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PERCEPTION TOWARDS ELECTRIC VEHICLES ADOPTION IN DELHI NCR

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Abstract

The demand for efficient solutions to environmental problems and the increasing scarcity of fossil fuels has led to the development of electric vehicles (to be further referred as EVs) to give an environment-friendly option. As a result, the Indian passenger car industry views electric vehicles as a viable answer for the country's environment and ecosystem. Still, the majority of consumers are unwilling to purchase electric vehicles. Therefore, even though governments have been putting solid EV policies into place, the current market penetration of EVs is very low. The scope of this paper is to determine the level of consumer awareness in the Delhi and NCR areas as well as the factors influencing the decision to purchase an electric vehicle. A survey was carried out and a quantitative approach was used for the investigation. Additionally, the reliability was assessed using the Chi-Square test, which was performed using SPSS. According to the analysis, more Indians are becoming aware of the benefits of electric automobiles for the environment. Nevertheless, despite the numerous incentives and initiatives implemented by the Indian government, some of the reasons Indian consumers are losing interest in electric cars are the high cost of purchasing them, the length of time it takes to recharge the batteries, and the absence of infrastructure.

Keywords : *Electric vehicles, government policies, environment-friendly, consumer awareness*



1. Introduction:

1.1 Background of the problem:

The world economy is expected to have a very dynamic rebound after 2021, with the commencement of the Covid-19 epidemic, marking the most vigorous post-recession growth in the past eighteen years. However, the situation is anticipated to differ from one nation to the next, with developed economies forecast to rise rapidly while developing nations may lag behind. The Indian economy is predicted to experience significant growth due to substantial investments and a high demand for infrastructure. A green tax is being levied on automobiles that are being re-registered after fifteen years of usage to discourage pollution and incentivize the use of fuel-efficient and environmentally friendly cars (Transport policy, 2021). By 2030, Indian car industry is expected to remain the third largest, showing room for expansion. With the announcement of the Union Budget 2025-2026, the government is stepping up its efforts to support electric vehicles by significantly raising the automotive sector's overall budget, which nearly doubled from ₹4,306 crores in FY2024 to ₹7,484 crores in FY2025. (*How the Union Budget 2025-26 Could Change the Electric Vehicle Landscape in India - The Economic Times*, n.d.)

The "FAME India" initiative is an incentive programme initiated by the Indian Government to encourage the use of electric and hybrid vehicles in 2015. This initiative intends to promote electric mobility by offering financial incentives to boost the production of EVs, development of technology and develop electric transportation infrastructure in India. It will also help establish charging infrastructure in India (Jose, 2018). During Phase-I (2015–2019), the government supported nearly 3 lakh electric vehicles (EVs) with incentives of Rs 359 crore, deployed more than 400 electric and hybrid buses, and set up 520 charging stations. With a budget of Rs 11,500 crore, Phase-II (2019–2024) was further enlarged with the goal of electrifying shared and public transportation while building a strong infrastructure for charging. As of July 31, 2024, OEMs had submitted claims for subsidy reimbursement for more than 16 lakh electric vehicles totaling Rs 6,825 crore. Of those, 6,862 e-buses had been approved, of which 4,853 had already been delivered. Together with an additional Rs 73.50 crore approved in March 2024 for 980 new fast charging stations, of which Rs 51.45 crore has been given, Rs 800 crore has also been approved for

7,432 public charging stations.

India's national strategy plan, NEMMP 2020, provides a vision and a path for the rapid uptake and production of electric vehicles. In order to assist the Indian automotive industry in becoming a global leader in production, this plan seeks to improve national fuel security and encourage the use of economical and ecologically beneficial modes of transportation (Gulati, 2013). To support the industry, the center has launched a number of programs, including the PM E-DRIVE (PM Electric Drive Revolution in Innovative Vehicle Enhancement) Scheme, PSM (PM e-Bus Sewa-Payment Security Mechanism) Scheme, PLI-Auto (Production Linked Incentive Scheme for Automobile and Auto Component Industry), ACC (LI Scheme for Advanced Chemistry Cell), and SPMEPCI (Scheme for Promotion of Manufacturing of Electric Passenger Cars in India). (*How the Union Budget 2025-26 Could Change the Electric Vehicle Landscape in India - The Economic Times*, n.d.)

