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Explore Factors Influencing Consumer Decisions in The Adoption of Electric Vehicles in India

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Abstract
In this study, the global automotive industry is undergoing a transformation as a result of the accelerated adoption of electric vehicles (EVs), which provide a sustainable alternative to conventional internal combustion engine (ICE) vehicles. Concerns about energy security, environmental preservation, and India's commitment to lower carbon emissions fuel most of the country's growing demand for electric vehicles. Despite government programs like the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) program, the rate of adoption of electric vehicles (EVs) is still low when compared to internal combustion engine (ICE) vehicles. With regard to the acceptance of electric cars (EVs), this study looks at the economic, technological, social, and policy-driven elements that mostly influence consumer choices in India. Using a mixed-method approach, the main data was gathered by means of structured surveys comprising 500 respondents from well-known Indian cities; the secondary data came from government reports, academic publications, and trade magazines. The survey notes several major roadblocks to the general acceptance of electric cars (EVs), including low customer knowledge, a lack of charging infrastructure, range anxiety, and outrageous starting prices. Furthermore, greatly impacted by environmental consciousness, government incentives, and tax breaks are the acceptance of electric vehicles. The findings imply that despite the financial incentives and legislative measures meant to promote adoption, issues with battery performance, infrastructure shortcomings, and cost continue to prevent general acceptance. Policymakers, manufacturers, and other interested parties will find the results of the research helpful as they create plans to allay customer fears and hasten India's shift to sustainable mobility.

Keywords: Electric Vehicles (EVs), Consumer Behavior, EV Adoption, Charging Infrastructure, Government Policies, Energy Security, Environmental Sustainability

1. Introduction

The growing frequency of electric vehicles (EVs) is causing significant disturbances in the worldwide automobile sector [1]. Among growing worries about energy security, environmental sustainability, and climate change, electric vehicles (EVs) have become a reasonable substitute for traditional Internal Combustion Engine (ICE) vehicles [2, 3]. Rechargeable batteries and electric motors drive electric vehicles (EVs), therefore negating the need for fossil fuels and lowering carbon emissions [4]. Governments worldwide are enacting regulations, offering incentives, and constructing infrastructure to facilitate the adoption of electric cars (EVs) [5]. One of the automotive markets with the greatest pace of expansion worldwide, India is seeing steady demand in electric cars. Even if using electric cars (EVs) has many advantages, several challenges still stand in their way of general acceptance [6]. India imports a significant amount of crude oil to meet its own needs and is among the biggest consumers of hydrocarbon products. Because it depends on fossil fuels, the transportation sector significantly adds to the air pollution and carbon emissions in the country. By implementing electric vehicles (EVs), India is expected to solve a range of problems, including the lowering of air pollution,

enhancement of energy security, and lessening of dependency on foreign fuels [7, 8]. Furthermore, congruent with India's commitment at the COP26 conference to reach net-zero emissions by 2070 are electric vehicles (EVs).

To promote the usage of electric cars, the Indian government has instituted a range of legislation and initiatives. Originally launched in 2015 and subsequently renamed FAME II, the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) program provides financial incentives to EV buyers and advances the creation of EV infrastructure [9, 10]. Still, despite the acceptance of these programs, India's relatively low percentage of electric cars (EVs) compared to conventional internal combustion engine (ICE) vehicles remains a cause of concern [11, 12]. The high initial cost, lack of charging infrastructure, low customer knowledge, and worries about battery performance define the main factors influencing the country's adoption of electric vehicles [13]. The aim of this study is to analyze the main elements influencing Indian customers' choices in accepting electric vehicles (EVs) [14]. It looks at consumer readiness to switch to electric mobility and their decisions in relation to policy-driven, social, technological, and economic aspects. Moreover, the study looks at how well current initiatives promote environmentally friendly transportation as well as how government policies, subsidies, and incentives affect the acceptance of electric cars [15, 16]. Policymakers, manufacturers, and providers of charging infrastructure are among the stakeholders who depend on an awareness of customer behavior and decision-making elements. The knowledge gained from this study will support the plans meant to remove obstacles to EV acceptance and improve the expansion of India's EV sector [17]. India's potential to fit the worldwide shift to renewable energy will greatly affect its future sustainable transportation options.

1.1 Background and Rationale

As India ranks fourth in the world's automobile market, it has gradually but significantly switched to electric mobility. Although conventional internal combustion engine (ICE) vehicles still rule the market, mounting environmental damage and energy security have caused more focus on the encouragement of electric vehicles (EVs). Among the worst in the world, vehicle emissions are a major contributor to the terrible air quality in Indian cities. One smart way to reduce emissions and create a more sustainable urban transportation system is by using electric cars (EVs).

1.1.1 Environmental and Economic Implications

Adoption of electric vehicles has obvious benefits for the surroundings. Whereas internal combustion engines (ICEs) run on fossil fuels, electric vehicles (EVs) produce no pollutants from their tailpipes [18]. This is particularly relevant in India, where the prevalence of health problems linked to air pollution has been rising. Consistent among the most polluted cities in the world are several Indian cities, including Delhi, Mumbai, and Kolkata, listed by the World Health Organization (WHO) [19].

Adoption of electric vehicles (EVs) could help to significantly lower carbon emissions and improve the quality of the environment [20, 21]. India's reliance on imported petroleum fuels has resulted in ongoing financial difficulties. The importation of around 85% of the nation's crude oil needs accounts for its trade imbalances and high gasoline costs. By using locally generated renewable energy sources like solar and wind, electric vehicles (EVs) could help to encourage energy self-sufficiency and lower reliance on imported petroleum [22, 23].

1.1.2 Government Initiatives and Policy Support

The Indian government has implemented a variety of regulatory initiatives to expedite the adoption of electric vehicles (EVs) in recognition of their potential to address both economic and environmental concerns [24]. The objective of the 2015 Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) program was to offer financial incentives to the manufacturers and consumers of electric vehicles [25]. The second phase, FAME II, was initiated in 2019 and allocated ₹10,000 crore

($1.3 billion) to support the expansion of charging infrastructure, demand incentives, and the research of electric vehicle technologies [26]. Additionally, the government reduced the Goods and Services Tax (GST) on electric vehicles (EVs) from 12% to 5% to enhance their affordability [27]. Maharashtra, Delhi, Tamil Nadu, and Karnataka have implemented a variety of state-level initiatives to encourage adoption, including infrastructure support, tax exemptions, and other subsidies. Furthermore, the government has implemented a Battery Swapping Policy to alleviate concerns regarding charging time and range anxiety. This arrangement allows customers to exchange depleted batteries for completely charged ones at a designated station. The government's dedication to transforming electric vehicles (EVs) into a viable mode of transportation in India is evident in these collaborative initiatives [28].

