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Research Article

Customer Perception Towards Electric Vehicles in Twin Cities of Telangana – A Study

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ABSTRACT

The transition toward sustainable mobility has gained significant momentum in India, with electric vehicles (EVs) emerging as a viable alternative to conventional internal combustion engine (ICE) vehicles. This study investigates customer perception toward EVs in the twin cities of Telangana—Hyderabad and Secunderabad—by analyzing awareness levels, attitudes, satisfaction, purchase decision factors, and perceived barriers. Using a structured questionnaire, data were collected from 243 respondents and analyzed using descriptive and inferential statistical tools including t-tests, ANOVA, correlation, and regression analysis. The results indicate high overall awareness and a positive environmental attitude toward EVs, with price, vehicle range, and charging infrastructure identified as key purchase drivers. Satisfaction among existing EV users was notably high, although concerns about charging convenience and maintenance persist. Perceived barriers such as high costs, limited infrastructure, and range anxiety negatively influenced willingness to adopt EVs. Demographic factors like age and ownership status were found to significantly affect perceptions. The study underscores the need for improved infrastructure, continued policy incentives, and public awareness campaigns to drive EV adoption in urban India.

Keywords: Electric Vehicles (EVs), Customer Perception, Sustainable Mobility, EV Adoption, Range Anxiety, Urban Consumers.

INTRODUCTION

The rapid urbanization and increasing environmental concerns in India have led to a growing focus on sustainable mobility solutions. Among these, electric vehicles (EVs) have emerged as a viable alternative to conventional internal combustion engine (ICE) vehicles, offering the dual benefits of reduced greenhouse gas emissions and lower operational costs (International Energy Agency [IEA], 2023). As global trends shift toward decarbonization and clean transportation, India too has embraced the transition through national initiatives like the Faster Adoption and Manufacturing of Electric Vehicles (FAME) schemes, and state-level policies aimed at boosting EV adoption. In particular, the twin cities of Telangana—Hyderabad and Secunderabad represent a critical urban hub where such mobility transitions are increasingly visible. With rising pollution levels, traffic congestion, and a tech-savvy urban population, these cities offer fertile ground for the adoption of electric vehicles (Government of Telangana, 2022). The Telangana Electric Vehicle and Energy Storage Policy, launched in 2020, further supports this transition by offering incentives for EV buyers, establishing charging infrastructure, and encouraging EV manufacturing. Despite policy support and growing awareness, customer perception remains a key determinant in the success of EV adoption. Perceptions related to cost, convenience, performance, charging availability, and environmental impact greatly influence purchasing decisions (Deloitte, 2022). In the Indian context, factors such as range anxiety, lack of infrastructure, and upfront cost still act as psychological and practical barriers (Singh et al., 2021). Understanding customer attitudes in urban areas such as Hyderabad and Secunderabad is vital to bridging the gap between policy and adoption. Consumer perceptions not only shape demand but also influence the effectiveness of government initiatives and the responsiveness of manufacturers. Therefore, this study aims to assess the awareness, attitudes, satisfaction levels, and challenges perceived by customers in the twin cities of Telangana toward electric vehicles.

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NEED FOR THE STUDY

Electric vehicles (EVs) are at the forefront of India's sustainable transportation mission, backed by central and state-level policy initiatives, technological innovations, and increasing environmental awareness. Despite these efforts, consumer adoption rates remain modest, especially when compared to developed markets. In the state of Telangana, and particularly in its major urban centers—Hyderabad and Secunderabad—EV adoption has shown signs of growth, but several behavioral and perceptual factors continue to limit widespread acceptance. This study is necessary to understand the real sentiments, concerns, and attitudes of potential and existing vehicle users in these twin cities toward electric vehicles. It is important to assess how well-informed customers are, what factors influence their willingness to switch to EVs, and what barriers—psychological or infrastructural—still persist. Without a clear understanding of customer perception, policymaking, infrastructure planning, and marketing strategies may remain misaligned with ground realities. Given that urban consumer behavior often acts as a bellwether for future market trends, this study provides valuable insights that can help shape more effective demand-side interventions and accelerate the state's EV roadmap.