1.2 Consumer Buying Behaviour:

Consumer buying behaviour (both online and offline) refers to the actions that customers take prior to making a purchase of a good or service. It helps enterprises better align their marketing efforts with previous marketing campaigns that have effectively influenced consumers to make a purchase. (Blythe, 2013). Electric vehicles (EVs) are emerging as a sustainable alternative to traditional fuel-powered automobiles. The increasing adoption of EVs is largely driven by growing concerns over urban air pollution, particularly in major Indian cities, which rank among the most polluted globally. Since transportation emissions play a significant role in deteriorating air quality, both manufacturers and policymakers are actively seeking eco-friendly solutions. The expansion of EV usage, particularly in the two-wheeler and four-wheeler segments, holds great promise if supported by government investment in charging infrastructure and financial incentives. India has set an ambitious goal of transitioning to an all-electric vehicle fleet by 2030, with the Ministry of Road Transport and Highways collaborating with the Society of Indian Automobile Manufacturers to facilitate this shift. This initiative underscores the government's dedication to fostering sustainable mobility (Solomon, 2013).

1.3 Objectives:

- To assess the level of consumer awareness regarding the availability of EVs.

- To assess the factors persuading consumer's inclination toward EVs.
- To ascertain the components determining the purchase decision of EVs.

1.4 Research Questions:

- What is the extent of knowledge possessed by consumers regarding EVs in Delhi NCR?
- What are the reasons that influence consumer's inclination toward EVs?
- What are the components determining the purchase decision of EVs?

1.5 Hypothesis:

H1₀: Gender has no significant influence on the preference of EVs over the other vehicles.

H1_a: Gender has a significant influence on the preference of EVs over the other vehicles.

H2₀: Consumer's income doesn't have a significant influence on their decision to purchase EVs.

H2_a: Consumer's income have a significant influence on their decision to purchase EVs.

H3₀: There is no strong correlation between a consumer's age and their level of awareness regarding EVs.

H3_a: There is a strong correlation between a consumer's age and their level of awareness regarding EVs.

H4₀: Elements like fuel economy doesn't impact the consumer's buying behaviour.

H4_a: Elements like fuel economy impact the consumer's buying behaviour.

2. Literature Review:

2.1 Consumer behaviour within the Indian electric vehicle sector:

Consumer behaviour involves analysing the decisions and usage patterns of customers regarding products in a certain market setting. Significant transformations have occurred in the automotive industry in response to evolving consumer behaviour (Sambandam & Lord, 1995). Consumer behaviour and tastes always modify due to several elements in the corporate environment. (Vidyavathi, 2021). Consumer car choices are influenced by demographic features, financial standing, and

lifestyle and by personal, societal, and psychological variables. Consumers' opinions and costs are vital factors in the automotive industry of any nation (Hanzaee & Yazd, 2010). Electric vehicles (EVs) are seen as a promising solution to environmental concerns in today's globe as they provide cleaner and more sustainable modes of transportation, which are vital in the ongoing struggle against urban pollution and climate change. India's transportation sector will be impacted by the forthcoming major revolution of the electric vehicle (EV) industry. IESA (India Energy Storage Alliance) projects that India's EV market would raise at a 36% compound yearly growth rate. With nearly 80% of its crude oil requirements met through imports, the country's dependency on conventional energy sources is increasing, especially with rising population and vehicle demand. To address this, NITI Aayog has set targets for 2030, aiming for 70% of commercial vehicle sales, 30% of private vehicle sales, 40% of buses, and 80% of two- and three-wheeler sales to be electric. These efforts align with India's long-term goal of achieving net-zero carbon emissions by 2070.

