

A study of consumer perception on Indian market for electric automobile considering the AQI.

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ABSTRACT

An electric automobile is also said as an electric car or vehicle propelled by one or more electric motors, using energy stored and rechargeable batteries. Indian market which is the origin of the country in the automobile industry and plays an important role in the emerging market for an electric automobile. The global spread of information about the electric automobile would save a lot of energy and emitted energy through the automobiles. This research is about understanding the attitude of consumers, the futuristic needs and wants of the Indian consumers and take the required actions for processing the electric automobiles for further profits and share on behalf of consumers. This research is made to collect consumer perception, market stability to emerge in the Indian markets, new companies to make changes, or relaunch its electric automobiles in the Indian markets. In 2019, there are 4000 Electric Vehicles in India, which is about 0.1% of close to 3.5 million cars. As the analysis has resulted that the consumers are accepting the new mean of travel with the extracting facilities in the infrastructure that would be easy to perform it on the Indian roads. Facilities such as electric fuel stations at distinct places, mileage, speed etc.

An Electric Vehicle has been saving a lot of carbon-dioxide emissions, looking in today's scenario the consumers also feel to have a healthy atmosphere as life

matters more than the toxic vehicle's surroundings. Even this is been a reason to have an Electric Vehicle at the residence.

KEY WORDS- Electric Automobile, Air Quality, Energy, Indian Market, Consumer Perception, Environmentally Friendly.

INTRODUCTION

WHAT IS AN ELECTRIC VEHICLE?

An electric vehicle (EV) is one that operates on an electrical motor, rather than an ICE that generates power by burning a mixture of fuel and gases. Therefore, like vehicle is seen as a possible replacement for current-generation automobile, so as to deal with the difficulty of rising pollution, heating, depleting natural resources, etc. Though the concept of electrical vehicles has been around for an extended time, it's drawn a substantial amount of interest within the past decade amid a rising carbon footprint and other environmental impacts of fuel-based vehicles.

WHAT IS AQI?

The air quality indicator which is known as AQI (Air Quality Index) is supported by government agencies to

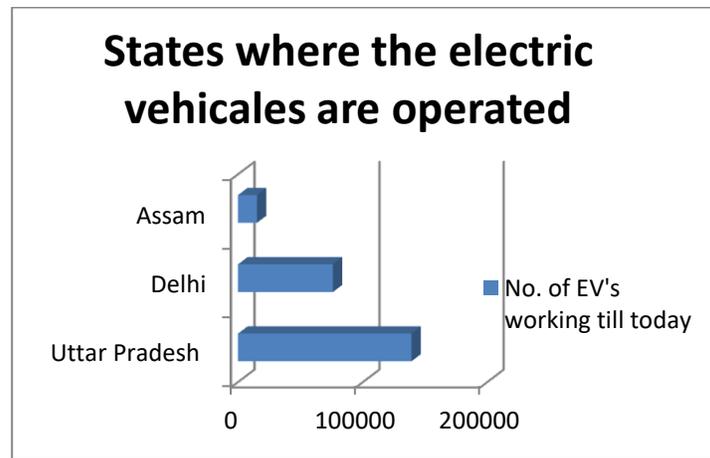
speak to the public but how much air quality is currently polluted no matter how polluted it is. Public health risks increase due to the increase in the Air Quality Index. completely different countries have their own air quality indicators, such as completely similar national air quality standards.

OVERVIEW

The automotive sector represents a major portion of worldwide economic activity with intensive upstream and downstream linkages to several various industries and sectors. Global spread of the information about the electric automobile would save a lot of energy and emitted energy through the automobiles. As seen in the recent letters mentioning about the stake of automobiles rank in all over India and states its tremendous progress throughout the globe. Electric vehicles have been a superior choice for the government as that reduces the fuel and even the energy required to get through the oil and diesel through other nations as of now the Indian consumer may not opt for the electric vehicle but the future circumstances may lead to the changes in nature. For example, the most populated and less oxygen level due to pollution states in India, UP leads the race, Delhi at 2nd spot. Electric vehicles are slowly, but evidently, becoming the flavor of the season and the primary goal is to improve Delhi's air quality by bringing down emissions from the transport sector. To do so, this policy can obtain to drive the fast adoption of Battery electrical Vehicles (BEVs). Market like India where the electric automobiles have tested before and have not met the expectations of the buyers. The companies which launched the similar products were Hyundai Kona Electric, Mahindra e-Verito, Mahindra e2o, MG ZS EV, Tata Tigor EV 2019 (Only for Commercial purposes), Tata Nexon EV 2020 etc. Lack of infrastructure, high prices and limited choices are some of the reasons why

