European Economic Letters
ISSN 2323-5233
Vol 14, Issue 2 (2024)
http://eelet.org.uk

A Study on Consumer Perception towards Electric Vehicles in India: With Special Reference to Noida City of Gautam Budhha Nagar, Uttar Pradesh

Dr. Ashish Gupta*
Assistant Professor, Maharishi University of Information Technology, Noida, India.
Ashishbondgupta@gmail.com

Dr Garima Srivastava
Associate Professor, Maharishi University of Information Technology, Noida, India
garima1480@gmail.com

Jiya Wadhwa
Assistant Professor, Maharishi University of Information Technology, Noida, India
Jiyawadhwa.muit@gmail.com

Sushma Kumari
Student, MBA, Maharishi University of Information Technology, Noida, India
sushma57801@gmail.com

Varsha Raghav
Student, MBA, Maharishi University of Information Technology, Noida, India
varsharaghav3003@gmail.com

ABSTRACT: Research Problem: The study aims to analyze customer perceptions of Electric Vehicles (EVs) in India, specifically focusing on seven criteria: environmental friendliness, cost, power levels, convenience, price, and safety. These characteristics will be compared to Traditional Vehicles.

This study aims to examine the potential association between demographic variables, including gender, age, educational level, and income, and the perception of Electric Vehicles in India.

Objectives of the study:

i. To study the consumer perception toward Electric Vehicles (EVs) in terms of seven categories. (Environment friendly, cost, power levels, convenience, expensive and safety)

ii. To study the relationship between Gender and perception towards EV

iii. To study the relationship between age and perception towards EV.

iv. To study the relationship between Educational Qualification and perception towards EV.

v. To study the relationship between Income and perceptions towards EV.

Methodology:

Data was obtained by randomly administering a structured questionnaire to 400 respondents residing in the Noida district of Uttar Pradesh. Google Forms are employed as a means of electronically gathering data from participants. In the current study, Slovin's method is employed to determine the appropriate sample size for the Nodia district in Uttar Pradesh. The present study used the convenience sampling technique. Data analysis is conducted using IBM SPSS Version 25. The statistical methods employed include percentage analysis, bar chart, Mann Whitney Test, and Kruskal-Wallis H test.

Findings of the study:

The study's findings illuminate the many ways in which participants view electric cars (EVs). Even while many people recognize that electric vehicles are better for the environment, there are still those who are worried about the price, the performance, the convenience, and the limited range of these vehicles. Crucially, gender, age, education level, and income are some of the demographic factors that are strongly associated with these impressions. Consequently, in order to tackle

these issues and hasten the broad acceptance of EVs, it is crucial to employ customized strategies that include focused education, technical advancements, and legislative interventions. Findings from this study highlight the need for targeted approaches to increase electric mobility's uptake and integration across different demographics.

Electric vehicle (EV) attitudes can be resolved and EVs can be widely accepted with the help of the present study's thorough framework. Stakeholders may overcome barriers to electric vehicle adoption and speed up the transition to electric mobility by focusing education campaigns, investing in infrastructure, creating incentive programs, encouraging technology advancements, passing laws that are supportive, and engaging communities.

Keywords: Consumer Perception, Electric Vehicles, Traditional Vehicles, Environment, Purchase Decision

1. INTRODUCTION:

Recently, electric vehicles (EVs) have become popular as cleaner, more efficient alternatives to gasoline-powered cars. Many drivers worldwide are considering EVs due to battery technology, charging infrastructure, and market demand. These battery-powered vehicles employ electric motors to operate the wheels, changing how we drive. Before Germany and Japan, India sells the third most cars worldwide. Manufacturers and governments are being urged to work together to promote greener options. The automobile sector accounts for 7.1% of India's GDP and provides many jobs. The Economic Survey 2023 expects 10 million yearly sales of electric vehicles in India by 2030, with a 49% CAGR between 2022 and 2030. By 2030, the electric car industry might provide 50 million direct and indirect jobs.

Finance Minister Nirmala Sitharaman allocated INR 35,000 crore for capital investments to achieve energy transition and net-zero targets by 2070 in the 2023-24 Union Budget.(Singh, 2023)

After growing its consumer and vehicle bases and adding domestic manufacturing facilities over the past two decades, India, a key automotive player, has begun shifting to alternative fuels to reduce pollution. 2024 will be vital for the country, the third-largest automotive market, as it struggles to provide expansion financing to late-stage startups and attract Tesla and other overseas EV manufacturers. According to government data on the Vahan portal, India, the world's largest two- and three-wheeler manufacturer, sold about 24 million commercial and personal four-, three-, and two-wheelers in 2023. Over 1.5 million EVs were registered, 6.35% of the overall base, including 813,000 electric two-wheelers. Even though 22 million automobiles were sold in 2022, EV sales climbed by 47% from 1.03 million last year.

Nearly 3.5 million electric vehicles have been sold nationwide. Two-wheelers led sales with over 47%, four-wheelers 8%, and e-rickshaws and three-wheelers the rest. (Singh, 2023)

The phenomenon of consumer perception comprises a range of dimensions, including beliefs, attitudes, opinions, and behaviors, that individuals have towards a specific product or service. Regarding electric vehicles, the matter at hand pertains to the manner in which consumers view these vehicles in relation to their performance, range, charging infrastructure, pricing, environmental impact, and general desirability as a means of transportation. These impressions may be subject to several effects, such as individual experiences, societal influences, promotional and advertising initiatives, and governmental regulations.(Muthukrishnan et al., 2023).