2.2 Technology Acceptance Model (TAM):

TAM was proposed by Davis in the year 1989. It was taken from the Theory of Reasoned Action that was developed by Ajzen and Fishbein in 1980 (Ajzen & Fishbein, 1980). For the purpose of describing and forecasting a person's adoption of technology, as well as evaluating the elements that affect their acceptance of new knowledge, Davis posited features of PU (Perceived Usefulness) and PEU (Perceived Ease of Use) (Davis, Bagozzi, & Warshaw, 1989).

The figure that may be found below is a representation of TAM.

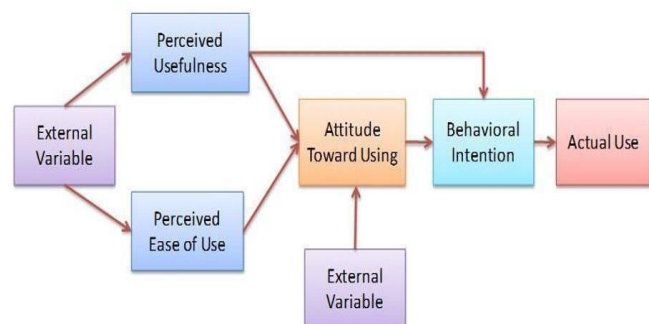


Figure 1. Technology Acceptance Model (Davis, Bagozzi, & Warshaw, 1989)

2.3 Theory of Planned Behaviour (TPB):

The theory of planned behaviour, also known as the TPB, was proposed by Ajzen in 1985. It was coined from the theory of reasoned action, also known as the TRA. However, it is distinct from TPB as it incorporates an additional dimension known as PBC, which stands for perceived behavioural control. The behavioural intention of individuals is what guides their specific behaviour, according to both the TPB and the TRA. This intention is also influenced by the individual's subjective norm and attitude in relation to a particular behaviour. The term "subjective norm" refers to the societal pressure that an individual is expected to endure when engaging in a particular behaviour. Therefore, if the subjective norm is more significantly impacted, it leads to a more significant influence on behavioural intention (Fishbein & Ajzen, 1975). In accordance with Ajzen (1985), it is a factor that depicts the possibilities and resources that people have to participate in a behaviour. It is for this reason that the TPB postulates that individual's behavioural intentions are also persuaded by their attitudes towards behaviour, their subjective norms, and their perceived levels of behavioural control.

2.4 Innovation Diffusion Theory (IDT):

According to Agarwal and Prasad (1998), the IDT (Innovation Diffusion Theory) was given by Rogers in 1983 as a means of forecasting and characterizing the manner in which people embrace innovations. Innovative ideas, services, goods, and experiences are referred to as "innovations" by users and consumers (Kotler & Keller, 2012). The acceptability of the invention is greatly influenced by how the organization or the person views its creative traits. (Schwarzer, 2021).

2.5 Opinions held by customers, which ultimately lead to the emergence of a consumer attitude:

It is possible that the opinions of consumers on a product or brand could be crucial, an internal procedure, or an outcome that leads to explicit behaviour inside the consumer. According to Blythe (2013), it is influenced by external circumstances that lead to creation at a cognitive level, where even insignificant aspects contribute to the decision that is ultimately made. Behaviour and opinion are the two primary factors that contribute to the formation of the consumers' attitudes. According to Solomon (2013), a favorable sentiment is the force behind the

purchase of a product or a brand. "Internalization" is a phrase used to describe the degree of engagement in customer attitudes, which vary widely. Due to their high cost and durability, electric vehicles are regarded as high-involvement goods (Bruhn M., 2004). Another important aspect is to provide assistance to the consumer either during the process of making the decision to purchase or after the consumption of the product (Solomon, 2013).

