

## **A study on customer satisfaction towards electric two-wheeler vehicles in Surat District**

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## **Abstract:**

This study research was done for customer satisfaction toward electric two- wheeler vehicles in Surat District to analysing the impact of key factors: Perceived Usefulness (PU), Perceived Ease of Use (PEOU), Social Influence (SI), Facilitating Conditions (FC), Perceived Risk (PR), and Environmental Concerns (EC). A quantitative research team was designed and employed for collecting primary data from 136 respondents using a structured questionnaire. Responses were measured using a 5-point Likert scale, and regression analysis was conducted using SPSS software. The result reveal that Facilitating Conditions (FC) and Environmental Concerns (EC) significantly influence customer satisfaction, with FC being the strongest predictor. Perceived Usefulness (PU) also makes a positive impact, whereas PEOU, SI, and PR do not have a significant effect. The model explains 66.66% of the variation in customer satisfaction ( $R^2 = 0.666$ ), and ANOVA results confirm the statistical significance of the regression model ( $F = 42.835$ ,  $p < 0.001$ ). These results show a change to be done by enhancing infrastructure, such as charging networks, and raising awareness of environmental benefits can help customer adoption towards electric two-wheeler vehicles purchase. Policymakers and manufacturers should focus on facilitating conditions and promoting the long- term advantages of electric two-wheelers to increase consumer satisfaction and adoption rates.

## **1. INTRODUCTION TO THE STUDY**

Preferences for electric engines have also been shifting due on the manner of transportation. The development of electric engines began in the 17th century. 17th century did not see the realization of the electric engine's solid bottom. To reduce the impact of modes of transportation on environmental deterioration, the modern, globalized world is realizing the relevance of electric engines in many facets of life. Consumer attitudes and choices are shifting in favour of using electric engines. Manufacturers who are prepared to adjust to the shift will benefit from these consumer demands. In the future, the likely adaptable manufacturer may emerge as the market leader in the auto sector. In the current period, global warming is a main problem, and efforts are being made worldwide to discover environmentally responsible solutions. Every sector is trying to be ecologically friendly and implement go green strategies. With the development of electric two-wheelers and the avoidance of fossil fuel, which can increase pollution and damage the environment, even the two-wheeler industry is attempting to help the environment.

## **ELECTRIC VEHICLES MARKET IN GLOBAL**

The global market share of electric vehicles has increased significantly in the last decade. Such an upward trend is expected to continue in future.

In several nations, majority of the population are having a strong preference for purchasing and using electric vehicles. The global sales data reveal that it is the beginning of growth of EV market.

### **Sales trends**

- In 2023, almost 14 million new EVs were registered globally. This shows 35% increase from previous year 2022.
- In the first quarter of 2024, EV sales showed an increase of about 25% compared to the same quarter of 2023.
- By the end of 2024, EV sales are expected to reach around 17 million, which shows that out of every five cars sold one of them is EV.

### **Factors of growth**

- Policy support: Countries are developing policies and incentives which are conducive to EV market. The growth of EV market is seen to rise because of supportive policies.
- Price competition: Because of price competition among manufacturers, the prices of EV declining which is helpful in growth of EV market.
- Technological advancements: New innovations and upgrades in battery technology and charging technology have made EVs more practical choice for daily commute. This contributes in growth of EV market.
- International commitments: Many nations have set high electrification and zero carbon emission records, which boosts the innovations and development in EV technology. This ultimately causes high growth rate.

## **ELECTRIC VEHICLES MARKET IN INDIA:**

In the recent period, EV market is seen to have develop in India. As the demand for EVs are increasing in India and at the same time the manufacturers have started focussing on the EV segment. The EV market in India is expected to rise soon. Indian Government is seen to be playing a proactive role in the development and establishment of EVs in India. It has made several policies, programmes, incentives and have offered different types of subsidies to boost the growth of Electric vehicles.

