5.1 Research Design: The study adopts a descriptive and analytical research design to examine customer satisfaction towards electric two-wheeler vehicles in Ballari City. Descriptive analysis was used to measure satisfaction levels, while regression analysis was employed to identify significant determinants influencing overall satisfaction.

5.2 Study Area and Sample: The study was conducted in Ballari City, Karnataka. The target population comprised electric two-wheeler owners. A total of 220 valid responses were collected for analysis. The sample size is adequate for regression analysis.

5.3 Sampling Technique and Data Collection: A non-probability convenience sampling method was adopted due to the absence of a formal sampling frame. Respondents were approached at dealerships, charging stations, residential areas, and commercial locations. Primary data were collected using a structured questionnaire.

5.4 Measurement Scale: Customer satisfaction was measured using a 5-point Likert scale (1 = Very Dissatisfied to 5 = Very Satisfied). Seventeen items were used to assess cost, performance, charging, and environmental satisfaction. Overall satisfaction was measured separately as the dependent variable.

5.5 Statistical Tools and Data Analysis: Data were analyzed using SPSS. The following techniques were applied: Descriptive Statistics (Mean and Standard Deviation), Reliability Analysis (Cronbach's Alpha), Pearson Correlation Analysis and Multiple Regression Analysis. A significance level of 5 percent ($p < 0.05$) was adopted for hypothesis testing.

5.6 Model Specification: The regression model used in the study is expressed as:

$$OVERALL = \beta_0 + \beta_1(COST) + \beta_2(PERFORM) + \beta_3(CHARGE) + \beta_4(ENV) + \varepsilon$$

Where:

- OVERALL = Overall customer satisfaction
- COST = Cost satisfaction
- PERFORM = Performance satisfaction
- CHARGE = Charging satisfaction
- ENV = Environmental satisfaction
- ε = Error term

6. RESULTS AND ANALYSIS

6.1 Reliability Analysis

Table No. 1: Reliability Statistics

Cronbach's Alpha	Number of Items
0.906	17

Interpretation

The reliability of the 17-item satisfaction scale was assessed using Cronbach's Alpha. As shown in Table 1, the alpha value of 0.906 indicates excellent internal consistency, exceeding the acceptable threshold of 0.70. This confirms that the measurement scale is reliable for further statistical analysis.

6.2 Demographic Profile of Respondents

Table No. 2: Demographic Characteristics of Respondents (N = 220)

Variable	Category	Frequency	Percentage (%)
Age Group	Below 25	20	9.09
	25–34	67	30.45
	35–44	63	28.64
	45 and above	70	31.82
Gender	Male	141	64.09
	Female	79	35.91
Occupation	Student	15	6.82
	Salaried Employee	37	16.82
	Self-employed	81	36.82
	Business	64	29.09
	Other	23	10.45
Monthly Income	Below ₹20,000	6	2.73
	₹20,000–40,000	48	21.82
	₹40,000–60,000	93	42.27
	Above ₹60,000	73	33.18
Primary Usage	Personal	128	58.18
	Commercial	58	26.36
	Mixed	34	15.45
Average Daily Travel	Below 10 km	17	7.73
	10–25 km	111	50.45
	25–50 km	60	27.27
	Above 50 km	32	14.55

Source: Primary Data

Interpretation

The sample is fairly distributed across age groups, with the highest representation in the 45 and above category (31.82%). A majority of respondents are male (64.09%). Most participants are self-employed (36.82%) or engaged in business (29.09%). The largest income group falls within ₹40,000–60,000 (42.27%). Electric two-wheelers are primarily used for personal commuting (58.18%), and half of the respondents (50.45%) travel between 10–25 km daily.

6.3 Descriptive Statistics

Table No. 3: Descriptive Statistics of Satisfaction Dimensions

Dimension	N	Mean	Std. Deviation
Cost Satisfaction	220	4.09	0.54
Performance Satisfaction	220	4.15	0.59
Charging Satisfaction	220	4.09	0.73
Environmental Satisfaction	220	4.24	0.73
Overall Satisfaction	220	4.20	0.91

Source: SPSS Output

Interpretation

Table 3 shows that overall satisfaction is high (Mean = 4.20). Among the dimensions, environmental satisfaction records the highest mean (4.24), followed by performance satisfaction (4.15). Cost and charging satisfaction also reflect positive evaluations, indicating favourable user perceptions across all measured aspects.