1.1.3 Challenges to EV Adoption

Although the government is working hard to encourage the usage of electric vehicles (EVs), several challenges still prevent their general acceptance in India [29]. The great initial cost of electric cars (EVs), which remain more costly than traditional internal combustion engine (ICE) vehicles due to the great expense of lithium-ion batteries, is one of the main challenges [30]. Though government subsidies and incentives help many middle-class consumers to acquire electric cars, many still cannot afford them [31]. Especially in rural and semi-urban areas, the inadequate infrastructure for charging raises further major issues. Prospective buyers are thus currently suffering "range anxiety," the fear that they will run out of charge without access to a nearby charging station. Furthermore, buyers continue to face major challenges related to battery performance and lifetime, as they are concerned about the car's overall lifespan, battery degradation, and the cost of replacement. Since there is ongoing uncertainty about the dependability, performance, and maintenance of electric vehicles (EVs), consumer views and comprehension also significantly influence the adoption rates [32, 33]. Further hindering the market's growth are false beliefs and insufficient knowledge of electric car technology. The widespread use of EVs would significantly raise the demand for electricity, so more extensive integration of renewable energy sources is necessary, and improvement of the current power infrastructure is essential to guarantee sustainable development [34, 35]. Integrating renewable energy sources with grid capacity will provide a major obstacle. Given these challenges, one must understand consumer opinions and investigate the factors influencing their choice to switch to electric vehicles. In order to fill in the gaps in our knowledge, this study's main goal is to find the main factors that affect the acceptance of electric vehicles (EVs) in India and share that information with customers, industry players, and lawmakers.

Literature Review

Chidambaram et.al (2023) discussed the Sustainable energy, output, and car emissions are expected in future mobility. Intelligent embedded systems improve vehicle autonomy, deployment, and electrification. In the coming decades, we expect electric vehicles to dominate automobile powertrain design, but various challenges impede their widespread adoption. Customer behavior, charging infrastructure, government support, battery technology, and car performance are the primary issues. Thus, these challenges must be thoroughly examined, especially in developing nations with limited electric vehicle usage. This article rates barriers based on the importance of identification and overcoming them. Consumer demand and adoption of electric cars are the focus of barrier analysis. This article uses a Consumer Perception Survey to determine how each barrier affects EV purchasers. The essay addresses how developing nations like India might overcome challenges and bridge gaps. The consumer perception survey and literature research found that high costs and a lack of charging infrastructure are the major impediments to electric vehicle adoption in underdeveloped nations.

KV et.al (2022) determined the More and more people are thinking about electric vehicles (EVs) as a fast-growing alternative to vehicles that use fossil fuels like gasoline, diesel, and compressed natural

gas (CNG). This is because of concerns about the environment related to fossil resource depletion and greenhouse gas (GHG) emissions. This article investigates consumer susceptibility to electric cars. An online quantitative survey employing snowball sampling acquired data from 172 Bengaluru residents. Exploratory factor analysis with IBM SPSS 23 determines the factors. Poor charging infrastructure, societal influence, financial constraints, vehicle performance barriers, environmental conservation, and social awareness of electric vehicles all affected electric vehicle uptake, according to the study. Developing countries can change electric car legislation based on the study's conclusions.

Xia et.al (2022) examined the EVs are touted as a sustainable solution to pollution and resource constraints. Their market uptake has lagged behind expectations. This study uses diffusion of innovation theory to identify factors that affect electric car adoption by treating them as novel products differently from traditional fuel vehicles. We experimentally evaluated the model using structural equation modeling, and an offline survey produced 375 valid replies. The empirical results show that perceived complexity, relative advantage, and compatibility can predict customer adoption of electric vehicles. The results also show that economic (monetary subsidies and the risk of price drops), functional (intelligent functions and the risk of sustainability), and social (status symbols and the risk of reputation) factors have a big impact on EV adoption by changing how people think about new technologies. This study adds to the field by providing a theoretical viewpoint on electric vehicle (EV) consumer uptake and highlighting several key antecedents.

Goel et.al (2021) proposed the Unfortunately, consumers seem uninterested in government measures to promote electric vehicles (EVs). Many barriers prevent consumers from buying electric cars. We critically analysed existing studies and identified new barriers to the adoption of electric cars (EVs) in the current study to identify and evaluate the biggest barriers. From literature review, 35 hurdles were found for the Indian market. The inquiry is examined using DEMATEL. Electric vehicle (EV) market adoption was hindered by unclear government laws and familial factors that made it difficult to buy an EV, according to prominent and causal relationship research. The outcomes of this study show causal links between identified barriers. However, the survey shows that buyers care more about maintenance support after buying electric vehicles (EVs) than the price.

Singh et.al (2020) discussed the Electric vehicles (EVs) help solve energy reliance and environmental damage. Even though many governments have dynamic advertising policies, electric vehicle (EV) market penetration is still low. This study empirically examines customer electric vehicle buying intentions. From 2009 to 2019, 211 peer-reviewed studies examined customer intentions in four main areas: adoption, purchase, behavioral, and use. This study classifies influential aspects as demographic, situational, contextual, and psychological. To understand consumer intents and EV adoption, theoretical viewpoints were thoroughly evaluated. The findings represent the most common method for monitoring, evaluating, and comparing EV variable correlations. A simple meta-analysis shows that research on EV adoption determinants has increased significantly over the last decade. Finally, this review study offers future options for EV academics and practitioners, along with management implications that could aid governments and the auto industry in increasing EV usage.

