

# **“AN ANALYTICAL STUDY ON CUSTOMER PERCEPTION TOWARDS ELECTRIC VEHICLES WITH SPECIAL REFERENCE TO MUMBAI REGION”**

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## **ABSTRACT**

The main goal of this study is to analyze the consumer perception of electric vehicles in India. It has been observed since 2015 that EV companies have taken a major step toward economic and environmental factors while producing their vehicles. In the current dynamic scenario, consumers are constantly looking for better eco-friendly products along with cost-efficiency to it. This research throws light on the positive and negative factors which affect the consumer's perception when approaching electric vehicles in India.

A vehicle that uses one or more electric motors for propulsion is referred to as an electric vehicle (EV). Due to its lack of tailpipe emissions, this kind of vehicle has the potential to drastically reduce urban pollution. Due to the distinctions between EVs and conventional automobiles, this sector has been expanding, resulting in new goods and changes in consumer views. Environmental concerns of the modern era are driving the production and marketing of electric automobiles. A big consumer base, a technological basis with qualified and semi-skilled workers in India, and comparatively low production and labour costs have attracted nearly all international electric car manufacturers and component suppliers to locate their operations there. This is because electric vehicles are the future. The automobile manufacturers slowly shifting their production from tradition automobiles to electric one. By 2030, Government of India plans to have majority of electric vehicle in India. The government also motivate the people by providing incentives and tax benefits. If automobiles are electrified, even the import of fuels will be reduced. The high price of gasoline and environmental concern might be few reasons which intends public to adopt electric vehicle. This study uses a descriptive approach to gather information from consumers by using a structured questionnaire. For the purpose of the study, 300 samples are collected from the Mumbai city.

**Keywords:** Electric Vehicles, Attitude, Perception, Technology, Environment, Consumer Perception, Buyer Behaviour, Purchase Intentions, Consumer Awareness.

## **1.0 INTRODUCTION**

Globally, electric vehicles are growing at a rapid pace, with a compounded annualized growth rate (CAGR) of 21.7 percent; by 2030, the number of electric vehicles is expected to increase from 8.1 million to 39.21 million. Several factors, such as efficiency, pollution, and environmental concerns, have influenced the enormous growth. Governments all over the world have begun to encourage EV

industries by providing subsidies, as consumers increasingly prefer eco-friendly vehicles to petroleum or diesel vehicles.

With the advancement of technology, everything has been electrified. In the same way transport system are coming up with electricity. Electric Vehicles were emerged in the 19th century. Later it did not go well because of its cost, speed and shortest range. Initially, there was less demand for Electric Vehicle but after a long period of time there was a sudden rise in sales of Electric Vehicle. This is because fuel vehicles emit lot of smoke which is harmful to the environment and the cost of the fuel also increased. Therefore people showed much interest towards Electric Vehicle at present. This study concentrates on consumer awareness and how the ordinary man's view towards Electric Vehicle. When we look at the roads today, we see a small proportion of electric vehicles compared to traditional vehicles. Now, in 2024, the EV industry has all of the tools it needs to reach its full potential and finally take off.

Collaborations between companies and the government have been beneficial in increasing EV production and market in India, as the Government of India has provided various schemes and benefits for EV manufacturers. Top executives from India's auto industry praised the government's new "vehicle scrappage policy" announced in the Union Budget for 2021-22. The budget for Fast Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) in 2023 is Rs. 2,908 crores, which is three and a half times more than the budget for FAME in 2022, which is Rs. 827 crores.

Consumer perception of electric vehicles in India has shifted dramatically as a result of both positive and negative impacts. Innovation has taken a quantum leap, encouraging consumers to consider affordability, eco-friendliness, and excellent service when purchasing an e-vehicle. Constant government promotion has resulted in a better mindset and knowledge of e-vehicles in the minds of consumers. This encourages EV manufacturers such as Tata Motors, Hyundai, Mahindra, and others to improve their products, thereby improving consumer perception of e- vehicles.

Electric Vehicles (EVs) are seen as one of the key means to reduce global greenhouse gas emissions and air pollution in the transportation sector, especially with the growing use of renewable energy. Production and marketing of electric cars are being driven by contemporary environmental concerns. By the year 2018 in India, the idea of electric automobiles as the best alternative for fuel cars (traditional diesel/petrol combustion engines) has undergone a revolution. Several indigenous Indian companies, including Tata Motors, Mahindra & Mahindra, TVS Motors, and Bajaj Auto, are utilizing the rapid growth phase of electric vehicles to their strategic competitive advantages in the sector. Nearly all worldwide electric car manufacturers and component suppliers have chosen to base their operations in India due to the country's trained and semi-skilled technological base, a platform with a huge customer base, and relatively reduced manufacturing and labour costs.

