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DETERMINANTS OF ELECTRIC VEHICLE PURCHASE INTENTION AMONG CONSUMERS IN ERNAKULAM DISTRICT

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SUMMARY

The use of electric vehicles (EVs) is rapidly changing due to the rising environmental issues and the shift to the system of sustainable transportation, which includes factors such as government incentives, advancements in battery technology, and increasing consumer awareness about climate change. This paper looks at the factors that affect the intention of consumers to buy EVs in the Ernakulam District, Kerala. The research design adopted was a descriptive research design, which involved the use of a self-structured questionnaire to gather primary data from 432 respondents using purposive sampling. Data that was collected was measured through the use of statistical software like SPSS and AMOS that included reliability analysis and Structural Equation Modeling (SEM). The findings also show that the proposed model accounts for a significant percentage of purchase intention ($R^2 = 0.58$), which is a good indicator of explaining the purchase intention. Among the determinants, purchase price and government incentives have the largest effects, with the standardized path coefficients being significant. The consumer intention is also positively influenced by the environmental concern as people become more aware of sustainability. Also, performance and design play moderately in terms of adoption. Nevertheless, the lack of charging infrastructure and high upfront price become one of the significant obstacles to consumer readiness to use EVs. The reliability analysis shows that there is a good internal consistency of all constructs, with the values of Cronbach's alpha being between 0.749 and 0.883. The good fit of the framework is further justified by the model fit indices that portray that the framework fits the empirical data. The results underline the necessity of policy measures, such as better subsidies and better charging infrastructure, and lowering costs to speed up the use of EVs. The research can be of interest to policymakers, manufacturers, and marketers in a bid to develop effective tactics that will facilitate sustainable mobility in the emerging markets.

Key words: *electric vehicles, purchase intention, consumer behavior, sustainable transportation, government incentives, charging infrastructure.*

INTRODUCTION

The environmental degradation and the climate change have become issues of serious concern, and thus, sustainable transportation systems have become very important in the world. The transportation industry is a significant source of greenhouse gases and air pollution, the cause of which is mostly the high level of consumption of the traditional vehicles with internal combustion engines. Consequently, the Electric Vehicles (EVs) have been developed as an option, which have lower emissions and better energy efficiency. Governments and policymakers around the world are actively stimulating the adoption of EVs by offering financial incentives, regulatory assistance, and charging infrastructure investments in order to speed up the process of moving toward cleaner mobility [17][21].

The trend toward electric mobility has become a strong force in India with a number of national and state-level efforts. Some policies including subsidies, tax exemptions, and infrastructure development programs have been put in place to meet the high targets of EVs. These programs are meant to improve affordability and accessibility with a solution to the environmental issues with regard to the traditional cars. The creation of supporting ecosystems, such as charging infrastructure and technology, is also important in supporting this shift [8][7].

The economic, environmental, and behavioral factors have been found to combine in order to make the decision to adopt EVs. The interest in sustainability and environmental awareness has also been cited as a high motivation that causes consumers to prefer EVs. Those who are more conscious of the environment will be more willing to use environmentally friendly technologies, as view EVs as a solution to decreasing their carbon footprint [24]. Further, the economic factors, including the cost of purchasing a product, saving in operation, and incentives provided by the government, play a major role in affecting the choices of consumers.

The increased popularity of EVs, a number of obstacles still exist that impede the popularization of EVs. Initial high expenses, inadequate recharging network, range anxiety, and perceived technology risk are some of the major issues that affect consumer reluctance. Research suggests that subjective risk and uncertainty about performances and reliability may adversely influence the purchase intention, especially in the case of the potential first-time users [18]. Consumer attitudes to EV adoption are also determined by regional factors like infrastructure availability, the level of awareness, and the socio-economic status.

In India, especially in such states as Kerala, EV adoption is at an early stage, which depends on the facilitating factors as well as the current limitations. Knowledge of consumer behavior and determination of the most important factors that drive the purchase intention are critical in the formulation of effective policies and strategies to enhance the adoption of EVs. Thus, the given work attempts to analyze the variables that influence the consumer purchase intention of electric vehicles in the State of Kerala and, in particular, in the Ernakulam District.

