

STUDY ON MARKET SUSTAINABILITY AND CONSUMER BEHAVIOUR TOWARDS ELECTRIC VEHICLES (EV) IN INDIA

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ABSTRACT

This study looks at the viability of the market and consumer attitudes towards electric cars (EVs) in India. EVs have developed as a competitive alternative to traditional combustion engine vehicles as the need for environmentally friendly transportation options and the reduction of greenhouse gas emissions grow more and more important. The current situation of the EV market in India, the variables impacting consumer behaviour towards EVs, and the difficulties and potential for market sustainability are all covered in this report. The report begins with an overview of the history and relevance of EVs, outlining the study's goals. After that, it gives a general review of the Indian EV market and analyses the government's programmes and policies targeted at encouraging EV adoption. developments in the market, growth predictions, and major players in.

Keywords: Market Sustainability, Consumer Behaviour, Electric Vehicles, Greenhouse Gas, Transportation.

Introduction

The potential of electric vehicles (EVs) to address environmental issues and lessen dependency on fossil fuels in the transportation sector has garnered substantial attention in recent years. Adoption of EVs has come to be seen as a possible answer as India faces growing problems with air pollution and energy security. An overview of the history and importance of electric vehicles in India is given in this section. India has experienced substantial industrial and urban growth in recent decades, which has increased pollution levels, particularly in big cities. The transportation industry, which is dominated by automobiles with traditional internal combustion engines, has contributed significantly to air pollution and greenhouse gas emissions. As a result, the need for ecologically friendly and sustainable mobility solutions has increased significantly.

Electric vehicles are significant because they have the potential to reduce the negative environmental effects associated with conventional automobiles. EVs have zero tailpipe emissions, which helps to clean up the air and cut back on greenhouse gas emissions. India can significantly advance towards fulfilling its sustainability objectives, such as the reduction of carbon dioxide emissions and compliance with international environmental commitments, by encouraging the adoption of EVs.

The adoption of EVs in India has been greatly aided by the establishment of government programmes and incentives. A favourable climate for EV growth has been made possible by programmes like the Faster Adoption and Manufacturing of Electric Vehicles (FAME) programme, which offers financial incentives to EV customers. With the help of these measures, EVs will be more approachable and appealing to consumers by removing obstacles like high upfront prices and a lack of adequate charging infrastructure.

This study intends to investigate the viability of the market and consumer attitudes towards electric vehicles in India. This study contributes to a greater understanding of how India might make the transition to a sustainable and electric vehicle-driven future by evaluating the factors impacting consumer decisions, highlighting problems, and outlining opportunities.

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Literature Review

As a means of halting climate change and encouraging environmentally friendly transportation, the introduction of electric vehicles (EVs) has garnered increasing interest in recent years. India is no different, with the government having established aggressive goals for EV adoption and infrastructure spending for charging stations. Research on market viability and consumer attitudes towards electric vehicles in India is expanding in this context.

Eric Molin, Bert van et al., as well as Fanchao Liao (Fanchao Liao, 2017)- We undertake the literature review to determine whether EV characteristics—including car characteristics, infrastructural systems, and EV promotion strategies—and aspects of its service system have an effect on the usefulness of EV. Identifying the individual-related factors that influence a person's choice for EV is another goal of our research. Because it offers a framework that is easily able to handle the impact of both vehicle attributes and individual characteristics on EV selection, the majority of research that examined both of these two areas used the stated choice approach.

Peter Slowik, Lingzhi Jin, et al. (Lingzhi Jin, 2017)- It provides a summary of the literature that recognises and explores the significance of consumer awareness, particularly how it supports the switch to electric driving. In addition to a review of five case studies that go into greater detail and offer new perspectives on some of the more advanced consumer-focused awareness and outreach programmes, the paper contains an overview of outstanding consumer awareness initiatives in top electric car markets.

