International Scientific Journal of Engineering and Management
Volume: 03 Issue: 05 | May – 2024
An International Scholarly || Multidisciplinary || Open Access || Indexing in all major Database & Metadata
ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

Deciphering determinants for adoption of e-mobility

Ms. Bhavya R. Mishra
Research Scholar
e-mail- mishrabhavya03@gmail.com
Dr. Ambedkar Institute of Management Studies and Research, Nagpur

Mr. Anuj Pathak
Software Engineer, Metacube Software
Email: Pathakanuj74@gmail.com

Dr. Raghvendra Mishra
Assistant Professor
Dr. Ambedkar Institute of Management Studies and Research, Nagpur
Email: mishraraghvendra 77@gmail.com

Abstract:

Electric vehicles represent a paradigm shift in transportation, offering a clean, quiet, and environmentally friendly mode of travel. India, as a significant market for electric vehicles, aims to become a predominantly electric vehicle-driven nation by 2030, marking a remarkable endeavor toward sustainability. The global automotive landscape reflects a growing trend towards electric mobility, with nearly every major manufacturer incorporating electric vehicles into their product lineup. This widespread acceptance underscores the increasing demand for eco-friendly transportation options worldwide. Governments worldwide have implemented various policies to promote electric mobility, with encouraging results. However, achieving India's ambitious goal requires a comprehensive policy framework aimed at phasing out fuel run vehicles and incentivizing the adoption of electric vehicles. To expedite the transition, policies should discourage the further proliferation of traditional gas vehicles while introducing initiatives to facilitate the widespread acceptance of electric vehicles. This includes the implementation of schemes to make electric vehicles more accessible and appealing to consumers. While the journey towards widespread adoption of electric vehicles is ambitious and challenging, with concerted policy efforts, it is indeed achievable. The implementation of effective policies and incentives is crucial in realizing India's vision of becoming an electric vehicle-centric nation by 2030. This paper aims to provide a comprehensive review of the factors influencing consumer acceptance of electric vehicles. By synthesizing existing literature and empirical research, the study seeks to shed light on the socio-economic, psychological, and technological determinants that shape consumer attitudes and behaviors towards EV adoption.

Key words: **E-vehicle, e-mobility, Consumer Attitude, Psychological Factors, Charging infrastructure.**

Introduction:

Electric vehicles (EVs) are becoming enormously popular. Certainly, the EVs are going to introduce

ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

critical changes in the Indian two wheelers and four wheelers industry with their massive adoption resulting in more futuristic business models. The global audience is becoming more amenable towards electric vehicles as the world is taking notice of the benefits that these vehicles bring along with them. EVs are recording impressive sales across the globe, and though the US, China and whole of Europe make up for a large chunk of the sales, industry leaders and experts trust that India is emerging as a promising player with a lucrative market.

Reasons why EVs Are Becoming Popular:

In India, the use of electric vehicles (EVs) is growing as a result of several variables coming together. Growing environmental awareness leads to a move toward greener modes of transportation, such as electric vehicles (EVs), which have lower emissions than conventional cars. Government subsidies and tax breaks are intended to lower the cost and increase the accessibility of EVs. Due to their cheaper running costs, EVs are becoming more and more popular among customers as fuel prices rise. Advancements in battery technology have mitigated worries over range anxiety, augmenting the efficiency and usefulness of electric vehicles. Furthermore, the use of EVs encourages the development of cleaner, quieter urban environments as a result of air quality and urban congestion concerns. Government initiatives to promote the growth of the EV market include production-incentive legislation and targets for EV adoption. campaigns to raise public awareness by government agencies and EV manufacturers educate consumers about the benefits of EVs, influencing consumer preferences. Overall, the interplay of environmental concerns, government support, technological progress, and shifting consumer attitudes drives the increasing popularity of EVs in India.