Indians aren't too enthused to buy personal EVs is the main reason for the failure of electric vehicles in India. Also, one of the reasons (of the slowdown) is that the financial system is not mature in India. Last year, the banks and the financial companies were not giving loans to the customer and sometime they would ask double the sum for the down payment. In that quite a scenario, we tend to discourage the consumer to shop for the automobile.

Today it's a realization that all the electric vehicles programs were failed and were going flop was also the reason for insufficient information to customers. Previously, the cost of the electric vehicles was as much expensive as the normal or regular fueled vehicles range much smaller than the gasoline car, charging solutions not available everywhere etc. problems faced and can be resolved for the future survival of electric automobiles.



Source – Business Standard Updated August 19

Chart 2.1- States where the electric vehicles are operated

In this industry the changes are able by seen the conditions of the economy. Changes which the Indian market should make can be listed as below:

- Government to have 100% electric- vehicle nation as the electric vehicle will be an effective alternative for fuel-based vehicles.
- To make the understanding in the market setup and conditions, the electric vehicle should be providing the required resources such as electrical points in place of fuel stations; electricity is cheaper than fuel in futuristic behavior of automobiles.
- To have differentiation in the range so that the automobile would travel in one charge of the battery and consume it the entire period of conversion.
- The concept of Electric Vehicle should be effectively communicated to the potential consumers through successful strategies which consist of accurate marketing strategy, perfect segmentation, targeting and positioning the product which lacked in the previous launches of Electric Vehicles.
- To have an optimum look towards the speed maintenance, as tested before that doesn't match the mileage of fuel-based vehicles comparatively. Changes in the construction may lead to overcome the difference between these types of vehicles.
- Indian consumers look for cost efficiency rather than quality efficiency. To match the need and the value of the Electric Vehicle, the product that means the automobile should be positioned and informed in detail to the consumer. (If the product is positioned effectively in the minds of the consumers then the cost may not matter.)
- To make the understanding that cost-effectiveness through increasing in the cost of fuel and diesel which would be comparatively more than the

electricity bill generated through charging the electric automobile.

OBJECTIVE

- To examine the Indian consumer perspective towards Electric Vehicle in the electric automobile industry.
- To study the expectation of Indian consumers in improving towards the Electric Vehicles in the future market considering the Air Quality in the atmosphere.

The other objectives have achieved through hypothesis testing using One Sample, Two-tailed test on analysis tool- SPSS (IBM) and has significantly shown results successfully.

PURPOSE AND SCOPE

This research is made to collect consumer perception towards electric automobile, market stability to emerge in the Indian markets, new companies to make changes, or relaunch its electric automobiles in the Indian markets.

In the year 2019, there are 4000 Electric Automobiles in India running on the streets, is about 0.1% of close to 3.5 million cars. Even reducing tailpipe emissions from urban transportation is critical to address change in climate. Government is also planned the eco-friendly vehicles or transportation modes to avoid carbon-di-oxide emissions and drastically increasing the pollution percentage. It's even initiated with the electrical buses which are on the streets of cities of India, not in large number but have succeeded enough with its quality.

As always mentioned in the newspapers and televisions regarding the increasing pollution rate because of excessive emission of carbon dioxide which is affecting the

environment, atmosphere, and falls in oxygen levels drastically facing the problems of breathing at the normal rate of respiration by people/citizens.