Inass Salamah Ali, et al. Pretty Bhalla, 2018)- Incentives from the government, infrastructure needs, availability of charging stations, and other factors all play a significant part in the decision to buy an electric vehicle, and studies already in existence have looked at their effects. Customer choice Depending on their opinion about electric vehicles, people may decide if they wish to buy one. According to the study's findings, perceived financial rewards and staff innovation have a big impact on people's intentions to buy electric cars. While criteria like perceived cost, perceived danger, and perceived environmental benefit do not significantly affect the intention to purchase an electric vehicle. Additionally, we looked into the effects of gender and demographic characteristics on the likelihood that people will buy electric cars, and we discovered that neither aspect had a very big effect.

A survey of potential EV customers was used in a study by Chaturvedi and Garg et al. (2019)- To evaluate the factors affecting EV adoption in India. They discovered that pricing and charging infrastructure were the most crucial elements, followed by range anxiety and battery performance. The research also revealed that customers are ready and eager to shell out more money for electric cars with greater ranges and quicker charging periods.

A discrete choice experiment was employed in a Purohit and Singh (2020) study to examine Indian customers' willingness to pay (WTP) for electric vehicles. The findings indicate that consumers are willing to pay more for EVs with more range, faster charging periods, and less expensive running costs.

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Rahman et al.'s (2021)- study looked at the influence of environmental sentiments on Indian consumers' attitudes towards electric automobiles. They discovered that customers' perceived behavioural control and subjective standards were mediating factors in the effect that consumers with higher levels of positive environmental awareness were more inclined to contemplate buying an electric vehicle. Additionally, we discovered that consumers were less inclined to consider buying an EV if they believed EVs were pricey and inconvenient.

In 2022, R. Hema, M.J. Venkata Rangan-India offers the world's largest untapped EV market. The Multiple potential market barriers limit the growth of the EV industry, necessitating the development of sophisticated charging infrastructure. The "Make in India" initiative urges companies to produce parts locally.

In particular, lithium-ion batteries must be made in India. To speed up the adoption of EVs, a new business model that allows for high infrastructure utilisation for both charging and swapping options must be discovered. Recent laws, like the battery swapping legislation, that were passed to promote a shift towards green energy generation and decentralisation are likely to result in the development of a well-established EV infrastructure across the country.

Objective of the Study

- To analyse the electric vehicle (EV) market's current situation in India, taking into account its development, market trends, and major players.
- To investigate the factors, such as government incentives, technological advancements, economic factors, and environmental awareness that affect consumer behaviour in India with regard to EVs.
- To look into how Indian consumers feel about EVs, their perceived advantages and disadvantages, and the success of awareness-raising campaigns and educational programmes.
- To identify the market sustainability issues and opportunities in the Indian EV market, including battery technology advancements, the development of charging infrastructure, supply chain and manufacturing issues, and policy support.
- To share knowledge and suggestions for fostering EV adoption and building a sustainable market in India, including potential tactics, suggested regulatory frameworks, and potential

Overview of the EV Market in India

In recent years, India's market for electric vehicles (EVs) has expanded significantly. The Indian government has put in place a number of initiatives and policies to encourage the adoption of EVs with the goal of lowering greenhouse gas emissions and promoting sustainable transportation. An overview of the Indian EV market is provided in this section, along with information on recent government initiatives, market trends, and market conditions.

Due to a number of factors, including governmental initiatives, environmental concerns, and technological advancements, the EV market in India has been expanding. The following are some crucial details about the Indian EV market:

