A Study on the Impact of Service Quality Dimensions on Consumer Satisfaction among Electric Two-Wheeler Users in Chennai

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Peer Review Information	Abstract
	In the twenty-first century, increasing worries about high energy use, environmental degradation, and climate change have heightened the worldwide need for sustainable transportation options. In the past ten years, India has witnessed a swift rise in motorization, leading to considerable strain on natural resources and the quality of the environment. This change has hastened the shift towards renewable and environmentally friendly options, with electric vehicles (EVs) standing out as one of the most viable and sustainable solutions. The transition from internal combustion engines to electric propulsion significantly decreases carbon emissions while simultaneously reducing operating expenses for consumers, rendering electric vehicles both environmentally and economically beneficial. This study investigates the influence of service quality on customer satisfaction among electric vehicle users in Chennai, reflecting the ongoing global and national transition. The study involved the collection of data from 114 respondents via a structured questionnaire, employing a convenience sampling method. Statistical methods, including percentage analysis, multiple regression, and one-way ANOVA, were utilized using SPSS (Version 26). The instrument's reliability was established with a Cronbach's alpha value of 0.839, demonstrating strong internal consistency. The results indicate that essential dimensions of service quality specifically e-vehicle features, implementation, and after-sales service have a substantial impact on customer satisfaction. Among these, enactment and vehicle features stood out as the most significant predictors of satisfaction. Additionally, factors such as age, occupation, monthly income, and driving experience were identified as having a notable impact on customer satisfaction regarding electric two-wheelers.

Introduction

In recent decades, increasing worries about the high energy usage and detrimental emissions generated by traditional vehicles have garnered worldwide focus. Recently, India has experienced significant advancement along the motorization curve. The Indian automobile sector, currently ranked as the sixth largest globally, accounts for approximately 22% of the nation's overall manufacturing output. The swift growth has exacerbated traffic congestion and worsened air quality in key urban areas. The transport sector is responsible for around 18% of India's overall carbon emissions. The Indian government has been proactively advancing the development of transportation technologies that utilize alternative fuels. Among these alternatives, electric vehicles (EVs) have surfaced as a highly viable and sustainable response to the ongoing environmental crisis.

Automobile manufacturers are progressively broadening their electric vehicle offerings, indicating a significant worldwide transition towards sustainable mobility. Innovative policies and market incentives aimed at promoting electric vehicles can greatly diminish reliance on fossil fuels and decrease pollution levels, yielding lasting advantages for consumers and the country. Electric vehicles are essential in decreasing greenhouse gas emissions and mitigating the environmental harm associated with the transportation industry.

The environmental consequences of petroleum-based transportation systems, along with fluctuating fuel prices, have sparked a resurgence of interest in electric mobility in the twenty-first century. In contrast to traditional vehicles, electric vehicles have the capability to harness energy from a variety of sources, which include fossil fuels, nuclear energy, and renewable resources like solar, wind, and tidal power. The increase in global temperatures and the pressing issues surrounding climate change have significantly propelled the shift towards sustainable transport solutions. The understanding of environmentally friendly technologies among consumers significantly impacts their purchasing decisions over the long term. As individuals become more informed about new energy vehicles, their perspectives on sustainable products are becoming more positive.

National government initiatives currently aim to improve the affordability and accessibility of battery electric vehicles. Decision-makers, industries, and businesses can methodically evaluate service performance and product efficacy by assessing customer satisfaction in relation to product quality. Quantitative metrics frequently assess customer satisfaction, but the real significance lies in the effectiveness of using these evaluation outcomes for ongoing enhancement.

Types of Electric Vehicles
- Battery Electric Vehicles (BEVs)
- Hybrid Electric Vehicles (HEVs)
- Electric Vehicles on Rails
- Electric Aerial Vehicles: Manned and Unmanned
- Electric Boats
- Tailored Electric Vehicles for Urban Applications

Effectiveness and Benefits of Electric Vehicles
1. Minimal operating costs: Electric vehicles provide reduced operating expenses, attributed to their exceptional energy efficiency and enhanced fuel economy. The expense associated with charging an electric vehicle is roughly one-third of what is needed to run traditional fuel-powered vehicles for each kilometres travelled.

2. Reduced Maintenance Expenses: Battery electric vehicles possess a reduced number of mechanical components when contrasted with internal combustion engine vehicles. These systems demand little maintenance and remove the necessity for intricate setups like fuel injection and exhaust systems. While plug-in hybrid electric vehicles require certain maintenance because of the petrol engine, their electric propulsion systems greatly minimize overall wear and tear.

