

# “Perception on Electric Cars and Driving Forces Towards Shift to Electric Cars among Potential Consumers - A Study in Bengaluru”

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## ABSTRACT

This study examines the perceptions surrounding electric vehicles (EVs) and the principal factors driving the transition towards these vehicles among potential consumers in Bengaluru. As India advances towards sustainable mobility, it is imperative to comprehend consumer attitudes to facilitate the effective adoption of EVs. Utilizing surveys and interviews conducted with a variety of demographic groups in Bengaluru, the research highlights key motivators such as environmental concerns, savings on fuel costs, government incentives, and technological innovations. However, it also notes that challenges like insufficient charging infrastructure and range anxiety persist. The findings aim to offer insights for policymakers, manufacturers, and stakeholders to accelerate the EV transition in urban India.

**Keywords:** Electric Vehicles, Sustainability, Environmental Concerns, Driving Range, Consumer Buying Behavior.

## INTRODUCTION

The survival and well-being of every man kind and other leaving creatures depends either directly or indirectly on our natural environment. The population is predictable to reach 9.8 billion by 2050 and the nature should serve the needs of every living creature. The world is experiencing the energy crisis, resources are already becoming depleted, and climate change is happening which is why experts started looking into sustainability as a solution that encompasses life and nature.

Sustainability is defined as taking care not to diminish natural and physical resources while serving currently relevant requirements of human and other living organisms for the future. On a daily basis, sustainability aims to address various environmental challenges like climate change, reduction in biodiversity, ecosystem services, land degradation, as well as the pollution of air and water, among others. Sustainability is centered on the 3 pillars of sustainability namely, economic sustainability, environmental sustainability, and social sustainability.

Conserving factors of economic production, including both renewable and exhaustible resources, while ensuring everyone can secure a livelihood is the focus of economic sustainability. Controlling life the sustaining health and the rate of pollution is the concern of environmental sustainability. The social sustainability concern revolves on the economic impact on human life - trying to alleviating poverty and hunger and securing personal, cultural, and labor rights free from discrimination.

Society can adopt or take steps towards a more sustainable environment in many ways. These ways include the maintenance of ecosystem services, the protection and co-creation of resources, mitigation of food and other natural resources wastage - renewable and nonrenewable alike, promoting research and development in the green technology industry, and the shift towards renewable energy sources, among other initiatives.

With the rapid development in environmental climate change and pollution, various industries including the automobile industry face an increased need for innovative solutions. Focusing on emission reduction in this sector has increased due to the large contribution vehicles make towards the carbon footprint.

EVs are altering commutation and personal transport attitudes. The worsening of fuel climatic conditions along with the growing concern over the carbon footprint diesel and petrol engines emit, gives rise to the need of EVs. Electric vehicles provide the world with a sustainable alternative to gas-powered automobiles. Because they run on rechargeable batteries, these vehicles do not emit any exhaust gases and help the world sustain the environment. Broader nevertheless, EVs have lower fuel operational costs compared to conventional combustion cars. Additionally EVs offer a smooth, quiet ride, good acceleration, and superior energy conversion efficiency. Moreover, the gentle propulsion and recurring driving requirements these vehicles render with the aid of intricate systems such as regenerative braking and sophisticated controls ensures noiseless movement of the cars. Strong emerging demand of Electric vehicles fueled automobile companies to hugely allocate funds for R&D broadening the EV market with different models to cater to different customers. As per the statistics, plug-in electric cars sales reached 10 million in 2022 marking a 1 million increase in sales from 2021 which represented a 9% growth.