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- **Government Support:** To encourage the use of electric vehicles, the Indian government has put in place a number of policies and incentives. In order to offer financial incentives for buying electric vehicles and setting up charging infrastructure, the Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME India) scheme was introduced in 2015.
- **Charging Infrastructure:** For EVs to be widely used, charging infrastructure development is essential. The establishment of a nationwide network of charging stations is being pursued by both the government and private businesses. The infrastructure for charging is currently still in its infancy and needs to be expanded.
- **Electric Two-Wheelers:** Have significantly increased in popularity in India's two-wheeler market. They are viewed as a more affordable and environmentally friendly option to traditional gasoline-powered two-wheelers. Targeting urban commuters, a number of Indian and foreign companies have released electric motorcycles and scooters on the market.
- **Three-Wheeler Segment:** In India, the market for electric three-wheelers, also referred to as e-rickshaws or e-auto-rickshaws, has grown significantly. In cities and towns, they are frequently used for short-distance transportation. Three-wheeled electric vehicles are an affordable, environmentally friendly option for last-mile connectivity.
- **Four-Wheeler Segment:** Compared to two- and three-wheelers, India has adopted electric cars relatively more slowly. But by 2030, the government wants to electrify a sizable portion of the fleet of passenger cars. To meet the rising demand, a number of automakers have introduced electric vehicle models in India.
- **Localization and Manufacturing:** The Indian government wants to promote domestic production of electric vehicles and the parts that go into them. Several domestic and foreign automakers have opened factories in India or have made plans to start producing EVs there. It is anticipated that the focus on localization will reduce costs and increase EV affordability.
- **Obstacles:** The Indian EV market faces a number of obstacles despite having room for growth. They include the high initial costs of electric vehicles, the scarcity of charging infrastructure,

range anxiety, and consumer awareness. The government must continue to support these efforts, and various stakeholders must collaborate and advance technology to overcome these obstacles.

Government Initiatives and Policies Promoting EV Adoption in India

- The FAME programme stands for faster adoption and production of electric vehicles.
- National Electric Mobility Mission Plan (NEMMP)
- Goods and Services Tax (GST) Reduction
- State EV Policies
- Phased Manufacturing Program (PMP)

Factors Influencing Consumer Behaviour Towards Electric Vehicles

- Environmental awareness and sustainability concerns
- Economic factors, including the cost of ownership and operating expenses
- Technological advancements and charging infrastructure
- Government incentives and subsidies
- Social factors, including peer influence and social acceptance

Challenges and Opportunities for Market Sustainability in the Indian EV Market

Challenges

- **Infrastructure Development:** The lack of a sufficient infrastructure for charging EVs is one of the market's biggest obstacles in India. To ease EV owners' concerns about range and promote the use of electric vehicles, charging stations must be accessible. It's still difficult to build a reliable charging infrastructure network all over the nation.
- **Cost and Battery Technology:** The cost and performance of electric vehicles are significantly influenced by battery technology. The price of batteries is currently a major obstacle to India's widespread adoption of EVs. For a larger segment of the population to have greater access to electric vehicles, it is crucial to develop affordable and effective battery technology.
- **Manufacturing and Supply Chain:** For the EV market to remain viable, a robust manufacturing ecosystem must be established. This covers the accessibility of manufacturing facilities for components, raw materials, and assemblies. The main challenges will be building a strong supply chain network and promoting domestic manufacturing capacities.
- **Consumer Perception and Awareness:** Electric vehicles are still fairly new on the Indian market, and consumers are unaware of their features and benefits. Important challenges include educating consumers about the benefits of EVs, busting myths about their performance and range, and cultivating a favourable perception.

Opportunities

- **Government Support and Policies:** To encourage the use of electric vehicles, the Indian government has put in place a number of programmes, including financial incentives, tax breaks, and subsidies. These regulations offer a supportive environment for the expansion of the EV market and open doors for long-term market expansion.
- **Growing Environmental Concerns:** The demand for cleaner transport options is being driven by rising awareness of climate change and air pollution. Traditional fossil-fuelled vehicles can be replaced with sustainable and environmentally friendly electric vehicles. The expansion of the Indian EV market is possible given the rising environmental consciousness.
- **Growing Renewable Energy Sector:** Solar and wind energy production, in particular, have seen significant growth in India. A greener and more sustainable transportation ecosystem can be produced with the help of the integration of renewable energy sources and electric vehicles. A promising opportunity for market sustainability is to take advantage of the synergy between EVs and renewable energy.
- **Potential Cost Savings:** As technology advances and economies of scale are realised, it is anticipated that the cost of manufacturing EVs and the components that go into them will decrease. This cost-saving potential could make electric vehicles more affordable and competitive with conventional vehicles, promoting market growth and sustainability.