Consumer perception refers to the subjective evaluations and emotions experienced by customers when making a purchase decision on a specific product or service. A favorable perception will result in a purchase choice, whilst an unfavorable perception will deter a buy decision. (Mirza & Gupta, 2020)

The increasing apprehension regarding environmental concerns, such as climate change and air pollution, is a key factor contributing to the favorable consumer view of electric vehicles. Electric vehicles (EVs) are known for their ability to generate zero exhaust emissions, making them an appealing choice for environmentally aware buyers. Furthermore, the advancement of sustainable energy sources and the enhanced accessibility of charging infrastructure have mitigated apprehensions regarding the feasibility of electric vehicles (EVs) for everyday utilization. Consumer perception is significantly influenced by the progress made in battery technology, which has resulted in enhanced range and performance of electric vehicles.

Contemporary electric vehicles (EVs) have demonstrated the ability to provide similar range and acceleration as their gasoline-powered equivalents, so addressing apprehensions regarding restricted driving distances and sluggish performance.(Muthukrishnan et al., 2023).

Nevertheless, Indian consumers face several obstacles when it comes to adopting Electric vehicles. These barriers include the high initial cost, limited availability and variety of models, insufficient consumer awareness and education, range

anxiety (the fear of running out of battery charge while driving), limited charging infrastructure, charging time, changes in battery technology and infrastructure, standardization issues, policy and regulatory challenges, and safety concerns. (Deccan Chronicle, 2023)

Novelty: The novelty of this research lies in its comprehensive evaluation of consumer perceptions regarding electric vehicles (EVs) compared to traditional vehicles across multiple criteria. By examining factors such as environmental friendliness, cost, power levels, convenience, price, and safety, the study provides a nuanced understanding of how individuals perceive EVs in relation to conventional automobiles. Furthermore, the research delves into the influence of demographic variables including gender, age, education, and income on Indians' attitudes towards EVs, revealing insights into the diverse factors shaping acceptance. The study proposes tailored strategies encompassing education campaigns, infrastructure investment, incentive programs, technological advancements, supportive legislation, and community involvement to promote EV adoption, highlighting a holistic approach to accelerate sustainable mobility in India.

Motivation for the research: The present study is motivated by analyzing the perception of the Indian consumers toward electric vehicles in contrast to traditional vehicles in terms of seven factors which are as follows:

i. Electric vehicles (EVs) are more environmentally friendly in comparison to traditional vehicles.
ii. Electric vehicles (EVs) are more costly in comparison to traditional vehicles.
iii. Electric vehicles (EVs) exhibit lower power levels in comparison to traditional vehicles.
iv. Electric vehicles (EVs) exhibit less convenience in comparison to traditional vehicles.
v. Electric vehicles (EVs) are more expensive in comparison to conventional vehicles.
vi. EVs may not have sufficient battery capacity to reach their destination in comparison to traditional vehicles
vii. Electric vehicles (EVs) are safer than traditional vehicles
viii. To analyse the relationship between demographic variables of the respondents with their total perception score towards electric vehicles. (gender, age, educational qualification and income with perception towards EVs)

Section 2 contains the literature review. The study's research methodology is outlined in section 3. The study's aims are emphasized in section 4. The study's breadth is emphasized in section 5. Section 6 contains the reference to the Research Methodology.The study's shortcoming is discussed in section 7. Section 8 provides the analysis, section 9 presents the findings, section 10 offers suggestions, and section 11 presents the conclusion.

2. REVIEW OF LITERATURE:

1. The study, "**An empirical study on consumer motives and attitude towards adoption of electric vehicles in India: Policy implications for stakeholders"** highlighted that Personal and social reasons drive Indian youth EV adoption. Attitude mediates linear and nonlinear consumer behavior intentions. Promoting a balanced EV environment by all stakeholders can address negative objectives. EV buyers' high involvement is driven by personal and social factors. Government policy must prioritize cost-effective EVs.(Sahoo et al., 2022)

2. The study, "**Barriers to the adoption of electric vehicles: Evidence from India"** examined technological, infrastructural, financial, behavioral, and external impediments to Indian EVs. Ranking and prioritizing EV hurdles helps decision-makers allocate resources to high-priority barriers/sub-barriers. The association between EV adoption hurdles was determined by driving and dependent power. Performance and range, total cost of ownership, charging infrastructure deficit, and customer awareness of EV technology are key impediments to EV adoption, according to study.(Tarei et al., 2021)

3. The study, "**Measuring and Modelling Electric Vehicle Adoption of Indian Consumers"** used structural equation modeling to examine how environmental enthusiasm, technological enthusiasm, anxiety (or perceived risk), social image, social influence, perceived benefits, performance expectancy, and facilitating conditions affect consumers' electric vehicle adoption intentions. Data from 675 Bengaluru, India, students is analyzed. Results show that environmental enthusiasm, technological enthusiasm, social image, social influence, perceived benefits, and performance expectancy positively affect electric vehicle adoption intention, while facilitating conditions and anxiety negatively affect it. (Bhat et al., 2022)