The development of electric cars began with the first electric vehicle (EV) constructed in the late 19th century, marking the incorporation of electrification during the Second Industrial Revolution. Anyos Jedlik, a Hungarian priest, was the first known person to create a practically usable electric motor in 1827. In 1828, he built a small car which he powered with that motor. The distinct advantages such as the silence, comfort and ease of operation that came with electric vehicles were not found in gasoline engine cars. However, in the 20th century, the limited energy storage capacities of the batteries led to range anxiety which reduced the mass adoption of EVs. This problem did not affect electricity based transportation which evolved into electric trains, trams, monorails and trolley buses. The 1990s marked an increase in the use of Hybrid Electric Vehicles, but today Plug-In Hybrid Electric Vehicles have become predominant thanks to government incentives promoting the use of EVs for daily mobility with two-wheelers, cars, buses, trucks, and even railways.

### **Three major categories of Electric Vehicle are;**

- **Battery Electric Vehicles (BEVs):** These vehicles run merely on electric power with rechargeable batteries. They scope from scooters to trucks, batteries are usually lithium-ion-based which provide energy to electric motor, which drives the vehicle and does not emit pollutants when driven. These vehicles need to be recharged by plugging into the external source of power, such as charging station, solar, or a regular electrical outlet.
- **Plug-in Hybrid Electric Vehicles (PHEVs):** These vehicles are a blend of both an electric motor and an internal combustibile engine. Compared to the conventional hybrid vehicles, these have larger battery packs which makes use of the electric power allows traveling longer distances. These vehicles can reclaim some energy for the battery while driving or through regenerative braking and also plug into an external electrical source. Once the battery charge depletes, the vehicle will switch into gasoline engine mode automatically or hybrid mode would depend on the engine and the electric motor.

Instead, consumers need to consider adopting the use of Electric vehicles with a more sustainable approach by selecting a renewable energy source for charging the batteries at home and preserving battery longevity. The inclusion of clean energy sources in Electric Vehicles will enhance the mix of renewable energy and help mitigate air pollution and associated health concerns. The government should encourage the use of Electric Vehicles by raising awareness about the sustainable benefits of electric vehicles and the financial incentives while supporting adequate infrastructure development aimed at fostering electric vehicles and creating a sustainable future.

### **Objectives of the Study:**

- Understand the concept of sustainability of Electric Cars
- Assess the customers' awareness on electric cars
- Examine the perception of the customers towards purchase of electric cars
- Identify the factors that promote potential customers shift towards electric cars