Objectives of the Study:

1.To identify and analyze the key socio-economic factors influencing consumer acceptance of electric vehicles,
2. To explore the psychological determinants shaping consumer acceptance of electric vehicles.
3.To examine the technological factors influencing consumer acceptance of electric vehicles

Research Methodology:
By synthesizing existing literature and empirical research, the study seeks to shed light on the socio-economic, psychological, and technological determinants that shape consumer attitudes and behaviors towards EV adoption.

Review of Literature:
Praveen Kumar, Kalyan Dash (2013): They recommended that rather than pursuing a massive turnaround, India should instead engage in small-scale reinforcements to address the load concerns locally. For grid balancing and extended battery life, home charging ought to be promoted. Appropriate planning for location, population, transportation volume, and safety should be taken in account before implementing changes in installing large-scale charging infrastructure in place. Groups of businesses in the transportation, energy, and power electronics industries that are collaborating on initiatives related to the establishment of fast-charging stations and commercial electric vehicle charging terminals should be motivated. The integration of energy-related industries appears to be the key question in the development of the electric vehicle market and the EV vehicle charging infrastructure, though.

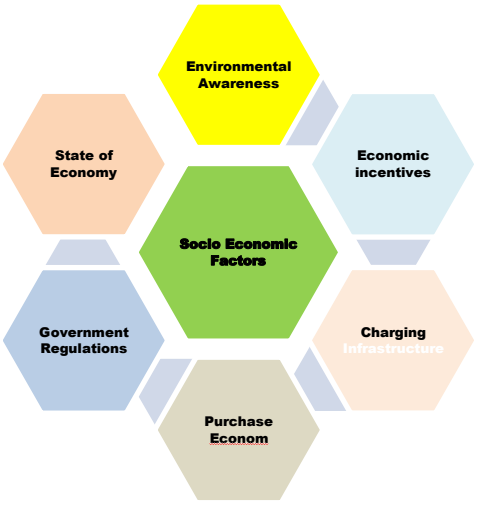
ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

Fanchao Liao, (2017); The widespread use of electric vehicles (EVs) may help reduce issues like global warming, environmental pollution, and oil dependence. Nevertheless, even though governments have aggressively promoted EV use, the adoption rate of EVs is still very low. They provided an extensive analysis of research on consumer preferences for EV with the intention of informing policymakers and providing guidance for future research. The financial and technical characteristics of electric vehicles (EVs), such as their cost of purchase and operation, driving range, charging time, vehicle performance, and variety of brands available, are typically deemed to have a substantial impact on their utility. The usefulness and marketing of EVs are also positively impacted by the density of charging stations. The effects of tax laws and incentive programs.

Masurali. A Surya P, (2018); Authors suggest perspective and degree of awareness regarding electric vehicle is less among potential customers. The Electric Vehicle (EV) is a highly viable substitute approach to combat current crises. A number of automakers are growing their lineups and launching EVs. Encouraging EVs can benefit customers and the country by lowering reliance on fossil fuels and pollution. In addition to manufacturers, the government ought to make a concerted effort to raise awareness and shape favorable opinions among prospective clients.

Analysis and Interpretation:

A) Socio Economic Factors:



Environmental Awareness:

Acceptance of EVs is significantly influenced by consumer attitudes regarding environmental sustainability and climate change. Those that place a high priority on lowering their carbon footprint and their impact on the environment are more inclined to think about buying an EV.Public relations campaigns, educational programs, and media coverage emphasizing the advantages of electric cars (EVs) in lowering air pollution and slowing down climate change can affect customer attitudes and raise knowledge of the benefits of EVs for the environment.

Economic Incentives:

Government incentives, subsidies, and tax credits aimed at promoting EV adoption can significantly influence consumer behavior. Financial incentives such as Refunds, tax credits, and lowered registration

ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

fees are examples of financial incentives that lower the upfront cost of buying an electric vehicle (EV) and increase its financial appeal to consumers. To further increase the financial attraction of EV ownership, incentive programs may also offer benefits like free parking, discounted power prices for charging etc.

.