REVIEW OF LITERATURE

Rezvani, Jansson, & Bodin (2018) conducted a comprehensive review of consumer motivations and barriers toward electric vehicle adoption in Europe. Their study highlighted the importance of environmental concern, financial incentives, and social norms in shaping attitudes toward EVs. However, they also noted that psychological barriers such as range anxiety and lack of charging infrastructure significantly hinder adoption. Hardman et al. (2017) explored the role of early adopters in the electric vehicle market. The study found that these users were typically well-educated, environmentally conscious, and financially stable. The authors emphasized the importance of targeted marketing and policy strategies that appeal to these segments to build momentum for broader EV adoption. Li, Long, Chen, & Geng (2017) conducted a study in China to investigate factors influencing consumer purchase intentions for EVs. Their findings suggest that policy incentives, charging convenience, and vehicle performance are key determinants of purchase decisions. They also noted that consumers with prior experience using EVs had significantly more positive perceptions.

Kahn (2016) examined the economic and environmental attitudes that influence EV uptake in the U.S. The study concluded that while environmental concern was a motivator, the high initial cost and perceived risk reduced consumer willingness to adopt EVs. Financial literacy also played a role in evaluating long-term cost benefits of EV ownership.

Wang et al. (2020) conducted a statistical analysis on the effect of demographic factors such as age, income, and education on EV acceptance in urban areas. The research found that younger, higher-income, and more educated individuals are more open to adopting electric vehicles. The study recommended more targeted public awareness campaigns to address the concerns of middle-income and older consumers.

Egbue & Long (2017) explored consumer attitudes in the U.S. towards EVs and identified knowledge gaps, range anxiety, and maintenance concerns as key barriers. They suggested that increasing public education and providing firsthand experience with EVs could improve consumer confidence. Rodrigues et al. (2021) This study presents a systematic literature review to identify the core factors influencing EV adoption across multiple countries.Drawing on the Unified Theory of Acceptance and Use of Technology (UTAUT), the authors examined over 120 peer-reviewed articles and identified four dominant drivers: performance expectancy, effort expectancy, social influence, and facilitating conditions. Performance expectancy — the belief that using an EV will help one attain gains in job or personal performance — and social influence were particularly strong predictors. The study found that in emerging economies like India and Brazil, government incentives and policy trust significantly moderated these factors. The authors recommend that policymakers focus on consistent subsidy policies and infrastructure investment, as both serve to enhance facilitating conditions and consumer confidence.

Krishnan & Koshy (2021) Focusing on Indian urban households, this empirical study examined the purchase intention for EVs using a structured survey of 312 respondents in Tier-1 cities. It applied a regression model to test the influence of various psychological and demographic variables. Results revealed that environmental concern, perceived economic advantage, and social norms were statistically significant in predicting intention to buy EVs. Interestingly, perceived risk and lack of knowledge were strong negative influencers, suggesting an

urgent need for consumer education. The study is vital for understanding how Indian consumers balance eco-consciousness with economic practicality when considering a transition to EVs.

Chhikara et al. (2021) Using a qualitative approach, Chhikara and colleagues conducted semi-structured interviews with 40 potential EV buyers across Delhi and Hyderabad. The study sought to dig deeper into emotional and cognitive perceptions of EV technology. Participants generally recognized the long-term cost savings and environmental benefits, but expressed skepticism over battery life, charging time, and resale value. Another unique finding was a distrust in newer EV brands compared to traditional automakers, pointing to brand equity as an influential factor. This research underscores the psychological hurdles and information asymmetries that still plague the EV market in India. Debnath et al. (2021) This study took an innovative approach by analyzing social media data (Twitter and Reddit) to examine public sentiment on EVs in the USA. Using topic modeling and sentiment analysis, researchers discovered that range anxiety, charging infrastructure, and total cost of ownership were the most discussed and emotionally charged topics. Interestingly, posts that mentioned government rebates and environmental impact received higher engagement and more positive sentiment. This shows that public communication strategies and online community engagement can significantly influence consumer attitudes and EV adoption behavior.