## REVIEW OF LITERATURE

Subash Dhar et al., (2016) (1) emphasis on analyzing the function of electric vehicles on Indian Transport System and the outlook demand for electric vehicles in India. The study results by saying; the electric two-wheeler is expected to have a good market by 2050 and comparatively smaller share for electric four-wheeler. The EV push strategy and financial incentives have the potential to increase the adoption of the Electric vehicles by 2030. The study suggests the EVs with Lithium-ion batteries and good driving range and payload capacity would become viable after 2030. Farhan Faisal (2016) (2) emphasis on identifying the driving factors for growth of EVs and proposing a roadmap and business strategies for India to adopt EVs as a solution for sustainable transportation. The major factors discussed in the paper include technological and environmental factors, economic and public policy factors, social and infrastructural factors, etc. The roadmap of paper also discussed about the Government Regulation Challenges, Technology Infrastructure challenges, and Public Transportation and Consumer Acceptance Challenges. The paper suggests that there is an untapped EV market in two-wheeler, three-wheelers, bus, introducing EVs in these markets by aligning it to public transportation system in future will have a positive impact on consumer acceptance, compared to expensive electric cars. R Srikanth (2018) (3) emphasis on the part of electric mobility in sustainable future by highlighting the significance of electric mobility such as reduced emissions and energy security and by proposing strategies for encouraging the acceptance of electric vehicles. The paper reviews various policies, initiatives, and technological advancements related to the electric vehicles in India through government reports, policy documents, and scientific literature. The paper highlights the function of the EVs in achieving National Electric Mobility Mission Plan (NEMMP-2020) and the Paris Agreement. The paper suggests establishing pilot plants to explore essential minerals and recover values from ores and promoting EV adoption through infrastructure development, that helps reach NEMMP goals. Pritam Keshavdas Gujarathi et al., (2018) (4) aims to present the current Indian market scenario and the government initiatives and consumer perception and challenges in EV adoption. The data is collected through both primary and secondary data using surveys, interviews, and existing literature. The paper highlights the government initiatives such as National Mission for Electric Mobility and its objectives; National energy security and growth of EV manufacturing capabilities. It also mentions Mahindra, BMW, Toyota etc., as the major EV manufacturers. The study depicts, the purchase cost would be higher for EVs than combustion engines, however the maintenance cost of EVs is lesser than combustion engine vehicles. The paper suggests, the conversion of conventional engine vehicles to Plug-in hybrid EVs may create a huge market in India. Rachana Vishi et al., (2018) (5) discuss the influence of the Electric vehicles on air pollution in Delhi, it analyzes the changes needed in terms of the environmental and sociological elements. The paper relies on the secondary sources for collecting data relevant to the subject. The paper also focuses on the emission created through battery production process for lithium batteries, including sulfur dioxide, nitrogen oxide, and carbon dioxide. The paper recommends various strategies towards sustainability mobility including, reducing petrol based two-wheeler and four-wheeler usage by encouraging EV usage through subsidies and tax exemptions, create warehouse outside cities and enable only EV transported goods vehicles to enter the city, ban battery manufacturing near New Delhi, fund innovation in battery technology, encourage shared mobility, etc., to encourage better adoption of EVs, reducing the pollution impact on Delhi. Shailendra Kumar et al., (2018) (6) identifies the initial roadblocks and suggest the solutions to scale up the project on a Pan India basis. The data is collected through questionnaire using convenience sampling technique and data analysis tool used is descriptive statistics. The major issues found in the project implementation are bureaucratic hassles in establishing charging stations, high investment, and waiting time for drivers. This paper suggests that pre-booking at charging stations to avoid longer waiting period for drivers. The paper states that practicability of electric vehicles in India depends on charging infrastructure, battery technology, and government policies; hence government should give incentives and charging infrastructure as a promoting factor to EV adoption. Amrut P. Bhosale et al., (2019) (7) focus on understanding the market condition and the public opinion and socio-economic barriers influencing the purchase decision of consumers. The paper uses survey on public opinion to collect the data to forecast the feasibility of electric vehicles. The opinion of the respondents' highlights that the EVs will be a part of the transport segment but will not fully replace the conventional internal combustion engine vehicles. The paper also revealed that the awareness of Battery EVs and Hybrid EVs is high, but should pay attention towards the Plug-in Hybrid EVs. The paper suggests that the new way of charging, such as on-board and wireless technology for charging could reduce the inconvenience for charging and promote EV adoption among the

