"A Study of Consumer Buying Behaviour towards Electronic Cars"

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Abstract:
The research aims to figure out how price affects a consumer's buying decision. Moreover, this study investigates the future of electric cars in India. Using a Questionnaire survey, we collected data from one hundred respondents who either already have a car or are willing to purchase along with adults in general from Punjab, India. The results of the study indicate that income is a big factor in the purchase of such cars because these cars fall on the steeper side. EVs contribute to a better environment, and this is possible when many people get to use them, which is possible when prices are moderate. This study suggests that if a buyer buys an electric car there should be forethought about the tax relaxation in that particular year or the next five years; this will grow the number of electric cars.

Keywords: *Consumer Buying Behavior, Electronic Cars, Environment.*

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INTRODUCTION

An electric car (also known as a hybrid car or all-electric car) is a vehicle that operates on electricity from one or more motors and rechargeable batteries. An electric car dates back to the end of the 19th century when transportation was ruled by steam engines (Yan et al., 2019). In 1884, the first electric car was built and designed with high-capacity rechargeable batteries. Over the next two decades, the electric car grew steadily and even Porsche built one but in 1914 WW1 broke and they needed another type of power that could drive automobiles with reliability and durability(Graham-Rowe et al., 2012). There came the beginning of the new era of the internal combustion engine (ICE). With that combustion engines grew at a faster rate and electric-powered vehicles were buried (Carley et al., 2013).

In the 1970s, as the oil crisis hit around the world concern rose against greenhouse gases as the emission of CO2 increased and impacted the environment of the earth where the melting of ice was seen in the region of Antarctica (He et al., 2018). Many countries came forward to taking incentive against it by lowering the emission and efficiency of automobiles (Saleem et al., 2018). Not only electric cars were seen as a substitute but hydrogen-powered cars also became known as 'fuel cells'(Becker et al., 2009). Due to a complication with hydrogen cars, it is still struggling to grab the attention of the world such companies Toyota and Hyundai are doing heavy research on hydrogen-powered cars (Degirmenci & Breitner, 2017).

In 2004 Tesla, as an electric automaker, began the development of the electric car. In 2008, Tesla produced Tesla Roadster which was delivered to customers (Singh et al., 2021) (Kley et al., 2011). The Tesla Roadster was powered by lithium-ion battery cells and had a range of over 320 kilometers (200 miles) on a single charge. In September 2017, Tesla sold over 250,000 units. The Renault-Nissan-Mitsubishi Alliance sold over 500,000 electric vehicles. In January 2018, the Global Leaf became the world's best-selling plug-in electric vehicle, with over 300,000 units sold.

People are now aware of all environmental issues related to the emission of carbon monoxide from petroleum and diesel engine cars (Singh, 2020) (Rezvani et al., 2015) (Egbue & Long, 2012). The world has seen a hike in the prices of these gases as well (Bozhuk & Pletneva, 2018). Electronic vehicles can be counted as revolutionary in terms of sustainability but along with the EVs come many issues like charging stations, battery backup, millage, and prices of the cars (Tu & Yang, 2019).

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The research will be around what the consumer perception towards EVs is and what the consumer buying behavior is when it comes down to the purchase of such cars plus all the factors related to when customers look for such vehicles.

OBJECTIVES OF STUDY

1. To understand the relationship between the price and the consumer's purchasing decision.
2. To analyze the consumer awareness towards EVs.
3. To investigate the future of electric cars in India.

LITERATURE REVIEW

Woodward (Deloitte UK) (2019), According to his report, EVs will hit a tipping point in 2022, when the cost of ownership of electric vehicles will be comparable to that of ICE vehicles (Internal Combustion Engine). (Carley et al., 2019). Ogra (2018) PwC is an advisory firm solving society's problems and documenting the transformation of mass transportation in India. The government of India creating a new means of technology by adopting green methods (Kushwaha, Singh, Tyagi, et al., 2020). Carbon emissions increase daily mainly due to the transportation sector. As per the forecast, 500 million people will live in cities. Governments of the world took a pledge to reduce the carbon intensity by 33-25% by 2030 as the baseline year 2005. In the car segment, 75% of small cars dominate the Indian Car Market. Acc. to the report of SIAM, the growth of 14.39% is accounted for by comparing the sales of 2017 (1.71 cr units) and 2018 (1.95 cr units). However, the Government of India is promoting companies to develop electric cars by providing 60% aid in R&D for developing low-cost electric technology.