The Indian EV market is quite unexplored especially in the category of two wheelers vehicles. This EV segment is open for a 100% FDI. Indian government has set a goal to convert 80% of

two wheelers, 70% of commercial vehicles and 30% of private vehicles to electric vehicles by year 2030.

### **Growth**

- In 2023, 15.29 million EVs were registered in India, which shows 49.25% increase compare to the year 2022.
- In the first half of 2024, EV registrations increased by 16% compared to the same period of 2023
- The Economic Survey 2023 projects a 49% CAGR for the EV market from 2022 to 2030.

### **ELECTRIC VEHICLES MARKET IN GUJARAT:**

Several state governments have already announced their respective EV policies in India. Gujarat government has introduced its EV Policy in June 2021.

In the recent years, the sales of EVs in Gujarat have shown a rapid growth. Such high growth rate could have been achieved because of government support, improvements in charging infrastructure, innovations in EV technology as well as huge investments in manufacturing sector.

#### **Sales growth:**

- In 2023, 88,619 EVs were sold in a year in Gujarat state, which is around 28% more than the previous year 2022 and 714% increase compared to 2021.

#### **EV ecosystem growth:**

- Public charging stations in Gujarat were 200 in April 2023, which are now increased to over 600. This shows that charging infrastructure has developed quite good in Gujarat state region.
- Several EV brands from Gujarat have gained popularity in recent times, such as Electrotherm and Tunwal.
- Many startups have contributed to the development of EV ecosystem in Gujarat state.

#### **EV manufacturing:**

- Manufacturers like MG Motors, Maruti Suzuki and Tata Motors have set up their manufacturing plants in Gujarat.

## **2. LITERATURE REVIEW**

**Abhishek & sumit bhardwaj (2023)**, emphasized the attitude of Haryana's customers and their contentment with e-vehicles. Businesses that remain flexible, innovative, and committed

to sustainability will be well-positioned to thrive in the increasingly competitive climate as the EV market changes. By putting these strategies into practice and keeping an eye on shifting consumer preferences and market trends, electric vehicle manufacturers have the chance to lead the shift to a more sustainable and ecologically friendly form of transportation. This study's primary goal is to determine how Haryana State consumers feel about e-vehicles. The reliability test results for each variable were found to be above 0.89, suggesting that the collected data was reliable and ought to be utilized in further investigation and analysis.

There is a significant connection between the independent and dependent variables, according to an analysis that used the chi and t test.

**Nigam et al. (2023)**, Customer satisfaction with Okinawa electric bikes is the foundation of the study. Finally, the brand name, alert, and motor power are the aspects that influence customer happiness. More than 90% of those surveyed are happy with the bike's cost, mileage, value for money, and upkeep.

**Deepak jaiswal et al, (2022)**, examined how consumer adoption of electric vehicles is influenced by knowledge about them: data from a developing market The use of electric vehicles as alternative fuel vehicles has grown in popularity since energy costs and greenhouse gas emissions are expected to play a significant influence in expanding mobility markets soon. This empirical study aims to analyse how customer adoption intention is predicted by electric car knowledge, both directly and indirectly, in the context of a growing industry. The findings demonstrate the validity of the current study model and demonstrate how customer adoption of electric vehicles is heavily influenced by perceived risk, perceived utility, perceived simplicity of use, and considered usefulness. Knowledge regarding electric vehicles is now the most powerful cognitive measure, influencing adoption intention in addition to "tam" measures. Additionally, this has a greater indirect impact on adoption intention in the integrated model.

**Som sekhar bhattacharyya and shreyash thakre (2021)**, examined the variables affecting the uptake of electric vehicles: an empirical investigation within the framework of India's expanding economy. The automotive sector in India was shifting from conventional cars to battery-powered electric vehicles (EVs), which are more ecologically friendly. These EVs, however, failed to gain traction and generated serious issues for the sector. The use of EVs was not well documented in India. The most crucial element turned out to be the availability of charging outlets. The results of the study showed that there was a lack of coordination among

the Indian EV ecosystem's players. Rather, there were definite organizational efforts. The study's objective of examining the regional demands of the Indian EV market was achieved by employing a dual-perspective approach. Collaboration across the EV ecosystem was necessary to boost uptake. investigated the connections between different ppm components. Charge times and energy costs get in the way of the intended use. The desire to use was positively impacted by EVs sales, the availability of charging stations and driving range.

