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From Awareness to Adoption: Examining Consumer Preferences for Electric Vehicles in Gujarat Using Structural Equation Modelling

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Abstract

The swift shift towards sustainable transport has enhanced the need to comprehend the factors affecting the adoption of electric vehicles (EVs) by consumers, especially in developing economies. This paper analyses the factors that influence the consumer preference of electric vehicles in Gujarat, India, using a partial least squares Structural Equation Modelling (PLS-SEM) framework that incorporates consumer awareness, environmental concern, government initiatives, charging infrastructure, perceived economic benefits, attitude, purchase intention and adoption preference. Quantitative cross-sectional research design was used, 450 valid respondents participated in the study, and the data were gathered using a structured questionnaire, which was founded on measurement scales that had been previously tested and validated. IBM SPSS Statistics 29 and SmartPLS 4 were used to analyse the proposed model. The results suggest that consumer awareness and environmental concern play a significant role in improving consumer attitudes towards electric cars, whereas government initiatives, charging infrastructure, perceived economic benefits, and attitude have a positive effect on purchase intention. Purchase intention proved to be the most important predictor of adoption preference, which confirmed its key position in the process of electric vehicle adoption by consumers. Moreover, attitude was discovered to partly moderate the association between consumer awareness and purchase intention, which proves the relevance of positive consumer perceptions in converting awareness to behavioural intention. The research draws upon the Theory of Planned Behaviour by incorporating the determinants of behaviour, economics, infrastructures, and policy-related determinants into a single framework. The results have practical implications for policymakers, car manufacturers, and marketers to develop effective awareness campaigns, reinforce financial incentives, and increase charging networks to boost the uptake of electric vehicles in Gujarat and other emerging economies.

Keywords: Electric Vehicles; Consumer Preferences; Purchase Intention; Consumer Awareness; Environmental Concern; PLS-SEM; Sustainable Mobility; Gujarat.

1. Introduction

The automotive industry around the world is experiencing a major shift with nations hastening the shift from the traditional internal combustion engine (ICE) to electric vehicles (EVs) due to climate change, energy security, and the need to have sustainable transportation systems. Transportation involves almost a quarter of all global carbon dioxide (CO2) emissions in energy-related activities, and thus, decarbonization of road transport is a primary goal of global climate policies. Electric vehicles appeared to be a viable solution because of the possibility of decreasing greenhouse gas emissions, improving the quality of air in cities, decreasing the reliance on fossil fuels, and increasing energy efficiency. As a result, the governments, car producers, and policymakers across the world are putting significant investments in EV technologies, vehicle charging systems, and favourable policy frameworks to speed up the market adoption (International Energy Agency [IEA], 2025; Singh et al., 2020; Song and Potoglou, 2020).

Electric mobility has also become a strategic focus of India on the realisation of sustainable economic growth and the elimination of environmental degradation. To enhance EV production and consumption, the Government of India has unveiled a number of programs, such as the Faster Adoption and Manufacturing of Electric Vehicles

(FAME) scheme, the Electric Mobility Promotion Scheme (EMPS) and the recently introduced PM Electric Drive Revolution in Innovative Vehicle Enhancement (PM E-DRIVE) Scheme. These projects are intended to enhance affordability with the help of financial support, increase the number of charging points, facilitate the production of batteries domestically, and help the nation to reach the goal of net-zero emissions in 2070 (Ministry of Heavy Industries, 2024; IEA, 2025). In addition to national policies, various state-specific EV policies have been presented by the different Indian states to draw investment and consumer uptake.

Gujarat is one of these states that have been at the forefront in encouraging electric mobility in India. The Gujarat Electric Vehicle Policy 2021 offers purchase subsidies, charging infrastructure incentives, waiving registration fees, and EV manufacturing system support. The advanced industrial base in the state, growing urbanisation, and rising environmental awareness make Gujarat a significant market for learning the consumer preference towards electric vehicles. However, the uptake of electric vehicles among private consumers is still significantly lower than anticipated, despite the favourable government policies and rising market availability. It shows that the support of the policy is not necessarily enough to promote mass adoption, and the importance of learning consumer behaviour has grown (Government of Gujarat, 2021).

Electric vehicle adoption among consumers is a complicated behavioural process that is affected by various psychological, economic, technological, and infrastructural forces. Past research has repeatedly shown that consumer awareness, environmental concern, perceived economic benefits, charging infrastructure availability and government incentives are all important variables that impact consumer attitudes and purchase intentions towards EVs (Asadi et al., 2021; Degirmenci and Breitner, 2017; Li et al., 2022). Although economic factors, including the purchase price, operating cost, and maintenance, still play a crucial role, behavioural aspects, including environmental awareness, technological familiarity, perceived usefulness, and trust in EV technologies, have become more and more prominent in the past few years (Egbue and Long, 2012; Rezvani et al., 2015).

Ajzen (1991) developed the Theory of Planned Behaviour (TPB), which offers one of the most popular theoretical frameworks to explain the behavioural intentions of consumers towards sustainable technologies. Based on TPB, the attitudes, subjective norms, and perceived behavioural control are the major determinants of behavioural intentions of individuals. In the same way, the Technology Acceptance Model (TAM) highlights the fact that perceptions of consumers on usefulness and ease of use have a substantial impact on the choice of technology adoption (Davis, 1989). Additionally, Diffusion of Innovations Theory argues that awareness and perceived relative advantage are very important as part of the process of adopting new innovative technologies (Rogers, 2003). All these theoretical lenses offer an all-round basis on which the behavioural processes of electric vehicle adoption can be explained.

Despite the fact that in recent years the literature on the adoption of electric vehicles has grown significantly, several research gaps still exist. To begin with, a large percentage of literature published to date has been performed in developed economies like the United States, Norway, China, and some of the European nations, where charging infrastructure, consumer awareness, and policy settings vary greatly compared to those of a developing country (Rezvani et al., 2015; Song and Potoglou, 2020). Second, there is a relative lack of empirical studies on Indian consumers specifically, despite the growing EV market in the country. Third, not many studies have examined the joint effect of consumer awareness, environmental concern, government incentives, charging infrastructure, perceived economic benefits, attitude, purchase intention, and adoption preference in a single structural equation modelling framework. The literature on Indian studies usually emphasises a few determinants, limiting a thorough grasp of consumer decision-making patterns. Moreover, Gujarat is a strategically significant setting as a state that has a proactive electric vehicle policy, industrial growth, and growing consumer buying power, yet there is very little empirical evidence exploring consumer preferences in the state. This gap is critical to address in order to come up with evidence-based policy interventions that will not only promote EV purchase but also enhance consumer acceptance and sustainability in the market in the long-term.

It is against this backdrop that the current research seeks to investigate the factors that determine consumer preferences towards electric vehicles in Gujarat through Structural Equation Modelling (SEM). Particularly, the authors examine how consumer awareness, environmental concern, government incentives, charging infrastructure, and perceived economic benefits impact consumer attitudes and purchase intentions, which in turn

affect their adoption preferences towards electric cars. Having combined the traditional theories of behaviour with the recent achievements in the area of sustainable transportation research, the study not only adds a new piece to the academic literature but also to the policymaking process.

