JETIR.ORG ISSN: 2349-5162 | ESTD Year : 2014 | Monthly Issue
JOURNAL OF EMERGING TECHNOLOGIES AND INNOVATIVE RESEARCH (JETIR)
An International Scholarly Open Access, Peer-reviewed, Refereed Journal

Study on the factors influencing the Purchase of Electric Car.

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Abstract: *As EV are being developed as an effective solution for the lack of fossil fuels and environmental issues. Still, most of the customers are not willing to purchase Electric car. Most of the companies are also doing on road driving test to increase the awareness of customer. In light of this, this study is conducted to find out awareness of customer and the factors influencing the purchase of Electric car. This study adopts a quantitative approach and conducts a survey to investigate this topic. Based on 157 online questionnaires response from consumers, this study employed SPSS to conduct a ANOVA, Pearson Correlation and Cronbach's Alpha to test the determining factors. The empirical results indicate that charging infrastructure, environmentally friendly, cost of electric car, low running cost, low maintenance cost, mileage, battery life are some factors that influence the purchase of electric car while my results do not show that safety, speed, registration, appearance and uncertainty of technology matters in influencing the purchase of consumers. Also, this study provides relevant suggestions to electric vehicle manufacturers and the Indian government about how to encourage the Indians to adopt electric vehicles in India.*

INTRODUCTION

Economic conditions around the world have been very encouraging. Global growth which as 3.2% in 2019 reached 3.5% in 2020 and is expected to hover around this level in the current year also. While the Chinese economy is growing at around 6.6% without any signs of slow down, the Indian economy is also continuing to grow at more than 6.8%. In the coming years, it is expected that the Indian economy are going to be booming due to the heavy demand on infrastructure. Energy sector is growing by leaps and bounds as it is receiving the highest attention of both the State Governments and Central Government. The manufacturing sector now contributes around one- fourth of the entire GDP.

Sustainable economic process of India also as remainder of the planet will depend upon effective energy planning. Nearly 40% of the world's energy comes from petroleum. Natural gas contributes to a different 20% and these two natural resources account for 60% of the world's energy. The growth in consumption of oil and gas within the past has been such the consumption has been doubling every 15 years. This trend is probably going to continue and can cause complete depletion of natural resources in next 30 years. It is significant to note that more than 20% of the world's total primary energy is consumed in transportation. There are quite 78.9 million cars currently within the world and in another 20 years the car population will reach billion marks. It is also significant to notice that after 1970 the new oil discoveries are only a few and any new discoveries won't make any significant contribution to the world's energy pool. Economic and environmental forces are frequently pitted against one another and lots of times the financial cost of environmentally friendly technologies and goods is so high that one has to strike a balance or look for Government subsidies. Electric Cars are unique during this aspect as they're not only economical but also environment friendly.

Research Problem

To increase the growth of sale of electric passenger car.

OBJECTIVES

i) To find out the awareness of consumer about the electric passenger car.
ii) To find out the reason why consumer prefers electric passenger car.
iii) To find out the factor influencing the purchase of electric passenger car.

Hypothesis

i) H0 = Null hypothesis = Consumers buying decision is not affected by advertising promotional strategy for electric passenger car.
H1 = Alternate hypothesis = Consumers buying decision is affected by advertising promotional strategy for electric passenger car.
ii) H0 = Null hypothesis = Electric vehicles cost will not be a major barrier in buying decision for mid segment passenger car.
H1 = Alternate hypothesis = Electric vehicles cost will be a major barrier in buying decision for mid segment passenger car.
H0 = Null hypothesis = Consumers are not aware of Electric passenger car.
H1 = Alternate hypothesis = Consumers are aware of Electric passenger car.
iii) H0 = Null hypothesis = various factors did not influence the purchase behaviour of consumer.
H1 = Alternate hypothesis = various factors did influence the purchase behaviour of consumer.

Literature Review

Bhupendra Kumar Verma (2007) in his study of the perception of buyer and user towards Electric-bike in Raipur city said that battery, mileage, purchase cost are the factors that affect the purchase of electric bike.

Trin Thananusak (2014) found that financial, infrastructure, performance, environmental and price premium factors affect the willingness of purchase.

