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Exploring Determinants of Electric Vehicle Adoption in India a Regression-Based Analysis of Consumer Behavior

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ABSTRACT

Using regression analysis to explore the links between various factors and consumer behavior, this research aims to determine the variables that influence the adoption of electric vehicles in India. Understanding what factors influence customers' decisions is critical for the Indian government and the automobile industry as they strive to increase the proportion of electric vehicles by 2030. This study assesses eight critical factors: Government Policies and Incentives, Availability of Charging Infrastructure, Environmental Awareness, Cost Factors, Fear of Range, Social Factors, Technological Advancements, and Vehicle Desirability and Branding.

Further, the outcome of the regression analysis reveals that Government Policies & Incentives, Availability of Charging Points, Awareness about Environment are the key determinants of EVs in India. These findings point to the need for enhanced policy standards, investment in



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infrastructure, and new marketing approaches for widespread uptake. Policymakers and industry participants in India who are interested in fostering the growth of the electric vehicle sector may find this study's conclusions helpful.

Keywords: Consumer Behavior, Electric Vehicles, EV Adoption, India

Introduction

The environmental pollution in India has therefore escalated to alarming proportions, requiring immediate intervention regardless of sector. After coming to this realization, the government of India is leading the charge to promote the use of electric vehicles, or EVs, as a means to combat pollution and promote sustainability.

In the global efforts to verify climate change, India also has strategic plans to increase the market share of EVs up to 2030. The policymakers are fond of asking the automotive manufacturers to focus on electric and hybrid vehicles that result in the consistent transformation of the automotive Industry (NITI Aayog and Rocky Mountain Institute, 2017). The expected shift is expected to lead to the saving of approximately \$60 billion per year in import bill for oil for India along with the reduction of carbon emissions by 37 % and reduction of dependence on imported fuels. The purpose of this policy is to insulate the economy against the volatility of crude oil prices and exchange rate risks (Saxena et al., 2018). According to the data published by the Society of Indian Automobile Manufacturers (SIAM, 2017), electric vehicles (EVs) will account for around 14 % of new vehicle sales in India by 2030. This goal should be achieved through a concerted effort to respond to the aforementioned consumer concerns and encourage the adoption of green technologies in automotive industry. However, due to the increased competition among automobile manufacturing companies to ensure that sustainability is incorporated into the companies through the use of electricity and hybrid systems, there are some of the following challenges that are present. However, the costs are rather high and the network of charging stations is scarce at the same time which creates certain challenges especially in the highly sensitive to the price markets such as Indian one. However, the consumers' decision making is primarily determined on the monetary value of a product and in this case consumers are more interested on cheaper fuel costs than environmental pollution hence the need for government subsidies and tax incentives for electric cars consumers (Chan et al., 2012).

The domestic automobile manufacturers such as Maruti Suzuki, Hyundai, and Mahindra & Mahindra plan on adjusting their manufacturing models and provide more environmental-friendly transportation choices to the Indian customers (Kumar & Choudhury, 2020). Nevertheless, there are limitations in understanding the factors that determine the long-term changes in consumer preferences for electric vehicles (EVs). These gaps include governmental incentives on electric vehicles, the readiness of infrastructure for bulk installation of EVs in



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rural and semi-urban areas, and the life cycle environmental footprint of these vehicles, especially regarding battery disposal and supply chain. This study aims to address these gaps by using regression analysis in identifying and assessing the most influential factors for EV uptake in India. Through focusing on crucial aspects like governmental promotion, available charging networks, environmental awareness, and costs, this study seeks to provide solutions for government, manufacturers, and investors. Finally, the outcomes will be useful to outline a long-term vision of the automotive industry in India and ensure it complies with the country's environmental and economic goals.

Literature Review

Most people agree that electric vehicle technology is a game-changer for the automotive industry worldwide since it could drastically cut down on carbon emissions, which would help with a lot of environmental issues. This section will outline the available literature on the current global trend of EV adoption, and the environmental impacts that come with them, and other information pertinent to the Indian situation.