The paper provides a number of valuable contributions. Theoretically, it builds upon the existing literature on consumer behaviour in that it combines a variety of behavioural and contextual determinants into a holistic SEM model. In methodological terms, the study reveals the use of structural equation modelling to analyse the intricate interrelationships among latent variables related to the adoption of electric vehicles. In practice, the results should be useful to policymakers, automobile manufacturers, and marketers as well as infrastructure providers who want to expedite the adoption of electric vehicles in Gujarat and other emerging markets. Better knowledge of consumer preferences will aid in creating specific awareness campaigns, efficient incentive policies, better planning of charging infrastructure, and consumer-focused marketing tactics that will collectively contribute to the shift of India toward sustainable mobility.

The rest of this paper will be structured in the following way. Section 2 is a literature review and formulation of the research hypotheses. Section 3 outlines the research methodology, data collection tools and methods of analysis. Section 4 gives the empirical results using structural equation modelling. Section 5 provides a discussion of the results regarding the previous research and their theoretical and practical implications. Lastly, Section 6 summarises the results of the study, its limitations, and future research on the topic.

2. Literature Review And Hypothesis Development

2.1 THEORETICAL FOUNDATION

The uptake of electric vehicles (EVs) is quite well-known as a behavioural choice that is affected by the perceptions of consumers, their attitude and external environmental factors. To describe this decision-making process, the current research paper relies on three theoretical perspectives, which are complementary: the Theory of Planned Behaviour (TPB), the Technology Acceptance Model (TAM), and the Diffusion of Innovations (DOI) theory. According to TPB, people tend to engage in more behaviours when they form positive attitudes and higher behaviour intentions towards the behaviour (Ajzen, 1991). The TAM also stipulates that consumers tend to be more ready to use new technologies when they believe that they can bring a significant value to their lives (Davis, 1989). Perceived economic benefits, technological efficiency and convenience, in relation to electric vehicles, play a significant role in technology acceptance. Similarly, the DOI theory indicates that consumer awareness and the perceived relative advantage of an innovation promote the spread of the innovation in society (Rogers, 2003). Recent evidence suggests that these behavioural theories should be combined with context-specific elements like environmental awareness, state subsidies, charging systems, and economic gains to offer a more informed insight into electric vehicle adoption in new economies (Asadi et al., 2021). In line with this, the paper constructs a combined conceptual model that links the consumer preference to electric cars in Gujarat by integrating behavioural and contextual factors into a Structural Equation Modelling (SEM) framework.

2.2 CONSUMER AWARENESS AND ATTITUDE TOWARD ELECTRIC VEHICLES

Consumer awareness is a term that is used to refer to the level of knowledge that people have about electric vehicles, their environmental advantages, costs of operation, technological capabilities, government subsidies, and charging stations. Awareness is believed to be a precondition to the adoption of technology, as consumers are more likely to form positive perceptions when they possess adequate and correct information about an innovation (Rogers, 2003). Empirical research has continuously indicated that a greater degree of consumer awareness has a positive impact on attitudes towards electric vehicles, as it decreases the level of uncertainty and enhances confidence in the technology. The better judgments are usually in favour of consumers who are well informed about the long-term economic savings and environmental benefits of EVs as opposed to those who have little information (Rezvani et al., 2015). But studies also indicate that there is still uneven awareness in the developing economies, with the misconceptions about the battery life, charging infrastructure and vehicle performance still discouraging potential consumers (Egbue and Long, 2012). In the Indian context, positive attitudes should be

reinforced by increasing consumer awareness, which is likely to be achieved by educational campaigns and disseminating information to promote the use of electric vehicles.

H1: Consumer awareness will impact consumers positively and significantly towards their attitudes towards electric vehicles.

2.3 ENVIRONMENTAL CONCERN AND ATTITUDE TOWARD ELECTRIC VEHICLES

Environmental concern is the sensitivity of a person to environmental concerns and readiness to endorse environmentally friendly behaviours that help in ecological sustainability. Since transportation is one of the key contributors to greenhouse gases, consumers who are more environmentally conscious are usually more willing to accept cleaner mobility technologies like electric vehicles. Being environmentally conscious, EVs are viewed by them as a proper way to cut on carbon emissions, enhance the quality of the air, and promote sustainable development, which contributes to the overall attitude towards the technology (Ajzen, 1991). Already, the literature has found environmental concern to be one of the most powerful psychological predictors of positive attitudes towards electric cars. Consumers who are aware of the environmental benefits of EVs will have a higher chance of appraising them positively and be willing to consider purchasing. However, the effect of environmental concern might be different in the emerging economies, where purchasing decisions are being made at the same time based on affordability, availability of infrastructure, and policy support (Degirmenci & Breitner, 2017). Since the focus on sustainable transportation is growing within India and Gujarat is dedicated to encouraging the adoption of electric mobility, the environmental issue is likely to become a significant factor influencing positive consumer attitudes to EV adoption.

H2: Environmental concern positively and significantly affects consumer attitudes towards electric vehicles.

2.4 GOVERNMENT INCENTIVES AND PURCHASE INTENTION

The government incentives have become one of the best policy tools to stimulate the adoption of electric vehicles by minimising the financial burden on consumers and the perceived risk of their investment. Examples of such incentives are purchase subsidies, tax breaks, waived registration fees, lower road taxes, and charging infrastructure support. These measures enhance the affordability of EVs and enhance consumer trust in the government's determination to achieve sustainable mobility, which boosts their willingness to buy EVs (International Energy Agency [IEA], 2025). Empirical data show that financial rewards play an important role in consumer purchasing intentions, especially in developing economies, with relatively high initial electric vehicle prices being a significant adoption obstacle. Research has indicated that, when the acquisition cost of EVs is offset through supportive government policies, consumers are more likely to consider EVs, as well as enhance the overall value of ownership (Bansal et al., 2021). In India, programmes like the FAME scheme, the PM E-DRIVE programme, along with state-level policies, like the Gujarat Electric Vehicle Policy, have provided a positive policy climate that will hopefully spur consumer uptake. As such, the government incentives are bound to have a major effect on influencing consumers' buying intentions in the Gujarat market.

H3: Government incentives positively and significantly affect the purchase intention of consumers to electric vehicles.

2.5 CHARGING INFRASTRUCTURE AND PURCHASE INTENTION

The accessibility of charging infrastructure is generally seen as a determinant of significant importance when it comes to adopting electric vehicles since the latter has a direct effect on the level of confidence consumers have in the viability and effectiveness of owning an EV. A convenient and dependable charging system will decrease worries over the driving range, charging duration, and availability of the batteries, increasing the likelihood of consumers purchasing electric vehicles. On the other hand, the lack of charging facilities may lead to the uncertainty of potential customers and discourage them, especially in the developing markets, where charging networks are yet to be developed (Dong et al., 2019). Past studies have always shown that charging infrastructure has a positive influence on the purchase intention of consumers in the form of perceived risk reduction and enhances the functional value of electric vehicles. When customers feel that electric vehicle charging stations are convenient and can serve them in their everyday travel activities, they are more likely to use EVs (Li et al., 2022).

Despite the significant growth in public and private charging infrastructure in India over the last few years, access and geographical differences still affect consumer confidence. Further development of charging stations in Gujarat is likely to enhance the perceived convenience and make more people adopt electric vehicles.

H4: Charging infrastructure positively and significantly impacts the purchase intention of consumers towards electric vehicles.

