



Charging Ahead: Personal Preferences and Perceptions of Electric Vehicles

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ABSTRACT

This study explores consumer behaviour and preferences with relation to electric vehicles (EVs), with an emphasis on determining the critical variables affecting adoption rates and resolving related issues. Data was gathered and examined through an extensive survey to obtain an understanding of customer attitudes, worries, and expectations regarding electric vehicles. One of the study's main conclusions is that consumers are willing to adopt electric vehicles (EVs) if certain important conditions are met. Although interest in electric vehicles (EVs) is growing, consumers have worries about several issues, including initial purchase costs, availability of charging infrastructure, range anxiety, and the requirement for government support in the form of subsidies and incentives. One of the biggest obstacles to EV adoption is range anxiety, which is caused by worries about the driving range of EVs and the accessibility of charging stations. Customers place a high value on dependability and convenience when it comes to charging infrastructure, emphasizing the necessity of a vast and easily accessible network of charging stations to reduce range anxiety and improve the experience of owning an EV in general. Additionally, the study shows a relationship between consumers' willingness to pay more for electric vehicles (EVs) and their predicted rise in popularity over the next five years. Consumer decisions to purchase electric vehicles (EVs) are influenced by various factors, including price competition, technology improvements, and environmental concerns. These factors suggest that EV adoption may become more widespread soon. Additionally, the data reveals a mutually beneficial link between the predicted driving range and EV pricing. Customers believe that the anticipated driving range has a direct impact on EV costs, underscoring the significance of affordability and range in promoting EV adoption rates. Support from the government is crucial in influencing how consumers feel about electric vehicles. Customers regard policies, subsidies, and incentives that encourage the adoption of electric vehicles favourably, which affects their purchase decisions and fuels the expansion of the EV market.

Keywords: Electric Vehicles; Consumer perception; Consumer behaviour; Purchase decisions; Adoption of EVs; Automotive Sector.

Introduction

The global shift in consumer preference toward electric cars (EVs) is causing significant changes in the automotive sector. Concerns about the environment, new technology, government regulations encouraging eco-friendly travel, and consumer preferences are some of the factors driving this shift. Comparing EVs to petrol/diesel-powered normal cars has several advantages, including less pollution, reduced usage of fossil fuels, and potential long-term cost savings. The increasing acceptance of EVs as a practical alternative for transportation is a result of consumers' growing interest in these vehicles. This study aims to investigate people's attitudes toward electric cars in detail. Important topics including whether they want to purchase one, whether they are concerned about using one, and their opinions of charging stations will be covered. Car manufacturers, legislators, and other industry players need to understand consumer attitudes and preferences. It is imperative that they create well-thought-out strategies to incentivize the usage of electric vehicles and address any obstacles that may impede their widespread adoption.

Analysing the results of other research can help us come up with useful hypotheses about what motivates individuals to choose electric vehicles. According to these studies, people are concerned about the environment, want to know how long they can drive an electric car before needing to charge it, want to know how much it will cost, and wonder if the new technology in electric cars will cause issues. Additionally, they observe that policies regarding electric automobiles, public education campaigns, and government backing can all have an impact on people's attitudes and decision-making. Although the use of electric cars is growing, there are still issues that need to be resolved to improve them and encourage more people to use them. One of the biggest concerns for individuals is range anxiety, which is the fear that they won't have enough power in their car while driving and will find it difficult to find a spot to charge it. More charging stations need to be constructed so that people can conveniently charge their cars wherever they go, and electric car batteries need to be improved so they can travel farther.

Enough readily available charging stations are critical to increasing the market share of electric vehicles. Consumers want to know that charging their electric cars at home or on the go can be done swiftly and simply. People will feel more comfortable using electric cars if there are adequate public charging stations, quick chargers, and clever ways to charge cars. This study involves asking a wide range of people from various backgrounds about their opinions on electric automobiles using a structured survey approach. The survey asks about their desire to purchase one, what concerns them about using one, what they think of charging stations, and how they feel about electric cars in general versus conventional vehicles. This study aims to gather additional information about how to promote the usage of electric automobiles and address any issues that consumers may encounter by examining the survey responses.

