Factors Influencing Electric Vehicle Adoption in India: An Investigation into Consumer Purchase Intention

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Research Question:
To what extent do economic, infrastructural, Environmental, and Technological factors influence consumers' intention to adopt electric vehicles in India?

Abstract:
The inexorable global transition towards electrified mobility is engendering a fundamental reconceptualization of the contemporary transportation paradigm, with India assuming an increasingly consequential role within this rapidly evolving landscape. Despite the accelerating proliferation of electric vehicles (EVs), their widespread diffusion remains contingent upon a complex and interdependent constellation of economic, infrastructural, environmental, and technological determinants that mediate consumer perceptions, preferences, and behavioural intentions.

This research critically examines the extent to which these multidimensional determinants influence consumers' intention to adopt EVs in India, Encompassing Affordability, Lifecycle ownership expenditure, charging accessibility, driving range, battery reliability, environmental consciousness, and governmental intervention. Using a quantitative framework, the study draws on primary data from a structured questionnaire to clarify consumer perceptions and identify the key determinants of EV adoption. Rather than reducing adoption to an exclusively economic or environmental proposition, the research conceptualises consumer transition towards electric mobility as a multifaceted behavioural phenomenon arising from the intersection of financial viability, infrastructural adequacy, technological assurance, environmental stewardship, and policy responsiveness. Through the critical synthesis of these interrelated dimensions, the study seeks to delineate the principal catalysts, deterrents, and underlying tensions that characterise consumers' transition towards electric mobility. Ultimately, the research illuminates the intricate architecture of consumer decision-making surrounding EV adoption in India and underscores the imperative of harmonising economic accessibility, infrastructural preparedness, technological advancement, environmental imperatives, and coherent governmental intervention to foster a resilient, inclusive, and sustainable electric mobility ecosystem. In doing so, the study contributes to a broader understanding of the conditions through which consumer willingness can be translated into substantive and enduring adoption, thereby supporting India's trajectory towards a progressively decarbonised transportation future.

Keywords:
Electric Vehicles, Charging Infrastructure, EV Adoption, Sustainability, Purchase Intention, Consumer behaviour and Environmental, technological, social, and economic factors.

Introduction:

An electric vehicle (EV) is a type of vehicle that is powered entirely or partially by electricity instead of gasoline or diesel. They have an electric motor as their primary source of propulsion, along with a battery system and advanced electronics. They are even a viable solution for reducing greenhouse gas emissions and the extreme dependence on fossil fuels.

The importance of EVs is increasing due to multiple reasons, which include, firstly, reducing emissions and air pollution, because daily road transport is one of the major sources of emissions and air pollution. In India, road transport accounts for over 92% of transport-sector energy-related CO2 emissions, according to NITI Aayog, India Electric Mobility Index 2024. EVs can help reduce direct vehicle emissions and significantly contribute to transport decarbonisation. EVs also reduce the demand for petrol and diesel, which is highly beneficial for countries highly vulnerable to imported oil, and the use of EVs can reduce the reliance and use of fossil fuels. According to the International Energy Agency (IEA), in its Global EV Outlook 2026. Globally, EV's displaced around 1.7 million barrels of oil per day in 2025. Overall, the importance of EVs is increasing due to their potential to reduce emissions, decrease reliance on fossil fuels, and support a cleaner and more sustainable transport system.

Transportation emissions are also a crucial issue that has a significant impact on climate change and the environment. The transportation sector is responsible for ~15-25% of global greenhouse gas emissions, which come primarily from the combustion of fossil fuels. Moreover, sustainable transportation solutions such as EVs are essential to mitigate these emissions and reduce transportation's environmental impact. EV adoption in India is also rising rapidly, with sales growing strongly and the number of EVs on road also rapidly increasing, According to NITI Aayog's India Electric Mobility Index 2024, EVs increase from 0.5% of total vehicles sales in 2018 to 7.7% of new vehicle sales in 2024, it states that over 2.03 million EVs were sold in 2024, over 6.5 million EVs were operating in India as of June 2025. Additionally, according to Vahan data reported by The Economic Times, 330,000 EVs were registered in July 2026.

EV adoption may be increasing rapidly, but still, not all customers are switching, because the initial purchase price of EVs can be relatively higher compared to traditional petrol and diesel cars, due to a lack of adequate charging infrastructure, especially in rural and semi-urban areas, which hinders the decision to switch; then concerns over the vehicle's ability to maintain power over long distance travels, also acts as a significant barrier. Moreover, the longer-term cost associated with maintenance and a potential battery replacement also acts as a concern for buyers, and the reliability of the battery and the uncertainty regarding its longevity also affect customer trust, preventing all customers from switching. Overall, these factors are a barrier between customers and electric vehicles. Now let's go deeper into the research question: to what extent do economic, infrastructural, environmental, and technological factors influence consumers' intention to adopt electric vehicles in India?