3. Sustainable Practices: Electric vehicles generate no tailpipe emissions, positioning them as exceptionally environmentally friendly. Utilizing renewable energy sources significantly reduces their environmental impact. A significant number of manufacturers integrate recycled and bio-based materials into vehicle production, thereby improving overall sustainability.

4. Health benefits: The adoption of electric vehicles leads to a decrease in air and noise pollution, which enhances public health outcomes and fosters cleaner air and more tranquil urban settings.

5. Enhanced Safety: Electric vehicles feature a low center of gravity, which minimizes the likelihood of rollover accidents. Their design incorporates features that significantly reduce the likelihood of fire or explosion, alongside sturdy structural elements that improve passenger safety in the event of a collision.

Review of Literature
Mitra and Srivastava (2025) conducted a study analyzing consumer perceptions of electric vehicles in emerging markets, particularly in India, utilizing survey data collected from 568 urban consumers across five metropolitan cities. The study employed structural equation modeling (SEM) to examine the relationships among awareness, environmental concern, marketing influence, and adoption intentions. The findings indicated that factors such as consumer awareness, perceived environmental benefits, and exposure to green marketing have a significant impact on purchase intention, together accounting for 64% of the variance in adoption intention. The investigation highlighted that educating consumers and maintaining consistent green communication strategies are crucial in speeding up the adoption of electric vehicles in developing economies. **Ramadoss et al. (2025)** performed an empirical classification of electric vehicle adopters and projected future adoption trends based on data gathered from

1,012 respondents in urban and semi-urban areas. The investigation utilized cluster analysis, logistic regression, and adoption diffusion modeling. Five segments of adopters were identified: innovators at 9%, early adopters at 21%, early majority at 34%, late majority at 26%, and laggards at 10%. Forecasting models indicate that, given the existing policy support, electric vehicle adoption is expected to surpass 55% of new vehicle sales by 2035. The results underscored notable variability in adoption behavior and emphasized the necessity of tailored policy and marketing approaches for distinct consumer segments. **Wang (2025)** conducted an analysis of global trends in electric vehicle adoption through meta-regression analysis, utilizing data from 38 peer-reviewed empirical studies across Asia, Europe, and North America. The findings indicated that economic incentives led to an increase in adoption rates by an average of 18–27%, whereas the expansion of charging infrastructure enhanced the likelihood of adoption by 22%. Enhancements in battery efficiency led to a notable 31% decrease in range anxiety. The findings indicate that well-coordinated policy frameworks, advancements in technology, and significant investments in infrastructure are the primary catalysts for the expansion of the global electric vehicle market. However, challenges such as high initial costs and existing infrastructure deficiencies continue to pose significant obstacles. **Bhat and Verma (2024)** examined the adoption of electric two-wheelers in India through discrete choice modeling, utilizing survey data collected from 1,004 urban commuters in Bangalore. The results indicated that purchase price, charging availability, operating cost, and driving range contributed to 71% of the variation in adoption intention. The findings indicate that while environmental concern sparks interest, the actual decision to purchase is significantly influenced by the readiness of the service ecosystem and the affordability of the options available. **Liang et al. (2024)** investigated consumer satisfaction and its influencing factors for electric vehicles in China by utilizing a comprehensive secondary dataset that includes more than 150,000 online customer reviews and objective product attribute data from 2019 to 2023. The investigation utilized machine learning, data mining methodologies, and SHAP (Shapley Additive Explanations) to conduct an interpretability analysis. The results showed that driving range, battery performance, and motor power emerged as the most significant objective predictors of satisfaction, whereas interior space, design quality, and comfort were the primary factors influencing subjective evaluations. The