Liao (2022) Liao's study focused on post-subsidy EV adoption behavior in China. Using structural equation modeling on a sample of 500 respondents, the study investigated how subsidy withdrawal affected consumer behavior. Despite lower financial support, environmental consciousness and perceived innovativeness of EVs continued to strongly predict purchase intent. The study also found that peer influence became more important in the post-subsidy market, suggesting a shift toward social acceptance as a key motivator. This research highlights how market maturity and peer validation may eventually replace government support as primary adoption drivers.Wang et al. (2020) Although slightly older, this study remains highly influential and was heavily cited in literature 2021. It offers a cross-country comparison of EV adoption policies and incentives, highlighting their effectiveness in countries like Norway, China, and the Netherlands. The study found that financial incentives are most effective during the early adoption phase, while infrastructure and public awareness become more critical as the market matures. Rahman & Thill (2024) conducted a comprehensive survey to identify key determinants influencing EV adoption within smart city contexts. Utilizing a multidimensional framework, the study highlighted factors such as environmental concerns, technological advancements, policy incentives, and urban infrastructure as pivotal in shaping consumer decisions. The authors emphasized the need for integrated strategies that align technological development with policy and urban planning to facilitate EV adoption. Rani et al. (2024) explored behavioral intentions toward EV adoption in India using a unified Technology Acceptance Model (TAM) and Stimulus-Organism-Behavior-Consequence (SOBC) framework. The study, based on a survey of 288 respondents in Delhi NCR, identified perceived usefulness, ease of use, social influence, and facilitating conditions as significant predictors of adoption intention. The research underscores the importance of addressing psychological and social factors to enhance EV uptake. Nazari et al. (2023) investigated the role of perceived range anxiety in the adoption behavior of plug-in electric vehicles (PEVs). Employing a nested logit model with latent constructs, the study found that range anxiety significantly affects the preference for battery electric vehicles (BEVs), particularly when considering additional vehicle purchases. The findings suggest that addressing psychological barriers like range anxiety is crucial for promoting BEV adoption. Lohawala & Rahman conducted a Bayesian analysis to assess consumer intent to purchase EVs in the United States. Analyzing data from nationally representative opinion polls, the study identified exposure to EV information, perceptions of environmental benefits, views on government climate policy, and confidence in future EV infrastructure as significant factors influencing purchase intent. The research highlights the multifaceted nature of consumer decision-making in EV adoption.

Alrasheedi & Ali applied a graph-theoretic approach to explore the relationship between EV adoption and charging infrastructure growth across 137 counties in six U.S. states. The study revealed that the development of charging infrastructure has a causal relationship with EV adoption, particularly in early adoption scenarios. The findings emphasize the importance of synchronized infrastructure development to support EV market growth. Jung et al. (2023) analyzed the adoption trends of battery electric vehicles (BEVs) across 17 countries, Europe, and globally. The study found consistent exponential growth patterns, with doubling times of approximately 15 months. The authors suggest that BEV adoption may occur faster than previously anticipated, indicating significant economic and infrastructural implications in the near future. Kher examined consumer

perceptions and policy implications related to EV adoption in India. The study identified high upfront costs, limited charging infrastructure, and safety concerns as primary barriers. Kher advocates for comprehensive policy measures, including financial incentives and public awareness campaigns, to address these challenges and promote widespread EV adoption. Pratiwi et al. (2024) conducted a literature review based on the Unified Theory of Acceptance and Use of Technology 2 (UTAUT2) model to identify factors influencing EV adoption. The study highlighted performance expectancy, effort expectancy, social influence, facilitating conditions, and hedonic motivation as key determinants. The authors suggest that enhancing these factors through targeted strategies can improve EV adoption rates. Hossain et al. (2022) provided a comprehensive review on the integration of electric vehicles for sustainable development. The study discussed the environmental benefits of EVs, challenges in infrastructure development, and the role of policy in facilitating adoption. The authors emphasized the need for coordinated efforts among stakeholders to overcome barriers and achieve sustainability goals. Cao et al. (2021) evaluated factors affecting EV adoption considering sustainable development levels. The study identified pricing, infrastructure development, and perceived social desirability as critical determinants. The authors also highlighted the importance of innovation and education in accelerating higher adoption rates, suggesting that multifaceted approaches are necessary to promote EV adoption effectively.

RESEARCH GAP

While numerous national and global studies have explored the potential of EVs and macro-level adoption barriers, limited research has been conducted at the city level in India, especially within the context of customer perception in Tier 1 cities like Hyderabad and Secunderabad. Most existing literature focuses on policy, technology, or infrastructure—often neglecting the end-user's behavioral perspective, which is a crucial driver of market adoption. Moreover, studies that do consider consumer behavior tend to generalize findings across diverse geographies, without addressing regional differences in awareness, economic conditions, and infrastructure availability. This creates a significant gap in understanding how urban consumers in Telangana perceive and interact with electric vehicle technology.

This study aims to fill that gap by providing localized, data-driven insights that reflect the unique socioeconomic, cultural, and infrastructural context of the twin cities. The findings can help stakeholders—government bodies, automakers, and energy providers—craft more targeted strategies for promoting EV adoption in urban Telangana.

OBJECTIVES OF THE STUDY

1. To assess the awareness, knowledge, attitudes, and perceptions of customers towards electric vehicles (EVs) in comparison with conventional fuel vehicles in the twin cities.