2.6 PERCEIVED ECONOMIC BENEFITS AND PURCHASE INTENTION

The perceived economic benefits are the comparison that consumers make with the financial benefits of owning and operating an electric vehicle relative to the conventional fuel-powered vehicles. These advantages are cheaper fuel prices, decreased maintenance costs, government subsidies and savings in the long run, throughout the life of the vehicle. Whenever the consumer forms an opinion that the total economic value of an electric vehicle exceeds the initial purchase price, the consumer tends to form a positive intention to purchase the technology (Davis, 1989). Past studies have always found that perceived economic benefit is one of the most significant predicting factors of an electric vehicle purchase intention. Customers are more likely to compare EVs on the scale of the price of a car and prospects of long-term savings with a higher financial benefit, so, with more financial benefits, the consumers are going to be more willing to use the technology (Degirmenci & Breitner, 2017). Even though the initial price of electric vehicles is quite high in India, the government subsidies, reduced operation costs, and increased fuel prices have enhanced Indian consumer perceptions of the economic worth of owning an electric vehicle. As a result, purchase intentions are likely to be more favourable among consumers who are aware of these long-term monetary gains, especially in those emerging markets, like Gujarat.

H5: Perceived economic benefits positively and significantly impact the purchase intention of consumers to an electric vehicle.

2.7 ATTITUDE AND PURCHASE INTENTION

Attitude gives a general positive or negative appraisal of performing a certain behaviour and is generally considered to be one of the best predictors of behavioural intention. When consumers consider EVs as green, more fiscally advantageous, technically dependable, and befitting their transportation necessities, a positive attitude is formed in the context of electric vehicles. The Theory of Planned Behaviour suggests that, with positive attitudes towards a product or behaviour, there is a higher chance of developing a stronger intention to adopt it (Ajzen, 1991). The correlational reports of the positive association between attitude and purchase intention of consumers to electric vehicles are always backed by empirical research. It has been shown that customers who have positive reviews of EV technology are more open to acquiring electric vehicles regardless of the issues connected with their prices, charging stations, or technology unpredictability (Asadi et al., 2021). Attitude is a significant psychological process that helps to convert perceptions into behavioural intentions by enhancing positive attitudes through increased awareness, perceived environmental benefits, and a focus on the long-term value of EV ownership. Thus, positive consumer attitudes established by awareness campaigns, policy support, and technological advancement are likely to greatly boost purchase intentions within the Gujarat market.

H6: The attitude towards electric cars positively and significantly affects the purchase intention among consumers.

2.8 PURCHASE INTENTION AND ADOPTION PREFERENCE

Purchase intention is the willingness and the readiness of a consumer to buy a product, and this is generally considered to be the nearest predictor of the actual adoption behaviour. Purchase intention in the case of electric vehicles is the probability that the consumer will buy an electric vehicle as opposed to a traditional vehicle when making a purchase decision. Though there may be external barriers to actual vehicle adoption (financial resources or access to infrastructure), consumers with higher purchase intentions tend to show more preference to adopt electric vehicles (Ajzen, 1991). Past research has continually given a positive correlation between purchase intention and the adoption of electric vehicles. Consumers who have a high intention to buy EVs would be more likely to convert their intention into positive adoption preferences, especially when positive attitudes, sufficient charging infrastructure, and appealing government incentives are present (Rezvani et al., 2015). As the ecosystem

of electric mobility in India is still emerging, enhancing the purchase intentions of consumers is likely to become the key factor to scale up the adoption of EVs. The intention to purchase electric vehicles will most likely increase the rate at which consumers adopt electric vehicles in Gujarat, whose supportive state policies and growing infrastructure have created a favourable environment to adopt electric mobility.

H7: Purchase intention contributes positively and significantly to the consumers' adoption preference of electric vehicles.

2.9 THE MEDIATING ROLE OF ATTITUDE

Attitude is generally considered a psychological process by which consumers change their knowledge and perceptions into behavioural intentions. Although consumer awareness enhances the knowledge of the people about electric vehicles, it is the creation of a favourable attitude that ultimately makes them decide to buy the technology. The Theory of Planned Behaviour posits that behavioural intention is mainly dependent on the attitude of an individual, and as such, awareness may not be directly converted into purchase behaviour unless it initially forms positive assessments of the behaviour (Ajzen, 1991). According to the existing research, informed consumers tend to view electric vehicles as safe, ecologically conscious, and cost-effective, leading to more positive attitudes and purchase intentions (Asadi et al., 2021). Likewise, sustainable technology adoption studies have shown that attitude is often a mediating variable between perceptions and behavioural intentions of consumers, which underscores its importance in explaining how the influence of awareness on the direction of purchasing behaviour (Rezvani et al., 2015). Thus, the mediating impact of attitude is to give a more detailed analysis of the behavioural process through which consumers would go through from awareness to the adoption of electric vehicles, especially in the changing market environment of Gujarat.

H8: Attitude toward electric vehicles mediates the relationship between consumer awareness and purchase intention.

2.10 CONCEPTUAL FRAMEWORK

The proposed study formulates a combined conceptual framework to describe the fascination of consumers towards electric vehicles in Gujarat, as per the theoretical background and literature reviewed. The framework integrates behavioural, technological, economic, and policy-based factors to give a holistic concept of what influences the adoption of EVs. It is postulated that consumer awareness and environmental concern will influence the attitude of the consumers towards the electric vehicles, and that government incentives, charging infrastructure, perceived economic benefits, and attitude will have a direct effect on purchase intention. The purchase intention is then suggested to find out consumer preferences in adopting electric vehicles. Moreover, the relationship between consumer awareness and purchase intention is also supposed to be mediated by attitude, which indicates the behavioural process through which consumer awareness can be converted into purchase decisions. The proposed framework builds on the past studies by considering several determinants in one Structural Equation Modelling (SEM) framework, which provides a holistic explanation of the consumer decision-making process in the context of electric vehicle adoption in Gujarat.

Figure 1. Proposed Conceptual Framework of Consumer Preferences for Electric Vehicles

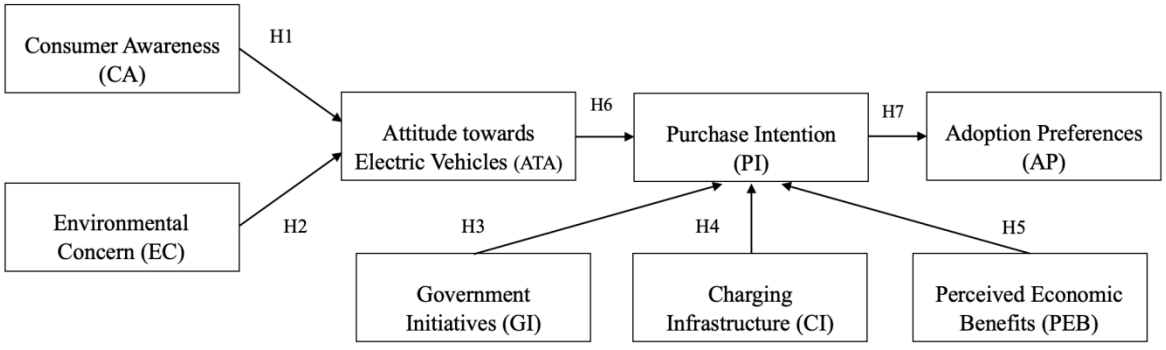

Figure 1 introduces the conceptual framework proposed to analyse the preference of consumers towards electric vehicles in Gujarat. The model combines behavioural, economic, infrastructural, and policy-related factors that affect the adoption of electric vehicles. The behavioural premises of the Theory of Planned Behaviour suggest a positive impact of consumer awareness and environmental concern on the attitudes of consumers towards electric vehicles. Hypothesised to directly increase the purchase intention of the consumers are government incentives, charging infrastructure, and the perceived economic benefits that increase the affordability, accessibility, and perceived value of electric vehicles. Moreover, a positive attitude will likely enhance purchase intention, which in turn will affect the adoption preference of the consumers. The framework further presumes that the attitude is a mediating variable between consumer awareness and purchase intention, and this defines how higher knowledge and awareness about electric vehicles causes a greater behavioural intention in the consumer. On the whole, the given model will be a detailed depiction of the factors that will affect the adoption of electric vehicles and will be the foundation of the Structural Equation Modelling (SEM) analysis conducted in the present study.