Literature Review:

1) Economic Factors

Price is a crucial factor influencing EV adoption and consumer behaviour, as it includes the initial purchase price, running costs, and maintenance costs. The initial purchase price of an EV can significantly affect its adoption, as a higher upfront cost may act as a barrier for potential consumers, particularly in price-sensitive markets such as India. Although EVs can be more expensive to purchase initially, advancements in battery technology and economies of scale are gradually helping to reduce production costs and make EVs more accessible. At the same time, running and maintenance costs can be lower than those of conventional petrol or diesel vehicles, as EV owners do not need to purchase fuel and generally have fewer mechanical components requiring regular maintenance. The absence of traditional oil changes can further reduce maintenance requirements. Therefore, while the high initial cost may discourage consumers from purchasing

an EV, the potential savings in fuel and maintenance costs over the vehicle's lifetime may make EVs economically attractive in the long term.

2) Charging Infrastructure

The charging availability and the charging infrastructure significantly affect EV adoption by providing the necessary support for vehicle owners. Public charging infrastructure is extremely crucial for providing the same level of accessibility as for refuelling conventional vehicles. Range anxiety is also a concern, as the EV may not have enough battery charge or enough battery capacity to reach a destination, and a charging station may not be available when needed, which can create anxiety and at least a significant barrier between consumers and EV adoption. Moreover, the reliability of the chargers is equally important, as the chargers must be functional and always available, while the location of the chargers is also highly important, as customers may prefer the chargers to be built near homes, workplaces, and major roads and highways. Additionally, the charging time is also a significant barrier that can deter buyers because EVs may take a longer charging time compared to traditional vehicles, which may discourage potential buyers. Faster charging times are extremely important, especially in the current generation with busy cities, and everyone being short on time. Moreover, faster charging may be more appealing, impacting consumer choices, making fast chargers a vital need for 100% EV adoption.

3) Technological Factors

Driving range, battery reliability, and technology confidence are critical factors that influence the adoption of electric vehicles (EVs). These elements are closely tied to the satisfaction and convenience of the users. Longer driving ranges reduce range anxiety, which can make EVs more appealing to consumers. Short-range EVs may face challenges in being appealing because they can increase anxiety and face ignorance from customers. Moving forward, battery reliability is also crucial because they are required for maintaining high-performance EVs and minimizing the environmental impact. Efforts to enhance EV battery reliability focus on the battery design and power. If the battery is not reliable, then more people will prefer traditional petroleum vehicles for higher reliability. While technology confidence is influenced by factors such as power efficiency, charging system, materials used, and consumer loyalty. Technological factors play a significant role in shaping consumer behaviours and gaining their trust for successful EV adoption.

4) Environmental factors

Environmental awareness significantly influences EV adoption, as it can raise concerns about pollution and encourage customers to use more environmentally friendly transportation. Awareness about the rising greenhouse gas emissions can encourage them to buy a vehicle that cuts emissions by a large extent; people considered about climate change may also have a strong intention to purchase EVs. While EVs are perceived as having lower direct emissions compared to traditional vehicles, environmental concerns can encourage customers to transition; however, they alone cannot guarantee purchase, as factors such as price, charging infrastructure, driving range, and how the government supports EV adoption can still influence or hinder final decisions. Moreover, while the environmental benefits are crucial, practical factors such as EV-friendly infrastructure and the cost of EVs are equally crucial; research suggests that while environmental factors are important, practical factors should be considered alongside them for effective EV adoption.

5) Government incentives

Subsides/tax benefits also significantly influence EV adoption, because a lower initial purchase price makes EVs more preferable and financially accessible. Lower taxes also reduce the high upfront cost of EVs. This improves the cost competitiveness of EVs compared to petrol and diesel vehicles and can increase consumers'

purchase intention. It can also encourage people who are interested but hesitant to purchase an EV by making the consumer feel that EVs are a more worthwhile investment, compared to conventional vehicles. Moreover, lower taxes can make EV ownership more attractive and preferred when combined with lower running and maintenance costs. Additionally, this effect solely depends on how accessible and substantial the incentives are, and if incentives are removed or reduced, some customers may even become less willing to purchase an EV; however, if the incentives have a stronger effect on consumers who are already considering an EV, it can significantly influence EV adoption. Moving on, government policies highly affect consumer decisions because lower cost can encourage consumers to choose EVs over petrol or diesel vehicles, consistent government policies can increase consumer confidence, government investing in charging infrastructure can make EV ownership more easy and practical, changes in polices can even create uncertainty for potential buyers, government subsidies and tax befits may make EVs mor affordable, and strong government support can encourage consumers to switch to cleaner from of transportation.

Methodology:
Research approach: Quantitative research
Data types: Primary data
Method-Questionnaire/Survey
Country: India
Sampling method: Convenience sampling
Targeted Number of participants/Respondents: 160 respondents
Target audience: All people eligible to buy a car.
Purpose: To investigate which factors influence consumers' intention to purchase EVs in India.