4. The study, "**Critical analysis on the implementation barriers and consumer perception toward future electric mobility",** analyzed barriers and ranks them by priority for resolution. Consumer opinion drives electric vehicle demand and acceptability, therefore barrier analysis is based on their opinions. This article uses a Consumer Perception Survey to assess how each barrier affects electric vehicle buyers. Fuzzy Stepwise Weight Assessment Ratio analysis and TOPSIS

assign evaluation criteria to each sub-barrier to determine priority. This article also discusses industrialized countries' electric vehicle policies and populations. The essay discusses ways developing nations like India can overcome obstacles. Literature research and consumer perception survey reveal that lack of charging infrastructure and high cost are major barriers to electric vehicle adoption in underdeveloped nations. Thus, developing countries must offer additional infrastructure and operational cost advantages to boost EV adoption.(Chidambaram et al., 2023)

5. The study, "**Willingness to pay and attitudinal preferences of Indian consumers for electric vehicles", highlights that** Accounting for reference dependence yields more accurate Willingness to pay (WTP) estimations than traditional utility estimation. Our findings indicate that Indian consumers are prepared to pay US$10–34 more to minimize fast charging time by 1 min, US$7–40 to increase EV driving range by 1 km at 200 km, and US$104–692 to save US$1 per 100 km in operating costs. These estimations and attitudes' impact on EV adoption provide insights into EV design, marketing, and pro-EV policies (e.g., EV lanes and dedicated parking) to accelerate EV adoption in India.(Bansal et al., 2021)

3. OBJECTIVES OF THE STUDY:

i. To study the consumer perception toward Electric Vehicles (EVs) in terms of seven categories. (environment friendly, cost, power levels, convenience, expensive and safety)
ii. To study the relationship between Gender and perception towards EV
iii. To study the relationship between age and perception towards EV.
iv. To study the relationship between Educational Qualification and perception towards EV.
v. To study the relationship between Income and perceptions towards EV.

4. SCOPE OF THE STUDY

The research is constrained to a sample size of 400 participants from the Noida area of Uttar Pradesh. This study aims to analyze the perceptions of respondents in the Noida district regarding Electric Vehicles, specifically focusing on seven key factors: environmental friendliness, cost, power levels, convenience, price, and safety.

5. RESEARCH METHODOLOGY

Research design

Quantitative research involves gathering and evaluating numerical data. This tool may identify patterns, averages, predict, assess causal linkages, and apply conclusions to larger populations. The study follows a descriptive research approach. Descriptive research is typically a sort of quantitative study, however qualitative research can also be descriptive. Our study design ensures valid and dependable outcomes. Survey research is a descriptive research approach used to collect and analyze huge amounts of data for frequencies, averages, and patterns.

Data Collection

Validated data collection approaches are used to obtain, measure, and analyze reliable findings for study. The primary objective of data collecting is to gather accurate and complete data for statistical analysis and informed research conclusions.

Primary Data

Primary data refers to data that researchers gather directly from significant sources, such as interviews, surveys, trials, and so on. Primary data is typically obtained directly from the source, where it originates, and is considered the most reliable type of data in research.

Secondary Data

Secondary data is defined as information that has been acquired by individuals other than the user. Additional sources of secondary data encompass censuses, statistics from government agencies, articles published on websites, and research papers published in diverse academic journals.

Research Instrument

A structured questionnaire was administered randomly to 400 respondents residing in the Noida district of Uttar Pradesh in order to obtain the data. The Google Form is utilized for the electronic collection of data from respondents.

Sample

A sample is a reduced version of a larger entity, as its name suggests. The chosen participants form what is formally referred to as a sample, and the process of selecting them is known as sampling.

Sample Technique

Sampling is the method of choosing a smaller set of participants to obtain information that is similar to what a bigger population would provide if all members of the larger population were given the same questions. Convenience sampling is a sampling approach that offers time and resource-saving benefits. Convenience sampling is a non-probability sampling technique in which units are chosen for a sample based on their accessibility to the researcher. The factors contributing to this phenomenon may include geographical proximity, temporal availability, or the willingness of individuals to engage in the research. Hence convenience sampling technique is used in the present study.

Sample size

In situations where the behavior of a population is unknown, Slovin's formula can be employed to determine the appropriate sample size. For present study Slovin's formula is used to calculate the sample size of Nodia district of UP.

Slovin's formula= $\mathbf{n = N / (1 + Ne^2)}$

Where:

- n = Number of samples,
- N = Total population and
- e = Error tolerance (level).

As per "Population Census" website, the estimated population of Noida Census Town in 2024 is approximately 903,000. Applying the above formula assuming 95% confidence interval with population size 903,000.

- n = N / (1 + N e2) =
- $903{,}000/ (1 + 903{,}000 * 0.05^2) = 400$

Sample Unit:

The sample population consists of walk-in clients of the showroom and the public of Noida city of Gautam Buddha Nagar district of Uttar Pradesh.

Tools used for analysis:

IBM SPSS Version 25 is used for data analysis. Percentage analysis, bar chart, Mann Whitney Test, Kruskal-Wallis H test is used.

Limitation of the study:

1. The study may have sample representation issues.
2. For instance, the study may have limited generalizability by only including clients from a given demographic, geographic region, or industry.
3. Few persons were chosen for the study due to time constraints. The sample size of customers was insufficient to generalize the study's conclusions.
4. The study focused on analyzing only seven factors such as environment friendly, cost, power levels, convenience, expensive and safety for gauging consumer perceptions towards Electric Vehicles in contrast to Traditional Vehicles.