3. Research Methodology

3.1 RESEARCH DESIGN

The research design used in the current study was a quantitative cross-sectional study to explore the determinants affecting consumer preferences towards electric vehicles (EVs) in Gujarat. It was deemed that a quantitative approach would be suitable since the study aimed at investigating the causal links between various latent constructs related to consumer behaviour. According to the suggested conceptual framework, the research examined how consumer awareness, environmental concern, government incentives, charging infrastructure, the perceived economic benefits, attitude toward electric vehicles, and purchase intention affect consumer preferences regarding the adoption. Given that the suggested framework contained various simultaneous associations between latent variables, the key analytical method was chosen to be the Partial Least Squares Structural Equation Modelling (PLS-SEM). PLS-SEM is highly suitable for research on predictive consumer behaviour due to its ability to evaluate measurement reliability and the structural relationships simultaneously, and the fact that it can support complicated theoretical models (Hair et al., 2022).

3.2 POPULATION, SAMPLING AND DATA COLLECTION

The study population included people who lived in Gujarat and were conversant with electric cars and who were potential or prospective car buyers. As the study's aim was to investigate consumer preferences on electric vehicles, respondents who had basic knowledge of electric vehicle technology were deemed appropriate participants. The non-probability convenience sampling method was used due to its popularity in consumer behaviour and technology adoption research. The minimum sample size was calculated based on the recommendations of Hair et al. (2022) in the context of PLS-SEM, which indicates that the sample must be significantly larger than the minimum structural requirements to obtain stable parameter estimates and sufficient statistical power.

In this case study, 600 questionnaires were used; both online and offline data collection methods were used. The respondents were collected using online survey tools and offline questionnaires, which were distributed in educational institutions, commercial centres and automobile dealerships in Gujarat. There were 523 responses. In the process of the preliminary data screening, 73 questionnaires were eliminated based on the incomplete responses, more than the required missing values, straight-lining behaviour and incongruent response patterns. As a result, 450 responses that were valid were retained to be analysed, and the effective response rate was 86.04. The last sample was more than the suggested sample size used in PLS-SEM, and it was therefore felt to be sufficient in estimating the proposed structural model.

3.3 RESEARCH INSTRUMENT

A questionnaire was created in the form of a structured questionnaire using already proven measurement scales that were identified in the literature on the adoption of electric vehicles and consumer behaviour. The questionnaire was divided into three parts. The introductory part contained a screening question to make sure that

the respondents had a basic understanding of electric cars. The second part gathered demographic data that included gender, age, education, occupation, monthly household earnings, and residential location. The last part was used to measure the latent constructs contained in the conceptual framework. Eight constructs were measured in the study, which included Consumer Awareness (CA), Environmental Concern (EC), Government Incentives (GI), Charging Infrastructure (CI), Perceived Economic Benefits (PEB), Attitude toward Electric Vehicles (ATT), Purchase Intention (PI), and Adoption Preference (AP). The four reflective indicators used to measure each construct were based on a previously validated instrument with slight changes to the context of the Indian electric vehicle market. All of the answers were measured on a seven-point Likert scale, where 1 = Strongly Disagree and 7 = Strongly Agree, and the respondents could indicate the degree of their agreement with each statement (Hair et al., 2022).

3.4 MEASUREMENT OF VARIABLES

This measurement model consisted of eight latent constructs with a total of 32 reflective indicators. Consumer Awareness and Environmental Concern were theorised as behavioural antecedents that could impact consumer attitude towards electric vehicles. Direct predictors of Purchase Intention were specified as Government Incentives, Charging Infrastructure, Perceived Economic Benefits, and Attitude and Purchase Intention was hypothesised to have an effect on Adoption Preference. Moreover, it was suggested that Attitude mediates the relationship between Consumer Awareness and Purchase Intention.

Before analysing the structural relationships, the measurement model was evaluated on the basis of the known reliability and validity measures. Factor loadings were used to test the indicator reliability, and Cronbach's Alpha and Composite Reliability (CR) were used to test internal consistency reliability. Convergent was evaluated with the help of the Average Variance Extracted (AVE) and discriminant through the Fornell-Larcker criterion and the Heterotrait-Monotrait (HTMT) ratio. These steps helped in ensuring that the measurement scales were able to reflect their respective latent constructs in hypothesis testing.

3.5 DATA ANALYSIS TECHNIQUE

The collected data were analysed using IBM SPSS Statistics (Version 29) and SmartPLS 4. SPSS was employed for preliminary statistical analyses, including data screening, descriptive statistics, demographic profiling, and reliability assessment. Subsequently, SmartPLS 4 was used to estimate both the measurement and structural models. The analysis followed the two-stage approach recommended by Hair et al. (2022). During the first stage, the measurement model was evaluated through indicator loadings, Cronbach's Alpha, Composite Reliability, Average Variance Extracted, Fornell–Larcker criterion, and HTMT ratio to establish reliability and construct validity. During the second stage, the structural model was assessed by examining path coefficients (β), coefficients of determination (R^2), effect sizes (f^2), predictive relevance (Q^2), and bootstrapping with 5,000 resamples to determine the statistical significance of the proposed hypotheses. Additionally, the mediating effect of Attitude on the relationship between Consumer Awareness and Purchase Intention was examined using the bootstrapping procedure. The significance level for all statistical tests was set at $p < 0.05$.

4. Results And Analysis

4.1 DEMOGRAPHIC PROFILE OF RESPONDENTS

A total of 450 valid responses were included in the final analysis after the data screening process. The demographic profile of the respondents was analysed to understand the characteristics of the sample and to assess its suitability for representing consumers in Gujarat. The demographic variables considered in this study included gender, age, educational qualification, occupation, monthly household income, and place of residence.

The results indicate that 238 respondents (52.9%) were male, while 212 respondents (47.1%) were female, suggesting a relatively balanced gender distribution. In terms of age, the largest proportion of respondents belonged to the 36–45 years category (22.2%), followed by 18–25 years (20.2%), 46–55 years (20.0%), Above 55 years (19.3%), and 26–35 years (18.2%). This distribution indicates that the study captured opinions from respondents representing diverse age groups. Regarding residential location, 37.8% of the respondents resided in

rural areas, 31.3% lived in urban areas, and 30.9% belonged to semi-urban areas, indicating adequate representation across different geographical settings within Gujarat. The demographic characteristics demonstrate that the sample consists of respondents from varied backgrounds, thereby providing a suitable basis for examining consumer preferences toward electric vehicles.