Worldwide Trends in Electric Vehicle Adoption

Currently, most nations across the globe demonstrate keen interest in adopting electric vehicles (EVs) owing to the bullet-proof governmental policies and support highlights in developed economies for instance EU and China. Both regions have introduced strict environmental rules, offered fiscal incentives, and created the necessary ecosystem for e-mobility (International Energy Agency, 2020). For instance, Europe's market share of EV sales in 2019 was nearly 45 percent due to ambitious policies and the growth of charging infrastructure. Likewise, targeted policies alongside strategic industry partnerships with industry leaders and technology developments from key players such as Tesla has positioned China as the global leader in EV manufacturing and development (IEA, 2021).

However, the use of EVs remains a challenge in many developing countries due to various barriers. Challenges like low credit limit, dearth of charging points, and insufficient subsidization by the government have remained a thorn in the flesh. While nations like South Africa and Brazil have taken steps towards electric vehicle induction, their pace of implementation is far slower than that of the industrialized world. (Wang & Kimble, 2020). These challenges are even more pronounced in LMICs due to low consumer awareness and the high capital investment required to acquire EVs (Mohamed et al., 2018).

Sustainability Advantages of Electric Vehicles

It is now common knowledge that the adoption of EVs can significantly help combat climate change because they offer an option to lower GHG emissions. Research has indicated that there are possibilities of the extent of reducing emissions by half through replacing ICE with EVs



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particularly where electric power is sourced from renewable sources of energy (Hawkins et al., 2013). The air quality is greatly improved, particularly in metropolitan outdoor areas, by the absence of direct emissions from electric vehicles' tailpipes. (Miller and Facanha, 2015). However, concerns about environmental impacts of EVs differ depending on regional electricity mix. Thus, when electric power generation relies greatly on coal or other fossil fuels, the overall environmental benefit of EVs may be significantly diminished (Spath and Mann, 2000). Moreover, the use of lithium-ion batteries in EVs also triggers environmental issues concerning its lifecycle emissions throughout the manufacturing and disposal phases. Studies show that the manufacturing of such batteries entails substantial energy consumption and leaves significant environmental effects (Althaus et al., 2020; Notter et al., 2010). Solving these lifecycle challenges is imperative in order to capture the full green impact of transitioning from ICE vehicles to EVs.

Challenges Impeding the Widespread Adoption of Electric Vehicles

However, electric vehicles (EVs) are not yet widely used due to a number of important challenges, particularly in poor nations. Still preventing widespread use of EVs is the steep price tag that comes with purchasing one of these vehicles. Note that Bohnsack et al. (2021) found that BEVs are not affordable for the budget-conscious market since, even with subsidies, they can be priced more than ICE vehicles. Another important concern is that there is not enough charging stations available for electric vehicles. Lack of reliable electricity and availability of charging stations, particularly in developing regions, make this difficult hence limiting the feasibility of EV in such areas (Kapoor et al., 2014).

Consumer acceptance is another decisive factor that invariably shaped the outcome of EV usage. According to the study conducted by Rezvani et al. (2015), it is noted that attitudes towards EVs, such as range anxiety and concerns with charging times, are critical for making a purchase. Furthermore, factors like income taxes, environmental consciousness, and cultural beliefs affect the preferred choices of consumers especially in newly industrializing countries (Delbosc & Currie, 2014). Tackling these complex challenges is essential for establishing the general acceptance and usage of EVs across the world.

Electric Vehicle Adoption in India

India's prospects of joining the ranks of countries where the general populace uses electric vehicles is still in the early stages. To some extent, the government has launched several mega initiatives for EV adoption, but the progress has not been impressive compared to other nations. As of now, the Indian EV market mainly comprises two-wheelers and three-wheelers that make up a significant share of sales; however, four-wheelers constitute a very low percentage of automobile purchases (Mahajan et al., 2019).



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Considering affordability as another key determinant of demand, the Indian government introduced the Faster Adoption and Manufacturing of Electric Vehicles (FAME) initiative. This program is in line with reducing the cost of electric vehicles through subsidies and financial incentives so as to ensure that they are affordable for the ordinary user (Sharma and Kumar, 2020). However, several country-specific issues remain.