Consumer perception refers to the thoughts, emotions, and assumptions that consumers have about the product. Each consumers have different opinions about the Electric Vehicle. Some consumers may feel Electric Vehicle is Comfortable but for others it may not. Therefore, this study helps in identifying the factors that influence the consumer perception towards Electric Vehicle.

## **2.0 REVIEWS OF LITERATURE**

(Chan, 2002) The transportation industry is compelled by environmental issues to adopt more environmentally friendly technologies. Electric vehicles (EVs) are viewed as a sustainable mode of

transportation. The paper's main focus is on batteries because they are essential to make electric vehicles more economical, cost-effective, and useful in everyday life.

(Hoyer, 2008) Electric car technology has been around for more than a century. Electric driving, however, was put on hold since combustion engines are readily available and simple to operate. Various (pushing and pulling) factors are currently reviving interest in electric vehicles. On the driving side, dwindling oil supplies and growing environmental consciousness about the impact of conventional internal combustion engines on the environment pave the way for cleaner electric automobiles. Recent advancements in battery and electric motor technology enable electric vehicles to compete well with conventional cars on the pulling side.

Deep Mehta (2021) "The E-vehicle industry in India: A policy analysis"

To guarantee the successful introduction and widespread use of electric vehicles in the nation, the Indian government has undertaken a number of initiatives. For example, it has been reported that the sale of electric two-wheelers would become necessary from 2025, the use of e-rickshaws from 2023, and the sale of electric vehicles will undoubtedly become mandatory from 2030. Finance Minister Nirmala Sitharaman presented a number of measures in the 2019 budget with the goal of positioning India as a global leader in EV manufacturing. According to Sitharaman, customers can receive income tax rebates of up to 1.5 lakh on interest paid on loans used to buy electric vehicles, for a total exemption benefit of 2.5 lakh over the course of the loan. Additionally, she said that there would be no customs charges on lithium-ion cells, which would help to lower the price of lithium-ion batteries. But the infrastructure for charging them is inadequate, and current battery technology is inadequate. Nirmala Sitharaman introduced the new scrappage policy in the 2021 Budget, stating that personal automobiles must be used for 20 years and commercial vehicles for 15 years. In addition to a few additional incentives, INR 18,000 crores was made available for the purchase of 20,000 buses; regrettably, no explicit statements regarding EVs were made. Experts in the field anticipated a cut in GST and an update on FAME II regulations.

(Ghasri et al., 2019; Sierzechula et al., 2014) In order to assist governments and automobile manufacturers in assessing consumer preferences, demand studies have looked into the financial, technical, fundamental, and political ideas of EVs.

(Dash P. K., 2013) instead of making a drastic adjustment, should invest in small-scale reinforcements to control the load difficulties locally. Home charging ought to be promoted. Before putting in place the massive-scale charging infrastructure, proper planning for location, population, traffic density, and safety should be taken into account. It is crucial to integrate activity in the transportation and energy sectors. Development objectives through various cutting-edge policies and programmes, such as the financial consumer incentives provided to electric car users in the form of tax credits, purchase subsidies, discounted tolls, free parking, and access to restricted highway lanes, would aid in the market's expansion.

Gandhi K. & Joshi R. (2019) "Comparative Analysis of Consumer Perceptions: Electric Cars vs. Electric Two Wheelers in Mumbai." Gandhi and Joshi's research takes a comparative approach, analyzing consumer perceptions of electric cars and electric two-wheelers in Mumbai. Through a quantitative survey, the study assesses preferences, concerns, and purchase intentions for both vehicle types. Key findings highlight distinct patterns, with factors such as affordability and ease of charging emerging as crucial for electric two-wheelers, while electric cars are more influenced by

range anxiety and infrastructure concerns. The study concludes with implications for manufacturers and policymakers in catering to varied consumer preferences within the Mumbai market.

Raj M. & Kapoor N. (2018) "Role of Government Incentives in Shaping Consumer Attitudes towards Electric Vehicles: A Mumbai Perspective." Raj and Kapoor delve into the impact of government incentives on consumer attitudes towards electric vehicles in Mumbai. The study utilizes a survey methodology, collecting data on consumer awareness and perceptions related to government policies promoting EV adoption. Findings underscore the positive correlation between awareness of incentives and increased purchase intention. The study's implications highlight the need for continued policy support and effective communication to enhance consumer understanding and confidence in adopting electric vehicles

Adhikary S., Jalan N. & Anute N. (2022) "Customers Perception about Electric Vehicles" These researchers carried out research on consumers' attitudes toward electric automobiles, their awareness of them in the Indian market, and the barriers that keep people from purchasing them. A survey was conducted with one hundred customers. According to the report, buyers are increasingly seeking for sustainable and environmentally friendly items. Additionally, the government started working to provide the infrastructure and services needed to legitimize the sale of electric automobiles in India