6.4 Correlation Analysis

Table No. 4: Pearson Correlation Matrix (N = 220)

Variables	COST	PERFORM	CHARGE	ENV	OVERALL
COST	1				
PERFORM	0.419**	1			
CHARGE	0.301**	0.610**	1		
ENV	0.341**	0.655**	0.797**	1	
OVERALL	0.098	0.419**	0.514**	0.574**	1

Note: $p < 0.01$

Source: SPSS Output

Interpretation

Environmental satisfaction exhibits the strongest positive correlation with overall satisfaction ($r = 0.574$). Charging ($r = 0.514$) and performance satisfaction ($r = 0.419$) also show significant positive relationships. Cost satisfaction does not demonstrate a statistically significant correlation with overall satisfaction.

6.5 Regression Analysis

Table No. 5: Regression Analysis Model Summary

R	R ²	Adjusted R ²	Std. Error
0.596	0.355	0.343	0.74015

Source: SPSS Output

Interpretation

The regression model explains 35.5% of the variance in overall satisfaction, indicating moderate explanatory power.

Table No. 6: ANOVA Results

ANOVA						
Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	64.813	4	16.203	29.577	.000
	Residual	117.783	215	.548		
	Total	182.595	219			
a. Dependent Variable: OVERALL						
b. Predictors: (Constant), ENV, COST, PERFORM, CHARGE						

Source: SPSS Output

Interpretation

The ANOVA results confirm that the regression model is statistically significant ($p < 0.001$).

Table No. 7: Regression Coefficients

Variable	Beta	t	Sig.	VIF
COST	-0.138	-2.269	0.024	1.225
PERFORM	0.101	1.31	0.191	1.965
CHARGE	0.142	1.536	0.126	2.845
ENV	0.442	4.548	0.000	3.143

Source: SPSS Output

Interpretation

Environmental satisfaction is the strongest and most significant predictor of overall satisfaction ($\beta = 0.442$, $p < 0.001$). Cost satisfaction shows a significant negative relationship with overall satisfaction ($p = 0.024$). Performance and charging satisfaction do not significantly predict overall satisfaction when analyzed simultaneously. VIF values below 5 indicate no serious multicollinearity issues.

6.6 Hypothesis Testing Results

Based on multiple regression analysis, the decisions regarding the hypotheses are presented below:

Table No. 8: Summary of Hypothesis Testing

Hypothesis	Relationship	p-value	Decision
H ₀₁	Cost → Overall	0.024	Rejected
H ₀₂	Performance → Overall	0.191	Fail to Reject
H ₀₃	Charging → Overall	0.126	Fail to Reject
H ₀₄	Environmental → Overall	0.000	Rejected

Source: SPSS Output

Interpretation

Based on the results of the multiple regression analysis, the decisions regarding the null hypotheses are as follows. The null hypothesis H_{01} is rejected, as cost satisfaction shows a statistically significant relationship with overall satisfaction ($p = 0.024$). However, the coefficient is negative, indicating that higher cost-related concerns reduce overall satisfaction. The null hypothesis H_{02} is accepted, since performance satisfaction does not demonstrate a statistically significant relationship with overall satisfaction ($p = 0.191$). Similarly, the null hypothesis H_{03} is accepted, as charging satisfaction does not significantly influence overall satisfaction ($p = 0.126$). In contrast, the null hypothesis H_{04} is rejected because environmental satisfaction has a statistically significant and positive relationship with overall satisfaction ($p < 0.001$). These findings indicate that environmental satisfaction is the strongest determinant of overall customer satisfaction among electric two-wheeler users in Ballari City, while performance and charging satisfaction do not significantly predict overall satisfaction in the presence of other variables.

7. DISCUSSION

The present study examined customer satisfaction towards electric two-wheeler vehicles in Ballari City and identified the determinants influencing overall satisfaction. The findings provide meaningful insights into post-adoption evaluation within the context of electric mobility in emerging urban markets.

The descriptive results reveal a high level of overall satisfaction among electric two-wheeler users. This indicates that electric mobility has moved beyond early experimentation and has achieved stable acceptance among users in the study area. From the perspective of Expectation–Confirmation Theory, satisfaction arises when product performance meets or exceeds prior expectations. The consistently high mean values across satisfaction dimensions suggest that users' expectations regarding electric two-wheelers are largely being fulfilled in practical usage.