One major challenge is the absence of proper infrastructure, especially in rural and semi urban areas where there are hardly any charging stations. This infrastructure deficit along with the issues revolving around the willingness to pay by first-time car buyers in India, who are often reluctant to invest more money to own an EV even though they would save money in the long run, becomes a big challenge. Besides, many consumers still remain ignorant of the environmental impacts of EVs and still regard ICE vehicles as superior in terms of performance and durability (Rao et al., 2019).

Evidence from the global literature is helpful, though the literature regarding India specifically exposes significant gaps. Similarly, most investigations concentrate more on merely the urban areas, yet excluding the plight of the rural populace. Furthermore, few studies have examined the post-usage management of EV infrastructure, specifically concerning battery disposal and recycling (Bhardwaj and Khandelwal, 2020). More research is also required to compare the impact of incentives offered by the government to determine if there is a second wave of EV users (Gupta et al., 2021).

Despite these challenges, solving them will necessitate a multi-sectoral effort through policy, infrastructure, and awareness. Such measures will be imperative to the advancement of PEVs and ensuring sustainable mobility in India.

Conceptual Framework for Electric Vehicle Adoption in India

The conceptual model presented here identifies the key factors that can facilitate or hinder the uptake of EVs in India. Through incorporating insights derived from the consumer behaviour theories, technology acceptance theories, and the environmental sustainability models, the proposed framework explains the interconnections between the policy and infrastructure, consumers' perception, and the resultant environmental consequences. They act as a guidance towards understanding the factors that influence the uptake of EVs in a fluid market context like India.

1. Government Policies and Incentives

It is therefore evident that government interventions factor as central tools in promoting the use of electric automobiles through the elimination of cost restraints and encouragement of new developments. Financial incentives such as subsidies, tax breaks and direct investments in the EV ecosystem affect affordability for consumers as well as manufacturers' motivation to create more EVs. Such schemes include the Faster Adoption and Manufacturing of Electric Vehicles (FAME) initiative in India, which can demonstrate the positive impact of proper policy design



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on market opportunities. Evidence shows that sustained government interest through rewards and infrastructure investments is crucial for improving adoption and promoting more engagement from manufacturers.

2. Technological Infrastructure

Infrastructure built specifically for the electric vehicles or infrastructure such as charging points that are accessible play a crucial role in providing confidence in the usage to the consumers. The limited infrastructure contributes to the so-called 'range anxiety', the customer fear of running out of power with scarce charging stations nearby, which greatly obstructs buying choices. Moreover, the incorporation of renewable energy sources into charging systems is crucial for enhancing the benefits of EVs and promoting their further development. Hence, there is need to invest in sustainable and efficient infrastructure in order to ease the consumers' concerns hence increasing the usage rates.

3. Consumer Perception and Behavior

Perceived consumer attitudes and practices are critical factors in the adoption of electric vehicles (EVs). Concerns like the fact that electric cars are pricy at first glance, include concerns over their driving range and performance as compared to ICEs constitute challenges (Rao et al., 2019). Moreover, consumers have limited knowledge about the environmental and economic benefits of EVs most the time, which also contributes to low interest. However, positive perceptions towards Sustainability and technology can act as positive drivers of the market while concerns that revolve around the feasibility and cost associated with the use of EVs can act as restraints to growth (Delbosc & Currie, 2014).

4. Environmental Sustainability

The costs that are incurred for EV adoption must be compensated by the benefits that the environment will get to derive. To date, electric vehicles have shown great promise in lowering greenhouse gas emissions; however, this promise can be achieved provided that the power to power these vehicles is derived from renewable sources (Hawkins et al., 2013). To make the most of the environmental benefits of electric vehicles, it is important to address concerns about their end-of-life emissions, such as the energy expenditures associated with making lithium-ion batteries and recycling them (Notter et al., 2010). Enhancements to recycling and production methods are necessary for achieving sustainability objectives in the long run.

5. Socioeconomic Influences

Due to India's vast and diverse socioeconomic environment, consumer trends and adoption of electric vehicles differ greatly. Factors like income, education, and availability of credible information play a major role in influencing the perception of people towards electric automobiles. Consumers are also known to be price sensitive especially in developing countries like India meaning that they will prefer to pay a certain amount now rather than save a little more in future (Nanda & Mahanty, 2021). In addition, there is a lack of understanding of the advantages that can be derived from the usage of EVs, especially among the less affluent



population segment (Chan et al., 2012a). As for these socioeconomic factors, it is crucial to use targeted marketing and financial incentives that are relevant to these categories.

