



Consumer Attitude Towards Adoption of Electric Vehicle

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Abstract

Electric vehicles have seen unprecedented growth over the previous decade around the world. In this paper, we first discuss the scope and opportunities of Electric Vehicles in India. We also discuss various policies and frameworks in place by the Government of India. Then, we study the various case studies from around the world on adopting Electric Vehicles. We finally conclude with how India could implement and benefit from these strategies at the local as well as national level. In these research paper people's mindsets about electric vehicles is analysed on the same ground various parameters that automobile companies and Government should before introducing electric vehicles to the society.

Keywords: E-Vehicle, Battery Technology, Electric charging station, Emission, Price, Comfort Level, Charging Time.

Introduction:

The Indian auto industry is the fourth largest in the world and is expected to become the third largest in 2021. The industry accounts for 7.1% of India's gross domestic product (GDP). The Indian auto industry (including component manufacturing) is expected to grow at 5.9% per year and reach INR 16.18-188 billion (251.4 to 282.8 billion US dollars) by 2026, which will make it the fastest growing industry in the country. According to the report of the National Mission Plan for Electric Mobility 2020, the Indian car market is governed by two-wheeled vehicles, which account for 75% of the total number of vehicles sold in the country. And the passenger car segment is dominated by the small car segment and it is increasingly likely that the number will increase significantly by 2030. This information was corroborated by the report of the Society of Indian Automobile Manufacturers (SIAM) entitled "The Car Industry in General Growing Steady with Marginal Double-Digit Growth in Passenger Vehicles", which indicates that the sector has produced a total of 1.95 crore vehicles, including commercial, commercial, three-wheeled and two-wheeled vehicles and quadricycle in April October 2018, compared to 1.71 crores in April

October 2017, recording growth of 14.39%. With regard to the sale of vehicles in the industry, the passenger car segment increased by 5.87%, the commercial vehicle segment by 35.68%, the three-wheel segment by 31.97% and two wheelers 11.14% in April same period of the previous year. Although India has seen an increase in vehicle sales year-on-year, the number of motor vehicles in the country remains low, with only 18 cars per 1,000 inhabitants, compared to nearly 69 in China and 786 in the United States. US11. This indicates that a large proportion of Indians do not own a vehicle and depend on shared or public mobility means.

India EV Scenario National Electric Mobility Mission Plan (NEMMP) 2020

- To launch 5 to 7 million EV by 2020
- Targeting 400,000 passenger battery electric vehicles by 2020 and thus putting off the adoption of 120 million barrels of oil and 4 million tons of CO₂.
- 1.3% reduction vehicle emission by 2020

A variety of reasons, from infrastructure to strategies to early product failures, have contributed to this trend. Among these

- Charging facilities are virtually non-existent, although charging station installations have recently started modestly due to recent efforts by entities such as Tata Power and NTPC.
- Government support has been uneven so far, with reduced funding and delays in implementing EE policy.
- Local component manufacturers are few in number and heavily dependent on Chinese imports.

Literature Review: -

- Literature review on EV adoption studies [15]-[20] shows that one of the prominent factors affecting the adoption of electric vehicle is the availability of charging station in the countries where the penetration of EV is at medium level. The paper published by Rick Wolbertus et al. [1] specifies the information on charging times, different charging patterns of EV car owners, EV Taxi owners so that charging infrastructure can expanded at large scale based on these charging patterns. Further with the help of these information charging points can also be identified.
- Scott Hardman et al. [2] specifies the information on early High-end and Low-end adopters of EV. These adopters have different socio-economic profile and psychographics differences, opinion differences, Attitude differences. Study is conducted to know their future intentions of buying EVs by analysing various factors affecting the adoption of EVs.
- Avdhoot Dixit et al. [3] specifies the information about various factors affecting EV adoption in different states of India. Prominent factors that he specified are Price, KM range of EVs, Availability of charging infrastructure, Tax on EVs, Subsidy provided by the Government, Reliability and safety and various other functional and operational parameter of EVs.
- Till Gnann et al. [4] specifies the information on need of Fast charging station for EVs. In his research paper he tried to analyse the gap between current charging behaviour from the large data collected from Sweden and Norway. The ideal charging time should be same as conventional refuelling in IC engine

vehicles. Due to which more focus is provided analysing the fast charging station for public demand of EVs.