Khurana et.al (2020) proposed the environment is presently a global concern due to pollution. One of the primary sources of air pollution is toxic emissions from internal combustion engines. Globally, there is a significant effort to encourage the use of electric vehicles (EVs) in order to address environmental concerns (ECs) and mitigate the effects of fossil fuel emissions. Incentives are being implemented by numerous governments to promote the adoption of electric vehicles (EVs). The high cost of electric cars, the lack of charging infrastructure, and time and range concerns have all been identified as barriers to consumer adoption in previous research. The Indian government aims to ensure that only electric vehicles are permitted on public highways by 2030. This article is current

and examines the numerous factors that influence the adoption of electric vehicles by customers. The respondents of the study are individuals who currently own cars in India. Structured Equation Modelling (SEM) was implemented to analyze the data. The adoption of electric vehicles was significantly influenced by attitude (ATT), which emerged as a potent mediator.

Kumar et.al (2020) explored the Government of India (GOI)'s efforts to advance electric vehicle (EV) research and development, identifies areas that need improvement, and examines the barriers to India's 2030 EV adoption. The report uses secondary data to determine India's main EV commercialization barriers. These materials explain domestic and international EV industry developments. To further analyze these challenges, 11 academics and businesspeople participate in a focus group. Public utilities and the sharing economy are crucial for promoting electric cars (EVs) in India, especially given high prices, poor infrastructure, and limited consumer purchasing power. Results emphasize the importance of these factors. A shared mobility model may maximize resource management for electric-powered transportation systems, according to studies. Additionally, it compares India's EV goals to global standards. The study's limitations include ignoring shared mobility model implementation challenges and relying on focus group participants' opinions. Even with these problems, the study gives stakeholders and the GOI useful details, supporting a sensible approach to EV deployment over goals that can't be reached. This study focuses on EV technology diffusion in a common format, a topic that has gotten little academic attention.

Tu et.al (2019) studied the global economy and technology improved civilization but damaged the environment. Sustainable environmental development is being considered. New autos may benefit the environment. Since the General Office of the State Council announced the "Energy Saving and New Energy Vehicle Industry Development Plan (2012–2020)," China has prioritized 100% electric propulsion. Rapid growth has made China the worldwide electric car leader. China sets the standard for electric car research. Energy-efficient, low-carbon electric cars reduce environmental effects. Innovation diffusion theory (IDT), technology acceptance model (TAM), and theory of planned behavior investigate the main elements influencing electric car purchases. The key factor model in this study may predict electric car purchases. SEM shows that resource control strongly influences consumers' inclination to buy electric cars. Consultants' environmental assessments influence consumers' behavior. Environmentalism and technology adoption will also affect consumer behavior. (2) Electric vehicles' convenience, ease of use, and personal, environmental, and national benefits will drive purchases. Customers view electric cars as fresh but equivalent to conventional cars in price and performance. Regulation-related: Coworkers, friends, family, and superiors don't influence EV purchases. Theory for electric vehicle popularization and a guide for consumers' selection and purchase affect consumer purchases and electric car design and development to meet consumer needs. Thus, the government and automakers should promote electric vehicles and develop battery and charging systems to attract consumers and boost the auto sector.

Shankar et.al (2019) studied the EVs are a major invention that could cut greenhouse gas emissions and climate change. EV sales have underperformed despite their many benefits. This suggests that EV makers must be more hopeful to speed adoption. Thus, this study uses a dual-factor model to examine vendors' EV operating motivations and barriers. The status quo bias theory has been used to study EV adoption hurdles, whereas the extended theory of planned behavior has examined enablers. The results show that attitude, subjective norm, perceived behavioral control, concern for the environment, and perceived corporate social responsibility obligation all have a positive effect on EV adoption. However, regret avoidance, inertia, perceived threat, and perceived value influence electric vehicle adoption resistance. This study expands on ecological technology adoption and reluctance studies. It gives marketers many suggestions for accelerating electric vehicle uptake.

3. Research Methodology

3.1 Research Design

This study adopts a mixed-method approach, combining both quantitative and qualitative research methodologies to explore the key factors influencing consumer decisions in adopting electric vehicles (EVs) in India. The research is descriptive in nature, aiming to identify and analyze economic, technological, social, and policy-driven aspects affecting EV adoption. The study involves primary data collection through surveys and secondary data analysis from government reports, industry publications, and academic literature.

3.2 Data Collection

This study employs quantitative and qualitative analysis methods to analyze the collected data. Quantitative analysis includes descriptive statistics to summarize demographic trends, Chi-Square Test to examine relationships between categorical variables, Regression Analysis to assess key factors influencing EV adoption, and Structural Equation Modeling (SEM) to evaluate causal relationships. Qualitative analysis involves Thematic Analysis to identify recurring consumer concerns and Sentiment Analysis using NLP tools to assess public opinions on social media regarding EV adoption. This mixed-method approach ensures a comprehensive understanding of consumer behavior and market dynamics.

3.3 Data Analysis Techniques

The factors that influence the adoption of electric vehicles (EVs) in India are examined through the use of IBM SPSS 27 in this study's data analysis. The study opens with a synopsis of demographic data including age, gender, education, income, and car ownership. The identification and analysis of important elements influencing the acceptance of electric cars (EVs) comprise government regulations, technological constraints, economic issues, and societal influence. Additionally looking at consumer decisions is the impact of financial incentives, battery performance, charging infrastructure, and environmental awareness. Analyzed in relation to different demographic groupings, variations in consumer preferences help to explain their adoption behavior. The results highlight how incentives and social influence help to promote the acceptance of the technology; major challenges are high pricing, battery issues, and inadequate charging infrastructure. These realizations can help legislators and business players create winning plans to support the acceptance of electric cars (EVs) in India.

3.4 Limitations of the Study

While this research provides valuable insights into the factors influencing EV adoption in India, certain limitations must be acknowledged. The study primarily focuses on urban and semi-urban consumers, leaving rural EV adoption patterns unexplored, which may limit the generalizability of the findings to the entire population. Additionally, since the data is collected through self-reported surveys, there is a possibility of response bias, where participants may provide socially desirable or inaccurate answers, affecting the reliability of the results. Furthermore, India's EV policy landscape is rapidly evolving, with frequent updates in government incentives, infrastructure development, and regulatory frameworks. These changes may influence consumer decisions after data collection, making some findings time-sensitive. Despite these limitations, the study offers valuable insights that can help policymakers and industry stakeholders formulate strategies to accelerate EV adoption.