Vidhi (2018) has a review of EV lifecycle emissions and, policy recommendations to raise EV Penetration in India. India's most polluted cities have been facing the problem of air pollution to the worst extent. India's capital, Delhi, is also one of the world's most polluted cities (Kushwaha, Tyagi, et al., 2020). Delhi has around 22 million people where a density is 260 per person. Therefore, such a city requires that sort of transportation, which emits less pollution. For that the Government has launched a scheme called FAME II where 10,000 cr will be invested in EV sales and R&D. Moreover, the government is trying to push factors from subsidies and pulling the customers (Kushwaha, Singh, Varghese, et al., 2020).

Jin (2017) This paper examines the various stages of an electric vehicle's (EV) lifecycle, their effect on environmental pollution, and policy recommendations tailored to a specific socioeconomic community applicable to the Indian market (Kushwaha et al., 2021). Consumer awareness is a concern that most people know aren't aware of EVs. For this government initiated the activities on the national and local levels for the promotion of EV awareness. The barrier is many but the most important ones are 'Consumer Awareness' (Kushwaha et al., 2021). As per data the sale of 2010 marked under 100 units climbed to 500,000 units in 2015 and will climb faster than ever.

Bansal (2017), has compared electric and conventional vehicles in Indian Market. In this research, they have focused on the total cost of ownership of electric cars and conventional cars. In this research paper the authors have implemented quantitative analysis and at last, concluded that electric vehicles are better than those of conventional in Indian Markets.

Wolfram (2016) this study was conducted on the three alternatives - BEV (Battery Electric Vehicle), PHEV, and HFCEV. As the EU emission, regulation passed the CO2 emission will be lowered to 95 gm. /km by 2021 but it will be extended further in 2025. As the BEV lithium-ion battery costs €250 (INR20, 200 approx.) the cost will be brought down to €130- €180 (INR10, 500-14, 500 approx.). In 1838 or 52 years before electricity came as a power source for the vehicles but as ICE came their existence became history. Half of the EVs are present in the US and most of them are registered in California. Whereas India accounts for only 3000 (e) and 300 charging centers across India. As of 2014 data accounts, the number of the fleet is 25 million (2014) where electric vehicles are .012 percent.

Natraj S. (2012) Market attitudes toward Internet-based carmaker websites are examined in this paper. We wanted to provide a

scientifically and empirically based initial reference position against which future research can analyze and interpret the role played by changes in the variables reflecting consumer preferences and shifts in these preferences, assisting car manufacturers in learning more about how to improve customer satisfaction in detail. The two independent variables have a major impact on the satisfaction of Indian car buyers on the Internet, according to regression analysis. Furthermore, by properly interpreting parametric change in the regression analysis, we can investigate the effects of potential (future) improvements to the Manufacturer's website on the Internet, especially in terms of optimizing the website's quality and ease of navigation to maintain a loyal customer. In general, we believe that by following the suggested model, Internet-based car manufacturers can effectively increase the degree of satisfaction of current and prospective customers(Busse et al., 2013).

Kiel (1981) establishes a taxonomy of customer external search activity based on three dimensions of knowledge seeking: source, time, and brand. Their findings show three distinct groups: high searchers, low searchers, and limited information seekers. Moreover, the variables of the different dimensions have a complicated relationship with the different groups' search behaviors.

Westbrook et al. (1979), "categorize the respondents based on the amount of physical shopping they do and whether they use neutral or personal sources to gather pre-purchase detail. Objective shoppers, moderate shoppers, store-intense shoppers, and personal advice seekers are the four categories they discovered. The buyer's age and education, satisfaction with a previously purchased product and its condition, the evoked set size, and joint husband-wife decision making have all been shown to affect the knowledge-seeking process".