Air Quality Index is valued after calculation of various findings in the air quality such as PM2.5, PM10, temperature, humidity & noise data with AQI India outdoor air monitors like,

PM2.5 – Refers to atmosphere Particulate Matter that has diameter less than 2.5 micrometers. (measured in ug/m3)

PM10 – Refers Particulate Matter that is 10 micrometers or less in diameter generally described as particle. (measured in ug/m3)

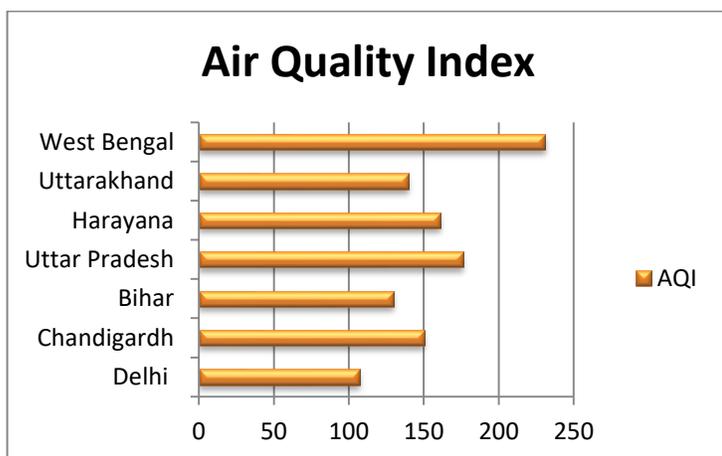
Ozone – It is an Inorganic Molecule with O3 chemical formula.

SO2 – Sulphur Dioxide which is a disinfectant, reducing agent, a bleach.

NO2 – Nitrogen Dioxide which used as a catalyst , and

CO – Carbon Monoxide (mainly toxic to animals)

Even the recent changing situation of Air Quality and the measuring unit named AQI (Air Quality Index) has shown in the cities graphed below.



DECREASING RATE OF AIR QUALITY IN THE STATES ARE MAXIMUM

Source – AQI India Updated March 2020

Air Quality Index

Scope of the report is idea generation for improvising the automobiles while in search of electric vehicles new product that can access the requirements of consumer keeping in mind of the Government rules, laws and nurture the nature also.

Structure of this report would mainly contain the consumer perception, requirements and changes that are to be made in the coming projects.

SECTOR PROFILE

INTRODUCTION

India became the fourth largest motor vehicle market in 2018 with sales increasing eight.3 % year-on-year 3.99 million units. Additionally, many initiatives by the Govt of Asian Country India and therefore the major automobile players within the Indian market square measure expected to create India a frontrunner within the two-wheeler and hackney coach market within the world by 2020.

The automotive trade contains a good vary of firms and organizations concerned within the style, development, producing, marketing, and commercialism of automobiles. it's one among the world's largest economic sectors by revenue. The automotive trade doesn't embrace industries dedicated to the upkeep of cars following delivery to the end-user, like automobile repair retailers and motor fuel filling stations.

The electric industry may be a part of the large Automotive Industrial sector wherever the producing and commercialism of cars have developed industries associates.

Overall domestic cars sales augmented at half-dozen. In FY19, year-on-year growth in domestic sales among all the classes was recorded in business vehicles at 17.55% followed by 10.27% year-on-year growth within the sales of three-wheelers. Sales of electrical two-wheelers square

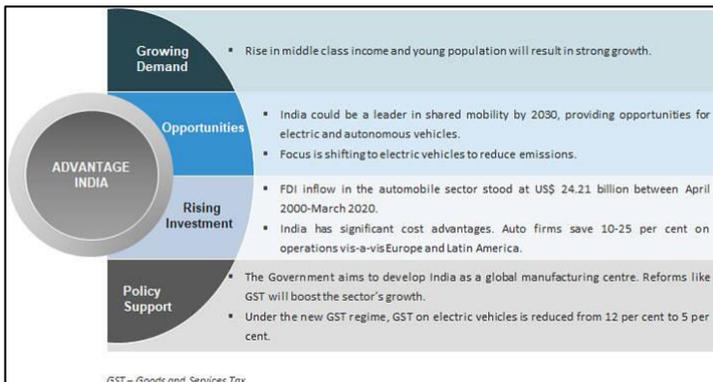
measure calculable to possess crossed fifty-five thousand vehicles in 2017-18. EV sales, excluding e-rickshaws, in Bharat witnessed a growth of 20 % and reached 1.56 Lakhs units in FY20 driven by two-wheelers.