Charging Infrastructure Accessibility:

The accessibility and availability of infrastructure for charging EVs are important factors in determining their acceptability. If there are charging stations near their homes, places of employment, and public spaces, consumers are more inclined to think about buying an EV. Customers find electric vehicles to be a more practical mode of transportation when there is a robust and widespread network of charging stations available, which also helps to minimize range anxiety and boost confidence in EV ownership

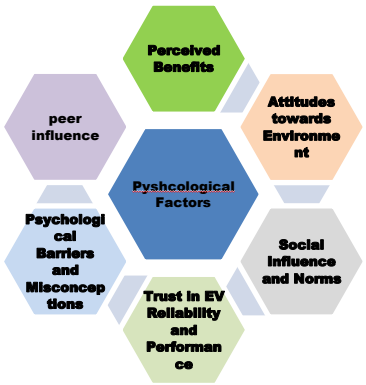
Economic Cost:

The upfront cost of purchasing an EV compared to conventional fuel-powered vehicles is a significant consideration for consumers. While EV prices have been decreasing in recent years, they often still have a higher initial purchase price. Consumer perception of the total cost of ownership, including fuel and maintenance savings over the vehicle's lifespan, also influences EV acceptance. Policies and incentives aimed at reducing the price gap between EVs and internal combustion engine vehicles can encourage adoption.

Government Regulations:

Consumer perceptions of electric vehicles (EVs) can be influenced by government policies and regulations, including legal norms, emission standards, and targets for decreasing greenhouse gas emissions. Policies that encourage the use of electric vehicles and limit or penalize the usage of fossil fuel-powered vehicles foster a climate that is conducive to the acceptance of EVs. ZEV mandates and emissions laws incentivize automakers to increase production of electric vehicles, hence expanding market availability and consumer choice. The interplay of these socioeconomic factors shapes customer attitudes and behaviors regarding the adoption of electric vehicles. Aiming to address these issues, policies and programs can hasten the shift to electric vehicles and help the transportation industry meet its sustainability targets.

B. Psychological Factors:



Psychological determinants play a significant role in shaping consumer acceptance of electric vehicles (EVs). Understanding these factors is essential for policymakers, manufacturers, and stakeholders aiming to promote the uptake of EVs. The following are the main psychological factors impacting whether or not

ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

consumers will accept electric vehicles:

Perceived Benefits:

The way that consumers view the advantages of electric vehicles has a big impact on whether or not they are accepted. These advantages include cheaper operational costs, a decrease in reliance on fossil fuels, environmental sustainability, and possible tax breaks. When compared to conventional internal combustion engine vehicles, electric vehicles (EVs) are frequently quieter, smoother, and provide rapid torque. These perceived benefits also apply to the driving experience.

Attitudes towards Sustainability:

Consumers' attitudes towards green technology and sustainability play a crucial role in their acceptance of electric vehicles. Individuals who are environmentally conscious and value sustainability are more likely to consider purchasing an EV. The loss of natural resources, air pollution, and climate change are major concerns that often motivate people's positive sentiments toward green technology. For customers, EVs offer a practical means of coordinating their mode of transportation decisions with their environmental principles.

Social Influence and Norms:

Consumer acceptance of electric vehicles is greatly influenced by social factors, such as peer pressure, cultural views about EVs, and social conventions. Adoption can be aided by positive word-of-mouth referrals, prominent people' endorsements, and societal acceptance of EVs. Consumer acceptance of EVs may be further aided by a shift in social norms surrounding transportation choices as EV use is more commonplace and accepted within communities.

Trust in EV Reliability and Performance:

Acceptance of electric vehicles depends on consumer confidence in their dependability, performance, and safety as compared to conventional vehicles. Crucial elements include the belief that EVs are dependable, cutting edge, and able to fulfill everyday transportation demands. Positive EV experiences—like test drives, positive reviews, and referrals from reliable sources—help consumers become more confident and trusting in EVs.