Furse et al. (1984) are the first to demonstrate that others are involved in the information-gathering process. They find six distinct external knowledge search patterns among new car buyers, four of which are identical to those found in previous studies: low search group, high search group, retail shopper group, and moderate search group. In this report, the other two groups—purchase-pal aided quest and high self-search—are profiled for the first time". This finding was also corroborated by salespeople's self-report results. The results were tested by salespeople on the basis that if customers used various search techniques, salespeople would be able to observe certain aspects of their search behavior as well. The findings backed up this theory, as the salesperson's data revealed a six-cluster solution that closely matched the customer data categories.

Urbany (1989) Examines how search and shopping habits are influenced by the uncertainty of choice and uncertainty of information. Their findings show that the four classes of respondents, each ranked on two dimensions of information uncertainty (high and low) and option uncertainty (high and low), search and shop differently (high and low). "Though the study's primary objective was not to classify distinct segments of consumers based on their search strategy, it did show the importance of personality variables such as ambiguity in distinguishing external search activity".

Klein (2003) looks at how people use the Internet differently, as well as the patterns of substitution they show through sources and media. They merge the two conventional dimensions of impersonal/personal and independent/seller-dominated sources with the third dimension of offline/online sources. They show that successful shoppers, late buyers, and early buyers have different search habits.

RESEARCH METHODOLOGY

For this research, both primary & secondary data have been considered. Primary data has been collected via questionnaire method and the secondary data has been collected from various journals, magazines, and internet sources. The respondents needed for research were youth and adults who either already have a car or are willing to purchase along with adults in general. The sample size selected for carrying out the research is 100. The research and survey are being conducted in Mohali, also known as SAS Nagar, a district in Punjab, India, that is a commercial hub located southwest of Chandigarh, the state capital. The tool used here to check the impact and relation between two variables would be done by the Chi-square method, correlation, and obtaining

mean values via descriptive frequencies. The chi-square test for freedom, also known as Pearson's chi-square test or the chi-square test of association, is used to see whether two categorical variables have a relationship.

ANALYSIS AND FINDINGS

H0: There is no significant impact of income on the price ranges of EVs.

H1: There is a significant impact of income on the price ranges of EVs.

From the table below, we can obtain how people from different income groups are distributed among the statements about the initial cost of an EV. Electronic vehicles are known to be expensive possessions. Hence it was extremely important to find out what respondents from different income groups felt about the price ranges of these vehicles. The statement is made on a 5-point Likert scale from not important at all to most important.

The results in the table are divided among expected and observed counts. If we take the income group belonging below 10,000/-, the 1 column says the expected count was 1 but the observed count came out 4. Similarly, in the 5 columns, the expected was 6.1 but the observed came to just 5. The results were balanced out. If we see the 5th row where the income group was 40,000/- to 50,000/-, the expected count for the 5 columns was 8.5 but observed came 10 whereas not at all important had zero observed counts. Therefore, it can be considered that the results were quite scattered evenly.

Income * The_initial_purchase_cost Crosstabulation

			The_initial_purchase_cost					
			Not at all important	Less important	Neutral	Important	Most important	Total
Income	<-10,000	Count	4	2	7	0	5	18
		Expected Count	1.0	1.2	4.6	5.1	6.1	18.0
	10,000-20,000	Count	2	1	4	13	13	33
		Expected Count	1.8	2.1	8.5	9.4	11.2	33.0
	20,000-30,000	Count	0	1	4	4	7	16
		Expected Count	.9	1.0	4.1	4.6	5.4	16.0
	30,000-40,000	Count	0	0	4	9	2	15
		Expected Count	.8	1.0	3.9	4.3	5.1	15.0
	40,000-50,000	Count	0	2	8	5	10	25
		Expected Count	1.4	1.6	6.4	7.1	8.5	25.0
	>-50,000	Count	0	1	1	0	0	2
		Expected Count	.1	.1	.5	.6	.7	2.0
Total		Count	6	7	28	31	37	109
		Expected Count	6.0	7.0	28.0	31.0	37.0	109.0

A Chi-square test has been carried out to test the significance of the hypothesis. The p-value obtained in this case is 0.003, which is lower than the normal alpha value of 0.05. As a result, the null hypothesis is denied, and the two variables are unrelated. The alternate hypothesis is accepted that there is an association between the income and price range of the EVs.