- Chethan Kn et al. [5] specifies the information on commercial viability of electric vehicles in India. India along with china and USA entered into Paris Agreement and agreed upon helping to reduce Earth's Avg temperature by 2 deg Celsius. The further analysis is done to analyse the effectiveness of EVs as compared to IC engine vehicles. EVs working method is analysed in these research paper.
- Mohammed M et al. [6] specifies the information on challenges and opportunities in adoption of EVs. Some of the challenges that he mentioned is Efficiency, Demand, Vehicles Quality etc. Some of the opportunities that he mentioned is Government Initiatives, Battery, environmental etc.
- K.W.E Cheng et al. [7] specifies the information about recent development in electric vehicles. Various developed operational parameters are Breaking and power generation, ABS (Antilock Braking Systems), Skid Steering etc.

Research Methodology: -

As electric vehicles are the new technology people are confused about their opinion regarding adoption of electric vehicles because there is unavailability of proper facility to support adoption electric vehicles. We have chosen qualitative and quantitative research design for our paper. Data is collected from the sample of size 51 and the method chosen for sampling is Non-probability sampling as we circulated a google form to our friends, 70% of the data is received from student and remaining 30% from working professionals. Frequency distribution techniques were used for data analysis and data interpretation. We tried to analyse the ground report about people's opinion about EVs without focusing much on quantitative data collection and data analysis

Findings: -

According to the data collected.

| Income (In Thousand) | Electrical Vehicles (votes) | Petrol Vehicles (votes) |
|------------------------|-----------------------------|-------------------------|
| (15K to 75K) Per month | 21 | 23 |
| <75K Per month | 2 | 5 |

Table:1

The above table specifies that out of the 51 respondents having income between 15000 to 75000 per month (Lower middle class + Upper Middle-class people), 23 people voted for petrol vehicles and 21 people voted for electric vehicles which shows their willingness to adopt electric vehicles. As the electrical vehicles is a new technology people are aware of it but they are not ready to adopt it right now that's why 23 people still preferred to go with petrol vehicles. Out of the total respondents 5 respondents voted for petrol vehicles and 2 respondents voted for Electric vehicle.

The above table show attitude of the people towards new technology as people are aware of new technology but are not willing to adopt it right now because of the various parameters. The decision is also affected by income and occupation a rich person may not consider the price as the main factor for purchasing the electric

vehicle but middle-class person may take it very seriously as the price of the electric vehicle is going to be 1.5 to 2 times greater than IC engine vehicles for the same performance. In India awareness and positioning about a product is very much important. If EV manufactures position their product as environment friendly it will not work but if they position the EV as a vehicle having less maintenance and service cost it might work because India is a developing country where most of the people are lower and upper middle class.