### **3. STATEMENT OF PROBLEM**

One of the largest industries in the global automotive market is the electric two wheelers. The demands for EV vehicles have increased because of environmental concern and high cost of fuel. The two wheelers EV wheelers are generally a preferred choice for people in urban and semi urban areas. There are several factors like, battery life, charging speed, performance, range anxiety, charging infrastructure, pricing, after sales services which are related with customer satisfaction. It became important to study customer satisfaction and identify major factors which influence customer satisfaction towards electric two wheelers. The introduction of electric two wheelers is the ideal way to save money and energy. This study shows that a detailed analysis of customer satisfaction is necessary.

### **4. SCOPE OF THE STUDY**

This research aims to study the customer satisfaction towards electric two wheelers with respect to Surat District. Surat district is a rapidly growing district known for its trade and commerce which makes it ideal to study customer satisfaction towards two-wheeler EVs. The research target individuals who are using two-wheeler electric vehicle. The study will consider demographic profile of the respondent as well as factors affecting customer satisfaction using TAM model.

### **5. THEORATICAL FRAMWORK**

#### **Technology Acceptance Model (TAM)**

The **TAM** (Technology Acceptance Model) is a widely used to understand how users adopt and use technology. It was developed by **Fred Davis in 1986** as part of his dissertation at the Sloan School of Management MIT.

#### **Starting and Progressing**

- The Technology Acceptance Model (TAM) was explaining user acceptance of information systems and technology.

- Which is based on Ajzen and Fishbein's Theory of Reasoned Action (TRA), which indicate that a person's behavioural intentions are influenced by their attitudes and subjective norms. TAM model's primary components include perceived usefulness (PU), perceived ease of use (PEOU), social influences (SI), enabling conditions (FC), perceived risks (PR), and environmental concerns (ECS).

#### **Explanation of each element:**

- **Perceived Usefulness (PU):**

This is the main component of TAM, identifying the degree to which a user thinks the technology will enable them to realized their objectives or perform better.

- **Perceived Ease of Use (PEOU):**

With an importance on the effort needed to run the technology, this component shows how simple a user thinks it will be to learn and utilize.

- **Social Influences (SI):**

This component considers how societal expectations and the views of important people affect an individual's choice to use a technology.

- **Facilitating Conditions (FC):**

These are outside variables that allow a user to use a technology efficiently, such as infrastructure, training accessibility, and system support.

- **Perceived Risks (PR):**

Concerns about data privacy or security are two examples of possible seatback that users may perceive when used the technology.

- **Environmental Concerns (ECS):**

This component considers a technology's perceived environmental friendliness, which may influence user adoption.

#### **TAM applications**

- Applied to studies on how users accept new technologies (e.g., adoption of AI, e-learning, mobile banking, healthcare IT).
- Aids companies and groups in enhancing their technology implementation and design plans.
- Offers advice to legislators and developers on how to improve the usability and efficiency of technology.



## **6. RESEARCH METHODOLOGY**

### **(a) Objectives of the study**

To study the impact of PU (Perceived Usefulness), PEOU (Perceived Ease of Use), SI (Social Influences), FC (Facilitating Condition), PR (Perceived Risks), EC (Environmental Concerns) on customer satisfaction towards Two-Wheeler electric vehicles in Surat District.

### **(b) Research design**

Quantitative research design is followed to study the impact of PU (perceived usefulness), PEOU (Perceived Ease of Use), SI (Social Influences), FC (Facilitating Condition), PR (Perceived Risks), ECS (Environmental Concerns) on customer satisfaction towards Two-wheeler electric vehicles in Surat District.