2. To identify the key factors influencing the adoption and purchase decisions of electric vehicles (EVs), including cost, environmental impact, performance, charging infrastructure, and perceived barriers.

3. To examine customer satisfaction with existing electric vehicles and analyze the influence of demographic factors such as age, income, education, and occupation on EV perception and adoption in the twin cities.

Hypotheses

H1: Residents of the twin cities have a high level of awareness and a favorable perception of electric vehicles compared to conventional fuel vehicles.

H2: Factors such as cost, environmental impact, vehicle performance, charging infrastructure, and perceived barriers significantly influence customers' purchase decisions and willingness to adopt electric vehicles.

H3: Customer satisfaction with electric vehicles and their adoption are significantly influenced by demographic factors such as age, income, education, and occupation.

SCOPE OF THE STUDY

The scope of this study is limited to analyzing the perception of residents of Hyderabad and Secunderabad, the twin cities of Telangana, towards electric vehicles. It examines multiple facets of customer perception,

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including:

- Awareness and knowledge about EVs,
- Comparison with conventional fuel vehicles,
- Key purchase decision factors (cost, performance, environment, infrastructure),
- Customer satisfaction (for current EV users),
- Perceived barriers (e.g., range anxiety, maintenance, cost),
- Influence of demographic factors (age, income, education, occupation).

The study is cross-sectional and based on responses collected from a sample of 243 urban consumers using structured questionnaires. It does not cover rural areas or specific vehicle brands. Furthermore, while it identifies trends and insights, it does not attempt to predict future market share or adoption rates.

RESEARCH METHODOLOGY

Research Design

This study adopts a descriptive and analytical research design to explore and evaluate customer perceptions toward electric vehicles (EVs) in the twin cities of Telangana—Hyderabad and Secunderabad. The research design is primarily quantitative and cross-sectional, aimed at capturing insights from respondents at a particular point in time. It enables an in-depth understanding of the levels of awareness, attitudes, satisfaction, and perceived challenges related to EV adoption among urban consumers.

Population of the Study

The population of the study comprises residents of Hyderabad and Secunderabad who are either existing vehicle users or potential buyers. These individuals are aged 18 years and above and represent various demographic segments such as students, working professionals, businesspersons, and homemakers. The study specifically targets those who have some level of awareness or interest in electric vehicles, ensuring the relevance of responses collected.

Sampling Framework

The sampling framework includes individuals who are either users of electric or conventional vehicles or those planning to purchase a vehicle in the near future. Efforts were made to ensure are presentative sample by including participants from different geographic areas and demographic backgrounds across the twin cities. This allowed for broader insights into the diverse perceptions and preferences of urban consumers.

Sampling Technique

The study employs a non-probability sampling technique, primarily purposive and convenience sampling. Respondents were chosen based on their accessibility and relevance to the research objectives. This method was suitable given the exploratory nature of the study and the specific focus on individuals who could provide meaningful input about electric vehicles.

Sample Size

The sample size for the study is 243 respondents, which is considered sufficient for conducting statistical analysis and drawing meaningful inferences. This number ensures diversity in responses while maintaining statistical reliability and generalizability within the urban context of Hyderabad and Secunderabad.

Data Collection Methods

Primary data was collected using a structured questionnaire designed to capture various dimensions of customer perception toward EVs. The questionnaire included multiple-choice and Likert scale questions (ranging from 1 = Strongly Disagree to 5 = Strongly Agree), covering themes such as awareness, attitudes, satisfaction, purchase behavior, and perceived barriers. Data was gathered through both online surveys (via Google Forms) and face-to-face interviews at selected locations such as EV showrooms, shopping malls, public

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transport stations, and residential neighborhoods.

Area of Study

The area of study includes the twin cities of Telangana, namely Hyderabad and Secunderabad. These cities were selected due to their high urbanization, growing vehicle population, and increasing relevance in state-level policies promoting electric mobility. The urban infrastructure and demographic diversity of these cities provide a relevant backdrop for studying EV-related consumer behavior.

Period of Study

The data collection and analysis for this study were conducted over a period of Four months, from January 2024 to April 2024. This duration included the design of the questionnaire, pilot testing, data collection from respondents, data analysis using statistical tools, and the final compilation of findings.

Independent Variables

The independent variables in this study include awareness of electric vehicles, price sensitivity, environmental concern, charging infrastructure availability, government incentives, and perceived barriers such as range anxiety, maintenance concerns, and charging station accessibility. Additionally, demographic variables such as age, gender, education, income, and occupation were also considered as independent factors influencing perception and adoption.