Yong & Park (2017) found that policy support, such as tax benefit and subsidy payment, whether the charging is free or not are not strongly influential factors on the diffusion of electric vehicles.

Li, Long, Chen and Geng (2017) has suggested that the intention for consumers to adopt the BEVs is likely to be a mixture of demographic, situational and psychological factors.
Robbert Slot (2017) found out the three factors influencing EV adoption are charging station accessibility, range anxiety and belief in EV technology.

Montian and Suthikarnnarunai (2018) invetigated that In Thailand, EVs still have a limitation in the complete adoption. Major factors are import car duties, infrastructure, charging stations, and consumers do not have confidence and experience in using EV. Demographic variables like gender, age, occupation, education highest and monthly income are all no significantly different for purchase intention towards Evs.

Wang & Zhou (2019 said that driving range, charging infrastructure, purchase cost, government financial incentives, perceived social influence are the major factor that influence the purchase willingness.

Tu and Yang (2019 suggested that Perceived usefulness, perceived ease of use, interpersonal influence and external influence as the sources of subjective norm and perceived behavioural control are the influencing sources of behavioural intention.

Research Gap

i) Many consumers are aware about it but very few of them put it in action to buy electric car.
ii) How Indian customers behaves (that to urban area) to various factors like environmental factors, safety, no registration and maintenance cost and running cost and car cost.

Research Methodology

In order to investigate the objectives of the research the primary data collection has been done with the help of questionnaire shared to 157 customers who are using automobile services in India. Number of customers to whom questionnaire are send is calculated by using Cochran formula. For collecting data simple random sampling method is used. For analysing the responses, SPSS software is used for statistical test like ANOVA and Tableau is used to make graphs to represent the data.

Reliability Test

Cronbach's alpha is a measure of internal consistency, that is, how closely related a set of items are as a group. A general accepted rule is that α of 0.6-0.7 indicates an acceptable level of reliability, and 0.8 or greater a very good level. However, values higher than 0.95 are not necessarily good, since they might be an indication of redundancy (Hulin, Netemeyer, and Cudeck, 2001). Table 1 shows value of α = 0.731 which is in the range of acceptable level of reliability.

Table 1 : Reliability Statistics

Cronbach's Alpha	N of Items
.731	24

Table 2 : Case Processing Summary

		N	%
Cases	Valid	157	100.0
	Excludeda	0	.0
	Total	157	100.0

a. List wise deletion based on all variables in the procedure.

Data Analysis

The table below deals with the basic demographic characteristics of respondents including age, gender, occupation and Household annual income of the respondents included in this research project.

Demographic		No. of Respondents	Percentage(%)
Gender	Male	118	74.7
	Female	40	25.3
Age	18-25	85	53.8
	26-35	65	41.1
	36-50	7	4.4
	>50	1	0.6
Occupation	Salaried	57	36.1
	Self-employed	25	15.8
	Student	76	48.1
Annual Income	1-5 Lakhs	61	38.6
	5-10 Lakhs	53	33.5
	10-15 Lakhs	29	18.4
	>15 Lakhs	15	9.5

OBJECTIVES

a) To find out the awareness of consumer about the Electric Passenger Car.

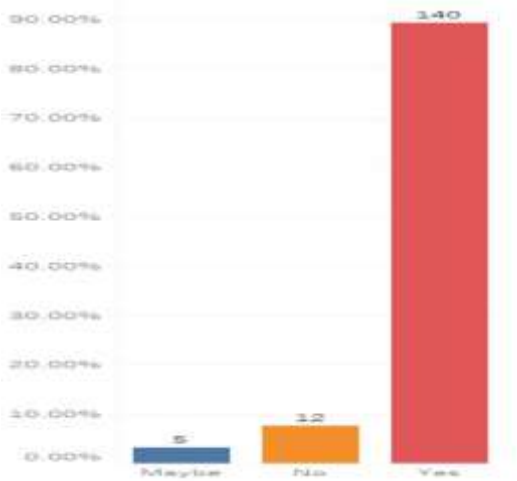


Fig. 6: Consumer awareness

Out of 157 responses 140 respondents are aware of Electric Passenger Car i.e. almost 89.2% respondents are aware of Electric car whereas 12 respondents (7.6%) are unaware of it.