### **(c) Data collection**

The data collection process for this study involves collecting primary data from respondent living in Surat District. Convenience sampling technique was used to collect the data from 136 respondent using structured questionnaire. The questionnaire was divided in to two main sections. In first section demographic information like age, gender, education, occupations, income, and area of residence was collected. In the second section data regarding constructs of tam modal like PU (Perceived Usefulness), PEOU (Perceived Ease of Use), SI (Social Influences), FC (Facilitating Condition), PR (Perceived Risks), EC (Environmental Concerns) on customer satisfaction. The responses for the second section were measured using a 5- point Likert scale ranging from Strongly Disagree (1) to Strongly Agree (5).

### **(d) Hypothesis**

#### **1. Perceived Usefulness (PU) and Customer Satisfaction (CS)**

- H0: There is no significant impact of PU (Perceived Usefulness) on CS (Customer Satisfaction).
- H1: There is significant positive impact of PU (Perceived Usefulness) on CS (Customer Satisfaction).

#### **2. Perceived Ease of Use (PEOU) and Customer Satisfaction (CS)**

- H0: There is no significant impact of PEOU (Perceived Ease of Use) on CS (Customer Satisfaction).
- H1: There is significant positive impact of PEOU (Perceived Ease of Use) on CS (Customer Satisfaction).

#### **3. Social Influences (SI) and Customer Satisfaction (CS)**



- H0: There is no significant impact of SI (Social Influences) on CS (Customer Satisfaction).
- H1: There is significant positive impact of SI (Social Influences) on CS (Customer Satisfaction).

#### **4. Facilitating Condition (FC) and Customer Satisfaction (CS)**

- H0: There is no significant impact of FC (Facilitating Condition) on CS (Customer Satisfaction).
- H1: There is significant positive impact of FC (Facilitating Condition) on CS (Customer Satisfaction).

#### **5. Perceived Risks (PR) and Customer Satisfaction (CS)**

- H0: There is no significant impact of PR (Perceived Risks) on CS (Customer Satisfaction).
- H1: There is significant positive impact of PR (Perceived Risks) on CS (Customer Satisfaction).

#### **6. Environmental Concerns (EC) and Customer Satisfaction (CS)**

- H0: There is no significant impact of EC (Environmental Concerns) on CS (Customer Satisfaction).
- H1: There is significant positive impact of EC (Environmental Concerns) on CS (Customer Satisfaction).

#### **(e) Tools and Technique**

1. Regression analysis was conducted to study the impact of PU (Perceived Usefulness), PEOU (Perceived Ease of Use), SI (Social Influences), FC (Facilitating Condition), PR (Perceived Risks), EC (Environmental Concerns) on customer satisfaction towards two- wheeler electric vehicles in Surat District.

2. The data formatting, data analyses and hypothesis testing were done using SPSS software.

#### **(f) Limitations**

1. The study is limited to users of Two wheelers electric vehicle in Surat District only.

2. Purposive sampling technique is used which might leads to selection bias.

## 7. RESULTS AND DISCUSSION

4.1 Demographic Profile of Respondents		
	Frequency	Percent
<b>Age Group</b>		
Less than 20	8	5.9
20-29	80	58.8
30-39	36	26.5
40-49	11	8.1
60 and above	1	0.7
<b>Total</b>	<b>136</b>	<b>100.0</b>
<b>Gender</b>		
Female	79	58.1
Male	57	41.9
<b>Total</b>	<b>136</b>	<b>100.0</b>
<b>Education</b>		
Secondary Education	1	0.7
Higher Secondary Education	3	2.2
Diploma	89	65.4
Graduation	40	29.4
Professional Degree	1	0.7
Post-Graduation	2	1.5
<b>Total</b>	<b>136</b>	<b>100.0</b>
<b>Occupation</b>		
Student	81	59.6
Employed (Full - time)	40	29.4
Self - employed	6	4.4
Homemaker	7	5.1
Retired	2	1.5
<b>Total</b>	<b>136</b>	<b>100</b>
<b>Income</b>		
Below ₹ 2,00,000	81	59.6
₹ 2,00,001 to ₹ 4,00,000	21	15.4
₹ 4,00,001 to ₹ 6,00,000	27	19.9
₹ 6,00,001 to ₹ 8,00,000	3	2.2
₹ 8,00,001 to ₹ 10,00,000	3	2.2
Above ₹ 10,00,000	1	.7
<b>Total</b>	<b>136</b>	<b>100.0</b>
<b>Area</b>		
Rural	61	44.9
Urban	75	55.1
<b>Total</b>	<b>136</b>	<b>100.0</b>

