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An empirical study of Indian consumer's preferences and buying behaviour of e-vehicles & pragmatic shift in the perception of new generation

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Abstract
Over the years, India is facing very serious environmental problems which are responsible for much malevolence in the society. The exponential growing market of automobiles and vehicles are becoming a major concern for the government to protect the environment from its harmful emissions. Thus, electrical vehicles have an answer of these problems up to the larger extent with a strong promising market potential. Therefore, it has become imperative to undertake some empirical study to investigate the factors affecting Indian Consumers' willingness to purchase electric vehicles over traditional fuel base vehicles and the scope and opportunities lie ahead in the Indian Market.
A strong paradigm shift in the automobile industry is taking place at a rapid pace. Consumers of cars and other vehicles are becoming more and more educated, conscious, and susceptible towards the depleting petroleum resources and deteriorating environment due to excessive usages of petroleum base vehicles.
The Electrical Vehicles are the next generation future vehicles and the answer of the issues. Since electrical vehicles are more efficient and less responsible for greenhouse gases and other harmful emissions hence future belongs to these cars not only in India but overseas as well. This research paper will encapsulate predominantly some salient features of consumers' perceptions such as driving range of electric vehicles, charging of the battery infrastructure, cost of the electric vehicles, government polices to promote the market and incentives to the customers, perception of the society etc.
This study will be both qualitative and quantitative one which will be supported with proper structured questionnaire. In order to prove the hypothesis some statistical tools are applied along with regression analysis to test the determining factors. This research endeavors to suggest electric vehicles adoption willingness of Indian consumers and advice to the government and concerned industry expertsas to how to encourage Indian buyers to buy electric vehicles to save the environment and to protect mother earth and society.

Keywords: electric vehicles, consumers perception, Indian market, government policies, opportunities, pragmatic shift

Introduction

The depleting natural reservoirs of fossil fuel and deteriorating environmental condition are the major issue before every sensible government. The growing demand of vehicles and subsequent harmful emission specially carbon dioxide (CO2) are much responsible for this situation. Therefore, electric vehicles are being developed to counter this menace as an effective solution for this problem. According to European Union emission inventory report 2019 under the UNECE Convention on Long Range Trans-boundary (LRTAP) Air Pollution – US is responsible for green house emission is 28% which is alarmingly high to destroy the world environment. Similar all other developing nations are also contributing their bit to disturb the environment by discharging CO2 in the atmosphere without the realization its impact to the society. India by and large is also not spared from this situation and growing population and ever increasing demand of automobiles have created much destruction in the environment. Therefore, on realizing the importance Indian government has implemented positive policies to reduce environmental issues which include encouraging people to drive electric vehicles. Developed countries have been more active in promoting electric vehicles and have greatly improved in recent years than India. (HenkBekker, 2019), in his paper has claimed that, In the first quarter of 2019, the registered electric vehicles in Europe increased by 41% to 126,885 units. Thus, in view of the importance of taking action to address climate change, many governments have implemented positive policies to reduce environmental issues which include encouraging people to drive electric vehicles (Brady and O'Mahony, 2011) [2]. Nevertheless, many European countries have developed long-term electric vehicle development plans. For example, the target of France is to keep 2 million cumulative electric vehicles by 2020 and Germany aims to maintain 1 million cumulative electric vehicles by 2020 (Tan *et al*., 2014) [3]. Meanwhile, the United States has one of the largest market shares of electric vehicles. In the early years, it targeted the deployment of over 22,000 chargers, including 350 fast chargers by 2014 (Tan *et al*., 2014) [3]. In 2018, the total U.S. electric vehicle sales came in at 361,307 unit which is a 70% increase in sales compared to 2017 (InsideEvs, 2019) [4]. These examples indicate that the market prospects of electric vehicles are relatively optimistic in developed countries like India.
The purpose of this research is to understand the trend of fast development of electric vehicles and to study consumers' adoption behavior of electric vehicles. It is important to study the popular issues of individual willingness to purchase any vehicle specially in the case of electric vehicle and the factors which influence the mind of the consumers before taking a final decision.
(Hidrue, *et al*., 2011; Peters and Dütschke, 2014;) [5, 6]

In recent years, the developing countries have begun to vigorously promote electric vehicles due to the exhaustion of energy and environmental problems, especially in India. With the recent development of electric vehicles in developing countries, India is still in the early stage, leading to less knowledge about it. Therefore, this research has explored the factors from a cultural perspective or social environment (Moons and De Pelsmacke, 2012) [7] and the scope of electric vehicles in the Indian market.

Specifically, this study focuses on to the elements cost benefit analysis which consists of nuances, restraints, KM per charge of electric vehicles, charging infrastructure, purchase cost, governmental financial incentives, individual environmental awareness and perceived social influence. According to these factors, the purpose of this study is to explore which factors can positively/negatively affect Indian consumers' willingness to purchase electric vehicles and understand the perception of Indian consumers about electric vehicles.

Hypothesis

H_0: Social and Economic factors have a positive influence on the willingness of the purchase of electric vehicles in Indian Market.

H_1: Social and Economic factors do not influence the willingness of the purchase of electric vehicles in Indian Market.