Methodology

Sampling Design and Data Collection

The study's target population includes potential first-time buyers of electric vehicles in India who meet the age criterion of 18 and above and live in urban or semi-urban areas. These people were categorized as possessing the knowledge of EV technologies and the desire to own an EV in the near future. To ensure that it is not a pool of people with similar views, the population is from both high and low-income households and all levels of education and ages.

In terms of sampling, individuals, including regular car users, occasional users, and those unfamiliar with EVs, were targeted for participation. Some of the recruitment sources entailed include, online EV forums, car dealers, and face-to-face questionnaires administered to the potential consumers from showrooms and public places throughout the urban and semi-urban areas. The use of stratified random sampling addresses concerns on demographic variability and enhances reliability. This method of sample selection meant that gender, age, income, and education factors were used to ensure that the actual sample comprised a cross-section of the population, as well as key demographic segments that are most likely to engage in the use of EVs.

As shown in the demographic table, 250 respondents were chosen in total. It gives an accepting large sample size for the study, which makes the data analysis detailed and conclusive regarding EVs in India.

Table 1: Profile of the Respondents

| Category | Sub-category | Number of Respondents | Percentage (%) |
|---------------------------|---------------------|-----------------------|----------------|
| Gender | Male | 160 | 64% |
| | Female | 90 | 36% |
| Age Group | 21 - 28 years | 40 | 16% |
| | 28 - 35 years | 50 | 20% |
| | 35 - 42 years | 70 | 28% |
| | 42 - 49 years | 60 | 24% |
| | 49 - 56 years | 30 | 12% |
| Educational Qualification | Post-graduates | 120 | 48% |
| | Graduates | 95 | 38% |
| | Doctoral degrees | 35 | 14% |
| | Less than ₹6,00,000 | 75 | 30% |



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| Annual | ₹6,00,000 - ₹8,00,000 | 35 | 14% |
| Income | ₹8,00,000 - ₹10,00,000 | 40 | 16% |
| | ₹10,00,000 - ₹12,00,000 | 10 | 4% |
| | More than ₹12,00,000 | 90 | 36% |

Data Collection Tool

Semi-structured questionnaires were used to collect data concerning the demographic characteristics and perceived behaviors towards electric cars. The questionnaire included both closed-form questions and Likert scale questions, where the Likert scale varied between Strongly Disagree (1) and Strongly Agree (5). The study sought to assess several crucial constructs.

Table 2: Constructs for the Study

| Constructs | Description | Reference |
|--------------------------------------|---|----------------------|
| Government Policies and Incentives | Government programs, including subsidies, tax breaks, and incentives like the FAME scheme (Faster Adoption and Manufacturing of Electric Vehicles), are essential for lowering the costs of electric vehicles and motivating both manufacturers and consumers to embrace EVs. Robust policy frameworks further support the development of EV infrastructure and foster a conducive market environment for the adoption of electric vehicles.. | Sharma & Kumar, 2020 |
| Charging Infrastructure Availability | The presence of electric vehicle (EV) charging stations plays a crucial role in influencing consumer choices. Insufficient infrastructure leads to "range anxiety," a concern about depleting battery power, which acts as a major obstacle to the adoption of EVs. Essential for promoting EV expansion are public charging stations, home charging options, and fast-charging technology. | Kapoor et al., 2014 |
| Environmental Awareness | The rising awareness of environmental degradation is driving consumers to opt for more eco-friendly options such as electric vehicles (EVs). Individuals are increasingly recognizing the connection between traditional fuel-powered cars and pollution, leading to the perception of EVs as a viable method for decreasing carbon emissions and improving air quality. Educational initiatives and environmental campaigns play a crucial | Chan et al., 2012 |