2.6 The emotional and logical oriented buying process of an EV:

Both emotional and rational considerations play a role in the decisions that consumers make when it comes to purchasing electric vehicles (EVs). A consumer's rational behaviour might be influenced by the capabilities of the product in terms of its physical performance and its availability. On the other hand, dynamic behaviour provides an explanation for the purchasing decision by demonstrating how psychological and social influences effect it. According to Rainey, the most successful environmentally conscious companies generally rely on emotional appeals in order to engage their target audiences (Rainey, 2022). Building relationships and using motivational messaging can significantly influence consumers' purchasing decisions, according to a more thorough discussion among academics and marketers (Heath & Feldwick, 2018). Furthermore, according to Kotler and Keller (2012), marketers have the ability to employ even negative emotional appeals, such as shame or fear, in order to have an effect on the positive behaviour of consumers. When it comes to the process of purchasing electric vehicles, the majority of customers have a strong inclination to associate themselves with the brand of the electric vehicle. In light of this, manufacturers of electric vehicles are obligated to implement efficient programmes in order to influence the consumers' favorable purchasing behaviour, such as the implementation of loyalty programmes for the consumers (Bruhn M., 2004).

3. Research Methodology:

Using the survey method, observations are made about the population, which helps in generalising the conclusions. During the course of this investigation, the deductive method was chosen to be utilized (Saunders, et.al., 2012). For the purpose of completing an adequate sampling framework, the random sampling methodology is utilized. The sample was taken from Delhi and the National

Capital Region who were likely to purchase an EV in the near future. As a result, a survey was administered to fifty-five of the respondents in order to investigate consumer behaviour and gather information regarding the perceptions of electric automobiles held by Indian consumers. For the purpose of conducting an analysis of the data SPSS was used. Following that, the chi-square statistical tests were done for the analysis. Data have been presented in the form of diagrams and tables, which have been used to identify interdependencies and compare individual relationships.

4. Analysis and Conclusion:

4.1 Demographic details:

Gender:

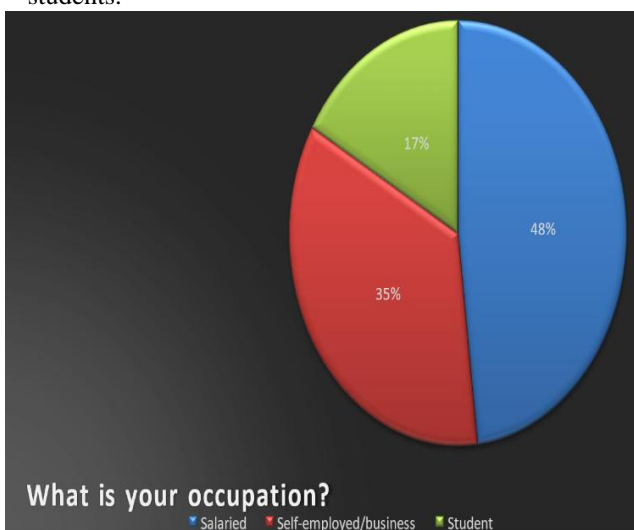
Out of 55 respondents, 52% were male while 48% were female

Age:

22% of the respondents belonged to the age of 50 years and above, 33% belonged to the age group of 36-50 years, 28% belonged to the age 26-35 years, 17% belonged to age between 18-25 years.

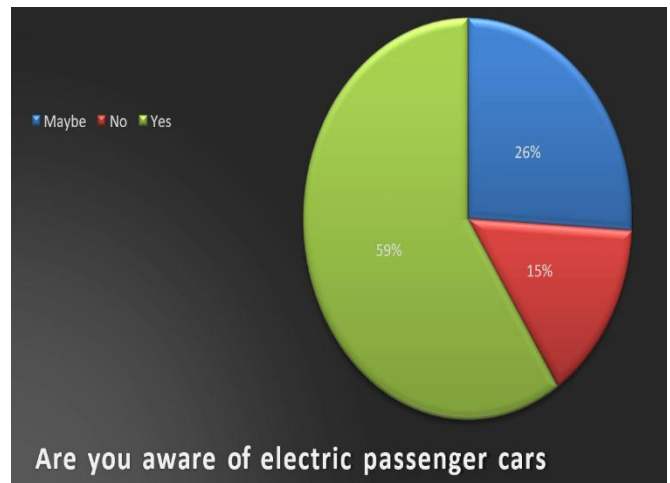
Occupation:

Of the responders, 35% were either self-employed or had their own firm, whilst 48% were salaried. However, 17% of those surveyed were students.