consumers. Ankush Sharma et al., (2019) (8) focus on the challenges faced by the electrical power distribution network as a result of increase in EVs in major cities in India and suggest solutions to address this issue. The study considers Delhi, Mumbai, Kolkata, Chennai, Bengaluru, and Hyderabad as a sample city for study. The study forecasts the impact of EV on electrical power distribution systems of select cities for the year 2025 and 2030 and reports that even 90% of the vehicles are charged at home in the night time, the system is still overloaded. The paper suggests that proper planning for EV rollout and charging infrastructure is needed to ensure better control on electrical power distribution system. Rupesh Kumar et al., (2020) (9) focus on identifying the challenges in adoption of EV in India by gathering information from experts of focus groups in automotive and EV industry, academia, and regulatory bodies. The study employs a purposive sampling technique to select eleven experts from different focus groups and uses qualitative approach by recording and transcribing the discussions, generating codes, and categorizing them to themes based on the identified challenges. The key challenges identified in the study include cost of battery, price multiples, and power grid challenges. This study suggests the need for addressing various other barriers in EV adoption by using multiple-criteria decision-making (MCDM) approach, such as total interpretive structural modeling (TISM), to obtain interrelations among the challenges and find a resolution to effective adoption of Electric vehicles. Meghana Verma et al., (2020) (10) focus on the key motivating factors and deterrents associated with adoption of electric vehicles in India. The data is collected using questionnaire survey by convenient sampling technique. The study found that awareness on environment and consciousness majorly impact consumers' behavior towards EVs. Financial incentives like government subsidies are the motivating factors, however inadequate charging stations, time consumption for recharging, size, style, brand, and performance of EVs are the major concerns that still exists. The paper suggests government to utilize the social media for promoting EVs awareness among consumers through promoting sustainability. Suparna Pal et al., (2020) (11) discusses the effect of Covid-19 Pandemic on electric vehicle industry and aims to find the future prospects of EVs. The paper is based on the review made on government policies, guidelines, and standards relevant to EVs. The paper highlights the various policies and guidelines given by Ministry of Power in India towards safety, reliability, accessibility, and affordable charging infrastructure to encourage adoption of EV. The author suggests implementation of new methodologies and policies to promote EV adoption, as well as development of EV supply equipment. The paper concludes by saying India has huge potential to become a manufacturing hub for EVs in next five years by encouraging new manufacturers. Pooja Goel et al., (2021) (12) intends to identify and analyze the barriers in adoption of electric vehicle in India through referring various existing literature and it attempts to build the interrelationships among these hindrances to resolve the issues. The collection of data was made through expert opinion and online survey using purposive sampling technique and DEMATEL method is been used to analyze the data. The major barriers to adoption of electric vehicle uncovered in the paper are high costs, lack of charging infrastructure, range anxiety, lack of awareness, and inadequate government policies. The paper also discovered that the barriers are interrelated and addressing a barrier could have a positive impact on other barriers. The paper suggests, the government should offer more financial incentives like tax exemptions and subsidies, to promote the adoption of EVs. The government should also increase awareness on the significance of using EVs and should facilitate proper infrastructure to stimulate EV adoption. Satyendra Pratap Singh (2021) (13) aims to discuss the advantages and threats in promoting the EVs in India, it also discusses the challenges and potential solutions for promoting EVs in India. The data is grounded on secondary sources and has collected information from several academic and industry sources and made analysis on review basis. The advantages discussed include, environmental friendliness, cost-effectiveness, and lower maintenance whereas challenges include, need of reliable power generation infrastructure and power distribution network using Phasor Measurement Units (PMUs) to ensure stability and reliability. The paper suggests, the government policies and initiatives could promote to fight against pollution issues and should focus on building required infrastructure and distribution to support greater adoption of EVs in country. J. Victor Charles (2021) (14) aims to comprehend the consumer perception in Madurai and its influence on purchase intentions. The data is collected using questionnaire by simple random sampling technique. The data analysis is done through path analysis to detect the influence of oil price and gas price on consumer perception towards EV. The study found that increase in price of oil and gas has a significant impact on consumer perception and is acting as a driving force towards faster adoption of EV. The paper suggests to create more awareness on lesser price in EV adoption to promote adoption of EV among potential consumers. S. Paul Sathiyam et al., (2022) (15) emphasis on thorough assessment of prospects and challenges in EV development and deployment, and policy initiatives to reduce greenhouse gas emissions. The data is collected