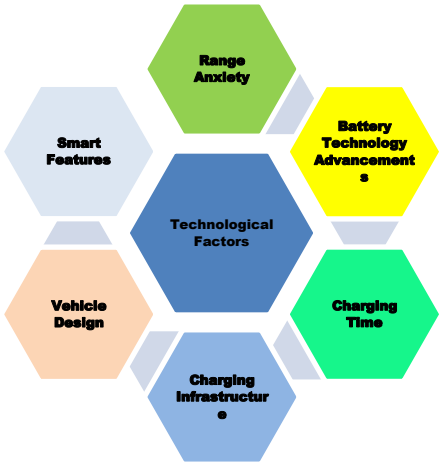
Psychological Barriers and Misconceptions:

Even though electric vehicles have many advantages, acceptance may be hampered by psychological obstacles and false beliefs. Common worries include perceived high upfront costs, limits in the charging infrastructure, range anxiety, and doubts regarding the longevity of batteries. Dispelling myths and boosting customer trust in EVs can be accomplished by addressing these psychological barriers through education, awareness campaigns, and first-hand experiences.

C. Technological Factors

Technological factors play a crucial role in influencing consumer acceptance of electric vehicles (EVs). Here are the key technological factors that impact consumer attitudes and behaviors towards EV adoption:

ISSN: 2583-6129
DOI: 10.55041/ISJEM01666



Range Anxiety:

Range anxiety refers to the fear or concern that an electric vehicle's battery will run out of charge before reaching its destination. Adoption of EVs is severely hampered by it, especially for those who opt for lengthy trips. By increasing the driving range of electric vehicles (EVs) on a single charge, advancements in battery technology, such as higher energy density and improved range, help reduce range anxiety. Range anxiety is further lessened by the availability of public charging stations and fast-charging infrastructure, which allow drivers to swiftly refuel their cars while they're on the road.

Battery Technology Advancements:

Improvements in battery technology are essential to raising the efficiency, range, and dependability of electric cars. Consumers find electric vehicles (EVs) more practical and attractive due to advancements in battery energy density, durability, and charging efficiency. Manufacturers are now able to create EVs with greater driving ranges and quicker charging times thanks to advances in battery chemistry, such as the creation of lithium-ion batteries with higher energy densities and faster charging speeds. Future technological advancements like next-generation battery chemistries and solid-state batteries could significantly increase the efficiency and affordability of electric vehicles.

Charging Time and Infrastructure:

When deciding whether to use an electric vehicle, buyers take infrastructure availability and charging time into account. Convenience and usefulness of an electric vehicle can be affected by how long it takes to recharge its battery, especially when it comes to long-distance and everyday driving. Technological developments in fast-charging, including as rapid chargers and high-power charging stations, shorten charging times and improve the availability of EV charging infrastructure. By resolving concerns about range and charging availability, the development of public charging networks and the placement of charging stations in homes, offices, and commercial buildings enhances accessibility and convenience for electric vehicle (EV) users.

Vehicle Design and Aesthetics:

Consumer preferences and impressions of electric vehicles are significantly influenced by the design and aesthetics of the vehicle. EVs are aesthetically pleasing and appealing due to their modern aesthetics, aerodynamic profiles, and stylish designs. In response to a wide range of consumer tastes and lifestyle requirements, manufacturers are placing an increased emphasis on creating electric vehicles with unique looks, cutting-edge features, and customized options. To set them apart from conventional internal

ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

combustion engine vehicles and improve their aesthetic appeal, electric vehicles frequently have distinctive design aspects including aerodynamic forms, lighted charging ports, and futuristic interiors.

Integration of Smart Features and Connectivity:

The user experience and functionality of electric vehicles are improved by the integration of smart features and connectivity, which increases customer acceptability and happiness. Modern infotainment systems, touchscreen displays, smartphone connectivity, and voice-activated controls are commonplace in electric cars, giving drivers access to a multitude of digital services and entertainment choices. By enabling EV owners to remotely manage and monitor their vehicles, connectivity features including telematics services, over-the-air software updates, and remote vehicle monitoring improve convenience, security, and peace of mind.