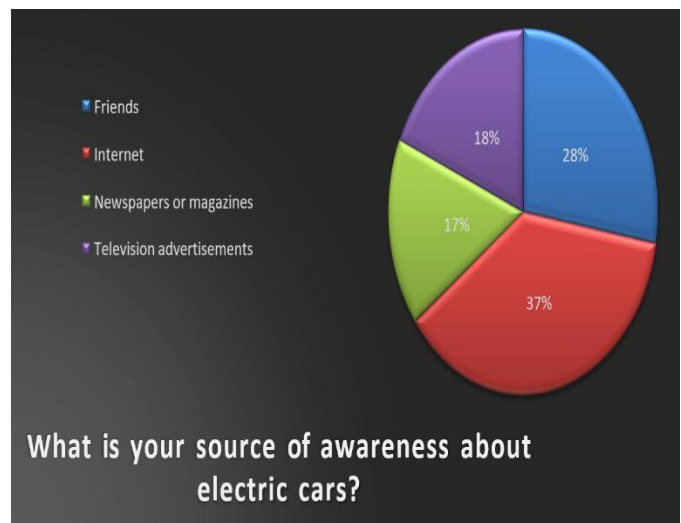
Awareness of the consumers regarding electric cars:

It was determined that, when it came to their understanding about electric passenger vehicles, 59% of respondents were knowledgeable, 26% were oblivious, and 15% were unknown.



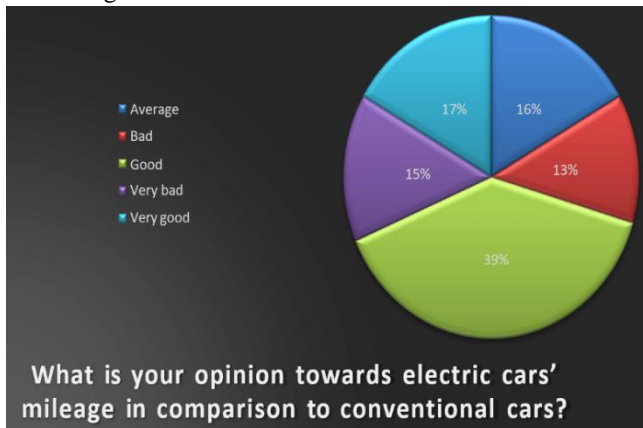
Source of Awareness:

37% of the respondents learned about electric passenger vehicles from the internet, while 28% of the respondents learned about electric cars from their friends or relatives. The internet was the primary source of information for 37% of the respondents. These respondents made up 18% of the total respondents, while approximately 17% of the respondents were able to learn about electric cars through television commercials. The other respondents learned about electric vehicles by reading newspapers or magazines.

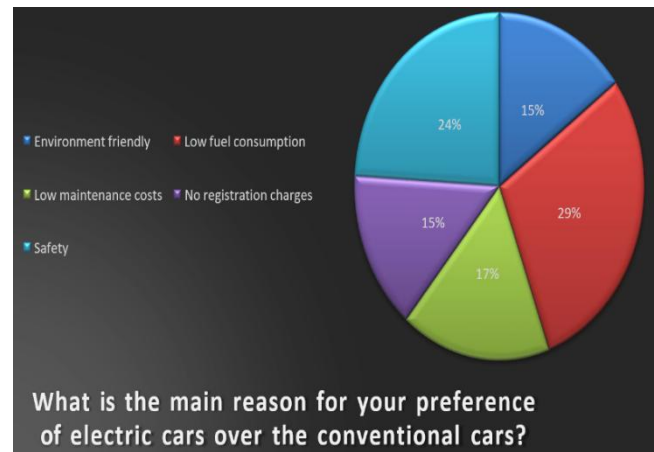


Opinion towards mileage of EVs in comparison to other cars:

It was found that 39% of the responders thought that the mileage of EVs was good, and 17% were of the opinion that it was excellent. On the other hand, it was observed that rest of the respondents were of the belief that electric passenger vehicles did not have adequate mileage.