GOVERNMENT INITIATIVES IN DEVELOPING EV'S

The Government aims to develop Bharat as a world producing and analysis and development hub. NATRiP's proposal for Grant-In-Aid for take a look at facility infrastructure for electrical Vehicle performance Certification from NATRIP Implementation Society» underneath FAME quicker Adoption and producing of the theme was approved by Project Implementation and sanctionative Committee on Gregorian calendar month 03, 2019.

The first part of the theme was extended to March 2019 whereas in February 2019, the govt approved the FAME-II theme with a fund demand of Rs ten,000 large integer for FY20-22. underneath Union Budget 2019-20, Government proclaimed to supply further tax deduction of Rs 1.5 lakhs on the interest paid on the loans taken to buy EVs.

The Government of Bharat expects the car sector to draw in US\$ 8-10 billion in native and foreign investment by 2023.



Source - <https://www.ibef.org/industry/automobiles-presentation>

Infographic on Indian Automobile

The following shows the models of electric automobile that are run on the streets of India.

Electric Cars

Models: Tata Nexon EV

MG ZS EV

Tata Tigor EV

Hyundai Kona Electric

Mahindra E Verito

Electric Two-Wheelers

Models: Bajaj Chetak

TVS iQube Electric

Okinawa iPraise

Hero Photon 48V

Revolt RV 40

LITERATURE REVIEW

- Jensen et al., (2013) proposed a comprehensive overview on the “Assessing the Impact of Direct Experience on Individual Preferences and Attitudes for Electric Vehicles” In this study, they investigate that using choice models to simulate the EV market share was problematic because the current market share used to recalibrate the model in the base year was very low. That means that despite major improvements in the EV attributes, a low market share was obtained in prediction. In this paper, they suggested a method which combines choice models estimated at the disaggregated level with diffusion models to take

into account jointly that new products often need time to obtain a significant market share, and that their demand was also strongly affected by the characteristics of the new product. EV attributes not to be overshadowed by the effect of the alternative specific constants which adjust the model to the low demand of the early market. This was highly relevant in the EV market because the technology was still under development. Finally, their results show that a model estimated after individuals had real-life experience with electric vehicles produces what appears to be more reasonable aggregate market shares, especially for the base year.

2. Mishra and Malhotra (2019) proposed a comprehensive overview on the “Is India Ready for e-Mobility? An Exploratory Study to Understand Electric Vehicles Purchase Intention” In the cities of India, the urban areas are facing the challenges of traffic congestion and severe air pollution as a result of urban sprawl and traffic growth. The focus of their study was to explore the various influences of the purchasing intentions of EVs in India by proposing a framework based on a practical concept that incorporates economic and psychological ideas. Research has identified environmental concerns and operational factors as the most important factors contributing to the exploitation of Indian consumers in EV’s. Presently, two factors-cost of ownership and infrastructure support was not imperative for the adoption of EV’s to Indians. As environmental concern was the most important factor for Indian consumers, therefore, it was pertinent for car

manufacturers and policymakers to highlight the environmental benefits of e-Mobility. Future studies may take some more psychological, technical, and interpersonal factors that might influence consumer’s purchase intention to widen the scope of this research area. Secondly, there might be a gap between the intention and actual adoption behavior towards EVs. Thirdly, the findings need to be further validated with larger sample sizes, and future studies could also focus on the impact of socio-demographic variables on the purchase intention of EVs.

