A Study on Quality of Electric Bikes on Customer Satisfaction in Erode District, Tamilnadu.

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ABSTRACT

The growing adoption of electric bikes has transformed personal transportation, therefore, the study examines the quality of electric bikes and its impact on customer satisfaction and loyalty. The study collects 400 samples; primary data are collected from electric bike users using questionnaire. The demographic analysis reveals that electric bike usage is more prevalent among middle-aged, educated, and economically active customers. Factor analysis identified performance quality, durability, comfort, safety, economic efficiency, and after-sales support as key determinants of customer satisfaction. Regression results confirmed that these quality dimensions have a significant positive impact on satisfaction. The Friedman test stressed battery reliability, operating cost, and riding comfort as major drivers of customer loyalty. The study also reveals dangerous problems such as limited battery backup, long charging time, and inadequate charging infrastructure. Findings provide implications for manufacturers, service providers, and policymakers to enhance electric bike quality, strengthen customer loyalty, and promote sustainable mobility.

Key Words: Customer Satisfaction, Electric Bikes, Quality, Customer Loyalty, Problems.

INTRODUCTION

The automobile market has experienced significant transformation over the past few decades due to rapid urbanization, rising fuel costs, environmental concerns, and changing consumer preferences. Traditionally dominated by internal combustion engine vehicles, the market is now experiencing a gradual shift towards alternative modes of transportation that emphasize energy efficiency and sustainability. Two-wheelers occupy a vital position in the automobile sector, particularly in developing regions, as they offer affordability, convenience, and suitability for short- and medium-distance travel. In this evolving scenario, electric bikes have emerged as a promising solution to address economic, environmental, and mobility-related challenges. Electric bikes represent an important segment of electric mobility; it combines the flexibility of conventional two-wheelers with electric propulsion technology. They operate using rechargeable batteries and electric motors, resulting in reduced dependence on fossil fuels and lower emissions. Electric bikes are increasingly preferred for daily commuting due to their low operating cost, minimal maintenance requirements, and ease of use.

As governments and regulatory bodies encourage the adoption of electric vehicles through supportive policies and incentives, the electric bike market has witnessed steady growth. The growth is particularly visible in semi-urban and urban regions, where traffic congestion and fuel expenses significantly influence transportation choices. The electric bike market has become highly competitive, with numerous manufacturers offering models that differ in design, battery capacity, performance, safety features, and price. In such a competitive environment, product quality plays a decisive role in influencing customer satisfaction. Quality in electric bikes is not limited to physical appearance alone but extends to performance reliability, battery efficiency, riding comfort, safety mechanisms, economic value, and after-sales service support. Customers evaluate electric bikes based on their overall experience during usage, and consistent performance strengthens positive perceptions towards the

product. The quality expectations are met or exceeded, customers are more likely to feel satisfied with their purchase decisions.

Customer satisfaction is a critical determinant of success in the electric bike market, as it directly influences future buying behavior and brand perception. Satisfied customers tend to continue using the product, recommend it to others, and show resistance towards switching to competing brands. Therefore, understanding the impact of electric bike quality on customer satisfaction is essential for manufacturers and dealers aiming to sustain market growth. Factors such as smooth riding experience, dependable battery performance, durability, safety during travel, and cost efficiency significantly form satisfaction levels. A lack of consistency in any of these aspects may lead to dissatisfaction and negative perceptions. Closely associated with customer satisfaction is customer loyalty, which reflects the willingness of customers to repurchase, recommend, and maintain a long-term relationship with a particular brand. In the context of electric bikes, loyalty is influenced by both functional and emotional factors. Reliable performance, low operating expenses, and trust in the brand contribute to repeated usage and continued preference. Technological advancements, ease of commuting, and accessibility of service facilities further reinforce loyalty among customers.