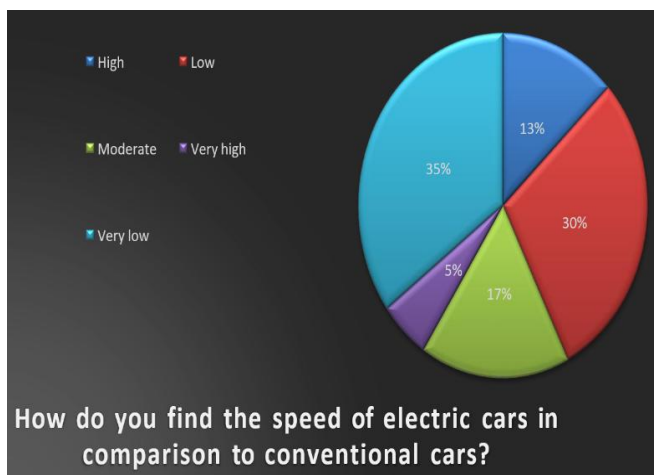


17% were more convinced that electric passenger vehicles have lower maintenance expenses than conventional vehicles, 15% favored electric passenger vehicles more since there are no registration fees associated with them, and 15% thought they are more environmentally friendly. Whereas only 24% considered safety to be a crucial issue.



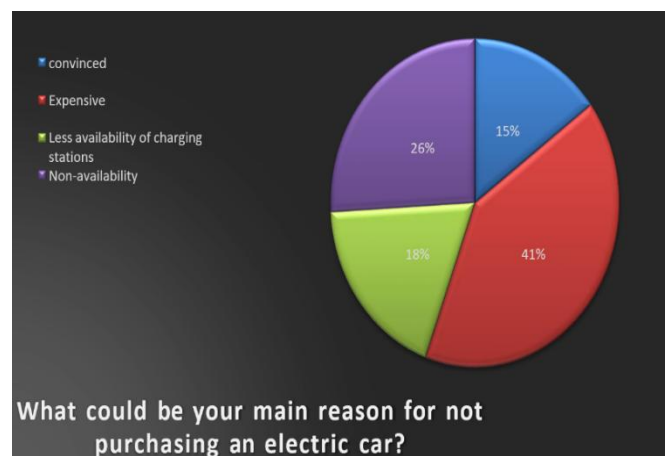
Opinion towards speed of EVs in comparison to other cars:

I was discovered that 35% of the respondents believed that the speed was extremely slow and 30% considered the speed to be slow in comparison to that of conventional vehicles. On the other hand, just 18% of the respondents, felt that the speed of EVs was high when compared to other cars.



Factors influencing consumer purchasing decisions for EVs

The responses indicated that 41% did not want to get an electric car because it is expensive. This was followed by 26% who thought non-availability due to lengthy waiting times. Furthermore, 18% noted that the availability of infrastructure for less charging stations was a significant factor that influenced their intentions to purchase an electric passenger vehicle rather than a conventional vehicle.



Main reasons consumers prefer EVs over other cars:

It was discovered that the most important reason for purchasing an electric vehicle was the low amount of fuel consumption cited by 29% of the respondents.

4.2 Hypothesis Testing

H10: Gender has no significant influence on the preference of EVs over the other vehicles.

H1a: Gender has a significant influence on the preference of EVs over the other vehicles.

A Pearson's Chi-Square test was used to statistically verify the facts of hypothesis 1, and the results showed a low degree of freedom, a p-value of 0.15, and a score of 5.884. The null hypothesis should be rejected as the p-value was less than the alpha value, according to the results of a comparison

Gender * Do you prefer electronic cars or conventional cars Crosstabulation				
Count				
		Do you prefer electronic cars or conventional cars		Total
		electronic cars	conventional cars	
Gender	Male	16	13	29
	Female	6	20	26
Total		22	33	55

**Table 1. Influence of gender on the preference of EVs over the other cars
Workflow pattern of NEOS – FLOW**

According to the cross-tabulation table, 13 of the 29 male participants favoured conventional automobiles, while 16 of them selected electric cars. However, just six of the twenty female respondents to the study said they would like to buy electric cars, while the other twenty said they would prefer to buy conventional cars. It proves that males are more likely than women to buy electric vehicles.

between the two. Thus, it is appropriate to adopt the alternative hypothesis. Because males are more likely than women to purchase electric vehicles, the test's results also statistically demonstrate that gender influences the decision to choose an electric vehicle over a conventional one.