through various manufacturer websites, government statistics, affiliated survey organizations, and technical reports published online. The paper discussed the competency factors such as affordability, vehicle specification, vehicle performance, etc. It also compares the capital and cost structure of most preferred EVs by various countries and found that China has a greater amount of capital invested on EVs. The paper also talks about the various power transfer modes such as Wireless Charging Power Transfer, Conductive Charging Power Transfer etc. The findings say, Countries charging standards differ and China and Japan together are working to cultivate a new high-power DC fast charging standard “ChaoJi” which is more companionable. The government policies highlighted are the stringent policies of government on fuel economy, emission levels are promoting EVs and the subsidies given, battery capacity etc., are benefits impacting consumer purchase decision positively. The government policy also includes the tax benefits, more public charging stations and additional subsidies putting EVs upfront against traditional combustion vehicles. Nitin Joshi e.t al., (2022) (16) aims to assess the adoption intension of electric vehicles and the government policies and its impact on adoption intension in India. The data collection is through survey questionnaire and uses five-point Likert scale to collect data. The analysis used includes composite reliability, Cronbach’s alpha, and structural equation modeling. The study discovered that government policies have a noticeable role on factors like price, infrastructure requirement, awareness of EV and environmental concerns. The study also found the price has a substantial impact on EV adoption intentions, provided sufficient infrastructure and knowledge of EV. The study suggests government to take measures on creating infrastructure and awareness of EVs leading to positive market to automobile manufacturers. Rajiv V. Shah (2022) (17) aims to study the financial incentives and policies since 2015 under EV policy in India and view through Environmental Policy Framework. The author relays on existing literature by collecting data using purposive sampling to make content analysis. The study uncovered that there are enough financial incentives, but there is a requirement to improve infrastructure and research in battery and the awareness on EV and its benefits on pollution control. It suggests a comprehensive and balanced mix of policy is needed to promote adoption of Electric vehicles in India to reduce pollution and global warming. B.K. Chaturvedi e.t al., (2022) (18) assess the expected evolution to electric vehicles and its impact on the stakeholders. Thematic analysis was used to extract codes, categories, and themes from select literature review from ScienceDirect relevant to Electric vehicles. The study states that projected transition of EVs will have a greater range of impact on Indian economy and the major stakeholders affected would be central and state government, petroleum sector, electricity sector, automobile industry and customers. The study revealed that the government if facing loses due to exemptions, income tax rebates, promotional expenses, etc., on adoption of new electric vehicles. The author suggests government to adopt alternative sources of revenue such as green tax on exploitation of fossil fuels, pollution tax on construction activities, plastic manufacturing, etc. The synergy between petroleum sector, electricity sector and automobile industry could help them easily adopt to this transition and benefit all stakeholders. The high vehicles users like Ola and Uber drivers can be the early adopters of electric vehicles, who then support in reaching the mass market. Abhishek Srivastava e.t al., (2022) (19) analyses the impact of tax and subsidy on the demand for gasoline vehicles and electric vehicles. The paper employs the theoretical modeling and empirical analysis to address the research questions and objectives. The study has computed different models such as tax, subsidy etc., to show its effect on demand for EV and located that it has a major impact on EV adoption. Hence the author suggests the policy makers to make joint policy instrument as a strategy to facilitate faster EV adoption. P. Muthulakshmi e.t al., (2023) (20) discusses the challenges faced by India in adopting electric vehicles and the benefits towards reducing greenhouse gas emissions. The paper reviews various existing literature through purposive sampling technique to select relevant studies. The major obstacles found in the study include infrastructure, promoting research and development in battery technology, and incentives for consumers to adopt EVs. The paper suggests that the India with its intelligence and government assistance can overcome these obstacles and create better market for EVs.

## RESEARCH METHODOLOGY

The study is grounded on questionnaire, gathered from prospective consumers of electric cars in Generation-Z who are considered as the highest potentials of future consumers of cars across Bengaluru. The questionnaire consists of both demographic and descriptive questions, which include 5 Likert Rating Scale ranging from strongly-agree to strongly-disagree.

Simple Random Sampling technique is used for sampling respondents. The respondents considered should be from Generation-Z and should have intentions to purchase car.

Chi-Square test is being applied in this study, the factors influencing the electric cars purchase and the driving forces for shift from Combustion engine car to electric car.

### Hypothesis

H1: Consumer perception has significant influence on purchase of electric vehicle.

H0: Consumer perception has no significant influence on purchase of electric vehicle.