Sources of awareness of electric car are given in the below graph. Out of 140 respondents, 62.18% of 140 respondents come to know about electric car from Internet, 16.67% from Newspaper/Magazines, 11.54% from Friends and 9.62% from Television. As lowest no. of respondents are aware of electric car through Television so, promotional activity in television should increase.

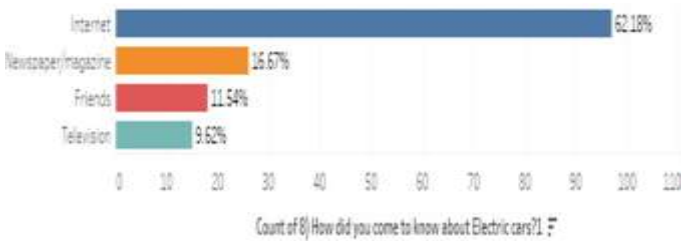


Fig. 7: Medium of awareness

b) To find out the reason why consumerprefers Electric Passenger Car.

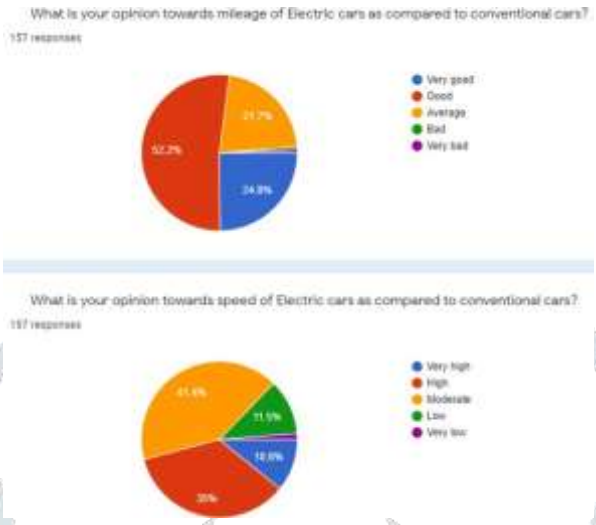
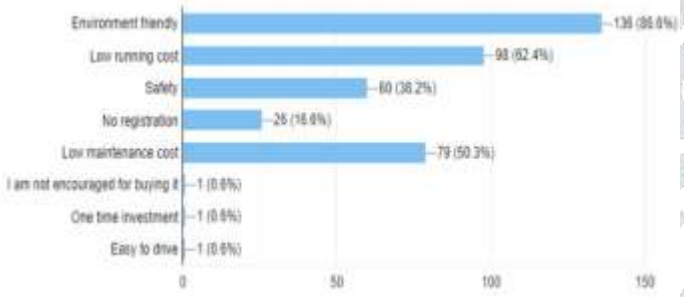


Fig. 8: Opinion towards mileage and speed

As you can see in the above graphs that majority of respondents thinks that Speed and Mileage of Electric Car is better than Conventional Car.

Fig. 9: Various Factors



And from the above graph we can say that various factors like environment friendly, low running cost, safety, no registration, low maintenance cost, one time investment and easy to drive are some of the many reasons why consumers prefer Electric car.

c) To find out the factor influencing the purchase of Electric Passenger Car.

Figure 9 shows the factors because of which consumer prefer Electric Car. As you can see, out of 157 respondents, 136 (86.6%) respondents prefer electric car due to Environment Friendly. Similarly 98 (62.4%) customers prefer due to Low running Cost, 60 (38.2%) customers prefer due to Safety, 26 (16.6%) of them prefer it as there is no registration required and 79 (50.3%) customers prefer due to Low maintenance cost.

Fig. 10: After sales service

And according to the respondents "after sales service" is also important factors that influence them in purchasing electric car. As seen in figure 10 that 95(60.1%) respondents give positive reaction to the availability of after sales service and only 22(13.9%) respondents give negative reaction and 41(25.9%) of them choose maybe.

Hypothesis

a) H0 = Null hypothesis = Consumers buying decision is not affected by advertising promotional strategy for electric passenger car.
H1 = Alternate hypothesis = Consumers buying decision is affected by advertising promotional strategy for electric passenger car.