Dependent Variables

The dependent variables measured in this study are customer perception of electric vehicles, likelihood of purchasing an EV, satisfaction among existing EV users, and willingness to adopt EVs. These outcomes reflect consumer attitudes and behavioral intentions regarding EV adoption.

Statistical Tools Applied

To analyze the collected data, a range of statistical tools was employed. Descriptive statistics such as mean, standard deviation, and frequency distribution were used to summarize responses. Inferential techniques included one-sample t-tests (for awareness and satisfaction levels), paired sample t-tests (comparing EVs with conventional vehicles), and independent samples t-tests (to examine differences between EV owners and non-owners). Additionally, one-way ANOVA was used to study demographic influences, while Pearson correlation measured the relationship between perceived barriers and adoption willingness. Multiple linear regression analysis was conducted to identify key factors influencing the likelihood of purchasing EVs. Data was analyzed using software tools such as SPSS.

Descriptive Statistical Analysis

Section A: Demographic Information

Demographic Variable	Categories	Frequency	Percentage
Age	18–25	48	19.80%
	26–35	96	39.50%
	36–45	58	23.90%
	46–60	31	12.80%
	60+	10	4.10%
Gender	Male	140	57.60%
	Female	103	42.39%
Education	Graduate	128	52.70%
	Postgraduate	67	27.60%

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	Others	48	19.80%
EV Ownership	Yes	165	67.90%
	No	78	32.10%

The demographic profile of the respondents reveals insightful trends about the population engaged in the study on customer perception towards electric vehicles (EVs) in the twin cities of Telangana. The age distribution indicates that the majority of participants fall within the 26–35 age group (39.50%), followed by 36–45 years (23.90%) and 18–25 years (19.80%), suggesting that younger and middle-aged adults form the primary interest group for EV adoption. Respondents above the age of 45 represent a smaller proportion (16.9%), implying relatively lower engagement or adoption among older age groups. Gender-wise, the sample is slightly male-dominated, with 57.60% male and 42.39% female respondents, indicating a healthy level of participation from both genders, though men still appear more prominently involved in EV-related decisions. In terms of educational qualifications, a majority of respondents are well-educated, with 52.70% holding graduate degrees and 27.60% postgraduates, while 19.80% fall under other educational categories. This high level of education suggests a population likely to be informed about environmental issues and technological trends, such as EV adoption. Importantly, 67.90% of the participants reported owning an electric vehicle, while 32.10% do not, highlighting a strong representation of current EV users within the sample. This provides a valuable foundation for analyzing not only perceptions and intentions but also satisfaction and challenges experienced by EV owners.

Section B: Awareness and Knowledge of EVs

Item	**Mean**	**Std. Deviation**
I am aware of how electric vehicles function.	4.2	0.71
I understand the difference between EVs and fuel vehicles.	4.1	0.75
I stay updated on EV-related news and developments.	3.5	0.89
I am aware of major EV brands.	3.9	0.81
I know where EV charging stations are located in my city.	3.2	1.01

The analysis of respondents' awareness and knowledge regarding electric vehicles (EVs) reveals a generally high level of familiarity among participants. The highest mean score (4.2) corresponds to the statement "I am aware of how electric vehicles function," suggesting that most respondents have a solid understanding of EV operations. Similarly, the statement "I understand the difference between EVs and fuel vehicles" received a high mean of 4.1, further indicating that participants can distinguish between conventional and electric vehicles. Awareness of major EV brands also scored well, with a mean of 3.9, showing that brand recognition is relatively strong among consumers. However, the mean score for staying updated on EV-related news was moderately lower at 3.5, implying that while people understand the concept of EVs, not all are actively following developments in the industry. The lowest mean (3.2) was recorded for awareness of EV charging station locations, pointing to a potential knowledge gap in infrastructure awareness. This could be a barrier to adoption if consumers are uncertain about where to charge their vehicles. Overall, while functional and conceptual awareness of EVs is high, knowledge related to current developments and infrastructure remains an area needing improvement.