6. ANALYSIS & INTERPRETATION

Table 1: Demographic variables of the respondents

Demographic Variables	Particulars	Frequency	Percent
Age	18- 24	235	**58.8**
	24- 34	134	33.5
	34- 44	25	6.3

	44- 54	6	1.5
	Total	400	100.0
Gender	Male	267	**66.8**
	Female	133	33.3
	Total	400	100.0
Educational Qualification	No formal education	11	2.8
	High school or below	37	9.3
	Bachelor's degree	242	**60.5**
	Master's degree	110	27.6
	Total	400	100.0
Employment Status	Public Company	24	6.0
	Private Company	145	**36.3**
	Self employed	90	22.5
	Unemployed	141	35.3
	Total	400	100.0
Income	Less than 25000	96	24.0
	25000- 50000	102	25.5
	50000- 100000	36	9.0
	Above 100000	29	7.2
	Unsalaried	137	**34.3**
	Total	400	100.0
Marital Status	Single	322	**80.5**
	Married	78	19.5
	Total	400	100.0
Type of Family	Nuclear family	189	47.3
	Joint family	211	**52.8**
	Total	400	100.0

(Source: Enumerated)

Based on the above table 1, here is a description of the demographic characteristics of the sample population:

Age Distribution: The age distribution shows that the majority of respondents fall within the younger age brackets, with 58.8% aged between 18 to 24 years, followed by 33.5% aged between 24 to 34 years. There is a gradual decrease in the percentage of respondents as age increases, with only a small percentage falling in the older age groups (6.3% aged 34 to 44 years and 1.5% aged 44 to 54 years).

Gender Distribution: The sample population is predominantly male, comprising 66.8% of the respondents, while females make up 33.3% of the sample.

Educational Qualification: Regarding educational qualifications, the majority of respondents hold either a bachelor's degree (60.5%) or a master's degree (27.6%). A smaller percentage have completed high school or below (9.3%), and a very small percentage have no formal education (2.8%).

Employment Status: In terms of employment status, the sample includes respondents from various sectors. The largest proportion is employed in private companies (36.3%), followed by those who are unemployed (35.3%), self-employed individuals (22.5%), and those working in public companies (6.0%).

Income Distribution: The income distribution among respondents varies, with the highest percentage earning less than 25000 (24.0%) and 25000-50000 (25.5%). A smaller proportion falls into the income brackets of 50000-100000 (9.0%) and above 100000 (7.2%), while a significant portion is unsalaried (34.3%).

Marital Status: Regarding marital status, the majority of respondents are single (80.5%), while the remaining percentage is married (19.5%).

Type of Family: The type of family structure among respondents is almost evenly split between nuclear families (47.3%) and joint families (52.8%).

European Economic Letters
ISSN 2323-5233
Vol 14, Issue 2 (2024)
http://eelet.org.uk

Overall, the sample population comprises predominantly young, educated individuals, with a significant representation of males. The employment status varies, with a notable proportion being unemployed. The income distribution is diverse, reflecting different earning capacities within the sample. Additionally, there is a mix of marital statuses and family structures among the respondents.

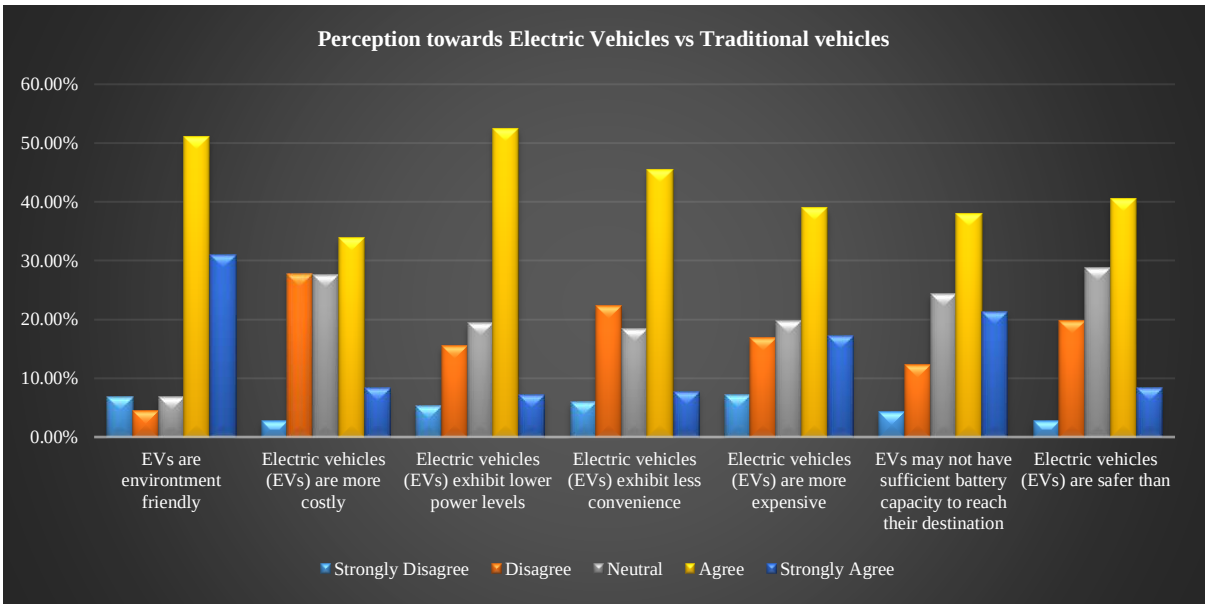

Figure:1 Perception towards Electric Vehicles vs Traditional vehicles
(Source: Enumerated)

Interpretation

1. Electric vehicles (EVs) are more environmentally friendly in comparison to traditional vehicles.
51% of the respondent agree that EVs are environment friendly when compared with traditional vehicles. 31% strongly agree, 6.80% are neutral, 4.5% are disagree and 6.8% are strongly disagree.

