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Determinants of Electric Vehicle Purchase: A Quantitative Study of India

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ABSTRACT

The two major problems which the means of transportation in the world are facing are rising costs of oil and carbon emission which are increasing day by day. Because of these reasons, Electric Vehicles are becoming popular because at one hand they are independent of oil and another benefit is that they do not produce greenhouse gases. There are some challenges as well as difficulties in their adoption like high infrastructure cost, lack of charging points and batteries performance. The solutions to solve these challenges areincreasing the infrastructure for charging, increasing the number of charging points, improving battery life and reducing the battery's charging times. Governments initiatives like giving incentives to peoples to buy EVs and investment in charging infrastructure can be fruitful. Stakeholders from industry and governments can collaborate with each other for the promotion of the use of EVs, which will be helpful in the reduction of carbon emissions and reduce air pollution also.

The paper aims to measure determinants /factors which influence the attitude of consumer to purchase electrical vehicle. The attitude and intentionof consumer to buy an Electric Vehicle is measured in this paper. This paper helps to find whether attributes of Electric Vehicle have anyeffect on attitude for innovation and whether the consumer's attitudeaffect theirintention to buy electrical vehicle or not.

Keywords: Electric Vehicles, Innovations, Intent to buy, Attitude of Consumer

INTRODUCTION

Study done by International Energy Agency in 2021, showed that the purchase of electric vehicles is increasing day by day in the whole world, which shows Electric Vehicle market is a well growing market.Since the problem of global warming is increasing day by day, so human beings are getting more aware about the environment and towards the sustainable side of development. The best solution of this problem is Electric vehicles (Tu & Yang, 2019)[1]. Moon (2021)[2] showed thatconsumer's interest towards Electric Vehicle is

increasing day by day, as now he is aware that in EV there is no combustion engine so there will be lower impact on environment,still many consumers are not willing to buy Electric Vehicle.

Attributes to be considered before buying Electric Vehicle

There are many things that a consumer considersbefore buying an Electric Vehicle. In this paper three categories are discussed which may have an effect on the attitude of consumer and their intention to purchase electrical vehicle. These three factors are:

1. **Price Factor**

- Electric Vehicle's Price
- Electricity Rate
- Petrol's Price
- Cost of Service
- Rate of Vehicle Tax
- Cost of Installing a charging Point in home

2. **Performance Factor**

- Mileage
- Charging Time
- Charging Ability
- Less Service
- Green Image

3. **Environmental Factor**

- No CO_2 Emission
- Better for environment than regularVehicle
- Contributes to sustainable future

Since last many decades, environment is getting degraded so the attitude of people has also changed. Now they are going for green products and are also looking for different ways to make the environment clear (Chen et al., 2010)[3]. Almost all the people are involving in this mission and trying to solve the issue of environmental degradation (Kilbourne & Pickett, 2008)[4].The behavior of consumer can be seen by seeing the buying

behavior of consumer towards electric vehicles(Mobility Sweden, 2021)[5]. Electric vehicle is considered as an eco-friendly alternative than conventional cars (Singer, 2016)[6].
Coffman et al. (2017)[7]showed that there are many factors which affect the demand of electric vehicles by consumer. One of them is ownership cost of Electric Vehicle, range of driving and charging time. They all have their influence on the purchase of electric vehicles by consumer (Hindrue et al., 2011; Rajper& Albrecht, 2020)[8,9].

OBJECTIVES OF STUDY

The paper aims to measure determinants /factors which influence the attitude of consumer to purchase electrical vehicle. The attitude and intentionof consumer to buy an Electric Vehicle is measured in this paper. This paper helps to find whether attributes of Electric Vehicle have anyeffect on attitude for innovation and whether the consumer's attitudeaffect their intention to buy electrical vehicle or not.

LIMITATIONS

- The paper only investigates the behavior of Indian consumers. Data are gathered from India so results are based on that specific region and not worldwide.
- The study is based on electric cars only and not on the cars of hybrid mode.

LITERATUREREVIEW

Hindrue et al. (2011)[8] showed that the first important factor which consumer consideredwhen he plans to purchasean electric vehicle is the price of EV.

Gallagher and Muehlegger(2011)[10] found as the price of fuel is increasing day by day, the consumer is increasing its demand of electric vehicle as so on sale of electric vehicle is increasing. Now the consumer is aware that he can save his money by purchasingElectric Vehicle and he has to pay for electricity and not for petrol or diesel.

Hagman et al. (2016)[11]showed that having an EV can lower the cost of ownership instead of a car having normal combustible engine.

Jeong (2016)[12] showed that as the environment is getting degraded day by day so the car manufacturers are moving towards manufacturing of alternatives of internal combustion engine vehicles.

Singer (2016)[6] showed thatincreasing use of Electric vehicles will reduce the consumption of petrol and diesel in the world.

Berkeley (2018)[13] showed that when consumer make the decision to buy an electric vehicle, he considers the driving range also and it is also an important factor which influence the demand of EV.

Rajper and Albrecht (2020)[9]found that the main reason to purchaseelectric vehicleis fuel cost saving.

Schulz (2022)[14] showed that before buying an electric vehicle, the consumer considers the charging time of EV and after then he makes his decision.

RESEARCH METHODOLOGY

H1: Price, performance and environment positively affect the attitude of consumer when he plans to purchase electric vehicle.