Result

The results of this study provide valuable insights into the factors influencing consumer decisions regarding electric vehicle (EV) adoption in India. The demographic analysis of 500 respondents reveals a diverse range of age groups, income levels, and educational backgrounds, indicating a broad

spectrum of consumer perspectives. A significant portion of respondents expressed concerns about the high upfront cost of EVs, limited charging infrastructure, and range anxiety, which remain major barriers to adoption. While financial incentives such as subsidies and tax benefits have been introduced to encourage EV purchases, the findings suggest that awareness of these schemes is relatively low, limiting their effectiveness. Additionally, technological factors such as battery performance, charging time, and perceived maintenance costs influence consumer choices, highlighting the need for further advancements and better communication of EV benefits. Social influences, including peer recommendations and brand perception, also play a role in shaping consumer attitudes toward EVs. The study's results underscore the necessity of addressing economic, technological, and infrastructural challenges to accelerate the transition toward sustainable electric mobility in India.

Table 1: Demographic profile

Age Group	Frequency	Percent
Below 20	86	17.2
21 – 30	100	20
31 – 40	117	23.4
41 – 50	91	18.2
Above 50	106	21.2
Total	500	100
Gender	Frequency	Percent
Male	268	53.6
Female	232	46.4
Total	500	100
Education Level	Frequency	Percent
High school or below	134	26.8
Undergraduate degree	129	25.8
Postgraduate degree	131	26.2
Doctorate or higher	106	21.2
Total	500	100
Monthly Income	Frequency	Percent
Below ₹30,000	118	23.6
₹30,000 – ₹50,000	105	21
₹50,000 – ₹1,00,000	90	18
₹1,00,000 – ₹2,00,000	96	19.2
Above ₹2,00,000	91	18.2
Total	500	100
Place of Residence	Frequency	Percent
Urban	156	31.2
Semi-urban	192	38.4

Rural	152	30.4
Total	500	100
Owns a Vehicle	Frequency	Percent
Yes	334	66.8
No	166	33.2
Total	500	100

The dataset presents demographic and socioeconomic characteristics of a sample of 500 respondents. In terms of age distribution, the majority fall within the 31–40 years category (23.4%), followed by those above 50 years (21.2%) and 21–30 years (20%). The youngest group, below 20 years, accounts for 17.2%, while those in the 41–50 age bracket make up 18.2% of the sample. Gender distribution indicates a slightly higher number of males (53.6%) compared to females (46.4%). Regarding education levels, the highest proportion of respondents have a high school or below education (26.8%), followed closely by those with postgraduate degrees (26.2%), undergraduate degrees (25.8%), and doctorates or higher (21.2%). The monthly income distribution shows that 23.6% earn below ₹30,000, while 21% fall within ₹30,000 – ₹50,000, and 18% between ₹50,000 – ₹1,00,000. A notable 19.2% earn ₹1,00,000 – ₹2,00,000, while 18.2% have an income above ₹2,00,000. The place of residence is predominantly semi-urban (38.4%), followed by urban (31.2%) and rural areas (30.4%). Lastly, vehicle ownership is relatively high, with 66.8% of respondents owning a vehicle, whereas 33.2% do not own one. These statistics provide an insightful overview of the respondents' demographic and financial background.