2. Electric vehicles (EVs) are more costly in comparison to traditional vehicles.
33.8% of the respondents agree that EVs are more costly in comparison to traditional vehicles.8.3% strongly agree, 27.5% are neutral, 27.8% disagree and 2.8% strongly disagree.

3. Electric vehicles (EVs) exhibit lower power levels in comparison to traditional vehicles.
52.5% of the respondents agree that EVs exhibit lower power level in comparison to traditional vehicles., 7.2% strongly agree, 19.5% are neutral, 15.5% disagree and 5.3% strongly disagree.

4. Electric vehicles (EVs) exhibit less convenience in comparison to traditional vehicles.
45.5% of the respondents agree EVs exhibit less convenience in comparison to traditional vehicles. 7.8% strongly agree, 18.5% are neutral, 22.3% disagree and 6% strongly disagree.

5. Electric vehicles (EVs) are more expensive in comparison to conventional vehicles.
39% of the respondents agree that EVs are more expensive in comparison to conventional vehicles. 17.3% strongly agree, 19.8% are neutral, 16.8% disagree and 7.2% strongly disagree.

6. EVs may not have sufficient battery capacity to reach their destination in comparison to traditional vehicles.
38% of the respondents agree that EVs may not have sufficient battery capacity to reach their destination in comparison to traditional vehicles. 21.3% strongly agree, 24.3% are neutral, 12.3% disagree and 4.3% strongly disagree.

7. Electric vehicles (EVs) are safer than traditional vehicles.
40.5% of the respondents agree that EVs are safer than traditional vehicles. 8.3% strongly agree, 28.7% are neutral, 19.8% disagree, 2.8% strongly disagree.

Table: 2: Perception towards Range of Electric Vehicles:

Particulars	Frequency	Percent
Less than 100 km	98	24.5
100- 200 km	167	41.8

200- 300 km	99	24.8
300- 400 km	36	9.0
Total	400	100.0

(Source: Enumerated)

The data presented in Table 2 provides insights into the perceived perception of respondents on the estimated range of an average electric vehicle (EV) on a single charge. 24.5% of the participants believe that an electric vehicle (EV) can travel less than 100km on a single charge. According to the survey data, a significant proportion of respondents, specifically 41.8%, have the belief that the majority of electric vehicles (EVs) have the capability to go a distance ranging from 100 to 200 kilometres on a single charge. In addition, 24.8% of participants say that the range of certain electric vehicle (EV) models is between 200 and 300 km, indicating a sense of significantly greater range capabilities. Significantly, 9.0% of participants hold the belief that electric vehicles (EVs) have the capability to cover a distance of 300 to 400 kilometres on a solitary charge, suggesting an increasing recognition of the progress made in EV technology. The aforementioned calculations provide valuable insights into the public's opinions regarding the range capabilities of electric vehicles (EVs). These perceptions play a critical role in shaping customer choices and influencing future advancements in EV infrastructure and technology.

Hypothesis:

$H0_1$: There is no relationship between Gender and perception towards EV
$H0_2$: There is no relationship between age and perception towards EV
$H0_3$: There is no relationship between Educational Qualification and perception towards EV
$H0_4$: There is no relationship between Income and perceptions towards EV.

Hypothesis Testing

H01: There is no significant relationship between gender and total perception toward EV.

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Gender	Statistic	df	Sig.	Statistic	df	Sig.
Total_Perception	Male	.096	267	.000	.976	267	.000
	Female	.162	133	.000	.848	133	.000
a. Lilliefors Significance Correction							

(Source: Enumerated)

Interpretation of results for Normality:

Testing for normality: Is the significance of the K-S and Shapiro-Wilk Test less than 0.05 (significantly different from normal) or greater than 0.05 (approximately normal)

For Total Perception toward Electric Vehicles, the distribution for:
Male, $D(267) = .000$, $p<0.05$, appears to be non-normal.
Female, $D(133) = .000$, $p<0.05$, appears to be non-normal.

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Total_Perception	Based on Mean	5.979	1	398	.015
	Based on Median	5.868	1	398	.016
	Based on Median and with adjusted df	5.868	1	390.494	.016
	Based on trimmed mean	5.203	1	398	.023

(Source: Enumerated)

Interpretation of Test if Homogeneity of Variance:

It shows the results of Levene's Test.
Total Perception $F(1, 398) = 0.15$, $p<0.05$, appears to be a significant variance in homogeneity.

So on the basis of the results of normality and homogeneity of variance, the data is not normal, hence for the above data, non-parametric test will be applied. Hence for the above hypothesis, Mann Whitney test will be applied.

Mann Whitney Test

Ranks				
	Gender	N	Mean Rank	Sum of Ranks
Total_Perception	Male	267	224.80	60020.50
	Female	133	151.73	20179.50
	Total	400		

(Source: Enumerated)

Test Statistics[a]	
	Total_Perception
Mann-Whitney U	11268.500
Wilcoxon W	20179.500
Z	-5.973
Asymp. Sig. (2-tailed)	.000
a. Grouping Variable: Gender	

(Source: Enumerated)

Interpretation:

There is a significant relationship between Gender and Total perception towards EV, U=11268.500, z=-5.973, $p<0.05$. Hence $H0_1$ is rejected and $H1_1$ is accepted.