Even though EV sales have increased, there are still issues and concerns that need to be resolved to hasten the shift to sustainable transportation. Range anxiety, or the worry of running out of battery power while driving and the perceived trouble of locating sufficient charging stations, is one of the main worries of consumers. Continuous developments in battery technology to improve driving range capabilities are necessary to overcome this worry. Additionally, to guarantee that EV owners have easy access to charging stations both at home and when traveling, it is imperative to enhance and optimize the infrastructure for charging EVs. The accessibility and availability of infrastructure for charging is a crucial factor in shaping customer attitudes and adoption choices. Customers need smooth and effective charging experiences, which makes the creation of strong public charging networks, quick-charging locations, and intelligent charging technologies necessary. All these factors work together to boost customer confidence and motivate more people to convert to electric vehicles.

A structured survey methodology is used in this study to collect data from a wide range of consumer demographic groupings. The survey's questionnaire covers a broad range of subjects, such as the intention to purchase an electric vehicle (EV), the variables that influence adoption decisions, worries and anxieties regarding the use of EVs, experiences with the current infrastructure for charging EVs, and general opinions about EVs in comparison to traditional gasoline-powered cars. This study intends to provide actionable insights that can guide strategic actions targeted at encouraging increased EV adoption and successfully addressing customer concerns by carefully examining the survey data. In conclusion, the automobile industry has undergone a significant transformation toward more environmentally friendly and sustainable transportation options with the move to electric vehicles. Stakeholders may work together to create an environment that is more favourable for the adoption of electric vehicles (EVs) and so contribute to a more sustainable and environmentally friendly future by comprehending and addressing consumer preferences and barriers.

The survey comprises several sections devoted to investigating purchase intent, clarifying variables influencing adoption choices, measuring apprehensions and worries regarding EVs, evaluating experiences with current charging infrastructure, and thoroughly analysing general opinions of EVs in comparison to conventional cars. This study aims to uncover important insights that may be utilized to develop strategies that encourage further EV adoption while skilfully resolving prevalent consumer concerns by means of a thorough analysis of the survey data. This study's primary goal is to investigate people's impressions of electric cars, with a particular emphasis on issues such as readiness to buy one, anxiety related to driving them, and views on the infrastructure for charging them. Policymakers, automakers, and other industry stakeholders must comprehend consumer attitudes and preferences. They must create practical plans to promote increased EV adoption and deal with any issues that might impede the expansion of the market. Examining previous research can yield insightful information about the factors influencing people's decisions to purchase electric vehicles. These studies have brought attention to several factors, including cost considerations, technological concerns, accessibility of charging stations, range anxiety (the fear of running out of battery charge), environmental consciousness, and the influence of laws, advertisements, and regulations from the government on consumer choices.

Even if EVs are becoming more and more popular, several issues still need to be resolved to improve their allure and usability. Range anxiety is a major customer concern that can be mitigated by expanding the infrastructure for charging and refining battery technology. More charging stations are necessary to give EV owners convenience and confidence, especially fast chargers. A structured survey approach is used in this study to collect data from a wide variety of individuals. The purpose of the survey is to gather information about purchasing intentions, adoption decision-making factors, EV-related anxiety, experiences with charging infrastructure, and general opinions of EVs in comparison to conventional cars. Effectively addressing customer concerns and promoting more EV adoption can be achieved through the analysis of survey data.

Literature Review

Several scholarly investigations have examined customer behaviour concerning electric cars (EVs) with the objective of comprehending the variables impacting adoption choices. Zhang and Gao's (2020) research emphasize how customer attitudes regarding electric vehicles (EVs) are shaped by perceived environmental benefits, government incentives, and technological improvements. In a similar vein, Sierzchula et al. (2014) stress the significance of economic factors, availability of charging infrastructure, and range anxiety in driving consumer adoption of EVs.

Methodologies for surveys are frequently used to get information on customer preferences and opinions about electric vehicles. In their 2012 study, Egbue and Long investigate how surveys might be used to gauge customer willingness to pay for electric cars while considering things like vehicle characteristics, cost, and environmental concerns. Furthermore, surveys are used in Axsen and Kurani's (2013) research to investigate how government incentives and policies affect the rates at which customers adopt electric vehicles.