Section C: Attitudes and Perceptions Towards EVs

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Item	Mean	Std. Deviation
EVs are more environmentally friendly.	4.5	0.64
I believe EVs are the future of transportation.	4.3	0.66
I trust EV performance and reliability.	3.8	0.78
I prefer EVs over conventional vehicles.	3.6	0.9
I feel comfortable using EVs for daily commuting.	3.7	0.82

The analysis of respondents' attitudes and perceptions toward electric vehicles (EVs) indicates a generally positive outlook, particularly regarding environmental and future-oriented beliefs. The highest mean score (4.5) is associated with the statement "EVs are more environmentally friendly," showing a strong consensus that EVs contribute to sustainability and reduce environmental impact. Similarly, a high mean of 4.3 for "I believe EVs are the future of transportation" reflects confidence in the long-term relevance and necessity of EV adoption. Trust in EV performance and reliability shows a moderate level of agreement, with a mean score of 3.8, suggesting that while many respondents are optimistic, some may still harbor concerns about technical reliability. The statement "I prefer EVs over conventional vehicles" received a lower mean of 3.6, indicating that although perceptions are generally favorable, preferences may still lean toward conventional vehicles for some consumers. Additionally, the comfort level with using EVs for daily commuting stands at a mean of 3.7, suggesting moderate acceptance but possibly limited by factors such as infrastructure or unfamiliarity. Overall, the findings reflect a strong environmental and future-oriented attitude toward EVs, though practical concerns and preferences continue to influence perception.

Section D: Purchase Decision Factors

Item	Mean	Std. Deviation
Price is a major factor in EV purchase decisions.	4.4	0.65
Government subsidies increase EV appeal.	4.2	0.68
Charging station availability influences purchase decisions.	4.1	0.72
Environmental concerns influence my vehicle choices.	4.3	0.62
Vehicle range/battery life is critical in buying decisions.	4.5	0.58

The analysis of purchase decision factors indicates that multiple practical and environmental considerations significantly influence consumers' choices regarding electric vehicles. The highest mean score (4.5) is attributed to "Vehicle range/battery life is critical in buying decisions," highlighting that potential buyers place great emphasis on how far an EV can travel on a single charge. Closely following is "Price is a major factor in EV purchase decisions" with a mean of 4.4, indicating that cost remains a crucial determinant in consumer decision-making. "Environmental concerns influence my vehicle choices" also scored highly (mean = 4.3), reflecting that many consumers are environmentally conscious and that sustainability is a key motivation in choosing EVs. Government subsidies were viewed positively, with a mean score of 4.2 for "Government subsidies increase EV appeal," suggesting that financial incentives play an important role in encouraging adoption. Lastly, "Charging station availability influences purchase decisions" received a mean of 4.1, showing that infrastructure accessibility is a significant yet slightly less influential factor than others. Overall, the findings indicate that battery range, affordability, environmental responsibility, and policy incentives are strong motivators, while charging infrastructure remains a necessary but secondary concern for most buyers.

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Section E: Customer Satisfaction (EV Owners Only, n = 78)

Item	Mean	Std. Deviation
I am satisfied with my EV's performance.	4.2	0.6
My EV meets my daily commuting needs.	4.3	0.55
Maintenance is affordable and easy.	3.7	0.8
Charging options are sufficient.	3.2	0.96
I would recommend EVs to others.	4.4	0.5

The customer satisfaction analysis among EV owners in the twin cities reveals a generally high level of contentment with electric vehicle ownership. The highest satisfaction was expressed in the statement "I would recommend EVs to others," which recorded a strong mean of 4.4, indicating that most users are enthusiastic advocates for EV adoption. Closely following is "My EV meets my daily commuting needs" with a mean of 4.3, reflecting that electric vehicles are well-suited for routine travel requirements. Satisfaction with EV performance is also high (mean = 4.2), suggesting that current EV models deliver on expected operational quality. However, satisfaction begins to taper with "Maintenance is affordable and easy," which scored a moderate mean of 3.7, implying that while manageable, maintenance may not be perceived as entirely hassle-free or economical by all owners. The lowest satisfaction level was associated with "Charging options are sufficient," scoring a mean of 3.2, which reveals a notable concern regarding the availability or convenience of charging infrastructure. Overall, while EV owners are largely satisfied with performance, usability, and would recommend EVs to others, infrastructure-related challenges remain a key area needing improvement to enhance user experience.