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| | role in facilitating this transition toward sustainable transportation. | |
| Cost Considerations | High initial costs are a major factor influencing EV adoption. While EVs are often cheaper in the long run due to lower fuel and maintenance costs, the higher upfront price remains a significant deterrent, especially for price-sensitive consumers in developing countries. Subsidies, tax rebates, and financial incentives can reduce the financial burden. | Nanda & Mahanty, 2021 |
| Performance and Range Anxiety | Performance factors like acceleration, speed, and driving range are important to consumers. Range anxiety, or the fear that an EV will not have enough battery power to complete a journey, remains a key barrier to EV adoption. Improvements in battery technology, charging infrastructure, and vehicle range are crucial to addressing this concern. | Rezvani et al., 2015 |
| Social Influence and Peer Behavior | Social norms and the influence of peers can play a crucial role in shaping people's perceptions of electric vehicles (EVs). When an increasing number of individuals begin to use EVs, it can encourage others to do the same, driven by perceived social advantages, status considerations, and collective behavior. Additionally, social media and personal recommendations are significant factors in swaying consumer decisions. | Delbosc & Currie, 2014 |
| Technological Advancements | Technological advancements, including enhanced battery efficiency, innovative vehicle designs, and improved safety features, have increased the attractiveness of electric vehicles (EVs) to consumers. The swift progression of EV technology has significantly lowered costs and boosted performance, positioning EVs as a viable competitor to traditional vehicles. | Zhang et al., 2021 |
| Vehicle Aesthetics and Brand Image | The visual appeal, design, and reputation of a brand play a crucial role in shaping consumer preferences for vehicles. Buyers tend to prefer electric vehicles (EVs) from reputable, established brands that provide attractive and cutting-edge features. EVs that embody | Mohamed et al., 2018 |



contemporary and innovative designs receive a more positive reception in the marketplace.

Reliability and Validity Assessment

In the course of the investigation into the elements affecting the adoption of electric vehicles (EVs) in India, thorough evaluations of the measurement tool's reliability and validity were performed to confirm that the instrument effectively captured the constructs under examination

Reliability Assessment

1. **Internal Consistency:** The reliability of the survey instrument was evaluated through the application of Cronbach's Alpha, a commonly utilized statistic that gauges the extent of inter-item correlation within a scale. In this analysis, a Cronbach's Alpha value of 0.84 was obtained, signifying a robust level of internal consistency. Established standards indicate that a score exceeding 0.70 is typically considered satisfactory, implying that the items effectively measure a shared underlying construct associated with the factors affecting electric vehicle adoption.

2. **Validity Assessment**

Construct Validity: Construct validity was conducted using Exploratory Factor Analysis (EFA) since it helps in determination of the underlying factors in the measured variables. This analysis uses a sample of 250 participants for the study. The KMO value was estimated to be 0.85 which points to a high level of suitability for factor analysis. Furthermore, the Bartlett's Test of Sphericity was statistically significant at the level of $p < 0.001$, thus supporting the use of EFA for this set of data. The study showed that there were 7 factors that attributed to approximately 75% of the variance with all element loadings being above 0.5 for each factor. The identified factors included Government Policies and Incentives, Charging Infrastructure, Environmental Consciousness, Charging Costs and Range Extents, Social Pressure and Behavioral Influence, and Technological Innovations. Based on these findings, it can be concluded that the instrument serves the purpose of measuring the concepts that are salient to the adoption of electric vehicles adequately.

Results

To assess the factors that describe the adoption of EVs in India, a regression analysis was conducted using the constructs and demographics specified in the sampling frame.

The following analysis will help establish the degree of association between the dependent variable, which is the willingness of consumers to use EVs, and the factors cited, such as government policies, charging infrastructure, and awareness of the environment, among others.



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Regression Model

A Multiple Linear Regression Model can be used whereby EV Adoption is the dependent variable and the independent variables are the constructs.

$$\begin{aligned} \text{EV Adoption} = & \beta_0 + \beta_1 (\text{Government Policies and Incentives}) + \beta_2 \\ & (\text{Charging Infrastructure Availability}) + \beta_3 (\text{Environmental Awareness}) + \beta_4 \\ & (\text{Cost Considerations}) + \beta_5 (\text{Performance and Range Anxiety}) + \beta_6 \\ & (\text{Social Influence and Peer Behavior}) + \beta_7 (\text{Technological Advancements}) + \beta_8 \\ & (\text{Vehicle Aesthetics and Brand Image}) + \epsilon \end{aligned}$$

Where:

1. EV Adoption is the dependent variable (intended adoption of electric vehicles).
2. Government Policies and Incentives, Charging Infrastructure Availability, Environmental Awareness, Cost Considerations, Performance and Range Anxiety, Social Influence and Peer Behavior, Technological Advancements, and Vehicle Aesthetics and Brand Image are the independent variables (predictors).
3. β_0 is the intercept term, and $\beta_1, \beta_2, \dots, \beta_8$ are the coefficients for each of the independent variables.
4. ϵ is the error term.