Research methodology

The research is based upon quantitative and qualitative methodology. The sampling has been done based on convenient sampling on the population of fifty respondents' population specially at the different vehicle showrooms selling electric vehicles at the main cities of UP such as Bareilly, Lucknow, Agra and Ghaziabad etc.

The quantitative approach was adopted as our research method since it largely relies on hypothesis testing. The primary data is collected through a sell structured questionnaire and secondary data through various newspapers, journals, research papers etc.

The questionnaire has two parts. The first part is to collect the background of respondents and the second part includes questions about the perception of the electric vehicle.

The questionnaire includes dependent variable, independent variables, and control variables and the respondents were requested to rate the agreeing of answers on 5-point Likert scales ranging from "strongly disagree" to "strongly agree" (1 = strongly disagree to 5 = strongly agree).

Table 1: Profile of the Respondents

Particulars	Items	Numbers	%
Gender	Male	38	76
	Female	12	24
Age	25-35	26	52
	35-45	12	24
	45-55	07	14
	Above 55	05	10
Marriage Status	Single	34	68
	Married with No Child	10	20
	Married with child	06	12
Qualification	Graduation	38	76
	Post-Graduation	12	24
Already having No, of Vehicles	1	42	84
	2	4	8
	3	4	8
Personal Income	Rs. 50,000 PM	17	34
	50,000 – 60,000	12	24
	60,000-70,000	5	10
	70,000 – 80,000	11	22
	80,000 and Above	5	10

Table 2: Perception of the customers to Purchase Electric Vehicles

	Very strong	Strong	Willing	Decide Later	Not Willing
Interest in Purchasing electric cars	40	6	2	1	1
Interested to purchase in the next two years	40	6	2	2	0
If the price difference is rational, interested to purchase	45	3	2	0	0
Perception about attractiveness	40	5	5	0	0
Charging of the battery is the major concern	45	5	0	0	0
Charging stations at the national highways are the concern	45	5	0	0	0
Cost of the electric cars are the concern	35	10	3	2	0
Do you think that government must do incentives/ subsidies to the customers to promote the sales of electric cars.	35	10	3	2	0
Do you think that electric cars are good for environmental safety.	50	0	0	0	0
Are you willing to pay more to protect environment	35	10	5	0	0
Do you agree that fuel base vehicle are responsible for environmental degradation	45	5	0	0	0
Do you feel that family and society will appreciate on your purchase of electric vehicle	35	15	0	0	0
Do you feel proud to drive electric vehicle	50	0	0	0	0
Do you think that it will create a differentiation in your status.	50	0	0	0	0

Table 3: Regression analysis

Factor	t	Sig
Charging Infrastructure	1.36	.39
Cost of the purchase of electric vehicle	.61	.11
Government Promotional Incentives	4.11	.001
Individual awareness about environment	2.90	.001
Social Influence after purchasing Electric vehicle	5.99	.001
Charging Problem likely to be faced	1.483	.069

Limitations

There are several limitations in this study:

1. Resources were the major constraints due to which reasons many other characteristics could not be studied.
2. Secondly, India being a developed country, it is inevitable that the gap between the rich and the poor in different cities is large, hence testing the hypothesis analysis is effected especially the gap between first-tier cities and other cities.
3. Thirdly, no proper data is available about the government incentives and encouragement polices to the customers, the interactive relationships between them may be complicated because the existence of financial incentives can reduce the cost of purchase
4. Furthermore, this study only focuses on some of the cities of UP state market, it would also be essential to conduct further research at larger prospective across India.

Findings

The main purpose of this research was to conduct an empirical study on consumers' willingness to purchase electric vehicles and to test influencing factors of the consumers. All the possible research was conducted on to the decided areas to determining factors including the driving range, charging infrastructure, purchase cost, government financial incentives, individual environmental awareness and perceived social influence. With the results of regression analysis, except the driving range and purchase cost, the effects of the other four factors are all significant for Indian consumers' purchase willingness.

Firstly, the charging of electric vehicles is a critical barrier to purchasing willingness. Secondly, the good construction of charging infrastructure positively affects the willingness of Indian consumers to purchase electric vehicles. Thirdly, the high purchase cost negatively affects Indian consumers to purchase electric vehicles. Fourthly, the government's financial incentives can effectively promote the adoption of electric vehicles by Indian consumers. Fifthly, Indian consumers have improving environmental consciousness that promotes Indian consumers to purchase electric vehicles as their transportation. Finally, the Indian perceive social factor has a positive influence on the purchase willingness of electric vehicles.

Suggestions

On the basis of the findings of the scope of electric vehicles in Indian market, few of the suggestions are as under:

1. Considerable number of concessions should be given to the consumers for the purchase of battery-operated electric vehicles,
2. Relaxation in the driving license should be allowed by the authorities,
3. Reduced GST and other taxes be permissible on the electric vehicles by the government regulatory authorities,
4. Low terrify charges should be allowed for the charging of the battery of electric vehicles,
5. Government should allow subsidy on the purchase of Electric Vehicles,
6. Offer dedicated parking and free parking for electric vehicles,
7. The government must launch a drive to enlighten the benefits of electric cars and contribution in environmental safety.

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