- **Partnerships and Collaborations:** The EV market in India can expand more quickly through partnerships and collaborations between a variety of stakeholders, such as automakers, energy providers, and infrastructure developers. Partnerships that concentrate on developing battery technology, charging infrastructure, and local manufacturing capabilities can open up new possibilities for sustainable market development.

Research Methodology and Data Collection

Research Methodology

- The research methodology used will be one on one interview method or questionnaire. The interview will be taken on the basis of demographics.
- The research will be on the basis of primary and secondary data.
- The sample size will be 40.
- Demographics Used – Age, Gender, Income, etc.

In the research, I have made a questionnaire from the dependent and independent variables regarding my research topic. I have taken a sample size of 40 different people based on different demographics. And floated the Google form for the same and collected the responses of respondents via Google form.

Now the independent and dependent variables are as follows or list given below.

Independent Variables

- Age
- Gender
- Education Level

Dependent Variables

- Yearly Income
- Marital Status
- Factors encouraging buying electric vehicles
- Factors discouraging buying EVs

Data Collection The data collected based on both ways

- Primary data collection
- Secondary data collection.

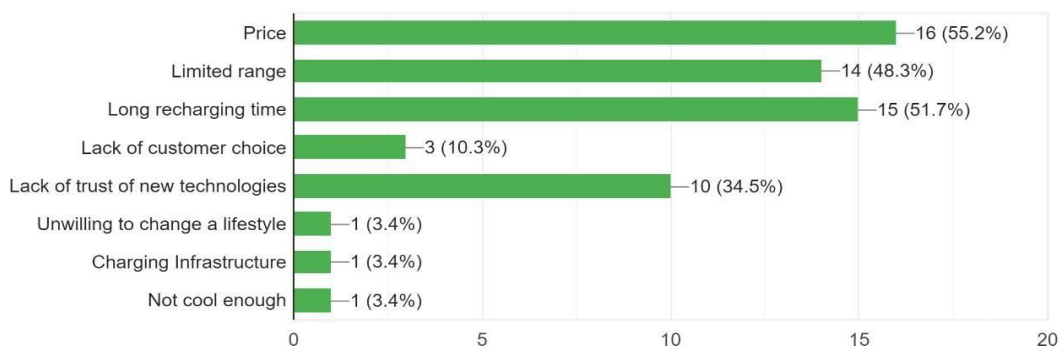
In the primary data collection, the Google form or interview method is used to collect the data from the different types of respondents.

In secondary data collection data is collected from different kinds of literature and research papers as a reference and the link is mentioned in the references

Data Interpretation & Analyses

What factors discourage you to consider buying electric car?(you can choose more than one)

29 responses



In this question, we have covered different factors which can discourage to buy electric vehicles in India. Like Price of the vehicles, Limited range, long charging time, Lack of customer choice, Lack of trust in new technologies, Unwillingness to change the new lifestyle etc.

In the results 87.5% of the people has chosen the factor which is discouraging them to buy an EV is long charging time and it is true because the current infrastructure for EVs we have is not properly developed and its results in the long charging time of the EVs. So, Therefore, it may be a significant deterrent to purchasing an electric car.