Statement of the Problem

Over recent times across the globe, people have begun to pay more attention to the state of nature, the saving of resources such as electricity, and the minimization of environmental impact caused by global warming, which stimulated the development of electric car use in recent years. Just like in other regions of the Ernakulam region of the Indian state of Kerala, there has been a sluggish development towards the use of ICE vehicles and the implementation of EVs. The move to electric vehicles is based on many aspects, such as the awareness of the same, the prices of purchasing an electrically powered car, the existence of charging stations, the technological developments required, and also the environmental issues. Nonetheless, the written material that deals with those issues regarding consumer behavior is lacking in Ernakulam at the moment. Particularly, the study will examine the most significant factors that will have an impact on the adoption of electric cars in the Ernakulam area. Therefore, the research aims at addressing a gap that is present in the consumer behavior of electric vehicles by offering policymakers, manufacturers, and advertisers' strategic advice on the uptake of EVs in the region.

Scope of the Study

This paper will focus on examining the background conditions of EV technology adoption in Ernakulam District, Kerala. It looks at various aspects of consumer behavior, among them being environmental consciousness, economic factors, technological attitudes, the impact of government policies, and the availability of infrastructure. The research offers an in-depth analysis of the variables influencing the purchase intention of EVs and the factors that inhibit it with the help of a systematic empirical method based on survey data and sophisticated statistical tools like structural equation modeling (SEM).

The main value of this study is that it can be taken as a region-specific analysis that can provide practical recommendations to policymakers, manufacturers, and marketers. It also discusses the relative significance of the key factors like the price, government incentives, and environmental concern and also the limitations of charging infrastructure and start-up investment costs. The results are useful in theory development and practical strategic development in enhancing the adoption of EV in other emerging market environments.

The rest of the paper has been organized in the following way. The section 2 is the review of the literature on the adoption of EV and consumer behavior. This section 3 succeeded by the research methodology that includes the study design, the methods used in the collection of data, and the methods used in the analysis. The section 4 will be a discussion of the findings and results obtained in the statistical analysis, which include reliability and structural modeling results. The section 5 paper ends with some major insights, policy implications, and recommendations. Lastly, the section 6, will be suggest the overall results and the future implementations.

REVIEW OF LITERATURE

The adoption of Electric Vehicles (EVs) has received massive scrutiny in the behavioral, economic, technological, and policy-based approaches. The theoretical framework of consumer intention is based on the behavioral theories, including the Theory of Planned Behavior, and explains how attitudes, subjective norms, and perceived behavioral control have an impact on making a purchase [1]. This framework has been widely used in the context of EV adoption to learn the intention and decision-making behavior of consumers.

This is what it is; some studies highlight the importance of the socioeconomic and macroeconomic factors in the adoption of EV. A detailed analysis of the European countries revealed that the impact of urbanization, education level, saving rate, and GDP per capita on EV adoption is massive, in other words, economically developed and educated individuals are more eager to embrace sustainable mobility [22]. Likewise, research studies represent the Indian population and prove that the level of income, education, and environmental awareness are the crucial factors that affect the EV adoption behavior [8][9].

The government policies and incentives are instrumental in increasing the adoption of EVs faster. A study in Jordan focuses on using tax cuts, no registration fees, and money as a way to boost consumer acceptance of EVs, but priced at a high initial cost, and not everyone knows about them, which are the primary obstacles [23]. According to this, the research on the policy basis in China indicates that the consumer adoption behavior is heavily influenced by regulatory framework, subsidies, and infrastructure investment [17]. A sustainable supply chain and working with vendors have also been found to be important facilitators to the EV ecosystem, especially in emerging markets like India [7].

There are several psychological and technological factors that determine the perception and behavioral intention of consumers to EVs. Research has shown that purchase intention is highly influenced by willingness to pay, environmental situation awareness, perceived risk, and product features, for which environmental concern is a positive influential factor [24]. The cross-cultural studies also confirm that perceived usefulness, social influence, and environmental values have an impact on the consumer intention [18]. The Indian region is no exception, as the research studies in the region, like in Kerala, point to the concept of environmental awareness, financial accessibility, and infrastructure preparedness as influencing EV adoption [13][19].

The innovation and technological progress also contribute to the EV adoption. Digital transformation and innovation with sustainability have been singled out as factors that were relevant in promoting consumer acceptance of eco-friendly technologies [26]. Still, the problem of battery life, the charging stations, and the stability of the technology is a challenge [10][11]. Bibliometric studies demonstrate that there is an increased interest in the adoption of EVs on a worldwide level, and the inclusion of technological, environmental, and behavioral approaches is essential [12].