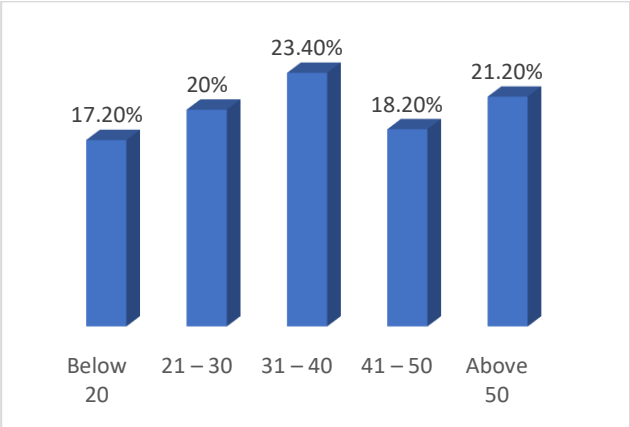

Figure 1: Age Group Distribution

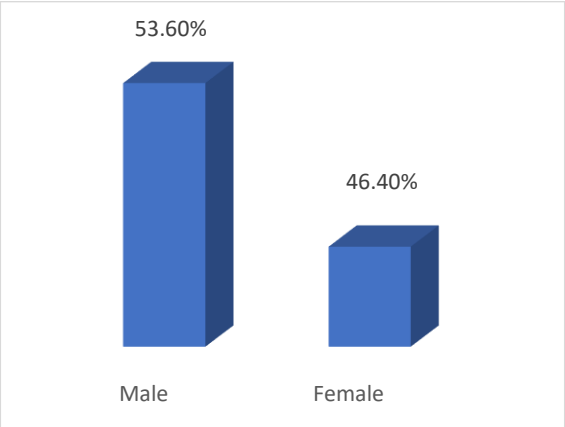

Figure 2: Gender Distribution

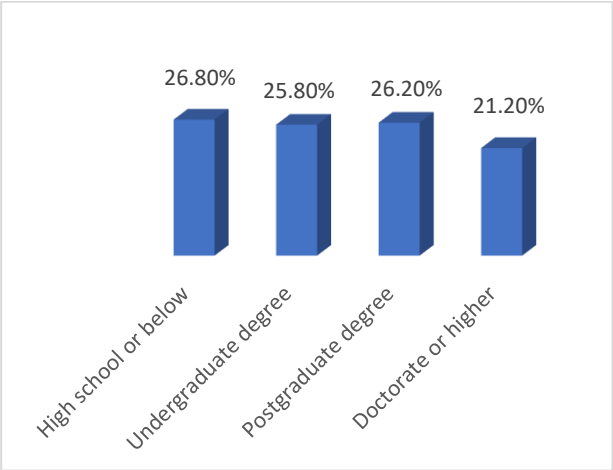

Figure 3: Education Level of Respondents

Figure 4: Monthly Income Distribution

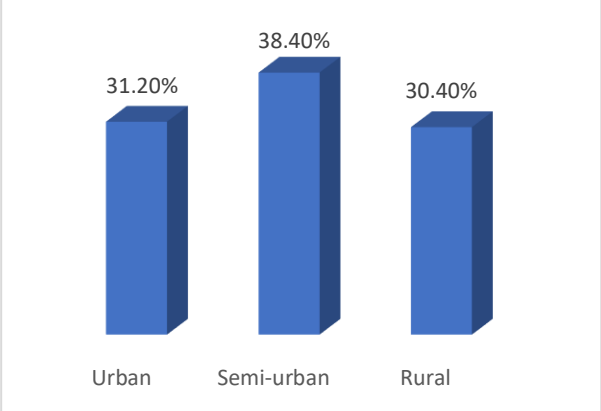

Figure 5: Place of Residence

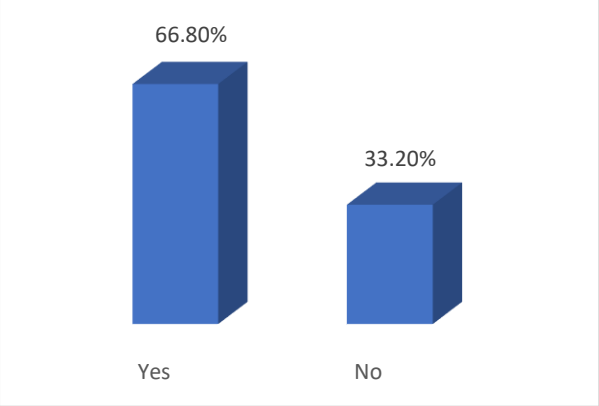

Figure 6: Vehicle Ownership

Table 2: Descriptive Statistics

Descriptive Statistics

	N	Mean	Std. Deviation
Age Group	500	3.06	1.385
Gender	500	1.46	0.499
Education Level	500	2.42	1.098
Monthly Income	500	2.87	1.436
Place of Residence	500	1.99	0.786
Owns a Vehicle	500	1.33	0.471
Up front Cost Importance	500	2.99	1.355
Aware of Financing Options	500	1.49	0.5
Government Subsidies Influence	500	2.51	1.099

EV Cost Effectiveness	500	3.01	1.414
Battery Concern	500	3	1.47
Preferred Driving Range	500	2.58	1.113
Fast Charging Importance	500	2.98	1.44
Battery Swapping Preference	500	2.09	0.837
Environmental Awareness	500	1.5	0.5
Influenced by Social Circle	500	2.01	0.789
Brand Influence	500	2.97	1.405
Perceived Maintenance Cost	500	2	0.822
FAMEII Awareness	500	1.5	0.501
Tax Benefit Influence	500	2	0.825
Biggest EV Barrier	500	3.01	1.43
Range Anxiety	500	2.55	1.129
More Public Charging Impact	500	1.46	0.499
Infrastructure Preference	500	2.45	1.102
Planned Purchase Time	500	2.54	1.084
Willing to Pay More	500	1.98	0.795
Switching Due to Fuel Prices	500	2.09	0.81
Likelihood to Buy EV	500	2.95	1.391
Valid N (listwise)	500		

Table 3: Economic Factors

Up front Cost Importance	**Frequency**	**Percent**
Very important	87	17.4
Somewhat important	111	22.2
Neutral	112	22.4
Not very important	101	20.2
Not at all important	89	17.8
Total	500	100.0
Aware of Financing Options	**Frequency**	**Percent**

Yes	254	50.8
No	246	49.2
Total	500	100.0
Government Subsidies Influence	**Frequency**	**Percent**
Strongly influence	122	24.4
Somewhat influence	120	24.0
Neutral	141	28.2
No influence	117	23.4
Total	500	100.0
EV Cost Effectiveness	**Frequency**	**Percent**
Strongly agree	101	20.2
Agree	96	19.2
Neutral	96	19.2
Disagree	110	22.0
Strongly disagree	97	19.4
Total	500	100.0

The given table presents an analysis of various economic factors influencing the adoption of electric vehicles (EVs) among a sample of 500 respondents. Regarding the importance of upfront cost, opinions are fairly distributed, with 17.4% considering it very important, 22.2% somewhat important, and 22.4% neutral, while 20.2% and 17.8% believe it is not very important or not at all important, respectively. This suggests that while the cost is a factor for many, it is not a universally decisive one. Awareness of financing options is nearly balanced, with 50.8% of respondents being aware of available options such as loans and EMI schemes, whereas 49.2% are not aware, indicating a need for better financial education regarding EV purchases. When considering the influence of government subsidies, 24.4% of respondents report strong influence, 24% are somewhat influenced, and 28.2% remain neutral, while 23.4% state that subsidies have no influence on their decision, suggesting mixed perceptions about the effectiveness of financial incentives. Finally, perceptions of EV cost-effectiveness in the long run are divided; 20.2% strongly agree, 19.2% agree, and another 19.2% remain neutral, while 22% disagree and 19.4% strongly disagree, indicating a lack of consensus on whether EVs offer significant financial benefits over traditional fuel vehicles. This data highlights the need for increased awareness and confidence-building measures to enhance EV adoption.

Table 4: Technological Factors

Battery Concern		
	N	%
Limited driving range	111	22.20%
Battery life and replacement cost	92	18.40%
Long charging time	99	19.80%
Safety concerns	83	16.60%
No concerns	115	23.00%
Preferred Driving Range		
	N	%
Less than 150 km per charge	115	23.00%
150 – 300 km per charge	113	22.60%
300 – 500 km per charge	139	27.80%

More than 500 km per charge	133	26.60%
Fast Charging Importance		
	N	%
Very important	109	21.80%
Somewhat important	97	19.40%
Neutral	89	17.80%
Not very important	106	21.20%
Not at all important	99	19.80%
Battery Swapping Preference		
	N	%
Yes	155	31.00%
No	147	29.40%
Maybe	198	39.60%

The table presents an analysis of respondents' concerns and preferences regarding electric vehicle (EV) battery technology, charging infrastructure, and driving range. Battery concerns vary among respondents, with the limited driving range (22.2%) and long charging time (19.8%) being notable issues. Additionally, battery life and replacement cost (18.4%) and safety concerns (16.6%) are also significant considerations, whereas 23% of respondents reported no concerns regarding EV batteries. When analyzing preferred driving range, the majority of respondents prefer a range of 300–500 km per charge (27.8%), followed by more than 500 km (26.6%), while 23% are content with less than 150 km, and 22.6% prefer 150–300 km per charge. The importance of fast charging infrastructure is varied, with 21.8% rating it as very important, 19.4% as somewhat important, while 17.8% remain neutral; 21.2% and 19.8% of respondents believe it is not very important or not at all important, respectively, showing a balanced perspective on its necessity. In terms of battery swapping preferences, 31% support battery swapping, 29.4% are against it, and 39.6% remain uncertain, indicating that while some respondents see value in battery swapping, a large portion of consumers are still undecided. These insights highlight key technological barriers and user expectations that must be addressed to enhance EV adoption.