H02: There is no relationship between age and perception towards EV

Test of Normality and Homogeneity of Variance for age and perception towards EV.

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Age	Statistic	df	Sig.	Statistic	df	Sig.
Total_Perception	18- 24	.104	235	.000	.970	235	.000
	24- 34	.103	134	.001	.922	134	.000
	34- 44	.132	25	.200*	.925	25	.067
	44- 54	.319	6	.056	.683	6	.004
*. This is a lower bound of the true significance.							
a. Lilliefors Significance Correction							

(Source: Enumerated)

Testing for normality: Is the significance of the K-S and Shapiro-Wilk Test less than 0.05 (significantly different from normal) or greater than 0.05 (approximately normal)

For Total Perception toward Electric Vehicles, the distribution for:

18-24, $D(245) = .000$, $p<0.05$, appears to be non-normal.

24-34, $D(134) = .001$, $p<0.05$, appears to be non-normal.

34-44, $D(25) = .200$, $p>0.05$, appears to be normal.

44-54, $D(6) = .056$, $p> 0.05$, appears to be normal.

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Total_Perception	Based on Mean	4.370	3	396	.005
	Based on Median	4.139	3	396	.007

	Based on Median and with adjusted df	4.139	3	368.788	.007
	Based on trimmed mean	4.349	3	396	.005

(Source: Enumerated)

Interpretation of Test of Homogeneity of Variance:

It shows the results of Levene's Test.

Total Perception $F(3, 396) = 0.005$, $p<0.05$, appears to be a significant variance in homogeneity.

So on the basis of the results of normality and homogeneity of variance, the data is not normal, hence for the above data non-parametric test will be applied. Hence for the above hypothesis, Kruskal-Wallis H test will be applied.

Null Hypothesis 02: There is no significant impact of age group of the respondents on the total perception towards Electric Vehicles.

Rank Test				**Statistics[a,b]**	
Age		**N**	**Mean Rank**		**Total Perception score Towards EV**
Total Perception score	18-24	235	190.22	Kruskal-Wallis H	17.086
	24-34	134	218.72	df	3
	34-44	25	164.74	Asymp. Sig.	.001
	44-54	6	345.25	a. Kruskal Wallis Test	
	Total	400		b. Grouping Variable: Age	

Interpretation: There is a significant impact of age variables on the perception towards electric vehicles (EV), Kruskal-Wallis H = 17.086, p =0.001. Hence, null hypothesis is rejected since p value (0.001)< a value (0.05).

(Source: Enumerated)

H03: There is no relationship between Educational Qualification and total perception towards EV

Test of Normality and Homogeneity of Variance for Educational Qualification and total perception towards EV.

Tests of Normality

		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Education Qualification	Statistic	df	Sig.	Statistic	df	Sig.
Total_Perception	No formal education	.396	11	.000	.662	11	.000
	High school or below	.207	37	.000	.857	37	.000
	Bachelor's degree	.151	242	.000	.929	242	.000
	Master's degree	.156	110	.000	.911	110	.000

a. Lilliefors Significance Correction

(Source: Enumerated)

Testing for normality: Is the significance of the K-S and Shapiro-Wilk Test less than 0.05 (significantly different from normal) or greater than 0.05 (approximately normal)

For Total Perception toward Electric Vehicles, the distribution for:

No formal education, $D(11) = .000$, $p<0.05$, appears to be non-normal.

High school or below, $D(37) = .000$, $p<0.05$, appears to be non-normal.

Bachelor's degree, $D(242) = .000$, $p<0.05$, appears to be non- normal.

44-54, $D(110) = .000$, $p< 0.05$, appears to be non- normal.

European Economic Letters
ISSN 2323-5233
Vol 14, Issue 2 (2024)
http://eelet.org.uk

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Total_Perception	Based on Mean	15.382	3	396	.000
	Based on Median	5.934	3	396	.001
	Based on Median and with adjusted df	5.934	3	158.060	.001
	Based on trimmed mean	14.180	3	396	.000

(Source: Enumerated)

Interpretation of Test of Homogeneity of Variance:

It shows the results of Levene's Test.

Total Perception $F(3, 396) = 0.000$, $p<0.05$, appears to be a significant variance in homogeneity.

So on the basis of the results of normality and homogeneity of variance, the data is not normal, hence for the above data non-parametric test will be applied. Hence for the above hypothesis, Kruskal-Wallis H test will be applied.

Null Hypothesis 03: There is no significant impact of Educational Qualification of the respondents on the total perception towards Electric Vehicles.

Rank Test				Statistics[a,b]	
Educational Qualification		N	Mean Rank		Total Perception score Towards EV
Total Perception score	No formal education High school or below	11	241.09	Kruskal-Wallis H	11.845
	Bachelor's degree	37	167.88	df	3
	Master's degree	242	191.40	Asymp. Sig.	.008
	Total	110	227.44	a. Kruskal Wallis Test	
		400		b. Grouping Variable: Age	

Interpretation: There is a significant impact of Educational Qualification of the respondents on the perception towards electric vehicles (EV), Kruskal-Wallis H = 11.845, p =0.008. Hence, null hypothesis is rejected since p value (0.008)< a value (0.05)

(Source: Enumerated)

H04: There is no relationship between Income and perceptions towards EV.