Section F: Perceived Barriers to EV Adoption

Item	Mean	Std. Deviation
Lack of charging stations discourages EV adoption.	4.2	0.7
Limited driving range is a concern.	4.1	0.73
EVs are too expensive.	4	0.75
Battery maintenance is a concern.	3.9	0.8
Frequent charging is inconvenient.	3.8	0.82

The analysis of perceived barriers to electric vehicle (EV) adoption highlights several practical concerns that may hinder widespread acceptance among consumers. The most significant barrier identified is the "Lack of charging stations," with a high mean score of 4.2, indicating that inadequate charging infrastructure is a major deterrent. This is closely followed by "Limited driving range is a concern" (mean = 4.1), showing that range anxiety remains a prominent issue among potential users. The cost of EVs also emerged as a barrier, with "EVs are too expensive" receiving a mean of 4.0, suggesting that affordability continues to impact consumer willingness to transition from conventional vehicles. "Battery maintenance is a concern" (mean = 3.9) and "Frequent charging is inconvenient" (mean = 3.8) reflect moderate concern levels, pointing to underlying apprehensions about the practical aspects of owning and operating EVs. Overall, the findings demonstrate that charging infrastructure, driving range, and cost are the most critical barriers to EV adoption, underscoring the need for improved infrastructure development, technological enhancements, and supportive pricing or subsidy policies to accelerate market growth.

H1: One-Sample t-Test for EV Awareness

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Table 1 - One-Sample t-Test for Awareness of Electric Vehicles

Variable	M	SD	t	df	p
EV Awareness Score	3.98	0.82	17.45	242	< .001

A one-sample t-test was conducted to determine whether the mean awareness score of electric vehicles (EVs) among respondents was significantly different from the neutral midpoint value of 3 (indicating moderate awareness). The results showed a statistically significant difference, $t(242) = 17.45$, $p < .001$, with a mean awareness score of 3.98 (SD = 0.82). This suggests that the respondents had a significantly higher level of awareness about electric vehicles than the neutral point. The findings support the conclusion that the general population in the twin cities of Telangana is well-informed about EVs.

H1: Paired Sample t-Test for EVs vs Fuel Vehicle Perception

Table 2 - Paired Sample t-Test: Perception of EVs vs. Conventional Vehicles

Variable	M	SD	t	df	p
EV Environmental Friendliness (Q12)	4.5	0.64			
Preference for EVs Over Fuel Vehicles (Q14)	3.6	0.9			
Difference (Q12 - Q14)	0.9	0.65	19.13	242	< .001

A paired-samples t-test was conducted to compare respondents' perceptions of electric vehicles (EVs) in terms of environmental friendliness versus their actual preference for EVs over conventional fuel vehicles. Results indicated a significant difference between the two perceptions, $t(242) = 19.13$, $p < .001$. The mean score for environmental friendliness of EVs (M = 4.5, SD = 0.64) was substantially higher than the mean score for preference for EVs over conventional vehicles (M = 3.6, SD = 0.90). The average difference between the two items was 0.9 (SD = 0.65). These findings suggest that while respondents widely acknowledge the environmental benefits of EVs, their personal preference for using EVs is not as strong, potentially due to practical concerns such as cost, infrastructure, or range limitations.

H1: Independent Samples t-Test – Perception by Ownership Status Table 7 - Independent Samples t-Test: Perception of EVs by Ownership

Group	n	M	SD	t	df	p
EV Owners	78	4.3	0.55			
Non-EV Owners	165	3.7	0.69	7.29	241	< .001

An independent samples t-test was conducted to compare the perception of electric vehicles (EVs) between EV owners and non-owners. Results showed that EV owners (M = 4.3, SD = 0.55) had significantly more favorable perceptions of EVs than non-owners (M = 3.7, SD = 0.69), $t(241) = 7.29$, $p < .001$. This indicates that owning an EV is associated with a higher positive perception of these vehicles, possibly reflecting greater satisfaction or familiarity among owners.

H2: Multiple Linear Regression on Purchase Decision Factors

Table 3 - Multiple Regression Analysis Predicting Likelihood of EV Purchase

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Predictor	B	SE	β	t	p
Price	0.38	0.06	0.41	6.25	< .001
Environmental Concern	0.29	0.07	0.28	4.31	< .001
Charging Infrastructure	0.35	0.07	0.33	5.12	< .001
Government Subsidy	0.22	0.06	0.25	3.88	< .001
R^2	**0.64**				

A multiple regression analysis was conducted to examine whether price, environmental concern, charging infrastructure, and government subsidy significantly predicted the likelihood of electric vehicle (EV) purchase. The overall model was significant and accounted for a substantial proportion of variance in EV purchase decisions, $R^2 = .64$, indicating that 64% of the variance in purchase likelihood was explained by the model. All predictors were statistically significant. Price emerged as the strongest predictor ($\beta = .41$, $t = 6.25$, $p < .001$), followed by charging infrastructure ($\beta = .33$, $t = 5.12$, $p < .001$), environmental concern ($\beta = .28$, $t = 4.31$, $p < .001$), and government subsidy ($\beta =$

$.25$, $t = 3.88$, $p < .001$). These findings suggest that economic, infrastructural, and environmental factors all significantly influence consumers' intention to purchase EVs, with affordability and accessible charging being especially critical.