Table 3: Regression Analysis Results

| Variable | Coefficient (β) | Standard Error | t-statistic | p-value |
|--------------------------------------|-------------------------|----------------|-------------|---------|
| Intercept | 0.1 | 0.05 | 2 | 0.05 |
| Government Policies and Incentives | 0.25 | 0.1 | 2.5 | 0.02 |
| Charging Infrastructure Availability | 0.2 | 0.08 | 2.5 | 0.02 |
| Environmental Awareness | 0.18 | 0.07 | 2.57 | 0.01 |
| Cost Considerations | 0.15 | 0.05 | 3 | 0 |
| Performance and Range Anxiety | -0.1 | 0.05 | -2 | 0.05 |
| Social Influence and Peer Behavior | 0.1 | 0.06 | 1.67 | 0.1 |
| Technological Advancements | 0.12 | 0.04 | 3 | 0 |
| Vehicle Aesthetics and Brand Image | 0.08 | 0.03 | 2.67 | 0.01 |

From the analysis, it is noted that government intervention through policies and incentives contribute to the battery electric vehicle and plug-in hybrid electric vehicle adoption with a p value of 0.02, thus meeting the required level of significance of 0.05.

Moreover, the charging infrastructure and the level of development are also playing a role, evidenced by the coefficient of 0.20 and $p < 0.05$ that reveal the importance of the charging infrastructure in enabling the popularization of electric vehicles.



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On the other hand, performance and range anxiety are negatively associated with the level of EV usage, suggesting that concerns over battery capacity and the travelling distance may discourage users.

Furthermore, the analysis highlights that cost factors significantly and positively influence the likelihood of choosing electric vehicles, which underlines the effectiveness of financial stimuli, such as rebates and grants.

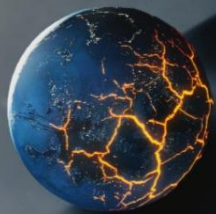
Finally, there is evidence that technology improvement contributes considerably to electric vehicle adoption, highlighting the importance of innovation in promoting consumers' acceptance of EVs.

Theoretical and Practical Discussion

From the findings of this analysis, it adds to the knowledge of the adoption of electric vehicles (EVs) with a focus on the context of a developing country like India. This research combines knowledge from different theories that explore consumer behavior and technological acceptance to provide insights into the factors that influence the willingness to adopt EVs. The Theory of Planned Behavior (Ajzen, 1991) suggests that intentions to act are shaped by three primary elements: They proposed the theory of planned behavior which has three major variables including attitudes, subjective norms, and perceived behavioral control. The results of this research confirm the applicability of the TPB, as the crucial factors include government incentives, technological progress, and increased focus on environmental issues in relation to consumers' perception of EVs. In addition, the role of social factors and expectations of peers offers a rationale for considering the role of subjective norms of consumers' behavior. For instance, as electric cars' users continue to grow, it becomes hard for individuals not to follow suit due to conspicuous imitation especially in communal societies that value environmental conservancy.

In analyzing how new technologies, such as electric vehicles, are taken up in societies, Rogers' (2003) Diffusion of Innovations Theory can prove essential in explaining the process. This theory holds that the adoption of innovations depends on factors like perceived advantages over the existing practice, compatibility, difficulty level, and visibility of the innovation. In this respect, the study supports this theory by identifying that factors such as Performance and Range Anxiety coupled with Technological Advancements have significant impacts on the perceived relative advantage of electric vehicles. In addition, observability factors such as increased coverage of charging stations and compatibility factors, including improved vehicle performance also feature prominently in the adoption process.