H2: Attitude of consumertowards electric vehicles positively affect his intention when he plans to purchase electric vehicle.

H3: Price, performance and environmenthave noeffect on the attitude of consumer when he plans to purchase electric vehicle.

- **Conceptual Model**

  In this study price, performance, environment and the attitude of consumer while purchasing EV are taken as independent variable and his intention to purchase EV is taken as dependent variable.

- **Methods of Data Collection**

  In this paper a non-probability method of sampling is used to collect data from samples of population in India. For data collection,a survey was conducted.

- **Methods of Data Analysis**

  First of all, the data is classified for the application ofproper analysis method.In this study 95%confidence interval is taken for the data analysis. linear regression method is used for the analysis of data. The three hypotheses created in the study is analyzed using linear regression analysis separately.

- **Results**

  The survey was conducted on156 respondents out of which150 answers were used. Table 1shows the age wise groups and table 2 shows the gender of the respondent.

The study gives more accurate results as the data is collected from various age groups of consumers who are planning to purchase vehicle.

Table 1: Age-wise groups

Age	Number of Respondents	Percentage
18-30	89	59.3
31-40	28	18.7
41-50	18	12
51-60	11	7.3
60 above	4	2.7

Table 2: Gender-wise groups

Gender	Number of Respondents	Percentage
Man	82	54.7
Woman	68	45.3

Table 3: Vehicle Ownership

Vehicle Ownership	Number of Respondents	Percentage
Yes	96	64
No	54	36

Table 4: Type of Vehicle

Vehicle Type	Number of Respondents	Percentage
CNG/diesel	123	82
Electric Vehicle	09	6
Hybrid Vehicle	05	3.3
Other	13	8.7

- **Correlation**

Table 5: Pearson's Coefficients of Correlation

	Attribute	Attitude	Intention
Attribute			
Attitude	0.253** <0.001		
Intention	′-0.058 0.240	′0.287** <0.001	

**significant at 1% level (2-tailed).

It is clear from the Table 5 that Pearson correlation coefficient between attitude and attribute is 0.253 which is significant at significance level of p<0.001, it indicates that there is positive correlation between attitude and attribute. Similarly, the Pearson correlation between attitude and intentionis 0.287' it is also significant at p<0.001 which indicates that there is positive correlation between attitude and intention also.

The p value between attribute and intent is p=0.240, itindicates that there can be correlation between attribute and intent, but as the value of p is greater than 0.05, so this correlation is not significant.

Table 6:Regression Analysis

Variables	**R**	**R^2**	**Adjusted R^2**	**S.E. of the estimate**
Attributes (Constant) Attitude (Dependent Variable)	**0.253**	**0.064**	**0.059**	**3.4863**
Attitude (Constant) Intention (Dependent Variable)	**0.287**	**0.082**	**0.079**	**28.3496**
Attributes (Constant) Intention (Dependent Variable)	**0.058**	**0.003**	**-0.001**	**31.2459**

It is clear from the Table-6 that 6.4% variation in attitude of consumer to buy an EV is explained by the attributes and 8.2% of variation in the consumer's intention to purchase EV is explained by the attitude of the consumer to buy EV. Only 0.3% of the variation in the consumer's intention to purchase EV is explained by the attributes.

Table 7: F-Test

Variables	**F-Value**	**Sig.**	**t-Value**	**Sig.**
Constant Attributes Attitude (Dependent Variable)	**22.445**	**<0.001**	**4.396** **5.243**	**<0.001** **<0.001**
Constant Attitude Intention (Dependent Variable)	**17.153**	**<0.001**	**-0.132** **4.926**	**0.391** **<0.001**
Constant	**0.532**	**<0.001**	**5.374**	**<0.001**

Attributes Intention (Dependent Variable)			**-0.734**	**0.240**

F-values in Table-7 shows that p -value is statistically significant with $p<0.05$ i.e. the model is well fitted in case of H1 and H2 but in case of H3, p-value is statistically insignificant with $p=0.240$ i.e. the model is not well fitted for H3.

In case of regression coefficients, the independent variable attribute is statistically significant with $p<0.05$ and $t=5.243$ means that attribute has significant effect on attitude. Similarly, the independent variable attitudeis also statistically significant with $p<0.05$ and $t=4.926$which means thatattitudeof consumer to buy EV has significant effect on his intention. But the independent variable attribute has significant level $p=0.240$ and $t=-0.734$ which means thatattribute of consumer to buy EV haveno significant effect on consumer's intention to buy an EV.

- **Hypotheses Testing Results**

The results obtained from the study lead to the acceptance of hypothesis H1 and H2. However, the hypothesis H3 is rejected.

CONCLUSION

The paper aims to study whether the attributes and the attitude of consumer to buy electric vehicles affecthis intention or not? To get the results, we conducted a survey and applied linear regression analysis to check the hypothesesproposed in study. The results& analysisshows the acceptance of alternative hypotheses H1 and H2, and the rejection of H3 alternative hypothesis. The results obtained from the study showed that consumer's attitude to buy electric vehicle is influenced mainly by the attributes involved in the innovation of electric car, Also, this attitude influence consumer's intention also. Results obtained in study is useful for the car manufacturers as the study shows the factors which influence the attitude of consumer and his intention to buy EV. Industry can know about consumer's behavior and optimize the production/ sales/ marketing accordingly. This study is relevant from theoretical also as it gives knowledge of electrical vehicle market in India and its development.

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