Table 5: Government Policies and Incentives

FAME II Awareness		
	N	**%**
Yes	266	53.20%
No	234	46.80%
Tax Benefit Influence		
	N	**%**
Yes	169	33.80%
No	160	32.00%
May be	171	34.20%

The table provides insights into respondents' awareness of FAME II (Faster Adoption and Manufacturing of Electric Vehicles in India) incentives and their perception of tax benefits related to EV adoption. FAME II awareness is relatively high, with 53.2% of respondents being aware of the scheme, while 46.8% remain unaware, indicating a need for further outreach and education regarding government initiatives supporting EV adoption. In terms of tax benefits, opinions are evenly

distributed: 33.8% believe tax benefits influence their EV purchase decision, 32% do not find them influential, and 34.2% are uncertain. This suggests that while financial incentives play a role, there is still a lack of clarity or strong conviction among consumers about the impact of tax benefits on EV affordability. These findings highlight the necessity for better communication and promotion of government policies to encourage greater EV adoption.

Table 6: Barriers to EV Adoption

Biggest EV Barrier		
	N	%
High initial cost	101	20.20%
Lack of charging infrastructure	104	20.80%
Limited driving range	86	17.20%
Battery performance concerns	108	21.60%
Lack of awareness and information	101	20.20%

The table highlights the biggest barriers preventing consumers from adopting electric vehicles (EVs). The most cited concern is battery performance (21.6%), indicating that consumers are worried about battery longevity, efficiency, and potential replacement costs. Lack of charging infrastructure (20.8%) is another major barrier, suggesting that concerns about charging station availability and accessibility hinder EV adoption. High initial cost (20.2%) and lack of awareness and information (20.2%) are equally significant, showing that both affordability and consumer education play crucial roles in adoption decisions. Additionally, limited driving range (17.2%) remains a concern, though slightly lower than the other barriers. These findings suggest that addressing battery improvements, expanding charging networks, reducing upfront costs, and increasing consumer awareness are key strategies to accelerate EV adoption.

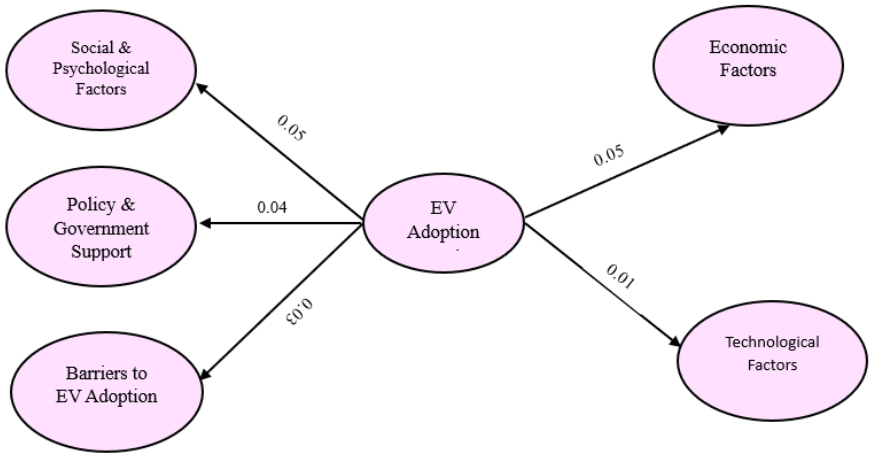

Figure 1: Conceptual Framework of Factors Influencing EV Adoption

The given figure represents a conceptual model illustrating the factors influencing Electric Vehicle (EV) Adoption. The central element in the model is EV Adoption, which is influenced by various external factors depicted as oval nodes. The factors affecting EV adoption include Social & Psychological Factors, Policy & Government Support, Barriers to EV Adoption, Economic Factors, and Technological Factors. Each of these factors has a path coefficient (represented by numerical values on the connecting arrows), indicating the strength of their influence on EV adoption. The Social & Psychological Factors and Economic Factors have the highest influence, both with a coefficient of

0.05, suggesting that these aspects significantly shape consumer decisions regarding EV adoption. Policy & Government Support has a moderate influence with a coefficient of 0.04, implying that regulatory measures and incentives play a crucial role. Barriers to EV Adoption have a slightly lower negative impact, represented by a coefficient of 0.03, indicating that challenges such as infrastructure limitations or high costs slightly hinder adoption. Finally, Technological Factors have the least influence, with a coefficient of 0.01, suggesting that while technology matters, it is not the primary determinant in the adoption of electric vehicles. Overall, the diagram provides a structured view of how different factors contribute to EV adoption, emphasizing the need for strong economic incentives, psychological assurance, and governmental policies to enhance the transition towards electric vehicles.

Hypothesis	**Relationship**	**Expected Impact**	**P Value**	**Decision**
H1	Social & Psychological Factors → EV Adoption	Positive	0.050	**Accepted**
H2	Policy & Government Support → EV Adoption	Positive	0.042	**Accepted**
H3	Barriers to EV Adoption → EV Adoption	Negative	0.034	**Accepted**
H4	Economic Factors → EV Adoption	Positive	0.050	**Accepted**
H5	Technological Factors → EV Adoption	Positive	0.018	**Accepted**

Discussion

The results of the research highlight the complex interactions of social, technological, financial, and policy-driven elements influencing Indian consumers' judgments about the acceptance of electric cars (EVs). Electric vehicles (EVs) have been embraced in part by government incentives and subsidies, including FAME II. Still, financial restrictions remain a major obstacle, mostly because of the high initial costs and ignorance about financing choices. Furthermore, even if electric vehicle (EV) technology is constantly developing, range anxiety, battery performance, and charging infrastructure still cause problems that discourage potential buyers. As the studies show, environmental consciousness and social impact also help to improve consumer views. Particularly, people are far more likely to consider using electric cars (EVs) when they relate them to innovation and sustainability. Still, mistrust and false information about their dependability and long-term advantages are hindering the increase of electric car adoption. To deal with these problems in a multifaceted way, we need to improve charging infrastructure, encourage technological progress in battery efficiency and other charging options, and step up efforts to educate consumers. Policymakers and manufacturers must work together to change consumer impressions by raising public knowledge, simplifying financial incentives, and developing focused marketing initiatives. By carefully addressing these issues, India may accelerate its shift to sustainable mobility and match international projects to lower carbon emissions and include renewable energy sources into transportation.