Table 4: Descriptive

Did advertisement influence you're buying decision?						
	N	Mean	Std. Deviation	Std. Error	95% Confidence Interval for Mean	
					Lower Bound	Upper Bound
1 - 5 lakhs	61	3.74	.874	.112	3.51	3.96
5 - 10 lakhs	53	3.62	.945	.130	3.36	3.88
10 - 15 lakhs	29	4.24	.739	.137	3.96	4.52
> 15 lakhs	14	3.57	1.284	.343	2.83	4.31
Total	157	3.78	.938	.075	3.63	3.92

Table 5: ANOVA

	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	8.202	3	2.734	3.243	.024
Within Groups	128.995	153	.843		
Total	137.197	156			

The table 5 shows the ANOVA test using Family annual income as independent factor and "did advertisement influence consumer buying behaviour" as dependent factor. Here we get an F-value of 3.243 whose sig. value is 0.024.As calculated Sig. = 0.024 is less than 0.05 so, we reject Null Hypothesis.

Hence, it was concluded that Consumers buying decision is affected by advertising promotional strategy for electric passenger car.

b) H0 = Null hypothesis = Electric vehicles cost will not be a major barrier in buying decision for mid segment passenger car.
H2 = Alternate hypothesis = Electric vehicles cost will be a major barrier in buying decision for mid segment passenger car.

Table 6: ANOVA

What do you feel about price of the Electric cars?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	16.061	3	5.354	8.560	.000
Within Groups	95.684	153	.625		
Total	111.745	156			

The table 6 shows the ANOVA test using Family annual income as independent factor and "price of the Electric cars" as dependent factor. Here we get an F-value of 8.560 whose sig. value is 0.000. As calculated Sig. = 0.000 is less than 0.05, hence reject Null Hypothesis.

Hence, it was concluded that Electric vehicles cost will be a major barrier in buying decision for mid segment passenger car.

c) H0 = Null hypothesis = Consumer are not aware of Electric passenger car.
H1 = Alternate hypothesis = Consumer are aware of Electric passenger car.

Table 7: ANOVA

Are you aware of electric car?					
	Sum of Squares	df	Mean Square	F	Sig.
Between Groups	1.963	3	.654	3.713	.013
Within Groups	26.955	153	.176		
Total	28.917	156			

The table 7 shows the ANOVA test using Family annual income as independent factor and "Are you aware of electric car" as dependent factor. Here we get an F-value of 3.713 whose sig. value is 0.013. As calculated Sig. = 0.013 is less than 0.05 so, we reject Null Hypothesis.

Hence, it was concluded that Consumer are aware of Electric passenger car.

H0 = Null hypothesis = various factor did not influence the purchase behaviour of consumer.
H1 = Alternate hypothesis = various factor did influence the purchase behaviour of consumer.

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Table 8

ANOVA

		Sum of Squares	df	Mean Square	F	Sig.
Environment friendly	Between Groups	.264	1	.264	2.285	.133
	Within Groups	17.837	155	.116		
	Total	18.101	156			
Low running cost	Between Groups	.974	1	.974	4.212	.042
	Within Groups	35.854	155	.231		
	Total	36.828	156			
Safety	Between Groups	.821	1	.821	3.509	.063
	Within Groups	36.249	155	.234		
	Total	37.070	156			
No registration	Between Groups	.073	1	.073	.520	.472
	Within Groups	21.822	155	.139		
	Total	21.894	156			
Low maintenance cost	Between Groups	1.983	1	1.983	8.249	.005
	Within Groups	37.265	155	.240		
	Total	39.248	156			

The table 8 show us the ANOVA test with gender as independent factor and "factors encouraged you to buy Electric car" as dependent factor. In case of Environment friendly, Safety and No registration, we failed to reject Null Hypothesis as calculated Sig. value of these factors are greater than 0.05(Critical Value). As there are some factors whose calculated Sig. value is less than 0.05(critical Sig. value) such as "low running cost and Low maintenance cost" we can reject Null Hypothesis. Instead of various factors we can say that, some factors like low running cost and low maintenance cost did influence the purchase behaviour of consumer.