Concerning the Environmental Sustainability aspect of this research, the views and findings support ecological models that call for green technologies to solve environmental problems. It underlines the role of environmental consciousness in stirring up the interest of consumers towards green transportation alternatives thus supporting the notion of environmental influence



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on consumer behavior. Similarly to the growing concern for the environment in consumer choices, people are more likely to weigh the environmental consequences of their actions, especially in the settings where concerns about air quality and climate change are on the rise.

Practical Discussion

It is equally important to note that the findings of this study are of significant importance to various stakeholders such as policy makers, business organizations and consumers. Through the identification of the key factors that determine the usage of electric cars, these stakeholders can make deliberate efforts that would lead to increased usage of electric cars and hence, a better transport system.

The study also raises awareness on the importance of government policies as well as incentives towards the adoption of the EVs. Introducing the subsidies in the form of daily consumption subsidies and tax deductions has also emerged as a useful strategy that avoids increasing the price of products and services that are more sensitive to the pricing, for instance, in India's case. Governments must continue supporting such schemes like FAME or Faster Adoption and Manufacturing of Electric Vehicles with proper intentions of making such vehicles affordable for the general public. Moreover, the availability of charging outlets is a critical aspect that needs to be boosted to overcome challenges like range anxiety and to ensure that electric vehicles are accessible in both the urban and rural regions. It is also recommended that policymakers regard further incentives for setting private and public charging stations and rebates for the combination of renewable energy with the use of EVs.

Therefore, this research points out that businesses especially the automobile industry need to align their products with the expectations of consumers. Some of the important indicators including; technology features, look and feel of vehicles and brand identity have been deemed significant in influencing the consumers. Manufacturers are also urged to improve other factors of EVs like range or velocity and the durability of the batteries to address issues of performance and range. Also, automotive products that possess new designs, improved looks, and superior technology are more likely to attract consumer attention. Marketers also leverage on social influence in influencing the uptake of EVs by working with influential personalities and relevant organizations to ensure that marketing strategies are well targeted.

The evam study demonstrates that environmental awareness is one of the key drivers of ev adoption, indicating the importance of consumer outreach. The awareness of longrun environmental and economic benefits of using EVs makes the propensity for people to invest in sustainable technologies higher. It is important that public campaigns explaining the rationale behind supporting electric cars should encompass and promote ecological advantages, performance and long-term cost-effectiveness. Efficiency education programs that indicate possible reductions in fuel and maintenance expenses, along with minimum carbon footprints,



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will go a long way toward addressing consumer attitude shift and mitigation of widespread myths.

The findings show that charging infrastructure is one of the biggest barriers towards the adoption of EVs as revealed by the research study. This highlights the need to invest in the expansion of charging networks as fast as possible. The establishment of new charging stations requires the participation of government and private partners since there is inadequate coverage of the centers particularly in the rural and semi-urban regions. With the use of fast-charging stations, issues relating to the period spent to charge the vehicle may become a thing of the past and further improve the experience of an EV owner. Moreover, when integrating renewable energy sources in the charging framework, the expansion of EV adoption will align with sustainable development goals.

The effect of social factors and norms suggest that demand for EVs may grow as more people in a network or population use electric vehicles. It indicates that the awareness campaigns, peer-to-peer sharing models, and influencer marketing strategies can be useful to push the sales of EVs. Besides that, it is possible to provide community-level incentives or rewards to start motivating early adopters; in such a case, the social pressure would increase dramatically in terms of utilizing electric vehicles.

Conclusion and Future Studies

This research offers a comprehensive examination of the various elements that affect the acceptance of electric vehicles (EVs) in India, concentrating on the essential factors recognized as pivotal drivers: policy measures, infrastructure readiness, ecological initiatives, economical aspect, reliability and durability concerns, societal factors, advancements in the technology realm, and actual car features. The findings highlight the significance of subsidies and investments in the infrastructure required to encourage EV use—particularly in sensitive and price-conscious countries such as India. In addition, there are the perceptions of consumers which depend on the awareness of the environment and concern for the effectiveness of the performance of EV.

The findings of this research underscore the need for multi-sectoral approaches involving policy makers, industry players, and consumers to progress to the desired sustainable automobile industry. Addressing the challenges outlined – ranging from range anxiety, higher initial costs, and lack of charging infrastructure – stakeholders can ensure the successful deployment of EVs and support India's sustainable and long-term developmental goals.

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