Overall Survey Analysis:
The survey was shared with multiple people for diverse responses and perspectives, and it received 160 responses. The overall survey shows a generally positive approach towards EV adoption. 61% of respondents have previously considered buying an EV, and the mean likelihood of buying an EV within the next five years was 3.55/5, while the mean likelihood of choosing an EV over petrol and diesel vehicles was 3.41/5, and the mean agreement with "I would seriously consider an EV for my next vehicle purchase" was 3.49/5. Making the overall purchase intention moderately positive. Secondly, the mean importance of adoption factors. The most important factor was the economic factor, with initial purchase price as the most highly rated barrier within it. The mean for choosing this was 4.47/5, while technological factors followed, with the driving range being a significant barrier too, having a mean rating of 4.46/5. Moreover, charging infrastructure, with public charging availability, had a mean of 4.43/5, and environmental factors, which included reducing air pollution, had one of the lowest means of 4.37/5. Additionally, the lowest rated individual factor was EV servicing, having a mean of only 3.76/5. Next, the barriers to EV adoption. The most common barrier was high purchase price, chosen by 29% of the respondents, followed by limited charging infrastructure, chosen by 21% of the respondents, then battery concerns, then battery concerns, chosen by 10%, long charging time by 8%, battery replacement cost by 6%, lack of servicing by 4%, lack of suitable model by 3%, and environmental concerns by 2% of the respondents. Therefore, the largest three barriers were initial purchase price, lack of charging infrastructure, and driving range, which were accounted as a major barrier for 67% of the respondents when combined. Moving on, the factors that are encouraging EV adoption. The most common factor encouraging the adoption was lower purchase price, with 24% of the people choosing it, followed by more charging stations, with 20% choosing it, followed by greater driving range chosen by 16%, lower running costs by 13%, faster charging by 9%, better battery technology by 7%, lower maintenance costs by 5%, greater reliability by 3%, and environmental benefits by 2%. The first three factors alone account for 60% of the

respondents, and they are the solutions to the highest-chosen barriers, showing how they are significantly influencing EV adoption. Overall, the data clearly shows how EV adoption is influenced more strongly by economic and practical considerations than by environmental motivation alone. The strongest concerns that were noticed were the high initial purchase price, low driving range, and limited charging infrastructure. These concerns were supported by their mean scores, as well as the percentage of people choosing them. For instance, the initial purchase price received the highest importance, with a mean score of 4.47/5, while it was also the biggest barrier, with 29% of the respondents choosing it. The environmental approach was relatively strong, with reducing air pollution receiving a mean score of 4.37/5; however, only 2% of people selected it as the most major factor that would encourage them to purchase an EV. This suggests that being environmentally friendly does not necessarily mean that environmental benefits are the main factors, because along with environmental concerns, many other things such as price, reliability, range, and infrastructure all need to be considered. Overall, the results suggest a positive relationship between EV awareness, charging infrastructure, environmental benefits, and EV purchase intention. EV awareness was associated with greater interest in purchasing an EV, as 61% of the respondents had previously considered buying an EV, while the purchase intention mean of 3.55/5 indicated generally positive interest. Charging infrastructure was also highly important, with a mean score of 4.43/5, and was a major barrier, with 21% of respondents identifying it as their biggest barrier. Environmental benefits also contributed to purchase intention by providing a solution for people concerned about the environment. This was demonstrated by the importance placed on reducing air pollution, which achieved a high mean score of 4.37/5.

Conclusion:

In conclusion, the results suggest that economic, technological, infrastructural, and environmental factors highly influence EV adoption, while economic and practical factors have the strongest influence; particularly, the purchase price, charging infrastructure, and driving range were the most important factors among them. Economic factors were the most influential, with initial purchase price having a mean score of 4.47/5, then driving range with a mean score of 4.46/5, and charging infrastructure/public charging availability with a mean score of 4.43/5. High purchase price was also the most common barrier, with 29% of the respondents choosing it, showing that affordability is a major concern. The least influential factors were EV servicing and climate change influencing transportation choices, both scoring a mean of 3.76/5. Environmental benefits were also equally valued by the respondents, but only 2% of the respondents chose it as the biggest factor influencing EV adoption. These findings strongly suggest that EV adoption could significantly increase with more affordable EVs, expanding charging infrastructure, and greater driving range. While environmental benefits are important, consumers may prioritise financial and infrastructural factors when making purchase decisions. Additionally, future research could collect representative data from different regions, communities, and age groups across India. Future research could also target a wider audience for even more diverse perspectives of different people from different communities and age groups. Overall, EV adoption in India hinges not merely on environmental consciousness, but on the decisive interplay of affordability, driving range, and charging infrastructure.

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