There is also a household behavior and usage pattern that affects the EV adoption. Research in developed economies shows that EVs tend to be secondary vehicles in multi-vehicle households; the income and education levels have a strong impact on the ownership habits [25]. More adoption rates are also promoted by workplace policies, leasing models, and support in organizations. Also, the trends of consumers in emerging countries indicate that affordability, the presence of infrastructure, and perceived long-term value are the key factors influencing adoption [20][14].

In terms of methodology, Principal Component Analysis (PCA) and Structural Equation Modeling (SEM) are the most popular advanced statistical methods of analyzing EV adoption behavior. The application of PCA has been used to determine the most important service quality factors and consumer satisfaction dimensions [2], whereas the SEM-based methods offer strong structures for analyzing the relationships among the latent variables [3]. The latest recommendations are that model fit measures of SRMR, CFI, and RMSEA should be reported to guarantee the validity and reliability of the results [4]. Research that incorporates machine learning methods indicates the increased contribution of data-driven methods to the sustainability and transportation systems analysis [16].

The consumer behavior towards EV adoption is also affected by entrepreneurial and marketing strategies [6]. According to empirical evidence, innovative marketing strategies and quality of services have strong influence on customer loyalty and intention to adopt [5]. The new studies of the autonomous and sustainable transportation system show that in the future, the technological evolution will keep on transforming the preferences of consumers in terms of mobility [15].

The literature shows that the adoption of EVs is associated with a complex of economical, environmental, technological, and policy-specific aspects. Even though the positive impact of government incentives, environmental awareness, and income level on adoption are positive, the high initial cost of adoption, the inadequate charging infrastructure, and the perceived risk are still considered to be barriers to mass adoption. The wide research done across the world and in the country, micro-level empirical studies in the region, like the Ernakulam District in Kerala, are not done. The present research will fill this gap by offering a localized consumer behavior analysis and establishing the main determinants that affect EV purchase intention.

OBJECTIVE OF THE STUDY

To study the factors that are responsible for the purchase intention of consumers toward Electric Vehicles (EVs) in the state of Kerala, with specific reference to Ernakulam District.

Methodology of the Study

The research design that is applied is the descriptive research design to investigate the factors that affect the intention of consumers to buy electric vehicles (EVs) in Ernakulam District, Kerala. The descriptive design suits well because it allows examining the consumer perceptions, attitudes, and behavioral intention to adopt EVs in a systematic manner.

Sampling Design and Data Collection

The primary data gathered through a structured questionnaire forms the foundation of the research work. The purposive sampling method was adopted in choosing respondents that are already using EVs or those that may engage in the use of EVs to allow relevance to the research objectives. The last sample will consist of 432 respondents from Ernakulam District.

The questionnaire used to collect data was a self-designed one that included a five-point Likert scale starting with Strongly Disagree (1) up to Strongly Agree (5). The questionnaire was designed in such a way that it could elicit responses in various dimensions that affect the purchasing of EVs.

RESEARCH MODEL

The research model is constructed to study the major factors that affect consumer purchase intentions for electric vehicles (EVs) in the Ernakulam District. According to literature and theories developed in the past, the model recognizes five significant independent variables that can have a serious influence on EV adoption behavior.

The model employs the following independent variables:

- Price (PR): The affordability of EVs, both initial cost and maintenance cost, and financial incentives.
- Environmental Concern (EC): Refers to the extent of awareness and concern about environmental sustainability and a decrease in carbon emissions.
- Performance and Design (PD): It incorporates performance, battery, looks, and technology.
- Charging Infrastructure (CI): Means the accessibility, convenience, and availability of EV charging systems.
- Government Incentives (GI): The government gives subsidies, tax incentives, and policy incentives to promote the adoption of EVs.
- It is proposed that the following variables will impact the dependent variable:
- Purchase Intention (PI): The propensity or the readiness of the consumers to buy electric vehicles.

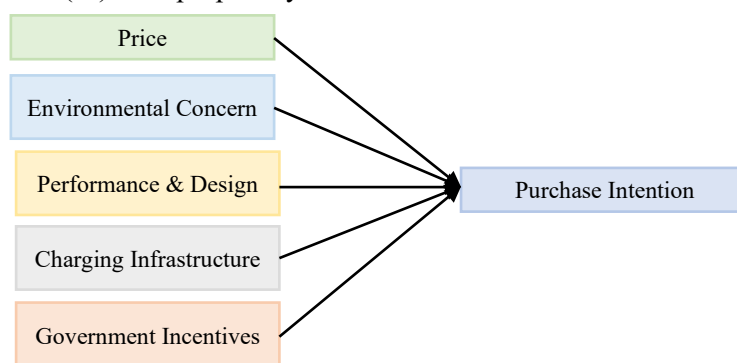


Figure 1. Proposed research model: determinants of purchase intention of EVs (EVs)

The intention of buying an electric vehicle (EV) is presented in figure 1 as the crucial variable in the rest of the story. These are the most pronounced of the five factors: price, environmental concern, performance and design, charging infrastructure, and government stimulus. This model examines the forces and the barriers to EV adoption.