### Data Analysis

#### Construct Validity and Reliability

	Cronbach's Alpha	rho_A	Composite Reliability	Average Variance Extracted (AVE)
BP – Battery Performance	0.81	0.825	0.874	0.635
BR – Brand Reputation	0.834	0.851	0.889	0.667
CF – Cost Factor	0.771	0.812	0.85	0.587
CI – Charging Infrastructure	0.861	0.878	0.905	0.704
CPI – Consumer Purchase Intention	0.759	0.775	0.862	0.677
CT – Charging Time	0.816	0.818	0.878	0.644
DR – Driving Range	0.794	0.793	0.867	0.62
GI – Government Incentives	0.782	0.79	0.873	0.696
LM – Less Maintenance	0.717	0.713	0.841	0.639

### Reliability Assessment

**Cronbach’s Alpha ( $\geq 0.7$  is acceptable,  $\geq 0.8$  is good,  $\geq 0.9$  is excellent)**

All constructs show values above 0.7, demonstrating acceptable to good reliability. The construct with the highest reliability is CI at 0.861, while LM reflects the lowest at 0.717. This specifies that all constructs consist of internally consistent items.

**Rho\_A (Alternative Reliability Measure)**

In line with Cronbach’s Alpha, every construct surpasses the 0.7 mark, reinforcing the notion of internal reliability.

**Composite Reliability (CR) ( $\geq 0.7$  is acceptable,  $\geq 0.8$  is good)**

Every concept reports values exceeding 0.8, affirming their strong internal consistency and reliability.

**Convergent Validity Assessment**

**Average Variance Extracted (AVE) ( $\geq 0.5$  indicates adequate convergent validity)**

All constructs have AVE values exceeding 0.5, signifying that each construct books for more than 50% of the variance in its indicators. CI (0.704) and GI (0.696) display the highest AVE values, demonstrating a strong correlation between their items and the respective constructs. CF (0.587) and DR (0.62) are above the required threshold, although they are relatively lower, indicating there is room for enhancement.

The constructs show strong reliability and validity, as specified by metrics like Cronbach’s Alpha, rho\_A, CR, and AVE. There are no concerns regarding reliability, with both CR and Alpha values exceeding 0.7. Furthermore, convergent validity is confirmed since all AVE values are above 0.5. Overall, the measurement model is solid and meets acceptable standards.

**R Square**

	R Square	R Square Adjusted
CPI	0.565	0.555

**Interpretation of R-Square (0.565)**

An  $R^2$  value of 0.565 indicates that 56.5% of the variance in CPI can be accounted for by the independent variables, which include BP, BR, CF, CI, CT, DR, GI, and LM. This result suggests a moderate to strong fit for the model, implying that the predictors in aggregate provide a substantial explanation of the variability in CPI.

**Interpretation of Adjusted R-Square (0.555)**

The Adjusted  $R^2$  value of 0.555 considers the number of predictors included in the model. The slight decrease from  $R^2$  to Adjusted  $R^2$  suggests that some variables may not contribute considerably to the model’s explanatory power. However, given that the difference is marginal (0.565 compared to 0.555), it can be inferred that the model maintains a robust level of explanatory relevance despite the occurrence of potentially insignificant predictors.

Overall, the model elucidates a moderate to strong proportion of the variance in CPI, quantified at 56.5%. The minor reduction in the Adjusted  $R^2$  shows that some independent variables may have less effect on the dependent variable. To improve model performance further, it may be beneficial to reflect the removal of less influential predictors such as BP, CF, CI, and LM, or to introduce additional relevant variables.

**F Square**

	CPI
BP	0
BR	0.049

CF	0.008
CI	0.001
CPI	
CT	0.034
DR	0.11
GI	0.019
LM	0.001

The variable DR (0.11) demonstrates the most considerable impact on the Consumer Price Index (CPI), although its effect size remains below the threshold for a medium effect. In comparison, BR (0.049) and CT (0.034) have the most modest, yet noteworthy effects on CPI. The variables CF, CI, and LM demonstrate minimal or no impact, suggesting they weakly contribute to CPI. Interestingly, BP (0.000) indicates no considerable effect on CPI.

DR stands out among the set as the most influential forecaster of CPI, followed afterwards by BR and CT. Other such as BP, CF, CI, and LM do not meaningfully diminish and hold little value in the context of explaining changes in CPI. Thus, it would be more beneficial focusing on those variables aiming to increase the CPI: which are primarily, DR, BR, and CT.