## 4.2 Descriptive Statistics of Constructs

Item		Mean	S.D.	Skewness	Kurtosis
PU1	Using an electric vehicle helps me save on fuel costs.	4.5147	.51619	-.223	-1.574
PU2	The performance of my electric vehicle meets my expectations.	4.1985	.60638	-.325	.523
PU3	Electric vehicles contribute positively to the environment.	4.5662	.59257	-1.236	1.662
PU4	I find electric vehicles to be more efficient than traditional vehicles.	4.0000	1.02560	-1.004	.278
PEOU1	Learning to operate an electric vehicle was easy for me.	4.2500	.75768	-.972	.989
PEOU2	Charging my electric vehicle is convenient.	3.8456	1.00280	-.847	.434
PEOU3	The maintenance of my electric vehicle is simple and hassle-free.	3.7647	1.04162	-.791	-.113
PEOU4	Overall, using an electric vehicle fits well into my daily routine.	3.9485	.99122	-1.146	1.106
SI1	My friends and family support the idea of owning an electric vehicle.	4.1324	.66454	-.768	1.680
SI2	I feel influenced by the growing popularity of electric vehicles in my community.	3.8971	.78201	-.949	1.030
SI3	Media and advertisements have positively shaped my opinion about electric vehicles.	3.7279	.93069	-1.164	1.128
FC1	Charging stations are easily accessible in Surat City.	3.8309	.97034	-.542	-.198
FC2	The government provides adequate support and incentives for electric vehicle owners.	3.8897	.82258	-1.251	2.167
FC3	Service centers for electric vehicles are readily available and efficient.	3.3529	1.11242	-.376	-.528
PR1	I am concerned about the battery life of my electric vehicle.	4.2279	.69886	-.742	.789
PR2	I worry about the lack of charging infrastructure in certain areas.	4.0735	.69530	-1.173	3.536
PR3	I believe the cost of replacing parts in an electric vehicle is high.	4.1838	.72216	-.532	-.101
PR4	I worry about the resale value of my vehicle	3.6029	1.05605	-.448	-.759
EC1	I prefer electric vehicles because they help reduce pollution.	4.4779	.53009	-.214	-1.301
EC2	I feel responsible for making environmentally friendly transportation choices.	4.3309	.59697	-.696	1.799
EC3	The environmental benefits of electric vehicles are a major factor in my decision to own	4.2426	.53743	.129	-.268
CS1	I am satisfied with my overall experience of using an electric vehicle.	4.0882	.63794	-.945	3.896
CS2	I intend to continue using electric vehicles in the future.	4.0809	.64470	-.749	1.927
CS3	I would recommend electric vehicles to my friends and family.	3.9338	.80923	-.474	.288
CS4	I am likely to purchase another electric vehicle in the future.	3.7206	.90013	-.467	-.175

Reliability Statistics	
Cronbach's Alpha	N of Items
.899	25

The above table shows Cronbach's alpha value of 0.899 for 25 items of the questionnaire which indicate excellent consistency. It suggests that the item is highly correlated and measured the underlying construct reliably.

**Model Summary (Table 1)**

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.816 <sup>a</sup>	.666	.650	.37229

Predictors: (Constant), EC, PR, FC, PU, SI, PEOU

The model summary in table 1 shows an R-value of 0.816, indicating a strong positive relationship between PU, PEOU, SI, FC, PR, EC and CS. The R<sup>2</sup> value of 0.666 suggests that 66.66% of the variation in cs is explained by PU, PEOU, SI, FC, PR, EC.