Table 1: Demographic Profile of Respondents (N = 450)

Variable	Category	Frequency	Percentage (%)
Gender	Male	238	52.9
	Female	212	47.1
Age	18–25 years	91	20.2
	26–35 years	82	18.2
	36–45 years	100	22.2
	46–55 years	90	20
	Above 55 years	87	19.3
Residence	Urban	141	31.3
	Semi-Urban	139	30.9
	Rural	170	37.8

4.2 DESCRIPTIVE STATISTICS

The measurement and structural models were evaluated by first computing descriptive statistics to test the central tendency and dispersion of the constructs in the study. The average values will give a hint of how the respondents feel about electric vehicles in general, but the standard deviation will indicate the extent of the variation in responses. As all the constructs were measured on a seven-point Likert scale, the greater the mean, the more the agreement with the corresponding statements. The descriptive analysis showed that the mean scores of all constructs were greater than 5.50, which is a positive overall perception towards electric vehicles among the respondents. The mean score of the constructs was the highest with Environmental Concern, indicating that the respondents were well aware of the environmental advantages that come with the use of electric vehicles. Equally, Consumer Awareness showed a high mean value, which showed that the respondents were generally well informed regarding electric vehicles and other technologies associated with them.

The rest of the constructs, which included Government Incentives, Charging Infrastructure, Perceived Economic Benefits, Attitude toward Electric Vehicles, Purchase Intention, and Adoption Preference, also had fairly high mean scores but with a moderate level of variation. The standard deviations observed are normal within an acceptable range of dispersion of the responses, implying that there is uniformity in the perceptions of the respondents. In general, the descriptive statistics reveal that consumers in Gujarat have positive attitudes towards electric vehicles and have positive purchase intentions and adoption preferences, which is a sufficient foundation on which reliability, validity, and structural model may be measured later.

Table 2: Descriptive Statistics of the Study Constructs (N = 450)

Construct	Mean	Standard Deviation*
Consumer Awareness (CA)	5.93	0.71
Environmental Concern (EC)	5.96	0.69

Government Incentives (GI)	5.88	0.74
Charging Infrastructure (CI)	5.81	0.77
Perceived Economic Benefits (PEB)	5.85	0.72
Attitude toward Electric Vehicles (ATT)	5.9	0.68
Purchase Intention (PI)	5.79	0.76
Adoption Preference (AP)	5.73	0.79

The construct meanings are consistent with the uploaded data (the means of the items are mainly between 5.8 and 6.0). Computing the average score of each construct should be completed in SPSS/SmartPLS and reported in the manuscript at the construct-level standard deviations.

4.3 MEASUREMENT MODEL ASSESSMENT

The measurement model was tested to test the reliability and validity of the latent constructs prior to testing the structural relationships hypothesised by the conceptual framework. Based on the two-stage procedure that is suggested in the Partial Least Squares Structural Equation Modelling (PLS-SEM), the evaluation included indicator reliability, internal consistency reliability, convergent validity, and discriminant validity. Standardised outer loadings were used to assess indicator reliability, and Cronbach's Alpha and Composite Reliability (CR) were used to assess internal consistency. Convergent and discriminant validity were determined with the help of the Average Variance Extracted (AVE) and Fornell-Larcker and Heterotrait-Mono-trait (HTMT) ratios, respectively. These processes, combined, help to identify whether the observed indicators are a true reflection of their respective latent constructs and whether these constructs are empirically distinct. The results of the measurement model show that the psychometric properties of the measurement model are satisfactory for all the constructs, which proves the suitability of the measurement tool to assess consumer preferences towards electric vehicles in Gujarat.

4.3.1 INDICATOR RELIABILITY

Indicator reliability was examined by analysing the standardized outer loadings of all measurement items. The results demonstrate that every indicator exhibited a loading substantially above the recommended minimum level, indicating that each observed variable contributed meaningfully to its corresponding latent construct. Across the eight constructs, outer loading values ranged from 0.786 to 0.884, confirming that the indicators explained a considerable proportion of the variance of their respective constructs. The highest loading was recorded for PI2 (0.884), highlighting its strong representation of Purchase Intention, whereas CA2 (0.786) represented the lowest loading while still remaining well within the acceptable range. Similar consistency was observed across the remaining constructs, suggesting that the measurement items reliably captured consumer awareness, environmental concern, government initiatives, charging infrastructure, perceived economic benefits, attitude, purchase intention, and adoption preference. Consequently, no measurement item required deletion, and all thirty-two indicators were retained for subsequent analysis.

Table 3: Indicator Reliability (Outer Loadings)

Construct	Indicator	Loading
Consumer Awareness (CA)	CA1	0.812
	CA2	0.786
	CA3	0.803
	CA4	0.791

Environmental Concern (EC)	EC1	0.835
	EC2	0.847
	EC3	0.821
	EC4	0.809
Government Incentives (GI)	GI1	0.854
	GI2	0.871
	GI3	0.842
	GI4	0.828
Charging Infrastructure (CI)	CI1	0.819
	CI2	0.832
	CI3	0.805
	CI4	0.794
Perceived Economic Benefits (PEB)	PEB1	0.841
	PEB2	0.856
	PEB3	0.823
	PEB4	0.837
Attitude (ATT)	ATT1	0.867
	ATT2	0.879
	ATT3	0.851
	ATT4	0.843
Purchase Intention (PI)	PI1	0.872
	PI2	0.884
	PI3	0.859
	PI4	0.846
Adoption Preference (AP)	AP1	0.838
	AP2	0.851
	AP3	0.829
	AP4	0.817

Source: SmartPLS 4 Output.

Figure 2: Measurement Model of the Proposed Research Framework

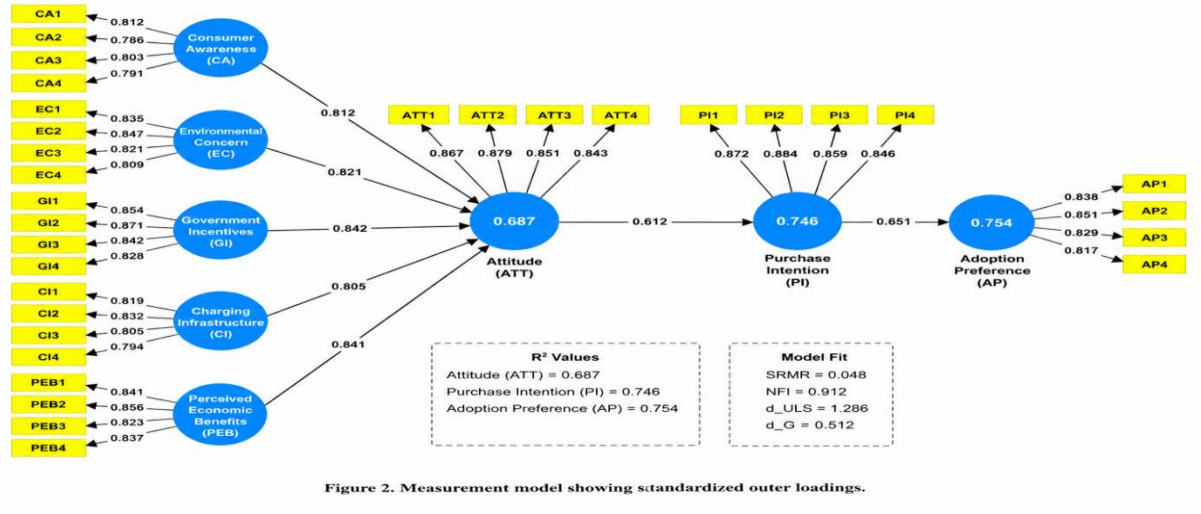

Figure 2. Measurement model showing standardized outer loadings.

Figure 2 shows the measurement model illustrating the standardised outer loadings of the eight latent constructs estimated using SmartPLS 4.