Conclusion

A range of social, technological, financial, and policy-driven factors influence India's adoption of electric vehicles (EVs). Though government programs like the FAME II program have greatly encouraged the acceptance of electric vehicles (EVs), challenges including poor infrastructure for charging EVs, high upfront costs, range anxiety, and low consumer awareness still prevent their broad acceptance. The study underlines how modest tax benefits and financial incentives affect purchase decisions. However, the lack of awareness about these rules suggests the need for outreach campaigns and improved communication. Technological issues, particularly those pertaining to battery

performance, lifetime, and charging accessibility, continue to discourage prospective buyers of electric vehicles. Providing battery switch choices, improving battery technology, and growing fast-charging networks can help to raise consumer confidence and allay these issues. Consumer preferences are largely influenced by social factors like peer pressure and environmental awareness. Though consumers who view electric cars (EVs) as creative and environmentally friendly substitutes are more likely to use them, there is still doubt and misinterpretation about their maintenance and efficacy. Fastening the acceptance of electric vehicles (EVs) in India calls for a multifarious approach involving customers, industry players, and government officials. Adoption rates can be greatly raised by supporting technological developments in the manufacturing of electric vehicles (EVs), improving consumer education through awareness campaigns, raising expenditures on charging infrastructure, and strengthening financial accessibility through low-interest financing. By means of these policies, India may propel itself toward its goal of sustainable transportation, which comprises the lowering of carbon emissions, improvement of energy security, and global leadership in the change to electric mobility.

Reference

1. Nour, M., Chaves-Ávila, J. P., Magdy, G., & Sánchez-Miralles, Á. (2020). Review of positive and negative impacts of electric vehicles charging on electric power systems. *Energies*, *13*(18), 4675.
2. Serrano, J. R., Novella, R., & Piqueras, P. (2019). Why the development of internal combustion engines is still necessary to fight against global climate change from the perspective of transportation. *Applied Sciences*, *9*(21), 4597.
3. Malaquias, A. C. T., Netto, N. A. D., Filho, F. A. R., da Costa, R. B. R., Langeani, M., & Baêta, J. G. C. (2019). The misleading total replacement of internal combustion engines by electric motors and a study of the Brazilian ethanol importance for the sustainable future of mobility: a review. *Journal of the Brazilian Society of Mechanical Sciences and Engineering*, *41*(12), 567.
4. Alanazi, F. (2023). Electric vehicles: Benefits, challenges, and potential solutions for widespread adaptation. *Applied Sciences*, *13*(10), 6016.
5. Qadir, S. A., Ahmad, F., Al-Wahedi, A. M. A., Iqbal, A., & Ali, A. (2024). Navigating the complex realities of electric vehicle adoption: A comprehensive study of government strategies, policies, and incentives. *Energy Strategy Reviews*, *53*, 101379.
6. Sanguesa, J. A., Torres-Sanz, V., Garrido, P., Martinez, F. J., & Marquez-Barja, J. M. (2021). A review on electric vehicles: Technologies and challenges. *Smart Cities*, *4*(1), 372-404.
7. Bishnoi, M. R. (2024). A Study on Electric Vehicles in India Opportunities and Challenges. In *Conference paper available at https://www. researchgate. net/publication/378737287*.
8. Aderibigbe, O. O., & Gumbo, T. (2023, September). The role of electric vehicles in greening the environment: Prospects and challenges. In *LET IT GROW, LET US PLAN, LET IT GROW. Nature-based Solutions for Sustainable Resilient Smart Green and Blue Cities. Proceedings of REAL CORP 2023, 28th International Conference on Urban Development, Regional Planning and Information Society* (pp. 777-786). CORP–Competence Center of Urban and Regional Planning.
9. Goel, P., Sharma, N., Mathiyazhagan, K., & Vimal, K. E. K. (2021). Government is trying but consumers are not buying: A barrier analysis for electric vehicle sales in India. *Sustainable Production and Consumption*, *28*, 71-90.
10. Deka, C., Dutta, M. K., Yazdanpanah, M., & Komendantova, N. (2023). Can gain motivation induce Indians to adopt electric vehicles? Application of an extended theory of Planned Behavior to map EV adoption intention. *Energy Policy*, *182*, 113724.
11. Soman, A., Kaur, H., Jain, H., & Ganesan, K. (2020). India's electric vehicle transition. *New Delhi: council for energy, environment and water*.