3. Bhalla et.al., (2018), proposed a comprehensive overview on the “A Study of Consumer Perception and Purchase Intention of Electric Vehicles.” In this study Commercial success and consumers purchase intention of an EV by Indians, there was a necessity to study the factors that’s influencing the consumer acceptance behavior for these vehicles. The results showed that environmental concerns and consumer trust in this technology world was an antecedent factor for perception about Electric vehicle purchase and the factors which give adoption blowback are cost, infrastructure, social acceptance. Therefore, to encourage the sale of electric vehicles the government should play a leading role by creating environmental policy, infrastructure, and subsidized vehicle costs or lowering the bank interest rate. According to the analysis, manufacturers of electric vehicles with the Government of India should invest more in public accreditation by building more infrastructure, by

investing more in technology, which can create trust in cars.

4. Jena (2020), proposed a comprehensive overview on the “An empirical case study on Indian consumers' sentiment towards electric vehicles: A big data analytics approach.” Climate changed due to global warming is a significant concern to all of us. India's rate of greenhouse gas emissions is increasing day by day, placing India in the top ten emitters in the world. Air pollution is being one of the significant contributors to the greenhouse effect. Transportation contributes about 10% of the air pollution in India. The Indian government are taking steps to reduce air pollution by encouraging the use of electric vehicles. But success depends on consumer's sentiment, perception and understanding towards Electric Vehicle.
5. Kurien et al., (2020) proposed a comprehensive overview on the “Emission control strategies for automotive engines with scope for deployment of solar based e-vehicle charging infrastructure” In this article, a detailed study had been conducted on the posttreatment emission control strategies for diesel engines and conversion efficiency of platinum-based diesel oxidation catalysis system has been investigated with experimental inference. The results of the study showed that the proposed PV system at 26 fuel stations had a total energy generation capacity of 1.9 GWh. The results of the study showed that the metallic DOC system had an average conversion efficiency of 45% for hydrocarbons, 54% for carbon monoxide, and

50% for particle number. Hence, emission control strategies for fossil fuel-powered vehicles would require a novel system for reducing the toxicity levels of overall exhaust emissions. Retrofitting of diesel oxidation catalysis system, diesel particulate filtration system, and the selective catalytic system could be considered as a possible solution to bring down the emissions to acceptable levels and would be considered in the future scope of this work. Further, the technical feasibility of integrating PV solar-based systems with existing fuel stations in Dehradun, India had also been evaluated. The total energy generation capacity of the PV system at 26 fuel stations in Dehradun would be about 1.9 GWh.

6. Kumar and Khurana (2019) proposed a comprehensive overview on the “Transitioning from Fuel Based Automobiles to Electric Vehicles: A Conceptual Model for India.” India has been a slow mover in this respect. For India, this paper assumes great relevance as major Indian cities have been classified as being among the topmost polluted urban centers and thereby affecting the health of its citizens. “Taking note of these concerns, the Government of India had given a push for having Electric Vehicles only by 2030. In conclusion, it may be stated that a big push is needed in India for the transition from fossil-fueled vehicles to EVs”
7. Shende (2014) proposed a comprehensive overview on the “Analysis of Research in Consumer Behavior of Automobile Passenger Car Customer” In this research of automobiles, it

would be helpful for the existing relaunching concerning and new entrant car manufacturing companies in India to find out the customer behavior their expectations and their market offerings. This paper has presented an analysis of the research in the area of consumer behavior of automobile car customers. The objective of their study was the identification of factors influencing customers' preferences for a particular segment of cars. Further classification of human behaviors under main categories will enable car producers or manufacturers to align their strategies in concurrence to customer behavior. While buying small computers with computers even though the customer was very aware of the cost this component also improved its requirements and due to the increase in revenue within the relocation of the component it was seen that the customer was more inclined to buy the Suzuki swift 120. For mid-size segment customer focus was for safety driving seating comfort brand. Also, this segment required value for money with the best features and also customer friendly vehicles.