Theories and adoption models offer frameworks for comprehending the dynamics of the market for electric vehicles. Consumer acceptability of new technologies, including electric vehicles (EVs), has been extensively studied using Davis's (1989) Technology acceptability Model (TAM). In a similar vein, Rogers' (1962) Diffusion of Innovations theory sheds light on the variables affecting the pace at which EV adoption varies among various customer segments.

The market for electric vehicles confronts several obstacles and opportunities that will affect how quickly it grows. According to research by Reichel et al. (2018), there are several obstacles preventing EV adoption, including low driving range, expensive initial expenses, and a lack of infrastructure for charging EVs. Zacharakis et al. (2020) have conducted research that emphasize the potential for EV market expansion that arises from developments in battery technology, regulatory backing, and cooperative endeavours among stakeholders.

Adoption decisions are significantly influenced by consumer views of electric vehicles in comparison to conventional automobiles. Consumer preferences for electric vehicle (EV) features, such as performance, driving range, and environmental effect, in comparison to conventional gasoline-powered vehicles are examined in the Franke et al. (2019) study. In order to create EVs that satisfy customer preferences and market demand, automakers and legislators must have a thorough understanding of these perspectives.

The adoption of electric vehicles is heavily influenced by government policies and incentives. Gillingham et al.'s 2019 study examines the efficiency of different policy approaches, including infrastructure improvements, tax breaks, and subsidies, in encouraging the use of electric vehicles. Analogously, research conducted by Anable et al. (2012) and Brand et al. (2017) investigates how regulatory frameworks influence customer behaviour and market dynamics in electric vehicle technology.

The electric vehicle market is evolving due to technological breakthroughs in car design, charging infrastructure, and battery technology. The Navigant Research (2021) report offers insights into new developments that are redefining transportation in the future, such as the integration of electric vehicles with renewable energy sources, intelligent charging systems, and autonomous driving capabilities.

One of the main factors influencing consumer interest and acceptance of electric vehicles is their environmental benefits and sustainability. Hidalgo et al. (2016) conducted a study that compares the environmental effects of electric cars (EVs) to internal combustion engine vehicles. The study considers many criteria, including resource use, energy consumption, and greenhouse gas emissions. Promoting the broad adoption of electric vehicles (EVs) as a sustainable mode of transportation requires an understanding of the environmental implications of these vehicles.

The infrastructure that consumers desire for charging and range assurance has a big impact on how quickly EVs are adopted. The study by Kormos et al. (2018) highlights the significance of practical and dependable charging solutions in propelling the growth of the EV market by examining consumer views about home charging alternatives, public charging networks, and fast-charging capabilities. In a similar vein, Axsen et al. (2017) study investigates range assurance tactics and how they affect consumers' trust in buying EVs for daily use.

The market for electric vehicles is expected to develop in the coming years, but to reach its full potential, several obstacles need to be overcome. Wang et al.'s research from 2022 addresses market dynamics, policy changes, and future trends in EV technology. It emphasizes the importance of cross-sector collaboration to break down barriers and hasten the global adoption of EVs.

Objectives

1. Determine and evaluate the present obstacles to the adoption of EVs, such as perceived prices, charging infrastructure constraints, and range anxiety.
2. Assess the relationship between the price and range of electric cars (EVs) to determine how it affects consumer choice.
3. Examine consumer adoption of EVs, paying particular attention to factors that influence purchasing decisions and intent.
4. Examine the prospects for the EV market in the future while taking regulatory and technological changes into account.
5. Offer practical advice and ideas to remove obstacles, enhance the infrastructure for charging EVs, and encourage a larger uptake of EVs.

Research Methods

This study's target group consists of people who are interested parties or prospective customers in the electric vehicle (EV) sector. This includes age groupings, income brackets, educational backgrounds, and geographic areas, among other various demographics. A variety of sample techniques have been applied for this study to get a range of viewpoints. By starting with well-known participants and asking them to recommend others, snowball sampling aims to increase the number of respondents who share similar interests. To reach a larger audience, network sampling made use of personal and professional networks. Random sampling was also used to guarantee a representative sample from various demographic groups. Targeting a sample size of at least 102 respondents is necessary due to the intricacy of the study objectives and the requirement for thorough data analysis. We employed a questionnaire as the method of data collection for the survey during the data collecting procedure. We have gathered data from the respondents via the questionnaire. We have exclusively utilized primary data obtained via mail-based questionnaires.