Overall, customer attitudes and behaviors toward the adoption of electric vehicles are greatly influenced by scientific breakthroughs in battery technology, charging infrastructure, vehicle design, and smart features. To accelerate the adoption of electric vehicles and promote their wider acceptability, these sectors require ongoing innovation and investment.

Conclusion:

The research has provided valuable insights into the factors influencing consumer acceptance of electric vehicles (EVs), encompassing socio-economic, psychological, and technological determinants. Environmental awareness, economic incentives, charging infrastructure accessibility, purchase price, and government regulations were identified as key socio-economic factors shaping consumer attitudes towards EV adoption. Additionally, psychological determinants such as perceived benefits, attitudes towards green technology, social influence, and trust in EV reliability significantly impact consumer acceptance. Moreover, technological factors including range anxiety, battery technology advancements, charging infrastructure, vehicle design, and integration of smart features play a critical role in shaping consumer perceptions of EVs.

Moving forward, policymakers, manufacturers, and stakeholders should prioritize initiatives to address these factors and promote the widespread adoption of electric vehicles. Recommendations include implementing supportive policies such as financial incentives, expanding charging infrastructure, enhancing consumer education and awareness, and investing in battery technology research and development. By implementing these recommendations, stakeholders can foster a conducive environment for EV adoption and accelerate the transition towards sustainable transportation, ultimately contributing to environmental conservation and reducing reliance on fossil fuels.

References:

[1 Egbue, O.; Long, S.; Samaranayake, V.A. Mass deployment of sustainable transportation: Evaluation of factors that influence electric vehicle adoption. Clean Technol. Environ. Policy 2017, 19, 1927–1939.

[2] Liao F.,Molin, Wee.B ; Consumer preferences for electric vehicles: a literature review,Transport Reviews Volume 37,Issue 3,2017.

[3] Blomgren, G.E. The Development and Future of Lithium Ion Batteries. J. Electrochem. Soc.

ISSN: 2583-6129
DOI: 10.55041/ISJEM01666

2017, 164, A5019–A5025. [CrossRef] 52. Ding, H.; Wang, J.; Zhou, J.; Wang, C.; Lu, B. Building electrode skis for ultra-stable potassium metal batteries. Nat. Commun. 2023, 14, 2305.

[4] China Considers Extending Its EV Subsidies to 2023. Available online: https://www.china-briefing.com/news/china-considersextending-its-ev-subsidies-to-2023.

[5] Hoffmann, C., Hinkeldein, D., Graff, A., Kramer, S.: What Do Potential Users Think About Electric Mobility? In: Evolutionary Paths towards the Mobility Patterns of the Future, pp. 85– 99. Springer, Heidelberg (2014).

[6] Schaumann, H.: Development of a Concept for Inner-City Delivery & Supply Utilising Electromobility. In: Efficiency and Logistics, pp. 121–127. Springer, Berlin (2013).

[7] Taylor, M., & fujita, K. (2018). Consumer Behavior and the Plug-In Electric Vehicle Purchase Decision Process: A Research Synthesis. Lawrence Berkeley National Laboratory.

[8] Zhang, Z.; Li, W.; Zhang, C.; Chen, J. Climate control loads prediction of electric vehicles. Appl. Therm. Eng. 2017, 110, 1183–1188.

[9] Fanchao Liao & Eric Molin & Bert van Wee, 2017. "Consumer preferences for electric vehicles: a literature review," Transport Reviews, Taylor & Francis Journals, vol. 37(3), pages 252-275.

[10] Marcello Contestabile et al, (2012) Electric Vehicles: A Synthesis of the Current Literature with a Focus on Economic and Environmental Viability.

[11] Williams Ackaah, Augustus Terry Kanton & Kwame Kwakwa Osei. (2022) Factors influencing consumers' intentions to purchase electric vehicles in Ghana. Transportation Letters 14:9, pages 1031-1042.

[12] Indian Passenger Vehicle Industry, An ICRA Perspective