Test of Normality and Homogeneity of Variance for Educational Qualification and total perception towards EV

Tests of Normality							
		Kolmogorov-Smirnov[a]			Shapiro-Wilk		
	Income	Statistic	df	Sig.	Statistic	df	Sig.
Total_Perception	Less than 25000	.189	96	.000	.825	96	.000
	25000- 50000	.190	102	.000	.914	102	.000
	50000- 100000	.181	36	.004	.909	36	.006
	Above 100000	.242	29	.000	.841	29	.001
	Unsalaried	.120	137	.000	.962	137	.001
a. Lilliefors Significance Correction							

(Source: Enumerated)

Testing for normality: Is the significance of the K-S and Shapiro-Wilk Test less than 0.05 (significantly different from normal) or greater than 0.05 (approximately normal)

For Total Perception toward Electric Vehicles, the distribution for:

Less than 25000, D(96) = .000, p<0.05, appears to be non-normal.
25000- 50000, D(102) = .000, p<0.05, appears to be non-normal.
50000- 100000, D(36) = .004, p<0.05, appears to be non- normal.
Above 100000, D(29) = .000, p< 0.05, appears to be non- normal
Unsalaried, D(137) = .000, *p*< 0.05, appears to be non- normal

Test of Homogeneity of Variance					
		Levene Statistic	df1	df2	Sig.
Total_Perception	Based on Mean	2.573	4	395	.037
	Based on Median	1.185	4	395	.317
	Based on Median and with adjusted df	1.185	4	256.927	.318
	Based on trimmed mean	2.029	4	395	.090

(Source: Enumerated)

Interpretation of Test of Homogeneity of Variance:

It shows the results of Levene's Test.
Total Perception $F(4, 395) = 0.037$, $p<0.05$, appears to be a significant variance in homogeneity.
So on the basis of the results of normality and homogeneity of variance, the data is not normal, hence for the above data non-parametric test will be applied. Hence for the above hypothesis, Kruskal-Wallis H test will be applied.

Null Hypothesis 04: There is no significant impact of Income of the respondents on the total perception towards Electric Vehicles.					
Rank Test				**Statistics[a,b]**	
Income		**N**	**Mean Rank**		**Total Perception score Towards EV**
Total Perception score	Less than 25000	11	207.45	Kruskal-Wallis H	13.372
	25000- 50000	102	199.67	df	4
	50000- 100000	36	203.88	Asymp. Sig.	.010
	Above 100000	29	265.72	a. Kruskal Wallis Test	
	Unsalaried	137	181.55	b. Grouping Variable: Age	
	Total	400			
Interpretation: There is a significant impact of income of the respondents on the perception towards electric vehicles (EV), Kruskal-Wallis H = 13.372, p =0.010. Hence, null hypothesis is rejected since p value (0.010)< a value (0.05)					

(Source: Enumerated)

7. FINDINGS OF THE STUDY:

1. Most respondents (51%), think that EVs are more environmentally friendly than traditional automobiles.
2. 33.8% of the participants concur that electric cars (EVs) are more expensive as compared to conventional vehicles.
3. 52.5% of the participants concur that electric cars (EVs) demonstrate a lower power level when compared to conventional automobiles.
4. 45.5% of the participants concur that electric cars (EVs) demonstrate lower levels of convenience when compared to conventional vehicles.
5. 39% of the participants concur that electric vehicles (EVs) are costlier than traditional vehicles.
6. 38% of the participants concur that electric cars (EVs) may lack adequate battery capacity to reach their intended destination when compared to conventional automobiles.
7. 40.5% of the participants concur that electric cars (EVs) are more secure than conventional vehicles.

8. A significant proportion of individuals, specifically 41.8%, hold the perspective that a majority of electric cars (EVs) possess the capacity to cover a distance spanning from 100 to 200 kilometers on a solitary charge.
9. A strong correlation exists between Gender and Total perception towards EV, with a correlation coefficient of U=11268.500, z=-5.973, p<0.05.
10. The perception towards electric vehicles (EV) is significantly influenced by age characteristics, as indicated by a Kruskal-Wallis H value of 17.086, with a p-value of 0.001.
11. The perception towards electric vehicles (EV) is significantly influenced by the educational qualification of the respondents as indicated by a Kruskal-Wallis H value is 11.845, with a p-value of 0.008.
12. The perception towards electric vehicles (EV) is significantly influenced by the income of the respondents as indicated by a Kruskal-Wallis H value is 13.372, with a p-value of 0.010.