H20: Consumer's income doesn't have a significant influence on their decision to purchase EVs.

H2a: Consumer's income have a significant

Chi-Square Tests					
	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	5.884 ^a	1	.015		
Continuity Correction ^b	4.623	1	.032		
Likelihood Ratio	6.049	1	.014		
Fisher's Exact Test				.027	.015
Linear-by-Linear Association	5.777	1	.016		
N of Valid Cases	55				
a. 0 cells (0.0%) have expected count less than 5. The minimum expected count is 10.40.					
b. Computed only for a 2x2 table					

Table 2. Chi-Square Test for analyzing if there is an influence of gender on the preference of EVs over the other cars

influence on their decision to purchase EVs.

What is your annual income? * Do you prefer electronic cars or conventional cars Crosstabulation				
Count				
		Do you prefer electronic cars or conventional cars		Total
		electronic cars	conventional cars	
What is your annual income?	1-5 lakhs	7	1	8
	5-10 lakhs	2	17	19
	10-15 lakhs	8	5	13
	15 lakhs and above	5	10	15
Total		22	33	55

Table 3. Influence of consumer's income on their decision to purchase EVs.

Hypothesis 2 was carried out to see whether a consumer's income significantly influences their decision to buy an EV. First, two variables—income and customers' preference for purchasing electric vehicles over other types of vehicles—were cross-tabulated in the chart above. 7 of the 8 respondents, whose income ranged from 1-5 lakhs, recommended purchasing an EV. Furthermore, just 2 of the 19 respondents who made between 5-10 lakhs intended to buy an EV, while 17 of them preferred to buy other cars based on their income. 13 respondents with incomes ranging from 10-15 lakhs preferred to purchase an EV than a conventional vehicle. The remaining 15 responders, 5 favored buying an EV and the remaining planned to buy other vehicles, all made more than 15 lakhs. Thus, data demonstrates clearly that purchasing intentions are correlated with various income levels.

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	17.189 ^a	3	.001
Likelihood Ratio	18.797	3	.000
Linear-by-Linear Association	.627	1	.428
N of Valid Cases	55		
a. 2 cells (25.0%) have expected count less than 5. The minimum expected count is 3.20.			

Table 4. Chi-Square Test for significant influence of consumer's income on their decision to purchase EVs

A p-value of 0.01 with a score of 17.189 and a degree of freedom of 3 was obtained from a Pearson's Chi-Square test, which was used to statistically verify the facts of hypothesis 2. When comparing the p-value to the alpha value of 0.05, it was found that the p-value was less than the alpha value, which makes it obvious that the null hypothesis should be rejected. The alternative hypothesis is accepted as a result. Additionally, it has been statistically demonstrated that consumers' incomes have a major influence on their decisions to buy EVs.

H3₀: There is no strong correlation between a consumer's age and their level of awareness regarding EVs.

H3_a: There is a strong correlation between a consumer's age and their level of awareness regarding EVs.

To analyze if Hypothesis 3 revealed a significant correlation between consumer's knowledge of electric automobiles and their age. According to the cross-tabulation above, all 10 of the respondents who were between the ages of 18 and 25 knew about electric automobiles.

Out of 15 responders between the age 26 - 35 years, 9 of them were aware of EVs, and the rest of them were not aware of EVs. The subsequent 20 respondents were from the age groups of 36-50 years or 50 years and above; out of them, almost 14 respondents knew about electric cars, and only five did not know about them. Only 14 respondents in total opted for maybe, which means they were not sure about their awareness of electric cars. This shows that most of the respondents aware of the electric cars were mainly from the age brackets of 18-25 years or 36-50 years.