Symmetric Measures

		Value	Asymp. Std. Error[a]	Approx. T[b]	Approx. Sig.
Ordinal by Ordinal	Gamma	.072	.117	.612	.540
N of Valid Cases		109			

a. Not assuming the null hypothesis.

b. Using the asymptotic standard error assuming the null hypothesis.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	41.771[a]	20	.003
Likelihood Ratio	44.214	20	.001
N of Valid Cases	109		

a. 20 cells (66.7%) have expected count less than 5. The minimum expected count is .11.

Chi-Square Tests

	Value	df	Asymp. Sig. (2-sided)
Pearson Chi-Square	4.745[a]	10	.908
Likelihood Ratio	6.060	10	.810
N of Valid Cases	109		

a. 14 cells (77.8%) have expected count less than 5. The minimum expected count is .06.

This shows the strength of the association between the two variables. Here the value is positive 0.072, which is farther to +1, which suggests the model has a low predictive ability. This is taken when we have symmetric data, which can be both independent and dependent ordinal variables. Awareness level of the customers in the various age groups regarding electronic cars.

H1: There is a significant difference in the awareness level of the customers in the various age groups regarding electronic cars.

The results are more defined here in this table. The analysis has been performed between the age of the respondents and their awareness regarding electric vehicles. It can be observed above that the second column, i.e. age group of 20-30, is most likely to be aware of such vehicles. The expected count of people who would go for option yes was 56 and the observed count came out close to this, i.e. 55.9 for option yes, which means this age group does know about such cars. In addition, the age group of 30-40 takes the second position. The expected count of people who would go for this option, yes, was 14.4 and the observed count came out close to this, i.e. 15, which means this age group does know about such cars. 87 people in total are aware of such vehicles whereas a few numbers (19 people) are not.

A Chi-square test has been carried out to test the significance of the hypothesis. The p-value is 0.908, which is higher than the normal alpha value of 0.05 but not important. As a result, the null hypothesis is accepted, and the two variables are interdependent. The alternate hypothesis is not considered. There is rather no significant impact of age on the awareness of age with the awareness of EVs.

This shows the strength of the association between the two variables. Here the value is negative -0.249 which is farther to -1 which suggests the model has a low predictive ability and they give in two different directions. This is taken when we have symmetric data, which can be both independent and dependent ordinal variables.

LIMITATION

Current research will certainly act as a foundation for future research. The current research, however, has some limitations. All the limitations that had been faced during the study have been listed below.

- Unwillingness to fill out the form
- Ambiguity about form
- Human error
- Avoidance/Ignorance
- Time-consuming
- Wrong information.

SCOPE FOR FUTURE WORK

The distinction between gasoline and electricity is not binary; a car's green credentials depend on whether and how it uses electricity, as well as how that electricity is produced, with important efficiency and range trade-offs.

"A report by the Ricardo consultancy estimated that production of an average petrol car will involve emissions amounting to the equivalent of 5.6 tonnes of CO2, while for an average electric car, the figure is 8.8 tonnes. Of that, nearly half is incurred in producing the battery. Despite this, the same report estimated that over its whole lifecycle, the electric car would still be responsible for 80% of the emissions of the petrol car."

The scope for future work is going into detail work for all the issues, which will directly connect the EVs and the environment.

CONCLUSION

The study was conducted to see the consumer buying behavior towards electronic vehicles. This study involved various factors like how income affects the purchase of what people look for while purchasing a vehicle or what perception they have towards the electronic vehicle. More than 100 people responded where 60 were male and the rest 48 were female.

It was found out after the analysis that; Income is a big factor for the purchase of such cars because these cars fall on the steeper side. Hence, people will only buy them if the prices are moderate. EVs contribute to a better environment but this is only possible when many people get to use them, which is possible when prices are moderate. It was also found out that age does not impact the purchase of such cars. It is quite subjective and depends on the individual.
Various other factors stand out to be important when it comes to purchasing, like the fuel cost, the looks of the vehicle, efficiency, etc. which have been mentioned in detail above.

Lastly, electronic vehicles are the future because they lead to sustainability. But it is only possible when the country and the people are fully aware and equipped with resources.

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