Analytical Tools and Techniques

The current research uses both descriptive and inferential statistics to understand the data obtained during the study with the respondents. The SPSS (Statistical Package of the Social Sciences) and AMOS (Analysis of Moment Structures) were used to analyze, making the results accurate and reliable.

Descriptive Statistics

The demographic characteristics of the respondents were summarized, and general tendencies in consumer attitudes toward electric vehicles (EVs) were identified using descriptive statistical tools, such as the mean, standard deviation, and frequency distributions.

Reliability Analysis

Cronbach's alpha was used to assess the scale's internal consistency. A value higher than 0.7 indicates good reliability of the constructs used in the study.

Confirmatory Factor Analysis (CFA)

Measuring CFA using AMOS was to confirm the measurement model and verify whether there is a relationship between the observed variables and the latent constructs of the model, i.e., price, environmental concern, performance, design, charging infrastructure, and government incentives.

Structural Equation Modeling (SEM)

The hypothesized relationships of independent variables and the dependent variable (purchase intention) were tested using SEM. The technique is used to analyze both direct and indirect effects simultaneously, providing a complete picture of the model.

Model fit Indices

To determine the goodness of fit of the model several fit indices were taken into consideration, among which include:

- Chi-square (χ^2)
- Comparative Fit Index (CFI)
- Root Mean Square Error of Approximation (RMSEA)
- Standardized Root Mean Square Residual (SRMR)

The threshold values are acceptable, indicating that the proposed model is adequate and valid.

It has been demonstrated using SPSS and AMOS, sophisticated CFA and SEM methods, which provide a strong, scientifically proven analysis of the factors affecting the intention to buy EVs.

Algorithmic Procedure

This paper follows an orderly, systematic process to examine the factors that determine the purchase intention for electric vehicles (EVs). The algorithmic procedure of the research follows the following steps:

Step 1: Problem Identification

Determine the central research problem, i.e., the factors that affect consumers' purchase intention for EVs in Ernakulam District.

Step 2: Literature Review

A review of existing studies should be conducted to identify the relevant variables, including Price, Environmental Concern, Performance and Design, Charging Infrastructure, and Government Incentives.

Step 3: Model Development

Formulate a conceptual research model to determine the interrelationships among the independent variables and purchase intention.

Step 4: Questionnaire Design

Construct a structured questionnaire using a five-point Likert scale to gauge responses for each construct.

Step 5: Sampling Design

Use purposive sampling to select respondents who are EV users or potential users.

Step 6: Data Collection

Gather first-hand information on 432 respondents in Ernakulam District.

Step 7: Data Preprocessing

Screen the collected data for:

- Missing values
- Incomplete responses
- Outliers

Step 8: Reliability Testing

Use Cronbach's Alpha to check the internal consistency of the measurement scales.

Step 9: Factor Analysis

Carry out Confirmatory Factor Analysis (CFA) to confirm the measurement model and construct validity.

Step 10: Model Estimation

AMOS Structural Equation Modeling (SEM) is used to estimate relationships among variables.

Step 11: Model Fit Evaluation

Measure the model's fitness using the indices CFI, RMSEA, and SRMR.

Step 12: Hypothesis Testing

Determine whether there are significant relationships between the independent variables and purchase intention.

Step 13: Interpretation and Conclusion

Analyze findings to identify the drivers and obstacles to EV adoption and draw conclusions.

This algorithmic process would also provide a logical, transparent, and replicable research framework, enabling the correct identification of factors affecting EV purchase intention.

Mathematical Model

A linear structural equation is used to model the relationship between the determinants and purchase intention of consumers of electric vehicles (EVs). The dependent variable, Purchase Intention (PI), is calculated from five independent variables: Price (PR), Environmental Concern (EC), Performance and Design (PD), Charging Infrastructure (CI), and Government Incentives (GI).