**ANOVA<sup>a</sup>**

Model	Sum of Squares	df	Mean Square	F	Sig.
<b>Regression</b>	35.622	6	5.937	42.835	.000 <sup>b</sup>
<b>Residual</b>	17.879	129	.139		
<b>Total</b>	<b>53.501</b>	<b>135</b>			

Dependent Variable: CS

Predictors: (Constant), EC, PR, FC, PU, SI, PEOU

The Anova results ( $f = 42.835$ ,  $p < 0.001$ ) indicate that the regression model is statistically significant. This means that at least one of the independent variables (PU, PEOU, SI, FC, PR, EC) significantly predicts cs towards two wheelers EV vehicles.

**Coefficients<sup>a</sup>**

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
<b>(Constant)</b>	-.499	.411		-1.215	.226
<b>PU</b>	.229	.090	.178	2.541	.012
<b>PEOU</b>	.056	.067	.067	.835	.405
<b>SI</b>	.033	.069	.032	.475	.635

<b>FC</b>	.464	.055	.560	8.462	.000
<b>PR</b>	.035	.067	.030	.527	.599
<b>EC</b>	.292	.094	.210	3.104	.002

a. Dependent Variable: CS

This table shows the results of a multiple regression analysis, showing how different independent variables influence the dependent variable. Summarized interpretation is as follow:

1. **Constant (-0.499, p = 0.226):** The interpretation is not significant, it does not contribute to the model.
2. **Perceived Usefulness (PU) (B = 0.229, p = 0.012):** This shows a positive and significant effect on the dependent variable, stating that higher perceived usefulness leads to a stronger outcome.
3. **Perceived Ease of Use (PEOU) (B = 0.056, p = 0.405):** This is not significant, which shows it does not have a meaningful impact.
4. **Social Influence (SI) (B = 0.033, p = 0.635):** This is also not significant, which means social influence does not strongly affect the dependent variable.
5. **Facilitating Conditions (FC) (B = 0.464, p = 0.000):** This is the strongest predictor (highest Beta = 0.560) and which is highly significant and indicates that better facilitating conditions strongly drive the outcome.
6. **Perceived Risk (PR) (B = 0.035, p = 0.599):** This too is not significant, which states that perceived risk does not have a major role.
7. **Environmental Concerns (EC) (B = 0.292, p = 0.002):** This point is significant and positively associated, that suggests that greater Environmental Concerns experience positively affects the dependent variable.

#### INTERPRETATION OF RESULTS

- **Facilitating Conditions (FC) has the strongest impact** on the dependent variable.
- **Perceived Usefulness (PU) and Environmental Concerns (EC) are also significant predictors** but with a less impact.
- **Other factors (PEOU, SI, PR) are not significant**, meaning they do not contribute much to explaining the dependent variable in this model.

## 8. CONCLUSION

Factors influencing costumer satisfaction towards electric two-wheelers vehicle in Surat district are examined by this study. Facilitating condition (FC) and Environmental Concern (EC) are the most important predictors of customer satisfaction, implying that the better charging facilities and environmental sustainability have a significant impact on consumers buying decisions. Cost-effectiveness and efficiency of electrical two-wheelers have a positive impact on consumers, indicating Perceived Usefulness (PU).

Customers satisfaction is not much affected by Perceived Case of Use (PEOU), Social Influences (SI) and Perceived Risks (PR). These factors have a strong relationship can be seen in 66.6% of the variation in customers satisfaction and adoption rates can be increased by infrastructure, promoting environmental benefits, and making the consumers about the practical advantages. Consumers can increase the usage of electric two-wheelers, if the policymakers and manufacturers make the consumers aware about the long-term benefit of electric vehicles. Also focus should be given to expanding charging networks.

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