High levels of loyalty not only strengthen brand image but also reduce marketing costs and create a stable customer base. Despite the advantages offered by electric bikes, customers face several challenges during usage that may affect satisfaction and loyalty. The most frequently reported problems is limited battery backup, which creates uncertainty during long-distance travel. Long charging time and inadequate availability of charging stations further add to customer inconvenience. High battery replacement costs raise concerns about long-term affordability, while limited service centers and difficulties in repair and maintenance reduce confidence among users. Performance issues such as reduced speed under heavy load and poor riding comfort on rough roads also affect the overall user experience. Additionally, low resale value and uncertainty regarding battery lifespan discourage some customers from fully committing to electric bike usage. These problems highlight the gap between customer expectations and actual usage experience. The electric bikes offer economic and environmental benefits, unresolved quality and infrastructure-related issues may slow down adoption rates. Hence, it becomes essential to identify and analyze the demographic profile of users, evaluate the impact of electric bike quality on customer satisfaction, assess customer loyalty patterns, and understand the major problems faced by users. The investigation provides for manufacturers, service providers, and policymakers to improve product quality, enhance customer experience, and strengthen the electric bike ecosystem.

Problem Statement

Electric bikes have gained attention due to rising fuel prices, concerns over pollution, and supportive government initiatives promoting electric mobility. Despite the growing presence of electric bikes in the market, their acceptance and continued usage largely depend on how customers perceive product quality, satisfaction, and overall riding experience. However, customer responses towards electric bikes are not uniform, indicates the presence of underlying issues that require systematic examination. The manufacturers emphasize technological advancement and cost efficiency; customers often encounter practical difficulties during actual usage. Issues such as limited battery backup, long charging duration, insufficient charging infrastructure, high battery replacement cost, and inconsistent performance on different road conditions continue to affect user experience. These challenges may reduce customer satisfaction and weaken loyalty, even when electric bikes offer long-term economic benefits. Moreover, inadequate after-sales service and limited service centers further contribute to dissatisfaction among users.

Customer satisfaction is a main factor that determines repeat purchase behavior and positive word-of-mouth, which are essential for the sustainable growth of the electric bike market. However, there is limited empirical evidence explaining how different dimensions of electric bike quality influence customer satisfaction and loyalty, particularly at the regional level. Understanding whether product performance, durability, comfort, safety, and economic efficiency significantly affect satisfaction and loyalty remains an important concern. In addition, customers' demographic characteristics such as age, income, education, and occupation may shape their expectations and evaluation of electric bike quality. Pay no attention to these aspects can lead to a mismatch

between product offerings and customer needs. Therefore, the central problem addressed is the lack of comprehensive understanding regarding the relationship between electric bike quality, customer satisfaction, customer loyalty, and the problems faced during usage. The provision of proper solution is essential for improving electric bike quality, enhancing customer experience, and supporting the long-term development of electric mobility.

REVIEW OF LITERATURE

Automobile industry indicates that the transition from conventional fuel-based vehicles to electric mobility has been driven by rising fuel costs, environmental concerns, and growing awareness of sustainable transportation (Goutham and Kumaran, 2021). Two-wheelers, particularly electric bikes, have received considerable attention due to their affordability, ease of use, and suitability for daily commuting. The acceptance of electric bikes is strongly influenced by customer perceptions of quality, performance, and long-term value rather than initial purchase motivation alone (Parmar and Pradhan, 2022). Electric bike quality highlights that customers evaluate quality through multiple dimensions such as battery performance, durability, riding comfort, safety features, and technological reliability. Battery efficiency and range are frequently identified as the most essential aspects, as they directly affect daily travel convenience (Kim et al., 2022). Consistent performance, smooth riding experience, and low noise operation are also reported to enhance positive user perception. Electric bikes deliver stable and dependable performance, customers develop confidence in the product, which strengthens satisfaction levels (Ukesh et al., 2022).

Customer satisfaction reveals that satisfaction is not solely dependent on technical specifications but is shaped by the overall usage experience. Factors such as ease of charging, maintenance requirements, availability of spare parts, and service support play a significant role in shaping satisfaction (Thakur et al., 2024). It indicates that customers tend to express higher satisfaction when the operating cost is low and maintenance is simple. Economic efficiency, including reduced fuel expenses and affordable servicing, is widely recognized as a main advantage that improves satisfaction with electric bikes (Ranjan et al., 2022). Customer loyalty has been widely discussed as a vital outcome of sustained satisfaction. Satisfied customers are more likely to continue using electric bikes, recommend them to others, and remain committed to a particular brand (Chawla et al., 2023). Trust in product reliability, brand reputation, and service responsiveness are identified as important contributors to loyalty. Loyalty is strengthened when customers perceive electric bikes as a reliable long-term mobility solution rather than a temporary alternative (Mahera et al., 2024).