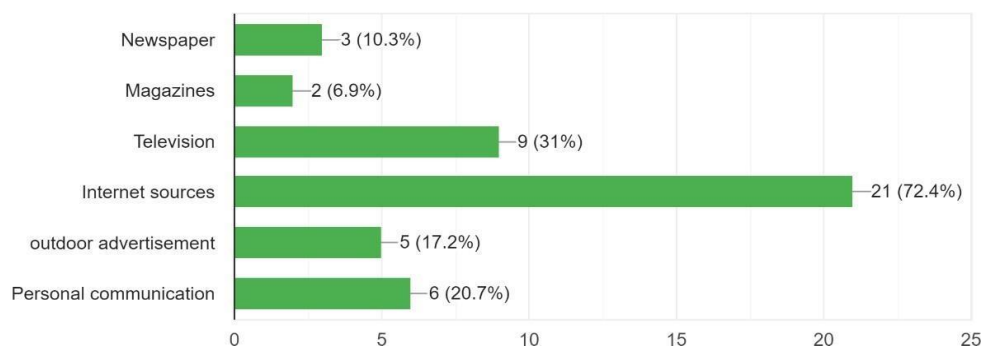
The second factor which is discouraging customer to buy an EV is Limited Range of the vehicles. It is true that the vehicles we have in current market have lower travelling range which is also a major factor that discourage customers to buy electric vehicles. 80% of the respondents have chosen this option as shown in Figure-6.2

The third major factor is Price because the price of the electric vehicle is higher than the IC engine vehicles because of the components used in the electric vehicles are costlier. This option was selected as a deterrent by 62.5% of the respondents as shown in figure-6.2.

And at last, the other factors like lack of consumer choice, lack of trust to new technologies, unwilling to change a lifestyle etc. as show in the figure

From what sources did you get the most of your knowledge about electric cars?

29 responses



Here they asked the question that what are the sources made them know about electric vehicles.

The most option which is chosen by them is Internet Sources like social media, online video platforms etc. 72.4% of the respondents have chosen this option because 60% of population in our research is less than 25 years old. So, they more connected with internet sources than other age group.

Then other people have Choose the options like magazines, televisions etc. it means that otherpeople are aware about it.

Summary of the Research

There are a number of important conclusions from the study on market viability and consumer attitudes towards electric vehicles (EVs) in India that provide insight into the development of the EV market in that nation.

First off, it is clear that consumers are becoming more aware of and interested in switching to electric vehicles as a more environmentally friendly and sustainable mode of transportation. This shift in consumer perception has been influenced by elements like rising pollution levels, government programmes promoting EVs, and rising fuel costs. More consumers are expected to view EVs as a practical substitute for conventional internal combustion engine vehicles in the years to come, continuing this trend.

The study also emphasises the significance of government initiatives and incentives in promoting the use of EVs. To entice people to switch to electric cars, the Indian government has implemented a number of initiatives, including tax breaks, subsidies, and the development of charging infrastructure. These initiatives have had a favourable effect on consumer behaviour and have helped the EV market expand. To address concerns about range anxiety and charging accessibility, additional policy support and investment in charging infrastructure are still required.

Thirdly, the study shows that cost is still a major obstacle to the widespread adoption of EVs in India. Although EV prices have been steadily declining, they are still frequently more expensive than vehicles powered by internal combustion engines. Additionally, consumers find it difficult to recover their investment because there isn't a significant secondary market for used EVs. Therefore, in order to hasten market sustainability, it is imperative to make efforts to lower the upfront cost of EVs through subsidies, incentives, and localised manufacturing.

The study also highlights the need to expand the nation's network of charging infrastructure. In order to allay potential EV buyers' worries about range anxiety, convenient and dependable charging stations must be made available. Consumer confidence in purchasing EVs will be greatly increased by investments in fast-charging infrastructure in public spaces, businesses, and residential areas.

The study's conclusion is that there is hope for the market viability of electric vehicles in India. The move towards EVs is being driven by rising consumer awareness, government support, and technological advancements. To ensure widespread adoption, issues like high upfront costs and a lack of adequate charging infrastructure must be resolved. India has the potential to become a global leader in consumer education, industry collaboration, and policy focus.

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