Findings

a) Figure 11 shows that the reasons what may affect their purchasing decisions. Major reasons that affect the buying decisions are expensive, non-availability of Electric passenger car and due to lack of availability of charging stations. Some of the customers are unaware of the technology being used in the vehicle and some of the customers are still not convinced about Electric car that it is better option as compare to conventional car or not.

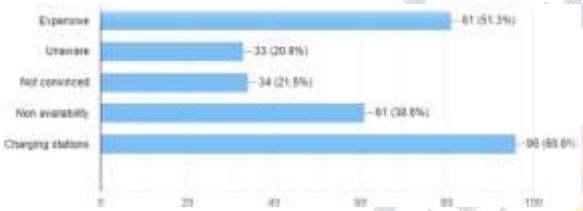

Fig. 11 Factors that affect buying decision

b) Figure 12 show that some other factors that affects the buying decisions of customer. Battery life and uncertainty of electric car technology are the main factors that affect the buying behaviour. Some customers also think that appearance and speed are also the factors that may affect their decision.

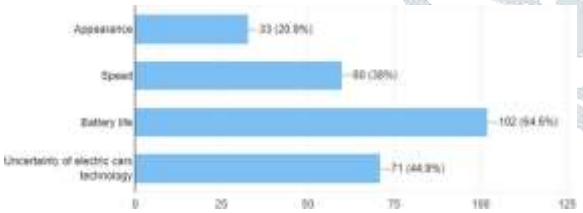

Fig. 12 Factors that consumers think about while purchasing

c) Some of the respondents are unaware about the Electric Cars and their benefits. 60% of the consumers came to know about electric car through internet and there are only few advertisements in newspapers and Tvs.

d) 76.6% of the customers were satisfied with the mileage of the Electric cars and are convinced about the electric car benefits and were willing to refer it to their friends.

e) 41.8% numbers of customers were influenced by advertisements while making their buying decisions.

f) 65.8% of the customers are not much satisfied with the price of theproduct, and price quoted by the companies has affected the customer satisfaction to a great deal.

g) 60.1% of the customers are not satisfied with after sales service.

h) Non-availability of Electric cars is also a reason for consumers for not purchasing it.

I) 58.2% of the respondents feel that the promotional activities for electric cars are not sufficient to make the purchasing decision.

i) The various factors that affect the buying behaviour are cost of vehicle, lack of charging stations, battery life of vehicle and the uncertainty of technology used in vehicle.

Limitation

a) Primary data collection was administered through online questionnaires owing to pandemic situation. As a result, personal interaction was not possible.

b) The respondents for primary data was restricted to a specific area like Pune region and considered to be representative of the entire population.

Suggestions

In order to increase the growth of sale of electric car, government and the other organisations should increase the promotional activities to increase their knowledge as customer are aware of electric car but are uncertain of its technology, function, battery life etc.

There are only few advertisements in newspapers and TVs. Thus maximum advertisements need to be put up in these Medias as they reach wider audiences.

The price of the electric cars need to be decreased it can be done by adopting sophisticated technologies and carrying out mass productions or some discounts on price or offers should be given in order to increase the sales.

More number of charging stations need to be opened at least in major areas.

More number of service centres need to be opened at least in major areas to cater to the problems & needs of the customers when needed.

Promotional activities should be increased to create awareness and increase the sales.

CONCLUSION

From the study conducted it was concluded that maximum number of respondents are aware of Electric cars but still they are not convinced enough to buy it. So various promotional activities need to be taken in order to increase the awareness level & thereby increase the sales. The study also identified and evaluated the consumer perception toward various factor about electric car. The result of this study shows that there is a combination of both positive and negative effect of that factor on consumer perception. Most of the respondents consider the cost and the mileage while purchasing a car, so there are ample potential to electric car in four wheeler sectors. But their battery performance, speed and appearance are the major factors which is affecting the sales of electric cars. The study explains what are the perceptions prevailing in the minds of customers and recommendations to create awareness through marketing campaign.

Future Scope

This study analyzed the factors influencing purchase of electric vehicles, which are mentioned in the previous researches. Therefore, there is a possibility that it overlooked factors which are not suggested in the previous studies but have an important influence on the purchase of electric vehicles. Hence, it is necessary to identify and analyze new influential factors for electric vehicles in further research. And the further research can be done by considering retailers and manufacturers of electric car as respondents.

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