model demonstrated an explanatory accuracy of 81% in forecasting satisfaction levels. The findings indicated that average consumer satisfaction rose by 24% throughout the study period due to enhancements in infrastructure and product quality, despite a continued high level of price sensitivity after subsidy reductions. **Lin and Yang (2024)** examined variations in consumer satisfaction regarding electric vehicle charging infrastructure through comparative surveys carried out in 2019 (n = 845) and 2023 (n = 1,132) in urban China. The authors utilized difference-in-means testing and multivariate regression analysis, revealing a 26% increase in overall satisfaction over the four-year period. The enhanced accessibility of charging stations and expedited charging times have elevated user satisfaction while alleviating range anxiety. **Zhang, Li, and Wang (2023)** examined the impact of service quality and charging infrastructure on customer satisfaction and the intention to continue using electric vehicles in urban China. The investigation gathered primary data from 1,356 electric vehicle owners in six major cities through a structured questionnaire. The team utilized structural equation modelling (SEM) and multiple regression analysis to test their hypotheses. The findings indicated that the accessibility of charging, the quality of after-sales service, and the perceived reliability of the vehicle significantly enhanced overall customer satisfaction. The analysis revealed that customer satisfaction accounted for 61% of the variance in the intention to continue usage. The findings indicate that the quality of the service ecosystem especially in terms of charging and post-purchase support plays a more significant role in long-term customer satisfaction than just the initial features of the vehicle, highlighting the critical role of service quality in the adoption and retention of electric vehicles. **Gupta and Raman (2022)** conducted an analysis of after-sales service quality and customer satisfaction within the Indian automobile sector, utilizing survey data collected from 356 vehicle owners across four states. The analysis utilized multiple regression and revealed that service process efficiency, employee responsiveness, and service cost collectively accounted for 58% of the variance in customer satisfaction. The findings highlighted that the quality of service plays a crucial role in customer retention and loyalty, especially in the context of electric vehicles, where the intricacies of technology necessitate reliable post-purchase assistance.

Objectives of the study
1. To empirically assess the impact of service quality dimensions on customer

satisfaction among consumers using electric two-wheelers.
2. To investigate whether customer satisfaction towards electric two-wheelers differs significantly across demographic characteristics of consumers.

Hypotheses of the study

H1: Service quality has a significant influence on customer satisfaction among electric two-wheeler users.

H2: Customer satisfaction towards electric two-wheelers differs significantly across selected demographic variables.

Research Methodology

This study investigates the impact of service quality on customer satisfaction regarding electric two-wheelers in Chennai. A total of 114 consumers utilizing electric two-wheelers in Chennai were chosen as the sample for the study. This study is descriptive in nature, utilizing a questionnaire as the instrument for data collection. Judgmental sampling, A non-probability sampling method is employed to select the consumers. The questionnaire is structured into three sections. The first section gathers personal information from consumers, while the second and third sections focus on service quality scales and customer satisfaction scales, respectively. The reliability of the study is confirmed by Cronbach's alpha. The application of multiple regression analysis is utilized to examine the impact of service quality on customer satisfaction. One-way ANOVA is

employed to determine the significant differences in demographic variables related to customer satisfaction. The analysis of data is conducted using SPSS v26.

Analysis and interpretation

The reliability of the study is assessed using Cronbach's alpha, which is determined to be 0.828 (threshold value > 0.7), confirming that the study's reliability is 0.828. A total of 94 customers utilizing electronic two-wheelers took part in this study. The following details regarding their personal information are provided below: 79.6% of the participants are males, with 52.6% falling into the middle-aged category of 30–40 years. Additionally, 67.2% are married, while 33.2% hold graduate degrees. Furthermore, 39.8% of the respondents are employed in the private sector, and 31.8% have a monthly income ranging from Rs.50,000 to Rs.1,00,000.

The impact of service quality on customer satisfaction regarding electric two-wheelers is examined through the application of multiple regression analysis. This analysis considers e-vehicle features, campaign, enactment, and after-sales service as independent variables, while customer satisfaction is treated as the dependent variable. Table 1 presents the findings of the regression analysis regarding the impact of two-wheeler service quality on customer satisfaction, leading to the formulation of the following null hypothesis.

H1: Service quality has a significant influence on customer satisfaction among electric two-wheeler users.

Table1: Regression analysis for influence of service quality on Customer satisfaction

Independent Variables	R^2	Beta	F	t
(Constant) Features	0.518	0.283	33.217** (p=.000)	3.285**
		0.319		5.333**
Campaign Enactment	Adjusted R^2	0.052		1.369
Sales after service				
	0.503	0.349		6.304**
		0.136		3.114**

** Significant at 1% level

Table 1 indicates that the F-value of 33.217(p=.000) is significant at the 1% level. The coefficient of determination (R^2) for the regression model is 0.518, indicating a robust coefficient. It has been observed that the features, enactment, and after-sales service of two-wheelers play a significant role in influencing customer satisfaction. It can be concluded that an increase of one unit in features,

enactment, and after-sales service for two-wheelers leads to a significant enhancement in customer satisfaction for electric two-wheelers by 0.319, 0.349, and 0.136, respectively. It can be concluded that features, enactment, and after-sales service significantly influence customer satisfaction in the context of e-vehicles. It is also observed that features associated with the

campaign are more predictive of customer satisfaction regarding electric vehicles.

The significance of the difference between demographic variables in relation to customer satisfaction is assessed using one-way ANOVA.

The null hypothesis has been formulated, and the results are displayed in Table 2.