The mathematical model of the problem is provided in equation (1):

$$PI = \beta_1(PR) + \beta_2(EC) + \beta_3(PD) + \beta_4(CI) + \beta_5(GI) + \epsilon \quad (1)$$

Where:

- PI = Purchase Intention
- PR = Price
- EC = Environmental Concern
- PD = Performance and Design
- CI = Charging Infrastructure
- GI = Government Incentives
- $\beta_1, \beta_2, \beta_3, \beta_4, \beta_5$ = Regression coefficients representing the influence of each independent variable
- ϵ = Error term capturing unexplained variation

Purchase intention is considered as a linear mix of the five determinants, as will be seen in equation (1). All the coefficients (β) indicate the size and direction of the effect of the respective variables on EV purchase intention. A positive coefficient indicates a direct correlation, and a negative coefficient indicates an inverse correlation.

The mathematical model is a quantitative framework for analyzing the effects of key determinants on EV adoption behavior and serves as the foundation for empirical testing using Structural Equation Modeling (SEM).

RESULTS AND DISCUSSIONS

Dataset Details

The research is based on primary sources, comprising 432 respondents from Ernakulam District, who were interviewed using a structured questionnaire. The dataset includes:

- Demographic Variables: Age, Gender, Marital Status, Occupation, Income, Education, Location.
- Price (PR), Environmental Concern (EC), Performance and Design (PD), Charging Infrastructure (CI), Government Incentives (GI), and Purchase Intention (PI) are the construct variables.
- Measurement Scale: 5-point Likert scale

Software Details

The analysis was carried out using the following tools:

- SPSS (Version 26) – For descriptive statistics and reliability analysis
- AMOS (Version 24) – For Confirmatory Factor Analysis (CFA) and Structural Equation Modeling (SEM)

The table 1 provides the demographic distribution of the respondents. Among other age groups, the 18-40-year-olds will be most inclined to adopt and use innovations and substitutes, including electric vehicles (EVs). As the majority of respondents 61.1% are males, compared to the 38.9% who are females, one can assume, or rather deduce, that decision-making regarding vehicle purchases is chiefly in the hands of males. The percentage of 59 respondents who are married suggests that acquiring a vehicle can be an outcome of a couple's joint financial plan. The same argument applies to the respondents' occupations. The percentage of private-sector employees and students is 30.6, indicating that EV use depends on employment status, organizational attitudes, and overall employment attitudes. 40.3% of respondents stated that their incomes are less than ₹ 50,000 per year, which supports the idea that economic constraints remain a significant issue.

Table 1. Demographic profile of the respondents

Variables	Frequency	Percent	
Age (in Years)	18-25	192	44.4
	26-40	144	33.3
	41-50	45	10.4
	51-60	27	6.3
	Above 60	24	5.6
	Total	432	100.0
Gender	Male	264	61.1
	Female	168	38.9
	Total	432	100.0
Marital Status	Married	255	59.0
	Unmarried	177	41.0
	Total	432	100.0
Occupation	Govt.	93	21.5
	Private	132	30.6
	Business	42	9.7
	Student	132	30.6
	Others	33	7.6
	Total	432	100.0
Annual Income (₹)	Less than 50,000	174	40.3
	50,001-2,00,000	54	12.5
	2,00,001- 3,50,000	57	13.2
	3,50,001- 5,00,000	63	14.6
	Above 5,00,000	84	19.4
	Total	432	100.0
Educational Background	PG	144	33.3
	UG	231	53.5
	+2	42	9.7
	Others	15	3.5
	Total	432	100.0
Location	Rural	105	24.3
	Semi-Urban	186	43.1
	Urban	141	32.6
	Total	432	100.0

(Source: Computed data)

At the same time, 19.4 % of respondents with annual incomes above ₹ 500,000 indicate that these potential customers will form the market for premium EVs. The educational credentials are rather high, and 86.8% of the surveyed individuals are graduates and postgraduates, reflecting the population's greater interest in the environment and the need to adopt sustainability. The largest percentage of respondents is semi-urban (43.1%); then, the city (32.6%); and then the village (24.3%).