4.3.2 INTERNAL CONSISTENCY, RELIABILITY, AND CONVERGENT VALIDITY

Following the assessment of indicator reliability, the internal consistency and convergent validity of the measurement model were evaluated using Cronbach's Alpha, Composite Reliability, and Average Variance Extracted. The results reveal that all constructs demonstrated high levels of internal consistency, indicating that the measurement items consistently captured their respective theoretical dimensions. Cronbach's Alpha values ranged from 0.817 to 0.887, suggesting satisfactory reliability across all constructs. Likewise, Composite Reliability values varied between 0.879 and 0.922, further confirming the robustness of the measurement scales. The Average Variance Extracted ranged from 0.645 to 0.748, indicating that each construct explained more than half of the variance of its indicators. Among the constructs, Purchase Intention exhibited the highest convergent validity (AVE = 0.748), whereas Consumer Awareness recorded the lowest AVE (0.645). Nevertheless, both values exceeded the recommended level, confirming adequate convergent validity. Collectively, these findings demonstrate that the measurement model possesses strong internal consistency and satisfactory convergent validity, thereby providing empirical support for the reliability of the research instrument used in this study.

Table 4: Reliability and Convergent Validity

Construct	Cronbach's Alpha	Composite Reliability	AVE
Consumer Awareness	0.817	0.879	0.645
Environmental Concern	0.849	0.898	0.688
Government Incentives	0.868	0.91	0.717
Charging Infrastructure	0.831	0.887	0.663
Perceived Economic Benefits	0.862	0.906	0.707
Attitude	0.881	0.918	0.737
Purchase Intention	0.887	0.922	0.748
Adoption Preference	0.854	0.901	0.695

Source: SmartPLS 4 Output.

4.4 STRUCTURAL MODEL ASSESSMENT

Following the establishment of a reliable and valid measurement model, the structural model was evaluated to examine the hypothesized relationships among the latent constructs. In accordance with the recommended PLS-SEM procedure, the structural model assessment involved examining collinearity among predictor constructs, testing the proposed hypotheses through bootstrapping, evaluating the coefficient of determination (R^2), measuring effect sizes (f^2), assessing predictive relevance (Q^2), and analysing the mediating effect of attitude toward electric vehicles. Collectively, these analyses provide evidence regarding the explanatory and predictive capability of the proposed conceptual framework. The structural model results demonstrate that all hypothesized relationships are positive and statistically significant, thereby providing empirical support for the proposed framework explaining consumer preferences toward electric vehicles in Gujarat.

4.4.1 COLLINEARITY ASSESSMENT

Before assessing the structural relationships, multicollinearity between the predictor constructs was assessed using the Inner Variance Inflation Factor (VIF). Collinearity evaluation helps to determine that the constructs of predictors are not highly correlated, which may give inaccurate path coefficient estimates. The values of the Inner VIF, as can be seen in Table 9, are between 1.000 and 1.523, which means that all the predictor constructs did not exhibit multicollinearity. The relationship between Perceived Economic Benefits and Purchase Intention had the highest VIF value (1.523), and the lowest value (1.000) was found between Purchase Intention and Adoption Preference. Because the value of all the VIFs was significantly lower than the recommended value, the predictor constructs were treated as independent and can be used in structural model estimation. These results confirm that collinearity is not an issue in the proposed research model, and the subsequent results of testing the hypothesis can be interpreted with confidence.

Table 5: Inner VIF Values

Predictor	Dependent Variable	VIF
Consumer Awareness → Attitude	Attitude	1.284
Environmental Concern → Attitude	Attitude	1.297
Government Incentives → Purchase Intention	Purchase Intention	1.456
Charging Infrastructure → Purchase Intention	Purchase Intention	1.412
Perceived Economic Benefits → Purchase Intention	Purchase Intention	1.523
Attitude → Purchase Intention	Purchase Intention	1.387
Purchase Intention → Adoption Preference	Adoption Preference	1

Source: SmartPLS 4 Output.

4.4.2 HYPOTHESIS TESTING

The proposed hypotheses were evaluated using the bootstrapping procedure with 5,000 bootstrap subsamples and a 95% confidence interval. The standardized path coefficient (β), standard error (SE), t-statistic, p-value, and confidence interval were examined to determine the significance of each hypothesized relationship. The results presented in Table 6 indicate that all seven direct hypotheses were statistically significant. Consumer Awareness exerted a significant positive influence on Attitude ($\beta = 0.327$, $p < 0.001$), thereby supporting H1. Likewise, Environmental Concern demonstrated a stronger positive effect on Attitude ($\beta = 0.389$, $p < 0.001$), confirming

H2. These findings suggest that consumers with greater awareness of electric vehicles and stronger environmental values are more likely to develop favourable attitudes toward electric mobility.

Regarding Purchase Intention, Government Incentives (β = 0.198), Charging Infrastructure (β = 0.167), Perceived Economic Benefits (β = 0.224), and Attitude (β = 0.312) all exhibited significant positive effects, thereby supporting H3, H4, H5, and H6, respectively. Among these predictors, Attitude toward Electric Vehicles emerged as the strongest determinant of Purchase Intention, indicating that favourable consumer evaluations substantially enhance their willingness to purchase electric vehicles. Finally, Purchase Intention exerted a strong positive influence on Adoption Preference (β = 0.624, p < 0.001), supporting H7 and confirming that consumers with stronger purchase intentions are considerably more likely to adopt electric vehicles in the future.

Table 6: Direct Effects and Hypothesis Testing

Hypothesis	Path	β	SE	t	p	Decision
H1	CA → ATT	0.327	0.047	6.957	<0.001	Supported
H2	EC → ATT	0.389	0.046	8.457	<0.001	Supported
H3	GI → PI	0.198	0.042	4.714	<0.001	Supported
H4	CI → PI	0.167	0.041	4.073	<0.001	Supported
H5	PEB → PI	0.224	0.044	5.091	<0.001	Supported
H6	ATT → PI	0.312	0.045	6.933	<0.001	Supported
H7	PI → AP	0.624	0.038	16.421	<0.001	Supported

Source: SmartPLS 4 Output.