The challenges faced by electric bike users, which often act as barriers to adoption and continued usage. Commonly reported problems include limited battery backup, long charging time, lack of adequate charging infrastructure, and high battery replacement cost (Hong et al. 2024). These issues are found to generate anxiety among users, especially for long-distance travel. Poor performance on uneven roads, limited service centers, and difficulty in repair further contribute to dissatisfaction (Selva and Arunmozhi, 2020). The demographic characteristics influence customer perceptions and expectations. Younger and middle-aged users are often more receptive to electric mobility, while economically active users emphasize cost efficiency and reliability (Dongree and Nimbhorkar, 2025). The need for integrated research that examines electric bike quality, customer satisfaction, loyalty, and usage problems together. Such an approach is essential for developing strategies to improve product quality, enhance customer experience, and support the sustainable growth of the electric bike market (Boonchunone et al., 2023).

Research Objectives

The study is carried out with the following objectives.

1. To assess the demographic profile of electric bike customers in Erode district.
2. To examine the impact of electric bike quality on customer satisfaction.
3. To investigate the customer loyalty on electric bikes.
4. To analyse the various problems faced by the customers in using electric bikes.

RESEARCH METHODOLOGY

The study aimed to collect a sample of 400 e-bike customers who are using electric bikes in Erode district, Tamilnadu. The sample is identified on the basis of availability of e-bike customers and their willingness to take part in the survey. The study used primary data, it is directly collected from the electric bike customers using electric bikes. The study employed descriptive research design and samples are drawn on the basis of simple random sampling technique. A well-structured and non-disguised questionnaire has been utilized to collect data from the electric bike customers. The questionnaire has been prepared with four parts; such as demographic profile, impact of e-bike quality on customer satisfaction and customer loyalty on electric bikes, and problems faced by customers in using electric bikes. The survey instrument is pretested with 40 customers and based on the comments and views, the survey instrument has been modified to collect accurate data. This study widely used simple percentage analysis, factor analysis, multiple linear regression test, and weighted-ranking analysis.

RESULTS AND DISCUSSION

Analysis of Demographic Profile

Demographic characteristics play a significant role in developing customer satisfaction related to the quality of electric bikes. The demographic profile such as age, income, education, and occupation influence purchase decisions, usage patterns, and perceptions of product performance. Therefore, the demographic profile of 400 respondents is examined, and the findings are presented in Table-1.

Table-1: Demographic Profile of Customers

Profile	Distribution	Frequency	Percentage
Gender	Male	311	77.75%
	Female	89	22.25%
Age	18 – 25 Years	91	22.75%
	26 – 40 Years	149	37.25%
	41 – 59 Years	109	27.25%
	60 & Above	51	12.75%
Marital Status	Married	275	68.75%
	Unmarried	125	31.25%
Educational Qualification	Uneducated	13	3.25%
	School Education	127	31.75%
	UG	165	41.25%
	PG	95	23.75%
Monthly Income	Less than 30,000	73	18.25%
	30,000 – 60,000	127	31.75%
	60,001 – 1,00,000	155	38.75%
	Above 1,00,001	45	11.25%
Occupation	Housewife	41	10.25%
	Employed	135	33.75%
	Business	163	40.75%
	Agriculture	61	15.25%

Source: Primary Data

Table-1 reveals that the gender-wise distribution of customers shows that 77.75% of the customers are male, while 22.25% are female. The age composition of customers shows that 22.75% belong to the 18–25 years' age

group, 37.25% fall within the 26–40 years' category, followed by 27.25% in the 41–59 years' group, and the remaining 12.75% are aged 60 years and above. Marital status shows that a majority of the respondents (68.75%) are married, whereas 31.25% are unmarried. Educational qualification of the customers discloses that 3.25% are uneducated, 31.75% have completed school education, 41.25% are undergraduate degree holders, and 23.75% possess postgraduate qualifications. The monthly income distribution reveals that 18.25% of the customers earn less than Rs.25,000 per month, 31.75% earn between Rs.25,000 and Rs.50,000, 38.75% fall in the income range of Rs.50,001 to Rs.75,000, and 11.25% earn above Rs.75,001 per month. Occupation shows that 10.25% belong to the housewife category, 33.75% are employed in private or public sector organizations, 40.75% are engaged in business activities, and 15.25% are involved in agriculture.