Table 2. Reliability statistics

Variables	Cronbach's Alpha
Price	0.749
Environmental Concern	0.831
Performance & Design	0.803
Charging Infrastructure	0.794
Government Incentives	0.883

(Source: Computed data)

The table 2 shows that Cronbach's alphas ranged from 0.749 to 0.883, indicating high internal consistency across all constructs. The highest reliability score, 0.883, is for Government Incentives, indicating high consistency in respondents' responses on this aspect. The aforementioned Environmental Concern 0.831, Performance and Design 0.803, and Charging Infrastructure 0.794 also meet the reliability requirement, which is why the measures for these constructs are reliable. The reliability under analysis concerns the scales characterizing the key variables influencing the intention to purchase an EV, for which respondents provided reliable responses and can therefore be used in more in-depth analyses.

The purchase of electric vehicles (EMs) involves considering behavioral responses within the Structural Equation Modeling (SEM) framework. The frame model includes five independent variables: concern and price, and concern about the environment. The Structural Equation Modeling (SEM) method is intended to measure the specified variables and their influence on the specified decision-making behavior of consumers.

Parameter Initialization

In the present research, a Structural Equation Modeling (SEM) analysis was performed using the Maximum Likelihood Estimation (MLE) approach in AMOS. This model was instantiated using a sample of 432 respondents and had five latent independent variables: price, environmental concern, performance and design, charging infrastructure, and government incentives, and one dependent variable, purchase intention. All the variables were measured on a five-point Likert scale and pre-analyzed by using standardization. It was determined that the significance level was 0.05, and default error terms were assigned to each observed variable to account for the unknown variance. The software automatically estimates the initial parameter values for factor loadings and path coefficients, which are guaranteed to converge and keep the model stable as it is estimated.

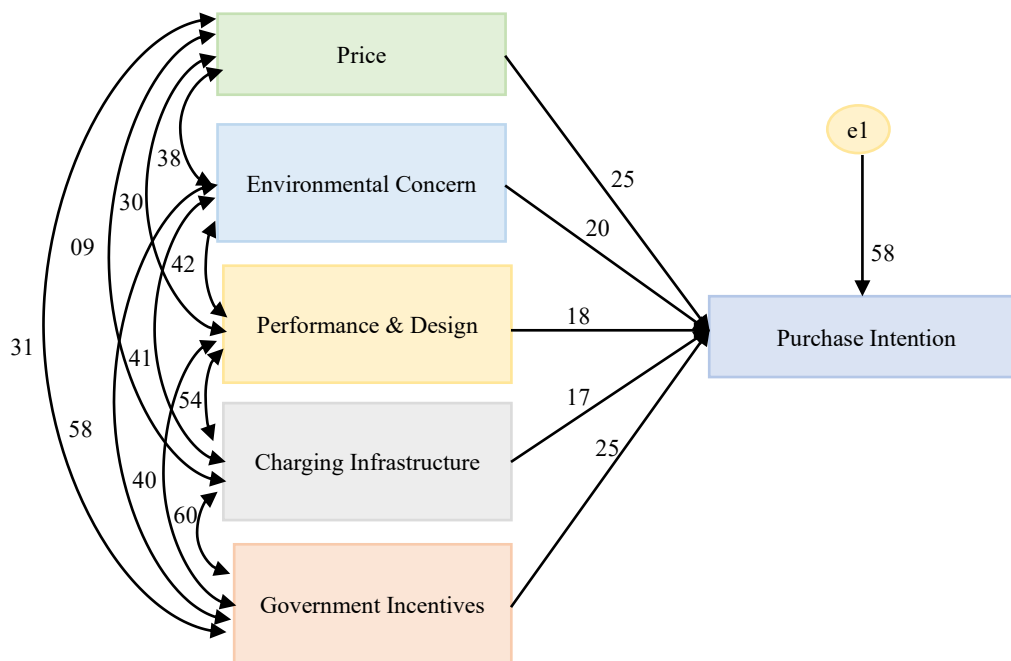


Figure 2. Purchase intention of electric passenger vehicle. sale of EV

Figure 2 illustrate the Kerala consumer model on EV purchase intention suggests that, in terms of supply-side government support and purchase price, both are parallel, with standardized path coefficients of 0.25. Monetary reward conditioning on the purchase price is the most instrumental part of the decision. The purchase intention model explains 58% of consumer purchase intention for EVs ($R^2 = 0.58$). In other words, the model substantiates and shows the explanatory power in the variance. The fundamental purpose of the model is to provide a far more accurate slice of the underlying relationships. EV expenditure restrictions are the main variables, so environmental concern and other toned-down elements, like make and infrastructure, are auxiliary.