Analysis and Interpretation

The examination of survey data about the adoption of electric vehicles (EVs) offers important insights into the variables affecting consumer behaviour and market dynamics. Analysis of the attitudes and preferences of respondents demonstrating the connection between adoption decisions, pricing, and driving range. The results emphasize how critical it is to solve obstacles like range anxiety, the accessibility of charging infrastructure, and

perceived expenses to promote a higher adoption rate of EVs. The principal instrument for statistical analysis was Microsoft Excel, with the chi-square test being used in particular. The analysis of correlations and linkages between categorical variables within the data set was made possible by this statistical technique. The analysis used the chi-square test to find significant patterns, trends, and dependencies between the variables associated with consumer preferences, the adoption of electric vehicles (EVs), and perceptions of EV-related aspects including price, driving range, and charging infrastructure. Utilizing Excel's analytical features made it easier to comprehend the data thoroughly and gave valuable insights into the variables affecting the dynamics of the EV industry and consumer behaviour.

The information gathered from all 102 respondents provides the basis for the analysis and interpretations. I have created a variety of charts, graphs, and statistical analyses using Microsoft Excel, including correlation and linear regression analysis of variance.

H0_a: Expected price of EV and expected range are independent of each other.

H0_b: Purchase intention of customers and future popularity of EVs are independent of each other.

H0_c: Willing to pay premium price for advanced feature and better range of EV and popularity of EV in next 5 years are independent of each other.

Table 1: Chi-square test of expected price and expected range.

Expected Range					
Exp Price	<200 km	200-300 km	300-400 km	>400 km	Total
<10 lakhs	11	5	3	5	24
10-20 lakhs	8	15	15	18	56
20-30 lakhs	1	6	4	2	13
Total	20	26	22	25	93
Expected Range					
Exp Price	<200 km	200-300 km	300-400 km	>400 km	Total
<10 lakhs	5.16129032	6.7096774	5.677419355	6.451613	24
10-20 lakhs	12.0430108	15.655914	13.24731183	15.05376	56
20-30 lakhs	2.79569892	3.6344086	3.075268817	3.494624	13
Total	20	26	22	25	93
	chi-square	p-value:	0.025149833		

The chi-square test has a p value of 0.0251 (Table 1), which is significant at the 5% level. As a result, the null hypothesis is disproved (H0_a), and we draw the conclusion that the expected range and price of EVs are related. It demonstrates both the factors are dependent on each other.

Table 2: Chi-square test of Purchase intention of customers and future popularity of EVs

PURCHASING				
NEXT 5 YEAR	YES	NO	NOT SURE	TOTAL
YES	31	29	9	69
NO	5	12	1	18
NOT SURE	4	4	7	15
Total	40	45	17	102
PURCHASING				
NEXT 5 YEAR	YES	NO	NOT SURE	TOTAL
YES	27.05882	30.44118	11.5	69
NO	7.058824	7.941176	3	18
NOT SURE	5.882353	6.617647	2.5	15
Total	40	45	17	102
	chi-square	p value:	0.004845	

The chi-square test has a p-value of 0.004 (Table 2), which is significant at 5% threshold. As a result, the null hypothesis is disproved (H_0b), and we draw the conclusion that people's intentions to acquire electric vehicles and their likelihood of doing so during the next five years are related to or dependent upon one another.

Next 5 years				
premium	NO	YES	NOT SURE	TOTAL
NO	7	11	2	20
YES	7	53	6	66
NOT SURE	4	5	7	16
TOTAL	18	69	15	102
Next 5 yr				
premium	NO	YES	NOT SURE	TOTAL
NO	3.5294118	13.529412	2.941176471	20
YES	11.647059	44.647059	9.705882353	66
NOT SURE	2.8235294	10.823529	2.352941176	16
TOTAL	18	69	15	102
	chi-square	p-value	0.00021764	

Table 3: Chi-square test of Willing to pay premium price for advanced feature and better range of EV and popularity of EV.