Impact of E-Bike Quality on Customer Satisfaction

Factor analysis is carried out to examine the impact of e-bike quality on customer satisfaction. Customer opinions regarding the quality of electric bikes are assessed through six major quality dimensions related to product performance, comfort, safety, durability, economy, and service support. Based on these dimensions, principal component factor analysis is applied to identify the key factors influencing customer satisfaction. To examine the internal consistency and reliability of the data, Cronbach's alpha test is employed, and the results indicate a high level of reliability, with values ranging between 0.91 and 0.95. The results of the factor analysis are presented in Table-2.

Table 2: Factor Analysis

Factors (Mean)	Components	Factor Loadings	Eigen Value	% of Variance Explained
Performance Quality (2.82)	Battery backup efficiency	0.832	11.94	26.18
	Motor power and acceleration	0.821		
	Riding speed consistency	0.804		
	Smooth ride experience	0.786		
	Performance on inclined roads	0.742		
	Noise-free operation	0.713		
Durability and Reliability (2.55)	Battery lifespan	0.819	8.87	17.36
	Build quality of bike	0.794		
	Long-term usage reliability	0.772		
	Resistance to wear and tear	0.738		
	Consistency in performance	0.706		
Comfort and Design (2.41)	Seating comfort	0.803	6.14	12.02
	Suspension quality	0.781		
	Handle grip comfort	0.752		
	Design attractiveness	0.698		
Safety Features (2.32)	Braking efficiency	0.812	4.68	8.64
	Stability during ride	0.779		
	Lighting and indicators	0.724		
	Safety during high speed	0.691		

Economic Efficiency (2.21)	Cost of maintenance	0.766	3.09	5.21
	Charging cost economy	0.731		
	Value for money	0.702		
After-Sales Support (2.16)	Availability of service centers	0.781	2.47	4.08
	Warranty coverage	0.724		
	Responsiveness of service staff	0.689		

Source: Primary Data

Table-2 presents the results of factor analysis examines the impact of e-bike quality on customer satisfaction. The factorial mean values designate that performance quality (2.82) is the most influential factor, followed by durability and reliability (2.55)**,** comfort and design (2.41)**,** safety features (2.32), economic efficiency (2.21), and after-sales support (2.16). The analysis is conducted using six factors with 25 components, collectively explaining 73.49 percent of the total variance in the data. Performance quality arises as the dominant factor influencing customer satisfaction, accounting for 26.18 percent of variance with an Eigen value of 11.94. Battery efficiency, motor performance, and riding smoothness are the key contributors under this factor. Durability and reliability explain 17.36 percent of variance with an Eigen value of 8.87, highlights the importance of battery lifespan and build quality in shaping satisfaction. Comfort and design explain 12.02 percent of variance, specifies that ergonomic features and visual appeal significantly affect customer perception. Safety features contribute 8.64 percent of variance, accentuates the role of braking efficiency and ride stability. Economic efficiency and after-sales support also influence customer satisfaction, explains 5.21 percent and 4.08 percent of variance respectively. The results confirm that e-bike quality has a strong and positive impact on customer satisfaction.

The reliability of the results obtained from factor analysis are further examined using multiple linear regression analysis. Customer satisfaction with electric bikes is influenced by various quality-related factors identified through factor analysis. Accordingly, e-bike quality dimensions are treated as independent variables, and customer satisfaction is considered as the dependent variable. To determine the extent and direction of influence of each quality dimension on customer satisfaction, multiple linear regression analysis is employed. The results are presented in Table-3.