Count		Are you aware of electric passenger cars			Total
		Yes	No	Maybe	
Age	18-25 years	10	0	0	10
	26-35 years	9	3	3	15
	36-50 years	10	5	3	18
	50 and above	4	0	8	12
Total		33	8	14	55

Table 5. The strong correlation between consumer's age and their level of awareness regarding EVs.

H4a: Elements like fuel economy impact the consumer's buying behaviour.

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	21.096 ^a	6	.002
Likelihood Ratio	23.772	6	.001
Linear-by-Linear Association	11.320	1	.001
N of Valid Cases	55		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is 1.45.

Table 6. Chi-Square Test for strong correlation between consumer's age and their level of awareness regarding EVs.

A Pearson's Chi-Square test was used to statistically verify the facts of hypothesis 3, and the results showed a p-value of 0.02 with a score of 21.096 and a degree of freedom of 6. By comparing the p-value to the alpha value of 0.05, it was evident that the null hypothesis should be rejected because the p-value was less than the alpha value. Thus, it is appropriate to adopt the alternative hypothesis. The findings of this research also statistically demonstrate that there is a substantial correlation between customer's knowledge of electric automobiles and their age.

H40: Elements like fuel economy doesn't impact the consumer's buying behaviour.

Which factor is likely to influence your buying decision while purchasing an electric passenger car? * Do you prefer electronic cars or conventional cars Crosstabulation				
Count		Do you prefer electronic cars or conventional cars		Total
		electronic cars	conventional cars	
Which factor is likely to influence your buying decision while purchasing an electric passenger car?	Appearance	3	5	8
	Speed	4	2	6
	Battery life	1	11	12
	No fuel cost	9	10	19
	High comfort	5	5	10
Total		22	33	55

Table 7. Various elements impact consumer's buying behavior:

Hypothesis 4 was tested to examine the impact of various components and determine their influence on the purchasing behaviour of customer's. This was depicted with the help of the above cross-tabulation that out of the eight respondents having their key influence as appearance, only 3 of them preferred electric cars. However, people who were influenced by the car's speed were 6 in total, out of which 4 of them preferred electric cars, and two respondents chose conventional cars. Of the respondents whose buying intentions were impacted by battery life, only one out of nineteen

respondents wanted to opt for electric cars over conventional cars. The respondents choosing high comfort as an important factor impacting their decisions were divided equally; 5 respondents each opted for electric cars or conventional cars. The respondents who chose no fuel cost as an influencing factor were also divided almost equally as 9 out of the total 19 respondents wanted to purchase EV. The rest wanted to go for other cars only.

Table 8. Chi-Square Test Various elements impact on the consumer's buying behaviour

Chi-Square Tests			
	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	7.659 ^a	4	.105
Likelihood Ratio	8.774	4	.067
Linear-by-Linear Association	.216	1	.642
N of Valid Cases	55		
a. 6 cells (60.0%) have expected count less than 5. The minimum expected count is 2.40.			

A Pearson's Chi-Square test was utilized to statistically verify the facts of hypothesis-3, and the results indicated a p-value of 0.105, a score of 7.659 and a degree of freedom of 4. It was evident that the null hypothesis should be accepted as the p-value was greater than the alpha value (0.05). The test's findings support the rejection of the alternative hypothesis. Additionally, it has been statistically demonstrated that a number of factors have no effect on the purchasing decisions of the customers.

5 Conclusions

In India, people are becoming more conscious of the rapidly shifting global climate and the advantages of environmentally friendly electric vehicles. However, before purchasing an EV in India, the high cost is an important consideration. Furthermore, the respondents stated that they would only be willing to purchase an EV in the future

provided the necessary infrastructure improved. Customers are now perceived as being hesitant to purchase EVs because of their high initial cost, limited number of charging stations, and the time required for battery recharging are key challenges that need to be addressed. To enhance consumer confidence in EVs, both manufacturers and the government must focus on improving charging infrastructure.

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