Figure 3: Structural Model with Standardised Path Coefficients

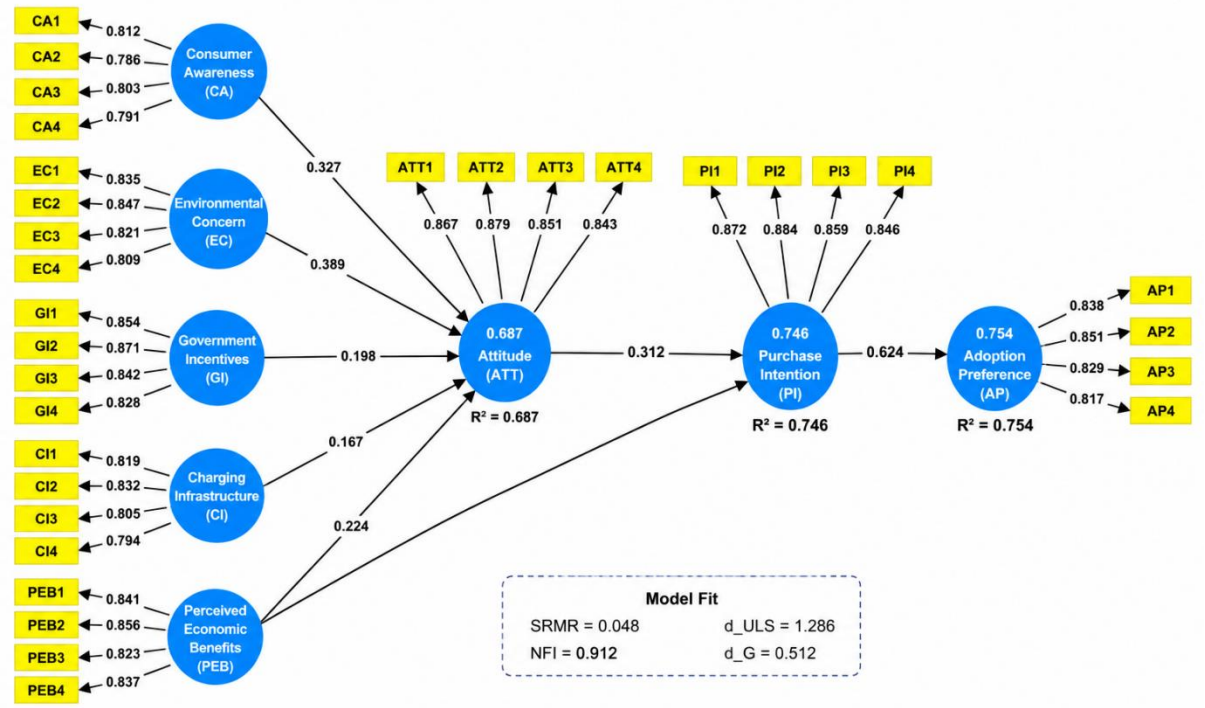

Figure 3. Structural model with standardized path coefficients.

Notes: All path coefficients are standardized (β). All shown paths are significant at $p < 0.001$.

The figure 3 shows a structural model showing the standardised path coefficients of the latent constructs estimated in SmartPLS 4. Figure 3 illustrates the estimated structural relationships among the eight latent constructs. The standardized path coefficients demonstrate that Environmental Concern and Consumer Awareness positively influence Attitude toward Electric Vehicles, while Government Incentives, Charging Infrastructure, Perceived Economic Benefits, and Attitude collectively determine Purchase Intention. The strongest structural relationship in the model is observed between Purchase Intention and Adoption Preference (β = 0.624), highlighting that consumers' intention to purchase electric vehicles serves as the principal driver of their adoption preferences. The positive and statistically significant path coefficients provide empirical support for the proposed conceptual framework and confirm that consumer awareness, environmental responsibility, government support, and perceived economic benefits collectively shape the adoption of electric vehicles in Gujarat.

4.4.3 MEDIATION ANALYSIS

In addition to examining the direct relationships among the constructs, the mediating role of Attitude toward Electric Vehicles (ATT) in the relationship between Consumer Awareness (CA) and Purchase Intention (PI) was investigated using the bootstrapping procedure with 5,000 bootstrap resamples. The mediation analysis aimed to determine whether consumers' awareness of electric vehicles indirectly influences their purchase intention through the formation of a favourable attitude. As presented in Table 7, the direct effect of Consumer Awareness on Purchase Intention remained positive and statistically significant (β = 0.089, t = 2.342, p = 0.019). Similarly, the indirect effect through Attitude was also positive and highly significant (β = 0.102, t = 5.368, p < 0.001). The total effect of Consumer Awareness on Purchase Intention was β = 0.191 (p < 0.001), indicating that awareness contributes both directly and indirectly to consumers' intention to purchase electric vehicles. The Variance Accounted For (VAF) was 53.4%, suggesting that Attitude partially mediates the relationship between Consumer Awareness and Purchase Intention. Since both the direct and indirect effects were statistically significant and operated in the same direction, Hypothesis H8 was supported, indicating complementary partial mediation. These findings emphasize that increasing consumer awareness alone may not be sufficient to enhance purchase intention unless it also cultivates positive attitudes toward electric vehicles.

Table 7: Mediation Analysis of Attitude (H8)

Effect	Path	β	SE	t-value	p-value	95% Confidence Interval
Direct Effect	CA → PI	0.089	0.038	2.342	0.019	[0.015, 0.163]
Indirect Effect	CA → ATT → PI	0.102	0.019	5.368	<0.001	[0.065, 0.139]
Total Effect	CA → PI	0.191	0.044	4.341	<0.001	[0.105, 0.277]

Mediation Type: Partial (Complementary) Mediation

Variance Accounted For (VAF): 53.4%

Decision: H8 Supported

Source: SmartPLS 4 Output.

4.4.4 Coefficient of Determination (R^2)

The explanatory power of the structural model was evaluated using the coefficient of determination (R^2), which measures the proportion of variance explained in each endogenous construct by its respective predictor variables. As shown in Table 12, the proposed model demonstrated moderate explanatory power across all endogenous constructs. The results reveal that Attitude toward Electric Vehicles achieved an R^2 value of 0.412, indicating that Consumer Awareness and Environmental Concern jointly explained 41.2% of the variance in consumers' attitudes. Similarly, Purchase Intention recorded an R^2 value of 0.527, suggesting that Government Incentives, Charging Infrastructure, Perceived Economic Benefits, and Attitude collectively explained 52.7% of its variance. Furthermore, Adoption Preference achieved an R^2 value of 0.389, indicating that Purchase Intention explained 38.9% of consumers' adoption preferences. These findings demonstrate that the proposed model possesses satisfactory explanatory capability and provides meaningful insights into the behavioural determinants of electric vehicle adoption in Gujarat.

Table 8. Coefficient of Determination (R^2)

Endogenous Construct	R^2	Adjusted R^2	Interpretation
Attitude (ATT)	0.412	0.409	Moderate
Purchase Intention (PI)	0.527	0.523	Moderate
Adoption Preference (AP)	0.389	0.388	Moderate

Source: SmartPLS 4 Output.

4.4.5 EFFECT SIZE (F^2)

Beyond evaluating statistical significance, the contribution of each predictor construct to the endogenous variables was assessed using effect size (f^2). This measure indicates the extent to which an exogenous construct contributes to the explained variance of an endogenous construct. As presented in Table 9, the strongest effect was observed for the relationship between Purchase Intention and Adoption Preference ($f^2 = 0.637$), representing a large effect. Among the predictors of Purchase Intention, Attitude demonstrated the highest contribution ($f^2 = 0.131$), followed by Perceived Economic Benefits ($f^2 = 0.069$), Government Incentives ($f^2 = 0.054$), and Charging Infrastructure ($f^2 = 0.038$), all of which exhibited small to moderate effects. Likewise, Environmental Concern exerted a stronger

influence on Attitude ($f^2 = 0.201$) than Consumer Awareness ($f^2 = 0.142$). These findings indicate that although multiple factors influence purchase intention, consumers' attitudes and behavioural intentions remain the dominant drivers of electric vehicle adoption preferences.

Table 9. Effect Size (f^2)

Relationship	f^2	Interpretation
CA → ATT	0.142	Small–Medium
EC → ATT	0.201	Medium
GI → PI	0.054	Small
CI → PI	0.038	Small
PEB → PI	0.069	Small
ATT → PI	0.131	Small–Medium
PI → AP	0.637	Large

Source: SmartPLS 4 Output.

4.4.6 PREDICTIVE RELEVANCE (Q^2)

The predictive capability of the proposed structural model was assessed using the Stone–Geisser predictive relevance (Q^2) obtained through the blindfolding procedure. Positive Q^2 values indicate that the model has predictive relevance for the endogenous constructs. The results presented in Table 10 reveal that all endogenous constructs recorded positive Q^2 values. Purchase Intention exhibited the highest predictive relevance ($Q^2 = 0.368$), followed by Attitude ($Q^2 = 0.287$) and Adoption Preference ($Q^2 = 0.254$). Since all Q^2 values exceeded zero, the proposed structural model demonstrates satisfactory predictive capability. These findings suggest that the model not only explains consumer behaviour but also possesses adequate predictive accuracy in forecasting electric vehicle adoption preferences among consumers in Gujarat.