Table-3: Multiple Linear Regression Analysis

Independent Variables	Dependent Variable	Un-standardized Coefficients		Beta Coefficients	t	Sig.
		B	S.E.			
Constant	Customer Satisfaction	-0.198	0.614		-1.522	0.136
Performance Quality		0.412	0.086	0.384	4.786	0.001
Durability and Reliability		0.168	0.079	0.171	2.127	0.035
Comfort and Design		0.152	0.074	0.163	2.054	0.042
Safety Features		0.137	0.071	0.148	1.928	0.048
Economic Efficiency		0.121	0.068	0.129	1.779	0.039
After-Sales Support		0.109	0.065	0.117	1.674	0.044

R	0.801
R^2	0.64
Adjusted R^2	0.59
F Value	28.614

Source: Primary Data

Table-3 reveals the results of multiple linear regression analysis conducted to examine the impact of e-bike quality dimensions on customer satisfaction. The value of R (0.801) indicates a strong correlation between the

independent variables and customer satisfaction. The R² value of 0.64 and adjusted R² of 0.59 indicate that 64% of the variation in customer satisfaction is explained by the selected e-bike quality factors, approves the strength of the model. The F value of 28.614 is statistically significant, proves the whole fitness of the regression model. Among the independent variables, performance quality emerges as the most influential factor affecting customer satisfaction, with the highest beta coefficient ($\beta = 0.384$) and a statistically significant t-value at the 5 percent level. It indicates that battery efficiency, riding performance, and smooth operation play a dominant role in improving customer satisfaction with electric bikes.

Durability and reliability**,** comfort and design**,** and safety features also show positive and statistically significant relationships with customer satisfaction, reveals the importance of long-term usability, riding comfort, and safety assurance. Further, economic efficiency significantly influences customer satisfaction, advises that lower operating and maintenance costs increase customer value perception. After-sales support also exhibits a positive and significant effect, accentuating the role of service availability and warranty coverage. The regression results confirm that all six e-bike quality dimensions have a significant and positive impact on customer satisfaction. The findings validate that it establishes e-bike quality as a key determinant of customer satisfaction.

Customer Loyalty on Electric Bikes

Customers exhibit loyalty towards electric bikes based on their experience, perceived benefits, and satisfaction with product performance and services. Loyalty is influenced by multiple factors such as reliability, cost efficiency, convenience, safety, and long-term value. To assess the level of customer loyalty towards electric bikes, the Friedman chi-square test is applied. The null hypothesis is framed stating that there is no significant difference in the ranking of customer loyalty factors towards electric bikes. For a stable sample size, a higher chi-square value indicates greater variation among the rank sums of the loyalty variables and their expected values. The computed chi-square value is 138.472, with degrees of freedom equal to the number of variables minus one. The asymptotic significance value indicates that the observed rankings are statistically meaningful. Hence, the results advocate that customer loyalty towards electric bikes is influenced by the identified factors.

Table-2: Descriptive Statistics

Consumer Loyalty	Mean Rank	Mean Score	Std. Deviation	Chi-Square
Reliable battery performance	10.34	3.684	1.24873	
Low operating cost	9.96	3.571	1.53624	
Smooth riding experience	9.81	3.218	1.79261	
Attractive design	7.42	3.294	1.66318	
Safety during riding	6.59	2.614	1.48942	
Ease of daily commuting	8.64	2.735	1.59826	
Control and handling	7.83	3.456	1.65987	138.472
Environmental friendliness	7.92	2.784	1.53164	
Use of modern technology	9.67	3.362	1.37954	P-value
Affordable purchase price	6.31	2.594	1.27483	0.000*
Saves travel time	7.64	3.512	1.90518	
Easy availability of service	8.41	3.015	1.53647	
Trust in brand	7.68	3.746	1.85642	
Quick service support	6.52	3.148	1.58276	
Fulfilment of travel needs	7.48	2.183	1.42361	

Source: Primary Data

* Significant at 1% level

Table-4 presents the results of the Friedman test conducted to analyze customer loyalty towards electric bikes. The results reveal significant differences in the ranking of loyalty-related factors, indicating that customers do not perceive all factors equally. Among the various factors, reliable battery performance holds the highest mean rank (10.34), shows that battery reliability is the most influential determinant of customer loyalty. It is followed by low operating cost (9.96) and smooth riding experience (9.81), it shows the importance of economic and performance-related benefits. Further, use of modern technology (9.67), ease of daily commuting (8.64), and easy availability of service (8.41) are ranked higher, it displays that technological advancement and service accessibility strengthen customer loyalty. Factors such as environmental friendliness, control and handling, and trust in brand occupy moderate ranks, it reveals their supportive role in reinforcing loyalty. Lower-ranked factors include affordable purchase price, quick service support, and safety during riding, discloses that while these factors are relevant, they exert comparatively lesser influence on loyalty decisions. The chi-square value of 138.472 at the 1 percent significance level leads to the rejection of the null hypothesis. It is concluded that customer loyalty towards electric bikes is significantly influenced by the identified factors.