8. SUGGESTIONS:

Based on the findings of this research report, several suggestions can be made to address the identified perceptions and promote the adoption of electric vehicles (EVs):

1. **Targeted Education Campaigns:** Develop educational initiatives aimed at dispelling misconceptions and increasing awareness about the environmental benefits, cost-effectiveness, and technological advancements of EVs. These campaigns should be tailored to different demographic groups to effectively address specific concerns.
2. **Infrastructure Development:** Invest in the expansion and enhancement of EV charging infrastructure to alleviate concerns about range limitations and increase convenience for EV owners. This could involve collaborations between government agencies, private companies, and community organizations to deploy charging stations in strategic locations.
3. **Incentive Programs:** Implement financial incentives such as tax credits, rebates, and subsidies to make EVs more accessible and affordable for consumers. These incentives can help offset the upfront costs of purchasing EVs and incentivize adoption, particularly among low- and moderate-income households.
4. **Technological Innovations:** Encourage research and development in battery technology and charging infrastructure to improve the performance, range, and charging speed of EVs. Investing in innovative solutions such as fast-charging technology and extended-range batteries can address concerns about power levels and battery capacity.
5. **Policy Support:** Enact supportive policies at the local, regional, and national levels to promote the adoption of EVs, including mandates for zero-emission vehicle sales, emissions regulations, and parking incentives for EV owners. Clear and consistent policy frameworks can provide certainty for consumers and industry stakeholders, driving investment and innovation in the EV market.
6. **Community Engagement:** Foster community engagement and collaboration to build public support for EV adoption. This could involve organizing EV showcase events, ride-and-drive demonstrations, and community forums to engage residents and stakeholders in discussions about the benefits and challenges of electric mobility.

By implementing these suggestions, policymakers, industry stakeholders, and community leaders can work together to address perceptions surrounding EVs and create a more conducive environment for their widespread adoption. Ultimately, promoting the transition to electric mobility is crucial for achieving environmental sustainability and reducing dependence on fossil fuels in the transportation sector.

9. CONCLUSION:

In summary, the research outcomes shed light on the multifaceted perceptions surrounding electric vehicles (EVs) among respondents. While a significant portion acknowledges the environmental benefits of EVs, concerns regarding cost, performance, convenience, and range limitations persist. Importantly, these perceptions are intricately linked to demographic characteristics such as gender, age, education, and income. Therefore, tailored approaches encompassing targeted education, technological innovations, and policy interventions are imperative to address these concerns effectively and expedite the widespread adoption of EVs. This research underscores the necessity of customized strategies to foster greater acceptance and integration of electric mobility across diverse societal segments.

The present study provides a comprehensive framework for resolving electric vehicle (EV) attitudes and supporting their widespread acceptance. By targeting education campaigns, investing in infrastructure, implementing incentive programs,

fostering technological innovations, enacting supportive policies, and engaging communities, stakeholders can overcome EV adoption barriers and accelerate the transition to electric mobility.

These proposals emphasize the need for a multidimensional strategy that addresses customers' different issues and preferences and recognizes the relevance of government regulations, industry innovation, and community engagement in promoting significant change. By collaborating across sectors and using their skills and resources, stakeholders can build a more sustainable and resilient transportation system.

These recommendations will reduce greenhouse gas emissions, improve air quality, boost energy security, boost economic growth, and encourage technical innovation. Electric transportation offers nations a chance to construct a sustainable and successful future for future generations.

References

1. Deccan Chronicle, 2023. Barriers to the Adoption of Electric Vehicles: Evidence from India [WWW Document]. Deccan Chronicles. URL https://www.deccanchronicle.com/business/in-other-news/280623/barriers-to-the-adoption-of-electric-vehicles-evidence-from-india.html (accessed 3.25.24).
2. Singh, A., 2023. India's EV Economy: The Future of Automotive Transportation [WWW Document]. Invest India. URL https://www.investindia.gov.in/team-india-blogs/indias-ev-economy-future-automotive-transportation (accessed 3.25.24).
3. Singh, J., 2023. How India will navigate EVs in 2024 [WWW Document]. https://techcrunch.com/. URL https://techcrunch.com/2023/12/29/india-ev-market-2024/ (accessed 3.25.24).
4. Bansal, P., Kumar, R. R., Raj, A., Dubey, S., & Graham, D. J. (2021). Willingness to pay and attitudinal preferences of Indian consumers for electric vehicles. Energy Economics, 100, 105340. https://doi.org/10.1016/j.eneco.2021.105340
5. Bhat, F. A., Verma, M., & Verma, A. (2022). Measuring and Modelling Electric Vehicle Adoption of Indian Consumers. Transportation in Developing Economies, 8(1), 6. https://doi.org/10.1007/s40890-021-00143-2
6. Chidambaram, K., Ashok, B., Vignesh, R., Deepak, C., Ramesh, R., Narendhra, T. M., Muhammad Usman, K., & Kavitha, C. (2023). Critical analysis on the implementation barriers and consumer perception toward future electric mobility. Proceedings of the Institution of Mechanical Engineers, Part D: Journal of Automobile Engineering, 237(4), 622–654. https://doi.org/10.1177/09544070221080349
7. Mirza, A., & Gupta, A. (2020). A Study on Consumers Perception towards Green FMCG Products : With Reference To Lucknow city in Uttar Pradesh. SHODH SARITA, 7(26), 277–284.
8. Muthukrishnan, R., Prakash, P. R., & Rajkumar, N. M. (2023). CONSUMER PERCEPTION TOWARDS ELECTRIC VEHICLES. In Chem. Bull (Vol. 2023).
9. Sahoo, D., Harichandan, S., Kar, S. K., & S, S. (2022). An empirical study on consumer motives and attitude towards adoption of electric vehicles in India: Policy implications for stakeholders. Energy Policy, 165, 112941. https://doi.org/10.1016/j.enpol.2022.112941
10. Tarei, P. K., Chand, P., & Gupta, H. (2021). Barriers to the adoption of electric vehicles: Evidence from India. Journal of Cleaner Production, 291, 125847. https://doi.org/10.1016/j.jclepro.2021.125847