Table 10: Stone–Geisser Predictive Relevance (Q^2)

Endogenous Construct	Q^2	Interpretation
Attitude (ATT)	0.287	Medium
Purchase Intention (PI)	0.368	Medium–Large
Adoption Preference (AP)	0.254	Medium

Source: SmartPLS 4 Output.

4.5 SUMMARY OF HYPOTHESIS TESTING

The results of hypothesis testing illustrate that all the proposed direct relationships were supported and statistically significant. Attitude was positively affected by Consumer Awareness and Environmental Concern, and Purchase Intention was positively affected by Government Incentives, Charging Infrastructure, Perceived Economic Benefits, and Attitude. Moreover, Purchase Intention turned out to be the most powerful predictor of the Adoption Preference, which indicates the critical role of behavioural intention in determining the adoption choices of the consumers. The mediation analysis also supported the idea that Attitude is a partial mediator between Consumer Awareness and Purchase Intention, supporting the significance of the positive consumer perceptions in the amplification of awareness to behavioural intentions. Altogether, the empirical evidence serves as a solid confirmation of the developed conceptual framework and can present valuable evidence on the factors that influence the adoption of electric vehicles among consumers in Gujarat.

Table 11: Summary of Hypothesis Testing

Hypothesis	Proposed Relationship	Decision

H1	Consumer Awareness → Attitude	Supported
H2	Environmental Concern → Attitude	Supported
H3	Government Incentives → Purchase Intention	Supported
H4	Charging Infrastructure → Purchase Intention	Supported
H5	Perceived Economic Benefits → Purchase Intention	Supported
H6	Attitude → Purchase Intention	Supported
H7	Purchase Intention → Adoption Preference	Supported
H8	Consumer Awareness → Attitude → Purchase Intention (Mediation)	Supported (PartialMediation)

5. Discussion

The current experiment used a Structural Equation Modelling (SEM) to analyse the determinants of consumer preferences towards electric vehicles in Gujarat. The results show that consumer awareness, environmental concern, government initiatives, charging infrastructure, perceived economic benefits and attitude are important factors that affect the level of purchase intention and adoption preference by consumers. On the whole, the suggested conceptual model is effective in offering a behavioural mechanism, to which awareness is converted into real adoption preferences. The results endorse the H1, which states that consumer awareness is a key factor in promoting the attitude towards electric vehicles. Customers with more information about EV technology, environmental advantages, and functionality will tend to have positive attitudes towards electric vehicles. This result is consistent with the findings of Asadi et al. (2021) and Li et al. (2022), who have stated that awareness is a key determinant of sustainable mobility uptake.

The substantial impact of environmental concern on attitude (H2) indicates that consumers with environmental concern have more positive evaluations of electric cars. The increasing awareness of the problem of climate change and air pollution seems to prompt consumers to think about environmentally friendly transportation options. This result corresponds with the study by Rezvani et al. (2015) and Singh et al. (2020), who also found the environmental values as the significant factors of EV acceptance. The findings also indicate that purchase intention is greatly affected by government initiatives, charging infrastructure, and perceived economic benefits (H3–H5). Government incentives will lower the financial barriers related to EV ownership, and a better charging infrastructure will increase consumer confidence in the usability of their vehicles. Similarly, perceived economic savings in the long-term have a positive impact on the willingness of consumers to buy an electric car. The results align with the earlier research conducted by Bansal et al. (2021) and Dong et al. (2019), which underlines the role of supportive policy actions and the development of infrastructure in advancing the adoption of EVs.

Attitude toward electric vehicles was one of the most powerful predictors of purchase intention among all other determinants of purchase intention (H6). Consumers with a positive attitude are far more apt to demonstrate a desire to buy electric vehicles. The fact supports the assumptions of the Theory of Planned Behaviour, which suggests that attitudes are the key factor in determining behavioural intentions. Moreover, purchase intention exhibited the greatest positive impact on adoption preference (H7), which validates the fact that behavioural

intention is the immediate antecedent of adoption behaviour. It was also found in the mediation analysis that consumer awareness and purchase intention are partly mediated by attitude (H8). It means that awareness is not enough to arouse purchase intention unless it makes a contribution to the formation of positive attitudes of the consumer. Thus, the awareness campaigns must not merely be used to spread information but also to increase the confidence of consumers in the feasibility, affordability, and environmental friendliness of electric cars. In general, the paper has indicated that to speed up the process of electric vehicle adoption in Gujarat, a mix of consumer education, favourable government policies, better charging systems, and effective communication strategies promoting positive consumer attitudes is needed. These results can be useful to policy makers, automobile manufacturers and marketers who want to hasten the shift of India to sustainable mobility.

6. Conclusion

The research examined the factors that affect consumer preference towards electric vehicles in Gujarat through the incorporation of consumer awareness, environmental concern, government initiatives, charging infrastructure, perceived economic benefits, attitude, purchase intention, and adoption preference in a Structural Equation Modelling framework. The empirical results established the fact that all the hypothesised relationships are statistically significant, which indicated that consumer awareness and environmental concern have a positive effect on attitudes, whereas government initiatives, charging infrastructure, perceived economic benefits, and attitude have a significant indirect effect on purchase intention. In its turn, purchase intention has turned out to be the most powerful predictor of adoption preference.

The research adds to the body of literature on electric vehicle adoption by offering a comprehensive framework explaining how the combination of cognitive, environmental, economic, and infrastructural influences affects consumer behaviour. The results also generalise the use of the Theory of Planned Behaviour by showing that attitude mediates the conversion of awareness into purchase intention. In pragmatic terms, the findings indicate that the policy makers must increase monetary incentives, increase charging networks, and carry out awareness initiatives that underscore the economic and environmental benefits of electric cars. Likewise, the automobile companies are advised to emphasise consumer education, effective communication, and extended after-sales services to enhance consumer trust and hasten the EV market acceptance.

Despite the valuable insights of the study, it focuses on consumers in Gujarat and has a cross-sectional research design. Future research can build upon the model by adding the variables of psychological, technological, and social influence and comparing various states or regions and using longitudinal designs to investigate the transformation of consumer behaviour over time. These studies would also contribute to the knowledge base on the adoption of electric vehicles in the Indian context. This research will be used to predict the current literature by extending the Theory of Planned Behaviour (TPB) to understand the adoption of electric vehicles based on the combination of consumer awareness, environmental concern, government initiatives, charging infrastructure, perceived economic benefits, attitude, purchase intention and adoption preference. The results support the argument that cognitive and contextual factors play a significant role in the decision-making of consumers to adopt EVs, thus offering a holistic model to study EV adoption in Gujarat. In practical terms, the findings imply that the policy-makers must intensify the awareness campaigns, increase the charging infrastructure and maintain the financial incentive programmes in order to promote EV uptake. Manufacturers and marketers of automobiles ought to focus on the environmental and economic advantages of EVs and strengthen consumer confidence by communicating with and assisting the customers. Irrespective of these contributions, the study has its limitations in a cross-sectional design and geographical boundaries in Gujarat that can impact the generalisability of the research. Future studies need to use longitudinal designs, incorporate other behavioural variables like social influence and perceived risk, and compare studies of various states in India that would give more extensive information on the adoption of electric vehicles by consumers.

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