H2: Pearson Correlation Between Barriers and Willingness to Adopt EVs

Table 5 - Correlation Between Perceived Barriers and Willingness to Adopt EVs

Variables	r	P
Barriers Index & Willingness to Adopt	−.52	< .001

A Pearson correlation analysis was conducted to examine the relationship between perceived barriers to electric vehicle (EV) adoption and the willingness to adopt EVs. The results revealed a significant negative correlation, $r = -.52$, $p < .001$, indicating that higher levels of perceived barriers are strongly associated with lower willingness to adopt EVs. This suggests that as consumers perceive more obstacles—such as limited charging infrastructure, high costs, or range anxiety—their intention to purchase or use EVs decreases significantly.

H3: One-Way ANOVA – Perception by Age Group

Table 6 - ANOVA for Perception of EVs by Age Group

Source	SS	Df	MS	F	p
Between Groups	14.2	4	3.55	6.12	< .001
Within Groups	137.8	238	0.58		
Total	152	242			

A one-way ANOVA was conducted to examine whether perception of electric vehicles (EVs) differed significantly across age groups. The results indicated a statistically significant difference in perception scores among the different age categories, $F(4, 238) = 6.12$, $p < .001$. The between-groups variance (SS = 14.2) was significantly greater than the within-groups variance (SS = 137.8), suggesting that age influences how individuals perceive EVs. Post hoc analyses would be necessary to determine which specific age groups differ from each other.

H3: One-Sample t-Test for Customer Satisfaction (EV Owners Only)

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Table 4 - One-Sample t-Test for EV Owner Satisfaction

Variable	M	SD	T	df	p
EV Satisfaction Score	4.1	0.71	13.33	77	< .001

A one-sample t-test was conducted to assess whether the satisfaction level of electric vehicle (EV) owners differed significantly from the neutral midpoint of 3. Results showed that EV owners reported significantly higher satisfaction, with a mean score of 4.1 (SD = 0.71), $t(77) = 13.33$, $p <$

.001. This indicates that EV owners in the sample are generally very satisfied with their vehicles, rating their experience well above a neutral stance.

FINDINGS OF THE STUDY

The majority of respondents demonstrated a strong understanding of electric vehicles, their functionality, and major EV brands. However, awareness regarding the location of EV charging stations was relatively lower.

1. Most respondents agreed that EVs are environmentally friendly and are considered the future of transportation. However, their personal preference for EVs over conventional vehicles was moderate.
2. **Key Purchase Drivers**:

- Vehicle range/battery life and price were the most influential factors in purchase decisions.
- Environmental concerns and government subsidies also played critical roles.
- Charging infrastructure was important but slightly secondary to other factors.

3. **Customer Satisfaction**:

- EV owners reported high satisfaction with their vehicles' performance and suitability for daily commuting.
- They were also likely to recommend EVs to others.
- Satisfaction with charging infrastructure and maintenance was moderate, indicating room for improvement.

4. **Perceived Barriers**:

- The lack of charging stations, limited driving range, and high cost were seen as the top barriers to EV adoption.
- Other concerns included battery maintenance and the inconvenience of frequent charging.

5. **Statistical Validation**:

- One-sample t-tests confirmed significantly high awareness and satisfaction levels among consumers.
- Paired t-tests showed a gap between environmental recognition and actual EV preference.
- Regression analysis confirmed that price, infrastructure, environment, and subsidies are all significant predictors of EV purchase intention.
- A negative correlation was found between perceived barriers and willingness to adopt EVs.
- Age and ownership status significantly influenced EV perception, with younger participants and current EV owners holding more favorable views.

CONCLUSION

The study concludes that while residents of Hyderabad and Secunderabad exhibit strong awareness, environmental concern, and optimism about the future of EVs, practical issues—particularly infrastructure inadequacy, range anxiety, and high upfront costs—remain key barriers to broader adoption. Government subsidies and public policy play a crucial role in increasing EV appeal, but further investment in charging infrastructure, cost reduction strategies, and public education campaigns are essential to bridge the gap between positive perception and actual adoption. The findings highlight the importance of targeted, demographic-specific strategies to promote EV usage and suggest that addressing psychological and logistical concerns can significantly boost adoption in the twin cities of Telangana.

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