Singh R. & Patel A. (2020) "Psychological Factors Influencing Consumer Perceptions of Electric Vehicles: A Mumbai City Survey." Singh and Patel's research focuses on the psychological factors influencing consumer perceptions of electric vehicles in Mumbai. Through in-depth interviews and psychological assessments, the study uncovers underlying motivations and barriers affecting consumer decision-making. Key findings emphasize the significance of psychological factors such as perceived prestige, social influence, and personal values in shaping attitudes towards electric vehicles. The study concludes that understanding these psychological nuances is essential for designing targeted marketing campaigns and interventions to promote EV adoption.

### **3.0 RESEARCH METHODOLOGY**

The review of the literature presented in the previous chapter acts as a foundation for the theoretical framework. In this research, seven factors have been integrated into the framework to better understand the consumers perception towards Electric Vehicles in Mumbai.

Journals and articles have been referred under the study. The relevant data are presented in appropriate tables in the report.

### **4.0 RESEARCH OBJECTIVE:**

1. To study consumers perception towards Electric vehicles in Mumbai.
2. To identify factors that influence consumers to purchase electric vehicles.
3. To evaluate the need for the promotion of electric vehicle by government.
4. To know the number of manufacturers who take the responsibility of producing electric vehicle.
5. To study the nature of the relationship between demographic characteristics such as gender, age and income of the consumer and consumers perception towards electric vehicles.

### **5.0 RESEARCH DESIGN:**

A cross-sectional correlation field study research design was used as the primary objective of the research was to study the perception and attitude towards Electronic Vehicles in Mumbai.

The items for the scale were identified through an extensive literature review and traditionally acknowledged theories and knowledge base. The research information was collected by means of a structured questionnaire. The items were rated on a 5-point Likert Scale with 1 being strongly disagree and 5 strongly agree. The questionnaire thus constructed was required to undergo a test for validity and reliability. The internal consistency of the items was tested for all the dimensions using Cronbach's alpha. The cut-off value used for Cronbach's alpha was 0.7.

### **6.0 Sampling Technique:**

The Non-Probability Purposive / Convenience Sampling technique is used for the selection of the samples. The sample size for the current study is 300 which has been collected from respondents in Mumbai.

### **7.0 Data collection:**

Structured questionnaires were e-mailed to 100 respondents. The filled questionnaires were screened for consistency and completeness. Incomplete questionnaires were discarded. After screening, 80 completed questionnaires were used for the purpose of the study.

### **8.0 Tool for Analysis:**

The data has been presented using Pie-charts, Frequency tables and Crosstabs. Linear Regression, ANOVA, Chi-Square test using Statistical Package for Social Science (SPSS).

A questionnaire was circulated to collect qualitative and quantitative data. The primary objective of the questionnaire was to perceive factors like pricing, positive environmental factors, financial gains, references, and low noise levels affecting consumers' perception in a positive manner.

### **9.0 DATA ANALYSIS**

#### **Descriptives**

The demographic of the study is as mentioned below:

Age –	
Age	Responses
20-25	124
26-32	76
33-37	56
38-47	38
48 & above	6
Total	300

**Gender –**

Gender	Responses
Male	174
Female	120
Others	6
Total	300

**Income –**

Income	Responses
0-30,000	90
30,000-60,000	104
60,000-1,00,000	86
Above 1,00,000	20
Total	300

**Type of Vehicle –**

Type of Vehicle	Responses
Diesel/Petrol	112
Electric Vehicle	86
Hybrid	38
CNG	42
Others	22
Total	300

**HYPOTHESIS:**

Ho<sub>1</sub>: There is no significant difference of perception towards electric vehicles across different age groups.

Ha<sub>1</sub>: There is a significant difference of perception towards electric vehicles across different age groups.

**Hypothesis Test Summary -**

Null Hypothesis	Test	Sig.	Decision
The distribution of Avg Perception is the same across categories of Age.	Independent-Samples Kruskal-Wallis Test	.000	Reject the Null Hypothesis.

Asymptotic significances are displayed. The significance level is .05.

**Interpretation:**

The significance value is 0.000 which is less than 0.05, hence we reject the null hypothesis. Therefore, we can say that **There is a significant difference of perception towards electric vehicles across different age groups.**

Ho<sub>2</sub>: There is no significant difference of perception towards electric vehicles across Gender.

Ha<sub>2</sub>: There is a significant difference of perception towards electric vehicles across Gender.