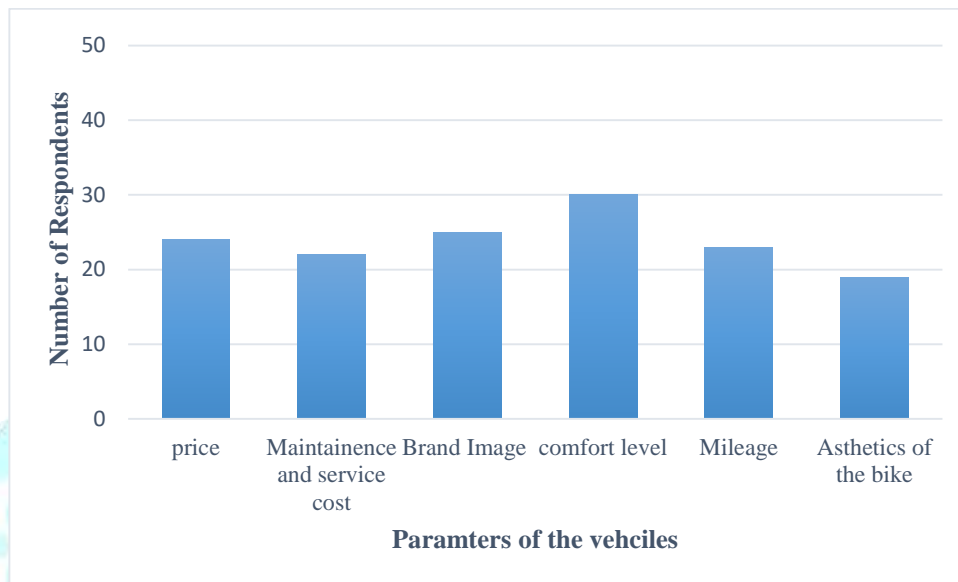


Fig:1 Graph of Number of respondent vs Parameters of vehicles they considered

As we can see from the above graph out of 51 respondents 30 respondents preferred to vote for comfort level as the main factor while buying a bike. These factors can easily be implanted in EVs as it is completely related to seating position and suspension of the car and bike. 25 respondents voted for brand image as one of the primary factors while purchasing a bike or car. The famous automobile brands like Hero, Honda, TVS, Bajaj, Royal Enfield, Tata, Hyundai, Maruti Suzuki has not started to manufacturing of electrical vehicle, may be price in the view of commercial viability is preventing them, so they are focusing more petrol engine upgradation. People trust these brands and prefers it to friends, family members etc. If these brands can come together and try to solve the issue, people may buy EVs. 24 respondents voted for the price, as the price of the EVs is going to be get 1 to 2 times more than petrol engine vehicles for the same performance so price is one of the main factors.

Purchasing of a Bike/Car = f (Price, Brand Image, Comfort level)

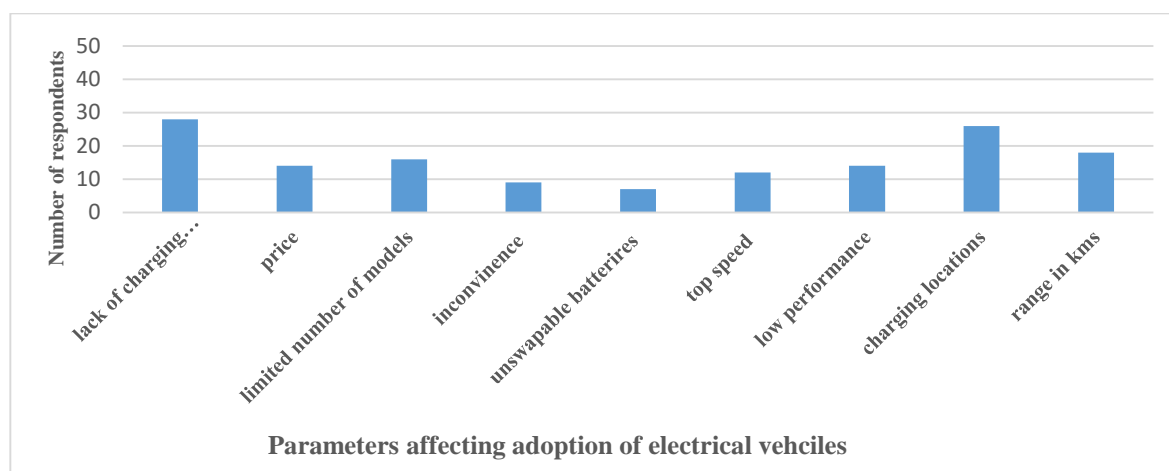


Fig:2 Graph of Number of respondent's vs Parameters affecting adoption of electric vehicles

The above graph suggest that lack of charging infrastructure and unviability of charging location are the two main factor that affects the people's decision to buy electric vehicle. People want electric charging point should be nearer to their home so that they charge their vehicle any time as like refilling their existing vehicle with petrol and diesel. Factors like price of vehicle, number of available models and millage are the second most important factor that people consider while buying electric vehicle this factor are secondary to their need in adoption of EV. According to our research the least bothered factor in terms of adoption are unsweepable batteries top speed and low performance.

Hence people are ready to adopt new technology of electric vehicle but somewhere due to lack of charging infrastructure and charging location and high price of vehicles they resist themselves. Due to which petrol and diesel vehicles are high in demand for now.

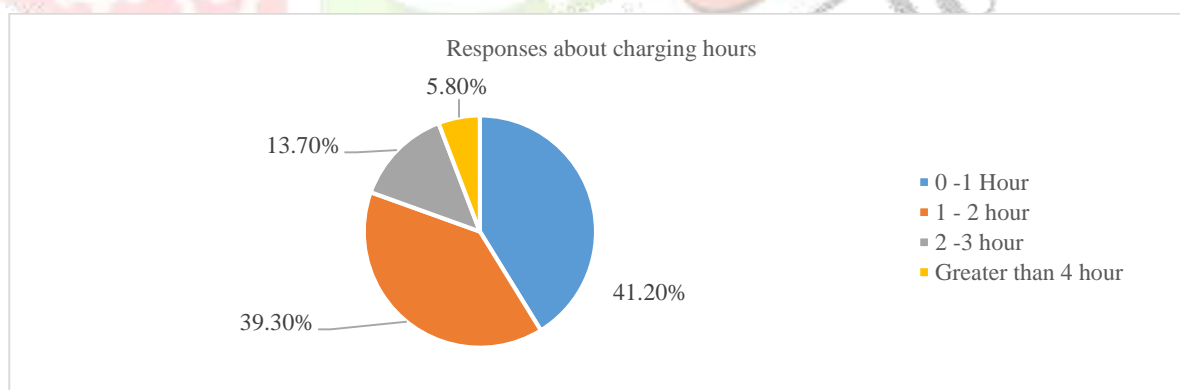


Fig:3 Pie chart of responses received for charging Hours

41 % (20) of people thinks that it will be more convenient if the charging time for their EV is not more than one hour so that they can charge their vehicle as soon as possible.