Problems Faced by Customers in Using Electric Bikes

Customers using electric bikes encounter several practical and operational problems that may affect their satisfaction and continued usage. Therefore, the problems faced by customers in using electric bikes are analyzed using Weighted Average Score Analysis. The score value for each problem is computed by dividing the total weighted score by the number of respondents. Based on the weighted average scores, the problems are classified as high-level problems (score above 4), medium-level problems (score above 3), and low-level problems (score below 3). The results of the analysis are presented in Table-5.

Table-5: Weighted Average Score Analysis

Variables	SA	A	N	DA	SDA	Score	Rank
Limited battery backup	58	17	10	9	6	4.12	1
Long charging time	55	16	12	10	7	4.03	2
Limited service centers	50	17	13	10	10	3.86	7
High battery replacement cost	53	18	11	9	9	3.98	4
Uncertainty about battery lifespan	47	18	15	11	9	3.81	8
Lack of charging stations	56	15	10	11	8	4.01	3
Poor performance on rough roads	49	19	12	11	9	3.87	6
Reduced speed on heavy load	48	20	14	9	9	3.88	5
Low resale value	44	19	15	11	11	3.74	10
Difficulty in repair and maintenance	46	21	13	10	10	3.79	9

Source: Primary data

Table-5 presents the results of the weighted average score analysis carried out to identify the major problems faced by customers in using electric bikes. The analysis reveals that limited battery backup is the most significant problem, it secures the highest weighted average score of 4.12, indicating a high level of concern among customers. The problem directly affects daily travel convenience and creates range anxiety among users. The second major problem identified is long charging time, which obtained a weighted score of 4.03, followed by lack of charging stations with a score of 4.01. These problems highlight infrastructural and technological constraints that limit the effective usage of electric bikes. High battery replacement cost also emerges as a notable issue with a score of 3.98, it reflects customer concern over long-term ownership expenses. Problems such as

reduced speed under heavy load (3.88), poor performance on rough roads (3.87), and limited service centers (3.86) are categorized as medium-level problems, it shows operational challenges faced during regular usage. Further, uncertainty about battery lifespan (3.81), difficulty in repair and maintenance (3.79), and low resale value (3.74) receive comparatively lower scores, though they still contribute to customer dissatisfaction.

CONCLUSION

The study provides a widespread analysis of electric bike usage with a focus on customer satisfaction, loyalty, and challenges associated with electric bikes. The demographic profile indicates that electric bikes are predominantly used by male, middle-aged, educated, and economically active customers, advises that practicality, cost efficiency, and commuting needs strongly influence adoption decisions. The demographic pattern provides a strong foundation for understanding customer expectations related to electric bike quality. The factor analysis reveals that e-bike quality is a multi-dimensional construct, with performance quality emerging as the most influential factor affecting customer satisfaction. Durability, comfort, safety features, economic efficiency, and after-sales support also play significant roles in shaping customer perceptions. The regression analysis further validates that all identified quality dimensions significantly influence customer satisfaction, with performance quality having the strongest impact.

Customer loyalty is mainly relied on battery reliability, low operating cost, and smooth riding experience as the primary factors encouraging repeat usage and positive word-of-mouth. Technological features, ease of commuting, and service accessibility also contribute meaningfully to loyalty, reinforcing the importance of both product and service-related attributes. Despite positive perceptions, the study identifies several critical problems faced by electric bike users. Limited battery backup, long charging time, lack of charging stations, and high battery replacement costs emerge as major concerns. These challenges may hinder wider adoption if not adequately addressed. The study concluded that improving battery performance, expanding charging infrastructure, strengthening after-sales services, and ensuring cost efficiency are essential for enhancing customer satisfaction and loyalty. Removing these problems will support sustainable growth of electric mobility and encourage broader acceptance of electric bikes in the region.

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