12. Bhaskar, M. G., Narahari, N. S., & Guptha, C. K. G. (2020). Consumer Preferences for mid-Segment electric cars—An Indian Perspective. *Int. J. Eng. Res. Technol*, *9*, 1303-1309.
13. Ling, Z., Cherry, C. R., & Wen, Y. (2021). Determining the factors that influence electric vehicle adoption: A stated preference survey study in Beijing, China. *Sustainability*, *13*(21), 11719.
14. Chawla, U., Mohnot, R., Mishra, V., Singh, H. V., & Singh, A. K. (2023). Factors influencing customer preference and adoption of electric vehicles in India: a journey towards more sustainable transportation. *Sustainability*, *15*(8), 7020.
15. Qadir, S. A., Ahmad, F., Al-Wahedi, A. M. A., Iqbal, A., & Ali, A. (2024). Navigating the complex realities of electric vehicle adoption: A comprehensive study of government strategies, policies, and incentives. *Energy Strategy Reviews*, *53*, 101379.
16. Reimers, P. (2021). The subsidized green revolution: the impact of public incentives on the automotive industry to promote alternative fuel vehicles (AFVs) in the period from 2010 to 2018. *Energies*, *14*(18), 5765.
17. Digalwar, A. K., & Rastogi, A. (2023). Assessments of social factors responsible for adoption of electric vehicles in India: a case study. *International Journal of Energy Sector Management*, *17*(2), 251-264.
18. Alanazi, F. (2023). Electric vehicles: Benefits, challenges, and potential solutions for widespread adaptation. *Applied Sciences*, *13*(10), 6016.
19. Hakkim, H., Kumar, A., Sinha, B., & Sinha, V. (2022). Air pollution scenario analyses of fleet replacement strategies to accomplish reductions in criteria air pollutants and 74 VOCs over India. *Atmospheric Environment: X*, *13*, 100150.
20. Al-Buenain, A., Al-Muhannadi, S., Falamarzi, M., Kutty, A. A., Kucukvar, M., & Onat, N. C. (2021). The adoption of electric vehicles in Qatar can contribute to net carbon emission reduction but requires strong government incentives. *Vehicles*, *3*(3), 618-635.
21. Zaino, R., Ahmed, V., Alhammadi, A. M., & Alghoush, M. (2024). Electric vehicle adoption: A comprehensive systematic review of technological, environmental, organizational and policy impacts. *World Electric Vehicle Journal*, *15*(8), 375.
22. Kulcsár, B., Mankovits, T., & Ailer, P. G. (2021). The renewable energy production capability of settlements to meet local electricity and transport energy demands. *Sustainability*, *13*(7), 3636.
23. Arévalo, P., Ochoa-Correa, D., Villa-Ávila, E., Espinoza, J. L., & Albornoz, E. (2025). Decarbonizing Insular Energy Systems: A Literature Review of Practical Strategies for Replacing Fossil Fuels with Renewable Energy Sources. *Fuels*, *6*(1), 12.
24. Sathiyan, S. P., Pratap, C. B., Stonier, A. A., Peter, G., Sherine, A., Praghash, K., & Ganji, V. (2022). Comprehensive assessment of electric vehicle development, deployment, and policy initiatives to reduce GHG emissions: opportunities and challenges. *IEEE Access*, *10*, 53614-53639.
25. Shah, R. V. (2022). Financial incentives for promotion of electric vehicles in India-An analysis using the environmental policy framework. *Nature Environment and Pollution Technology*, *21*(3), 1227-1234.
26. KOHLI, SUMATI. "Electric vehicle demand incentives in India." (2024).
27. Shah, R. V. (2022). Financial incentives for promotion of electric vehicles in India-An analysis using the environmental policy framework. *Nature Environment and Pollution Technology*, *21*(3), 1227-1234.
28. Kumar, R., Jha, A., Damodaran, A., Bangwal, D., & Dwivedi, A. (2020). Addressing the challenges to electric vehicle adoption via sharing economy: An Indian perspective. *Management of Environmental Quality: An International Journal*, *32*(1), 82-99.
29. Ramesan, S., Kumar, P., & Garg, S. K. (2022). Analyzing the enablers to overcome the challenges in the adoption of electric vehicles in Delhi NCR. *Case Studies on Transport Policy*, *10*(3), 1640-1650.

30. Faizal, M., Feng, S. Y., Zureel, M. F., Sinidol, B. E., Wong, D., & Jian, G. K. (2019). A review on challenges and opportunities of electric vehicles (evs). *J. Mech. Eng. Res. Dev*, *42*(4), 130-137.
31. Deka, C., Dutta, M. K., Yazdanpanah, M., & Komendantova, N. (2023). Can gain motivation induce Indians to adopt electric vehicles? Application of an extended theory of Planned Behavior to map EV adoption intention. *Energy Policy*, *182*, 113724.
32. Krishna, G. (2021). Understanding and identifying barriers to electric vehicle adoption through thematic analysis. *Transportation Research Interdisciplinary Perspectives*, *10*, 100364.
33. Dutta, B., & Hwang, H. G. (2021). Consumers purchase intentions of green electric vehicles: The influence of consumers technological and environmental considerations. *Sustainability*, *13*(21), 12025.
34. Lipu, M. S. H., Mamun, A. A., Ansari, S., Miah, M. S., Hasan, K., Meraj, S. T., ... & Tan, N. M. (2022). Battery management, key technologies, methods, issues, and future trends of electric vehicles: A pathway toward achieving sustainable development goals. *Batteries*, *8*(9), 119.
35. Strielkowski, W., Civín, L., Tarkhanova, E., Tvaronavičienė, M., & Petrenko, Y. (2021). Renewable energy in the sustainable development of electrical power sector: A review. *Energies*, *14*(24), 8240.
36. Chidambaram, K., Ashok, B., Vignesh, R., Deepak, C., Ramesh, R., Narendhra, T. M., ... & Kavitha, C. (2023). Critical analysis on the implementation barriers and consumer perception toward future electric mobility. *Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering*, *237*(4), 622-654.
37. KV, S., Michael, L. K., Hungund, S. S., & Fernandes, M. (2022). Factors influencing adoption of electric vehicles–A case in India. *Cogent Engineering*, *9*(1), 2085375.
38. Xia, Z., Wu, D., & Zhang, L. (2022). Economic, functional, and social factors influencing electric vehicles' adoption: An empirical study based on the diffusion of innovation theory. *Sustainability*, *14*(10), 6283.
39. Goel, P., Sharma, N., Mathiyazhagan, K., & Vimal, K. E. K. (2021). Government is trying but consumers are not buying: A barrier analysis for electric vehicle sales in India. *Sustainable Production and Consumption*, *28*, 71-90.
40. Singh, V., Singh, V., & Vaibhav, S. (2020). A review and simple meta-analysis of factors influencing adoption of electric vehicles. *Transportation Research Part D: Transport and Environment*, *86*, 102436.
41. Khurana, A., Kumar, V. R., & Sidhpuria, M. (2020). A study on the adoption of electric vehicles in India: The mediating role of attitude. *Vision*, *24*(1), 23-34.
42. Kumar, R., Jha, A., Damodaran, A., Bangwal, D., & Dwivedi, A. (2020). Addressing the challenges to electric vehicle adoption via sharing economy: An Indian perspective. *Management of Environmental Quality: An International Journal*, *32*(1), 82-99.
43. Tu, J. C., & Yang, C. (2019). Key factors influencing consumers' purchase of electric vehicles. *Sustainability*, *11*(14), 3863.
44. Shankar, A., & Kumari, P. (2019). Exploring the enablers and inhibitors of electric vehicle adoption intention from sellers' perspective in India: A view of the dual-factor model. *International Journal of Nonprofit and Voluntary Sector Marketing*, *24*(4), e1662.