A key finding of the study is that environmental satisfaction emerged as the strongest and most significant predictor of overall satisfaction. The rejection of H_{04} confirms that environmental considerations play a dominant role in shaping customer evaluation. This result aligns with sustainability-oriented behavioural frameworks, which emphasize that intrinsic motivations such as environmental responsibility significantly influence consumer attitudes. Users appear to derive psychological and moral value from contributing to pollution reduction and sustainable transport, indicating that environmental benefits extend beyond functional utility.

Cost satisfaction also demonstrated a statistically significant relationship with overall satisfaction, leading to the rejection of H_{01} . However, the negative regression coefficient suggests that cost-related concerns exert a downward influence on overall satisfaction. Although electric two-wheelers are often perceived as cost-efficient in terms of running expenses, apprehensions related to initial purchase price and battery replacement costs may reduce satisfaction levels when considered alongside other factors. This finding highlights the continued importance of financial risk perception in technology evaluation.

In contrast, H_{02} and H_{03} were accepted, indicating that performance satisfaction and charging satisfaction do not significantly predict overall satisfaction in the regression model. Although these dimensions exhibited positive correlations with overall satisfaction, their effects diminished when analyzed simultaneously with other variables. This suggests that performance and charging convenience may be perceived as essential baseline attributes rather than decisive drivers of satisfaction. Within the framework of the Technology Acceptance Model, perceived usefulness and ease of use are critical during adoption; however, once adoption occurs, their influence on satisfaction may decline if expectations are consistently met.

The model explains 35.5 percent of the variance in overall satisfaction, indicating moderate explanatory power. This implies that while environmental and cost factors significantly influence satisfaction, other variables such as service quality, brand reputation, technological trust, and resale value may also contribute to overall evaluation but were not included in the present model. Customer satisfaction in electric mobility thus appears to be multidimensional, encompassing both functional and psychological determinants.

Overall, the findings suggest that customer satisfaction towards electric two-wheelers in Ballari is driven more by environmental consciousness than by purely technical attributes. Electric mobility is evaluated not only as a transportation alternative but also as a socially responsible choice. The results contribute to the literature by shifting focus from adoption intention to post-adoption satisfaction and by providing empirical evidence from a mid-sized Indian city context.

8. CONCLUSION

The present study examined customer satisfaction towards electric two-wheeler vehicles in Ballari City and analyzed the determinants influencing overall satisfaction. The findings indicate that electric two-wheeler users report a high level of overall satisfaction, suggesting that electric mobility has achieved stable acceptance in the study area.

Among the satisfaction dimensions examined, environmental satisfaction emerged as the most influential determinant of overall satisfaction. The results confirm that users derive significant value from the environmental benefits associated with electric two-wheelers, including reduced emissions and contribution to sustainable mobility. This highlights the growing importance of environmental consciousness in shaping consumer evaluation and post-adoption behaviour.

Cost satisfaction was found to have a statistically significant but negative relationship with overall satisfaction, indicating that financial considerations continue to influence user perceptions. Although electric two-wheelers offer long-term operational savings, concerns related to initial purchase cost and battery-related expenses may moderate overall satisfaction levels.

In contrast, performance satisfaction and charging satisfaction did not significantly influence overall satisfaction when analyzed alongside other variables. This suggests that users may perceive performance and charging convenience as expected standards rather than distinguishing factors affecting satisfaction.

Overall, the study demonstrates that customer satisfaction in the electric two-wheeler segment is influenced more strongly by environmental motivations and financial perceptions than by purely functional attributes. By providing empirical evidence from a city-level context, the study contributes to the growing literature on post-adoption evaluation in electric mobility and offers insights into the sustainability of electric vehicle adoption in emerging urban markets.

9. PRACTICAL IMPLICATIONS

The findings offer several practical implications for stakeholders in the electric mobility ecosystem.

For policymakers, the strong influence of environmental satisfaction suggests that awareness initiatives highlighting environmental benefits can strengthen long-term acceptance of electric two-wheelers. At the same time, financial incentives and subsidy schemes remain important to address cost-related concerns that negatively affect overall satisfaction.

For manufacturers, emphasis should be placed on environmental positioning and transparent cost structures. Providing extended warranties, affordable financing options, and reliable after-sales support can help reduce perceived financial risk and enhance customer satisfaction.

For local authorities, improving and expanding charging infrastructure remains essential to sustain user confidence and support continued growth of electric two-wheelers in urban areas.

Overall, the results indicate that promoting environmental value while reducing financial uncertainty is critical for sustaining customer satisfaction in the electric two-wheeler market.

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