The arguments supporting sponsorship pricing policies, public incentive policies, and the necessary infrastructure to promote public education for instructors, as well as marketing strategies targeting economically disadvantaged segments of the social pyramid and the adoption of EVs by low- and middle-income residents of Kerala, are well-founded. The table 3 presents the results of the Goodness of Fit test for the model, which shows the following values:

Table 3. Result of the goodness of fit test for determinants of purchase intention of EVs in kerala

Fit Indices	CMIN/DF	P	AGFI	GFI	CFI	NFI	RMSEA	TLI	RMR
Model Value	1.753	0.0773	0.911	0.903	0.958	0.916	0.0432	0.973	0.031
Suggested Value	≤ 3	> 0.05	> 0.9	> 0.9	> 0.95	> 0.9	< 0.06	> 0.95	≤ 0.10

(Source: Computed from primary data)

The combined fit indices for the model components indicate that the basic model, in terms of the causal elements of intent to purchase an EV in Kerala, fits the real-world data only fairly; in other words, the model fit is reasonable to excellent. These results indicate that the hypotheses identified in the model are, to a large extent, empirically confirmed, thereby significantly advancing the theory regarding consumer purchase intentions for EVs in Kerala.

Performance Metrics and Formulae

To address the sufficiency and predictive ability of the proposed Structural Equation Model (SEM), several goodness-of-fit and performance measures were used. These measures help evaluate the similarity between a model and the observed data and confirm the association between variables.

A coefficient of determination (R^2) is used to determine the percentage variance of the dependent variable that is accounted for by the independent variables. It is defined as below in equation (2):

$$R^2 = 1 - \frac{SS_{res}}{SS_{tot}} \tag{2}$$

A higher R^2 value indicates greater model explanatory power.

Root Mean Square Error of Approximation ($RMSEA$) is used to assess the model's fit to the population covariance matrix. It is expressed as in equation (3):

$$RMSEA = \sqrt{\frac{\chi^2 - df}{df(N - 1)}} \tag{3}$$

Lower values of $RMSEA$ (less than 0.06) indicate a good fit for the model.

The Comparative Fit Index (CFI) is used to compare the proposed model with a baseline model, as shown in equation (4):

$$CFI = 1 - \frac{\chi_{model}^2 - df_{model}}{\chi_{baseline}^2 - df_{baseline}} \tag{4}$$

The model fit is excellent, with a CFI that is above 0.95.

Normed Fit Index (NFI) is a measure of the relative improvement of the proposed model over the null model as follows equation (5):

$$NFI = \frac{\chi_{baseline}^2 - \chi_{model}^2}{\chi_{baseline}^2} \tag{5}$$

Values exceeding 0.90 indicate an acceptable fit.

The Non-Normed Fit Index is also referred to as the Tucker-Lewis Index (*TLI*), which corrects the model complexity and is expressed as in equation (6):

$$TLI = \frac{\chi_{baseline}^2/df_{baseline} - \chi_{model}^2/df_{model}}{\chi_{baseline}^2/df_{baseline} - 1} \quad (6)$$

A *TLI* of above 0.95 is an excellent fit.

These measures, as demonstrated in Equations (2) to (6), all determine the rate of reliability, validity, and overall performance of the proposed model, such that the structural associations are statistically sound and significant.

Performance Evaluation

Five important fit indices are used to assess the performance of the proposed structural equation model (SEM). The results are presented in table 4.

Table 4. Performance evaluation of the model

Metric	Model Value	Threshold Value
R^2 (Coefficient of Determination)	0.58	> 0.50
<i>CFI</i> (Comparative Fit Index)	0.958	> 0.95
<i>RMSEA</i> (Root Mean Square Error of Approximation)	0.0432	< 0.06
<i>NFI</i> (Normed Fit Index)	0.916	> 0.90
<i>TLI</i> (Tucker-Lewis Index)	0.973	> 0.95

The table 4 shows that all performance measures are within the suggested threshold values, indicating that the proposed model is highly reliable and valid. The R^2 of 0.58 indicates that the model explains a significant share of variance in purchase intention. In contrast, the *CFI* and *TLI* values, along with the low *RMSEA*, indicate that the overall model fits perfectly.

Ablation Study

The comparative significance of each determinant in the model was assessed by sequentially eliminating variables through ablation analysis.