### P Values

	Original Sample (O)	Sample Mean (M)	Standard Deviation (STDEV)	T Statistics ( O/STDEV )	P Values
BP -> CPI	-0.001	0.005	0.071	0.017	0.986
BR -> CPI	0.542	0.534	0.127	4.275	0
CF -> CPI	-0.096	-0.093	0.058	1.662	0.097
CI -> CPI	0.028	0.031	0.051	0.553	0.58
CT -> CPI	0.206	0.206	0.076	2.705	0.007
DR -> CPI	0.405	0.405	0.069	5.857	0
GI -> CPI	-0.319	-0.313	0.132	2.417	0.016
LM -> CPI	0.031	0.025	0.075	0.407	0.684

### Key Interpretation Points

#### Path Coefficient (Original Sample, O)

This metric assesses both the strength and direction of the relationship between each independent variable and CPI. A positive coefficient indicates that the independent variable has a favorable impact on CPI, whereas a negative coefficient signifies an adverse effect.

#### T-Statistic & P-Value

The T-Statistic is utilized to evaluate the significance of the relationship in question. A P-Value of less than 0.05 denotes statistical significance, suggesting that the relationship is unlikely to be due to chance. Along with that, a P-Value higher than 0.05 suggests that there may not be statistical significance effects.

### **Positive Notable Effects on CPI:**

BR (0.542,  $p = 0.000$ ): Considered as the most notable positive indicator for CPI. DR (0.405,  $p = 0.000$ ): Has a maintained and noted powerful positive influence on CPI. CT (0.206,  $p = 0.007$ ): Has observable positive affect on CPI, but not as strong as the other two.

### **Significant negative effect on CPI:**

GI (-0.319,  $p = 0.016$ ): Shows observable decrease in CPI.

### **Non-Remarkable Indicators ( $P > 0.05$ ):**

BP, CF, CI, and LM: These do not show a considerable focus on CPI do not show any significant impact.

BR and DR emerge as the most evident positive predictors of CPI. Conversely, GI exerts a negative effect on CPI, suggesting that an increase in GI results in a reduction in CPI. Additionally, CT plays a substantial role in positively impacting CPI. In contrast, BP, CF, CI, and LM do not exhibit a significant contribution to CPI and, therefore, may not be deemed essential within this model.

### **Key Findings from the Analysis**

#### **Demographics:**

The majority of participants are within the ages of 18-35, with most holding a Master's or Bachelor's degree. The respondents primarily comprise students, professionals, or private employees. Household incomes are predominantly in the ₹15,000 - ₹55,000 bracket.

#### **Experience with EVs:**

Roughly 57% have either driven or ridden in an electric vehicle (EV), though ownership is low. While there is considerable awareness of EVs, adoption is lacking.

#### **Perception of EVs:**

The general attitude and perception of EVs is neutral to optimistic as a sustainable substitute, scoring an average of 2.5 out of 5. The majority of respondents seem to think that EVs can significantly reduce carbon emissions and help sustain the environment, albeit with some concern regarding their practicality.

#### **Influencing Factors:**

Charging duration, infrastructure, cost and battery life, impact purchasing decisions more than any other factor. Cost and battery performance are moderate barriers to wider adoption. There is some influence from government incentives, but that is not considered a primary reason.

#### **Barriers to Adoption:**

The primary issues are the high cost of purchase, insufficient driving range, and underdeveloped charging stations. There is some lack of awareness, but this issue is considered minor when compared to the practical and financial constraints.

#### **Satisfaction Regarding the EV Market:**

Responses concerning the charging network, as well as government policies have been rather varied. Battery performance and driving range continue to be, however, areas of concern.

### **Likelihood of Purchase:**

Responses indicate a neutral to positive orientation overall (Mean ~2.6), which points to some reluctance, but a greater acceptance of electric vehicles.