The chi-square test's p-value is 0.0002 (Table 3), which is significant at 5% level, meaning that the null hypothesis is rejected (H_0c). As a result, we may draw the conclusion that being popular and wanting to pay more for advanced features over the next five years are related to one another.

Table 4: Percentage of respondents displayed related to awareness, experience, and barriers to EVs.

Experience of driving	Respondents in %
Yes	46.5%
No	53.5%
Awareness level	Respondents in %
Yes, very much aware	51.5%
Somewhat aware	25.7%
Less	13.9%
Not at all	8.9%
Biggest barrier	Respondents in %
Range Anxiety	28%
Charging infrastructure	51%
Initial cost	12%
Others	9%

From Table 4, it is evident that over half of the respondents to the study indicated that they were very aware of electric vehicles (EVs), indicating a noteworthy level of knowledge among them. This suggests a rising body of knowledge and interest in non-traditional modes of transportation. Furthermore, the fact that a sizable percentage of respondents had personal experience operating an electric vehicle or riding in one implies a degree of familiarity that may have a favourable effect on how they perceive and use EVs. This first-hand experience is essential because it enables people to establish views based on actual experiences rather of just theoretical considerations. This helps people make more educated decisions when deciding whether to consider electric vehicles (EVs) as a feasible alternative for their transportation needs. The study's findings suggest that the scarcity of infrastructure for charging may be the most significant obstacle. Concerns about charging station accessibility and adequacy were voiced by over half of the respondents. This emphasizes how critical it is to make investments in growing and improving charging networks to reduce range anxiety and improve the experience of owning an EV in general. To allay customer worries and increase trust in the usefulness and convenience of owning an EV, particularly for daily commuting and longer excursions, a strong charging infrastructure is needed.

Conclusion

Conclusively, the study results illuminate the intricate terrain of electric vehicle (EV) adoption, accentuating the obstacles and prospects for the forthcoming sustainable transportation landscape. The prevailing motif that surfaces is the enormous potential that electric vehicles (EVs) must transform the automotive sector and make a substantial contribution to environmental conservation. To fully realize this potential, though, several stakeholders must work together to remove important obstacles and create an environment that is conducive to the widespread adoption of EVs. The report identifies the upfront cost of electric vehicles (EVs) as a major barrier that frequently dissuades prospective purchasers, especially those with little financial resources. EVs may initially cost more than conventional petrol/diesel-powered cars, but over time, the cost savings on fuel and maintenance make them a more cost-effective option. To make EVs more appealing and accessible to a wider spectrum of consumers, government subsidies, tax breaks, and manufacturer discounts can be extremely important in boosting market demand and adoption.

The survey also emphasized the fact that EV charging infrastructure is less developed than that of conventional petrol and diesel stations. The accessibility and availability of charging stations have a significant impact on consumers' propensity to use electric vehicles. Expanding the charging network is crucial to reducing range anxiety and improving the overall ease of owning an EV, especially in high-traffic regions and along important travel routes. Advancements in rapid charging systems and public-private partnerships reinforce the infrastructure required to facilitate the mass deployment of electric vehicles.

Another important aspect impacting consumers' decisions toward EVs was education and awareness. To eliminate misunderstandings and promote educated decision-making, it is critical to provide thorough information about the advantages of electric vehicles (EVs), including reduced operating costs, environmental benefits, and technological developments. Consumer awareness of environmental issues is rising and emphasizing the lower carbon footprint and cleaner air linked to electric vehicles (EVs) appeals to these people, increasing interest in EV adoption.

Positive outlooks are reflected in the survey results, which show that consumers are eager to accept EVs under the proper circumstances. Through tackling issues pertaining to expenses, facilities, and knowledge, interested parties can establish a setting that promotes quicker adoption of electric vehicles. Governments, corporations, and digital entrepreneurs must work together to advance and create an electric vehicle-powered, sustainable transportation future. We are in position to see a revolutionary change toward cleaner, greener, and more effective mobility solutions for future generations with sustained efforts and investments in EV technology, infrastructure, and education.

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