#### Hypothesis Test Summary -

Null Hypothesis	Test	Sig.	Decision
The distribution of Avg Perception is the same across categories of Gender.	Independent-Samples Kruskal-Wallis Test	.137	Retain the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

#### Interpretation:

The significance value is 0.137 which is higher than 0.05, hence we failed to reject the null hypothesis. Therefore, we can say that There is no significant difference of perception towards electric vehicles across Gender.

Ho<sub>3</sub>: There is no significant difference of perception towards electric vehicles across different income groups.

Ha<sub>3</sub>: There is a significant difference of perception towards electric vehicles across different income groups.

#### Hypothesis Test Summary -

Null Hypothesis	Test	Sig.	Decision
The distribution of Avg Perception is the same across categories of Income.	Independent-Samples Kruskal-Wallis Test	.041	Reject the null hypothesis.

Asymptotic significances are displayed. The significance level is .05.

#### Interpretation:

The significance value is 0.041 which is less than 0.05, hence we reject the null hypothesis. Therefore, we can say that There is no significant difference of perception towards electric vehicles across different income groups.

#### 10.0 FINDINGS:

In the case of electric vehicles, the user may lack or believe that they lack the knowledge required to make an informed decision. This creates an unfavorable perception of electric automobiles. Because a vehicle is a tangible and visible asset, a person may be concerned about how far the car will travel on a single charge, where I will recharge it, what the cost will be, and whether it will be more expensive than a conventional vehicle.

The majority of respondents are aware of the fact that, E-vehicles improve the air quality and hence, feel neutral about the contribution of EV towards sustainable environment. But still the companies should create awareness and educate the society about usefulness of Electric vehicles.

It is interesting to find that the high income groups prefer more EV's than the low income group. 23% of the respondents in the survey who belong to income level over 5lakh per annum prefer to go for EVs. Only 1% of the respondents of this group said no to EV. It is surprising that elite class perceive and show interest for EV. Means to say the high income group has concern for their pocket as well as environment.

The main reason why the EV has not become popular till date is the lack of choice. Till now only Mahindra, TATA's, MG Comet, Kia is on the market. New brands are yet to come to market. People are also aware of charging stations.

In our study, we found that young females were major respondents. Nearly 87% of them were aware about Electric Vehicle and they get to know about Electric Vehicle through Social Media platforms followed by Television, Friends & Relatives.

As expected before the research itself, it is found in the research as well 58% of respondents feel EV is eco-friendly and it is suitable for city limits. Perhaps people in cities are well aware of pollution by automobiles. Many are facing lot of health issues

This research attempted to identify those factors influencing consumer perception towards electric vehicles in Mumbai and how much these factors affect the perception of a consumer. It considered various factors like age, gender and income level of the consumer as variables that affect the perception of a consumer. The research found a significant relationship between the factors and the perception towards an electric vehicle, by testing out the various hypotheses. also influenced by education and income level to make a decision to buy an electric vehicle.

## **11.0 CONCLUSIONS:**

The Indian market for electric vehicles is expanding. The national and state governments have started programmes and incentives to encourage the use of electric vehicles, and there are also rules and standards in place. Even though the country stands to gain significantly from switching its transportation from internal combustion engines to electric motors, there are obstacles to overcome, including a lack of charging infrastructure, a high initial cost, and a lack of electricity generated from renewable sources. Nevertheless, e-commerce businesses, automakers, app-based transportation network companies, and mobility solution providers have entered the market and are gradually increasing the capacity and visibility of electric cars.

The government is aiming to establish a subsidy for businesses who establish facilities for charging electric vehicles around India. A 200-KW charging infrastructure for EVs would be developed up with a subsidy of about 4-5 lakh.

India's EV drive will open up a lot of business opportunities in the mobility, infrastructure, and energy sectors if electric vehicle automobiles take off. And now consumers are switching from fuel-powered automobiles to electric vehicles. People believe that the use of Electric Vehicle will reduce the carbon foot prints and fuel cost will also be eliminated. Every coin has the two sides. In the same way, the consumers have both positive and negative view towards Electric Vehicle. This study helps



in identifying the consumer awareness and the factors that influence the consumer perception towards Electric Vehicle. Some factors creates positive perception and motivates the consumer and few factors discourages the consumers and act as the hindering factors.

There are several ways that car and truck owners can reduce the effects of environmental pollutants. Old and poorly maintained vehicles cause most pollution from cars, but electric, hybrid and other clean, fuel-efficient cars have a reduced impact. When buying a new car, check the fuel economy and environment level. High ratings mean low pollution levels. Maximize fuel economy by removing all unneeded items, such as roof racks, and driving steadily, rather than accelerating quickly and braking hard. Keep your vehicle wellmaintained, with regular tune-ups and tire checks, and leave the car at home whenever you can. Walk, bike or use public transportation when possible.

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