### **Hypothesis Statements:**

- Null Hypothesis ( $H_0$ ): Consumer perception has no significant influence on the purchase of an electric vehicle.
- Alternative Hypothesis ( $H_1$ ): Consumer perception has a significant influence on the purchase of an electric vehicle.

The statistical analysis presented in the document encompasses assessments of reliability, validity, and regression analysis, which are prominent for hypothesis testing.

1. Reliability and Validity Assessment: Constructs related to consumer perception—specifically Brand Reputation (BR), Cost Factor (CF), Charging Infrastructure (CI), and Battery Performance (BP)—exhibit acceptable levels of reliability and validity, thereby affirming the robustness of the measurement model.
2. Regression Analysis (R-Square): The  $R^2$  value of 0.565 indicates that 56.5% of the variance in Consumer Purchase Intention (CPI) can be credited to consumer perception-related factors, including brand reputation, driving range, and charging time.
3. Significance of Influencing Factors (P-Values and Path Coefficients):

The analysis reveals the following significant positive effects on Consumer Purchase Intention (CPI): Brand Reputation (BR) demonstrates a strong positive correlation, with a path coefficient ( $\beta$ ) of 0.542 and a p-value of 0.000. Similarly, Driving Range (DR) emerges as a robust predictor of CPI, exhibiting a path coefficient of 0.405 and a p-value of 0.000. Charging Time (CT) also presents a moderate positive effect, with a path coefficient of 0.206 and a p-value of 0.007.

In contrast, Government Incentives (GI) yield a significant negative effect, indicated by a path coefficient of 0.319 and a p-value of 0.016. This surprising result may stem from skepticism regarding the effectiveness of relevant policies.

Factors identified as statistically insignificant, with p-values exceeding 0.05, include Battery Performance (BP), Cost Factor (CF), Charging Infrastructure (CI), and Less Maintenance (LM), as they do not exert a statistically prominent influence on CPI.

## **FINAL CONCLUSION**

The analysis discloses that various factors related to consumer perception, specifically brand reputation (BR), driving range (DR), and charging time (CT), have a crucial impact on consumer purchase intention (CPI) with p-values less than 0.05. Consequently, we reject the null hypothesis ( $H_0$ ) and accept the alternative hypothesis ( $H_1$ ), which suggests that consumer perception significantly influences electric vehicle purchase decisions. Nevertheless, it is significant to note that other elements of perception, such as battery performance (BP), cost factors (CF), charging infrastructure (CI), and less maintenance (LM), do not exhibit a significant effect on CPI. This designates that not all components of consumer perception are essential in shaping purchasing behaviors.

## **CONCLUSION**

The analysis substantiates the reliability and validity of the measurement model, as evidenced by elevated values of Cronbach's Alpha, Composite Reliability, and Average Variance Extracted (AVE). The model

accounts for 56.5% of the variance in Consumer Purchase Intention (CPI), indicating a moderate to strong explanatory capacity.

The key findings reveal that Brand Reputation (BR) and Driving Range (DR) serve as the most crucial positive predictors of CPI, whereas Government Incentives (GI) exert a negative influence. Furthermore, Charging Time (CT) has a considerable positive effect. In contrast, factors such as Battery Performance (BP), Cost Factor (CF), Charging Infrastructure (CI), and Less Maintenance (LM) do not demonstrate a significant impact on CPI.

Demographic analysis indicates that individuals within the age range of 18 to 35 who possess higher education levels show interest in electric vehicles (EVs); however, actual adoption remains limited.

The main barriers to purchase are cited as: expensive price, limited distance that can be driven on a single charge, and poor charging facilities. Even though government subsidies are provided, these do not greatly influence the decision to make a purchase.

Overall, there is a need to shift stakeholder focus towards improving brand perception and resolving issues associated with EV range and driving range if they seek to increase adoption. It seems that government strategies also need to be revised to enable better alignment with consumer demands to increase their intent to buy and foster acceptance.

*All authors declare that they have no conflicts of interest.*

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