39% of respondent feels like the charging time should be in between one to two hours considering the millage of vehicle. 14% of people are in favour of charging time in between 2 to 3 hours and rest of population is ok with more than 4 hours of charging. The idle time for refuelling a petrol engine vehicle is 1 to 2 minutes

according to respondent's idle time for charging of electric vehicle is between 1 to 3 hrs. charging time is one of the main factors for EVs as people might not prefer to wait for 2 hrs.

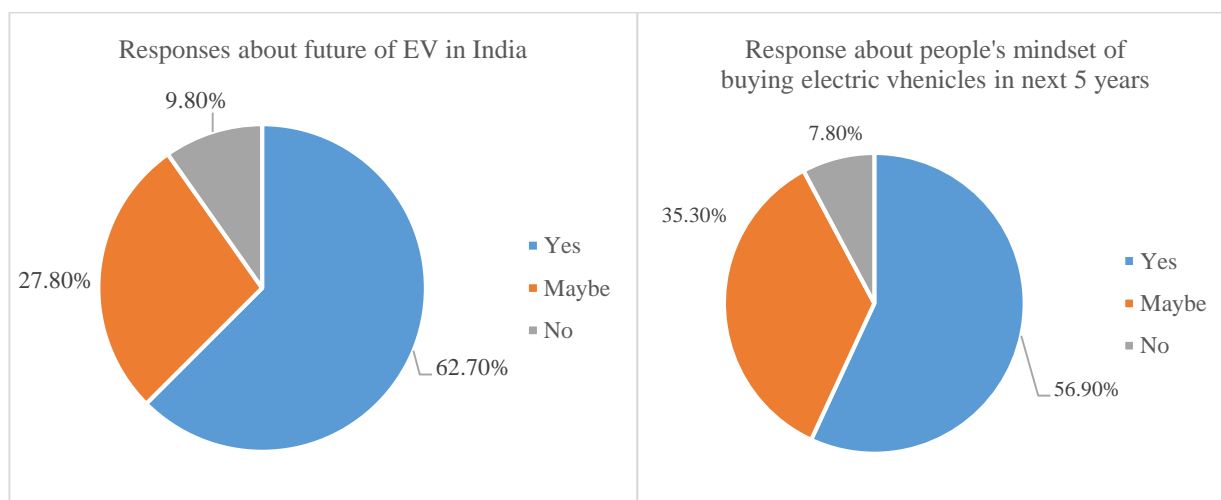


Fig:4 Pie charts showing respondents Mindset and Attitude Towards adoption of electric vehicles

This pie charts gives us a clear idea about people attitude toward adoption of electric vehicle. 57 % of people will surely switch to electric vehicle if government takes proper action to provide better infra and environment for EVs. 35 % will think of buying it that means there are high chances of conversion among this 35% we can predict that at least 20% will turn out as a user of EVs in coming 5 years.

Hence forth around 75 to 80 % of people will purchase electric vehicle in coming 5 years, if they get proper infra and facility available.

As we can see here 63% of people already believe in better future of EVs and from the other graph it has been seen that 75 to 80 % people are ready to adopt EVs if government provide better infra in terms of charging location and various other facilities. Never the less we cannot deny that for coming few year people will buy such vehicles for social status also.

Conclusion: -

We conclude from the above data that people are ready to adopt electric vehicles but right now due to unavailability of proper infrastructure to support electric vehicles people may not buy it right now. So, penetration of EVs in India might not work unless various companies or government builds proper facility for EVs. The main factors that should be considered by automobile companies are price, Mileage, Charging speed, swappable batteries, fast Charging batteries etc. These are the factor that are most considered by people who buy automobiles as per our research, more focus on these factors while designing EVs might able to increase their penetration in the market. Considering the need of middle-class people petrol and diesel engine are still in demand due to their affordability and performance. However, there are people who are significantly concerned about the rising pollution due to which there is demand for EVs but is restricted by commercial and infrastructural factors. In Indian market cost of the EVs will be the deciding factor for EVs penetration in the market.

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