H2: Customer satisfaction towards electric two-wheelers differs significantly across selected demographic variables.

Table 2: Difference between demographic variables with regard to Customer satisfaction

Variable	Classification	Mean	S D	F
Gender	Male	3.54	0.984	0.764 (p=.362)
	Female	3.67	0.799	
Age	18 to 20 years	3.32	0.864	8.692** (p=.000)
	20 to 30 years	3.52	0.901	
	30 to 40 years	3.91	0.947	
	40 to 50 years	3.66	0.907	
	50 years and above	3.75	0.938	
Martial Status	Married	3.56	0.943	1.324 (p=.232)
	Unmarried	3.51	0.892	
Educational Qualification	Below SSLC	3.52	0.784	2.168 (p=.089)
	SSLC/HSC	3.63	0.938	
	UG/PG	3.47	0.924	
	Professional	3.62	0.947	
	Others	3.56	0.972	
Occupation	Government service	3.38	0.773	1.386 (p=.098)
	Private Service	3.55	0.913	
	Self-employed/ Business	3.81	0.886	
	Student	3.24	1.155	
	Others	3.32	1.015	
Monthly income (in Rs.)	Below 25,000	3.41	0.902	6.988** (p=.000)
	25,000 to 35,000	3.52	1.016	
	35,000 to 50,000	3.63	0.809	
	50,000 to 1,00,000	3.81	0.846	
	1,00,000 and above	3.92	0.931	
Experience in two-wheeler driving	Below 1year	3.32	0.906	6.328** (p=.000)
	1-3 years	3.71	1.055	
	3-5 years	3.61	0.869	
	5-8 years	3.42	0.812	
	8 years and above	3.83	0.904	
Frequency of usage of electric vehicle	Less than 1 time	3.58	0.964	1.799 (p=.099)
	2 to5 times	3.36	0.778	
	6 to10 times	3.54	0.917	
	More than 10 times	3.83	0.949	

** Significant at 1% level

A significant impact of age (F=8.692, p=.000), monthly income (F=6.988, p=.000), and experience in two-wheeler driving (F=6.328, p=.000) on customer satisfaction has been identified. Nonetheless, no notable impact of gender (F=0.764, p=.362), marital status (F=1.324, p=.232), educational qualification (F=2.168, p=.089), occupation (F=1.386, p=.098), and frequency of electric vehicle usage (F=1.799, p=.099) is detected.

The data suggests that customers aged 30-40 years (3.91) exhibit higher satisfaction levels regarding electric two-wheelers, while those in the 18-20 age group (3.32) show comparatively lower satisfaction in Chennai.

The findings indicate that respondents earning between Rs.50,000 and Rs.1,00,000 report a higher satisfaction level with electric two-wheelers (3.81), while those with a monthly income below Rs.25,000 show lower satisfaction (3.41).

Customers who have been riding two-wheelers for over 8 years report a higher level of satisfaction with electric two-wheelers, scoring an average of 3.86. In contrast, those who have been riding for less than 1 year show a lower satisfaction level, with an average score of 3.32.

Conclusion

In today's global landscape, there is a swift shift from traditional fossil-fuel-based transportation to electric mobility systems. At this pivotal moment, the current study holds considerable significance by illustrating that the characteristics of electric vehicles, their implementation, and after-sales support have a profound impact on customer satisfaction. The results indicate a growing awareness among consumers regarding climate change and environmental degradation, leading to a notable shift in their preferences from conventional vehicles to more sustainable options. Nonetheless, the cost of purchase continues to be a significant factor influencing decisions regarding the adoption of electric vehicles.

The findings suggest that there is a strong propensity among consumers to embrace electric vehicles moving forward, contingent upon the establishment of sufficient charging infrastructure. However, obstacles like the significant upfront cost, scarcity of charging stations, and extended charging durations persist in undermining consumer confidence and hindering adoption rates. To effectively leverage the opportunities presented by electric mobility, it is essential for the government to take a proactive approach in tackling these challenges through the implementation of supportive policies and the strategic development of infrastructure.

India primarily focuses on minimizing greenhouse gas emissions and reducing reliance on fossil fuels through the introduction of electric vehicles. The Government of India's Vision 2030 shows a strong and forward-thinking commitment to sustainable transportation. To achieve this vision, the government has implemented several initiatives, such as purchase subsidies and eased foreign direct investment (FDI) regulations, aimed at enhancing the production and adoption of electric vehicles. Moreover, a strong partnership between governmental bodies and electric vehicle manufacturers is crucial for enhancing infrastructure development and establishing a conducive environment that promotes the widespread adoption of electric vehicles.

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