1. Removal of Price and Government Incentives: The deletion of these factors led to a significant reduction in the model's explanatory power (R^2), indicating that economic variables and policy support are the most significant factors in the intention to purchase an EV.
2. Removal of Environmental Concern: Removing the environmental concern moderately impacted model performance, indicating that sustainability awareness does influence adoption, but not as strongly as financial factors.
3. Removal of Performance, Design, and Charging Infrastructure: The elimination of these variables showed a low impact on the model, i.e., support but are not determinants of purchase intention.

DISCUSSION

The research results provide valuable insights into the variables that affect consumers' intention to purchase electric vehicles (EVs) in Kerala. The findings show that the most important determinants of EV adoption are the economic factors, especially the price and government incentives. The strong effect of these variables indicates that customers are highly sensitive to EVs' initial costs and rely on financial support instruments, such as subsidies and tax benefits. This aligns with the general trend in developing economies, where affordability is key to technology adoption.

Another finding of the study is that the purchase intention is positively associated with environmental concern; however, the effect is rather moderate. The result shows that consumers are aware of environmental issues and sustainability, but this knowledge is insufficient to drive purchases without economic viability. That is, environmental consciousness is more of a supporting factor rather than a driving factor.

Besides, the influence of performance, design, and charging infrastructure was determined to be relatively low on purchase intention. This means that consumers can better understand these factors over time, or may not be viewed as cost-related barriers. The successful long-term adoption and customer trust also hinge on the availability of proper charging systems and innovations in vehicle functionality, as these directly address consumers' concerns about performance and design, ultimately influencing their purchase intentions.

The model's ability to explain consumer behavior in EV selection ($R^2 = 0.58$) indicates that the adopted variables capture a substantial portion of it. Also, the measures of goodness of fit indicate that the proposed model is statistically sound and appropriate for fitting the empirical data.

In general, the paper has pointed out that the facilitators of EV adoption in Kerala are financial accessibility and policy support, whereas environmental awareness and technological factors are complementary. These findings underscore the need for measures that address affordability, incentives, and infrastructure development to accelerate the transition to sustainable mobility.

Suggestions

- The government should provide additional subsidies, tax-free credits, and interest-free credits for EV purchases.
- Increase battery innovation to enable electric vehicles (EVs) to have a larger range and charge more quickly.
- Adopt policies that are comfortable, e.g., allocated parking, free tolls, and EV-only highways.
- Offer car dealerships that sell EVs highly qualified, knowledgeable employees to help sell electric cars. Also offer promotional discounts and easy loan options to appeal to first-time EV buyers.

CONCLUSION

The present study was a systematic examination of the factors influencing consumers' buying decisions for electric vehicles (EVs) in Ernakulam District, Kerala. The results indicate that economic factors, especially price and government incentives, are the primary drivers of consumer preferences. The results of the Structural Equation Model (SEM) indicate that the proposed model explains 58% of the variance in purchase intention ($R^2 = 0.58$), demonstrating high explanatory power and supporting the effectiveness of the chosen determinants. Concern regarding the environment was also identified as positively, albeit moderately, affecting adoption, implying that, as consumers become more aware of sustainability and carbon emissions, this awareness does not make adoption financially viable. Performance and design, such as driving range, speed, comfort, and aesthetics, are other issues that consumers prefer, but their influence is not as great as that of economic factors. The availability and accessibility of charging infrastructure are critical factors in alleviating range anxiety and reducing consumer mistrust in EV adoption. Government assistance through subsidies, tax incentives, and other financial incentives goes a long way toward lowering vehicle costs and serves as a major facilitator of EV adoption. The research notes that the shift to electric mobility can be rapidly accelerated by targeted policies, particularly those focused on low- and middle-income audiences. Moreover, it is necessary to extend the charging infrastructure along the highways and commercial and residential zones to overcome the practical obstacles and increase the rate of adoption, as these measures will ensure that potential EV users have convenient access to charging stations, thereby alleviating range anxiety and encouraging more individuals to switch to electric vehicles. In general, the paper has found that the main factors include affordability and policy support. In contrast, environmental awareness and technological factors are complementary and can enhance the effectiveness of the primary factors in promoting the adoption of electric mobility.

Scope for Future Research

The Influence of Charging Infrastructures on EV Adoption in Ernakulam District

Whether the availability, accessibility, and efficiency of charging stations affect consumers' purchase intentions for electric vehicles in Ernakulam district could be the focus of a research study. Some issues include the geographic distribution of charging stations, users' perceptions of the time and effort required to charge, and several other policies aimed at improving charging station infrastructure. Such studies in areas with a relatively high EV adoption rate would be highly valuable for strategy planning.

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