8. Liao et al., (2017) proposed a comprehensive overview on the “Consumer preferences for electric vehicles: a literature review” Universal adoption of electric vehicles had contributed to the release of issues like surroundings pollution worldwide global warming and oil outpost. However, the present market perception of EV was somewhat low despite many governments executing strong promotion policies. First, they compared the economical and psychological address towards this study topic followed by a

hypothetical framework of EV tastes which was then allocated to organize our review. Approximation of customers' choices for financial technical infrastructure and policy attributes are then reviewed. Many governments have been initiated and implemented policies to stimulate and encourage electric vehicle production and adoption. The expectation was that better knowledge of customers' preferences for EV can make these strategies more effective and efficient.

9. Adnan et al., (2017) proposed a comprehensive overview on the “A comprehensive review on theoretical framework-based electric vehicle consumer adoption research” For long-term benefits, the need for the adoption of EV's has always given environmentally-friendly innovation to society. In this study, the researcher found that the literature regarding electric vehicle adoption tried to address is through the only diffusion method of EV's. Whereas this study highlighted customer innovations which provided them a wide insight into customers' emotions to look over the major aspect of consumer electric vehicles adopting research. The theme of this particular literature could be implemented to make a better understanding of the consumer's emotions and attitude towards the adoption of electric vehicles. the scholars further also stated that there was a possible cause for more recent developments within the technological adoption part that could have to assist to be a standard for the upcoming developments. Over the past few years, information about problems surrounding the adoption and distribution of EVs has received

little attention. This study expanded this line of research by focusing on making a chance for developing the aspects of theoretical frameworks in terms of adding emotions from a psychological perspective where consumer behavior and ethics are considered.

10. Rezvani et al., (2015) proposed a comprehensive overview on the “Advances in consumer electric vehicle adoption research: A review and research agenda” The study has presented an extensive survey of the operators for and hurdles against customers adopting the plug-in or chargeable EVs was also a review of the conceptual outlook that has been taken advantage of for interpreting consumers' aims and adopting behavior towards electric vehicles. Adding to it they have identified breaks and curbs in existing research and propose areas in which future study would be able to contribute. Finally, they found consumer emotions an overlooked aspect of consumer EV adoption research has provided a stepping stone for the study of emotions and their antecedents in the consumer EV adoption context. to continue the research, they saw an opportunity in developing this area further with conceptual frameworks of the emotions in psychology PEB ethics and customer behavior area.

11. Monika (2019) proposed a comprehensive overview on the “A study on customer perception towards e-vehicles in Bangalore” Every day the researchers come across so many topics and articles which states the importance of E-Vehicles and how Government around the world were

implementing policies to promote E-Vehicles to reduce the dependences on oil, decrease greenhouse gasses and improve air quality. As of 2018-08-30, The Indian Automobile Industry registered a record sale of 24.6% growth in commercial vehicles, these figures were sufficient to pull our sleeves up and do something about it.

Likewise, given in this context, E-Vehicles promises to an extent to be then game-changer, but their drawback would be if people dint know about them. This paper is aimed to capture the views, sentiments, and perception of the awareness and likeliness to buy the vehicles so that sustainability in the environment could be maintained.

12. Carleya et al., (2013) proposed a comprehensive overview on the “Intent to purchase a plug-in electric vehicle” An overview of early opinions in large united states cites that this study inspects customer narrated target to purchase a plug-in or chargeable EVs and evaluates the features that expand or diminish interest. Each of the known drawbacks of plug-in or electrically charged vehicles' initial cost recharging time and limiting driving range is associated with diminished interest. although customer attraction in electric vehicles was low it should be noted that despite more than 20 years of marketing conventional hybrid vehicles account currently for less than 3% of new passenger-vehicle sales in the united states.150,000-300,000 units per year which were enough to begin the development of a new industry.

13. Vidhi and Shrivastava (2018) proposed a comprehensive overview on the “A Review of electric Vehicle Lifecycle Emissions and Policy Recommendations to extend EV Penetration in India.” Electric Vehicles lower the pollution as long as an excessive percentage of the facility mix comes from renewable sources and if the battery production was happening at a plot far away from the vehicle utilize region. The Indian government had perpetrated to answering new Delhi's pollution problems through an aspiring policy of switching 100% of the light-duty customer vehicles to EVs by 2030. There are many human attitudinal changes useful to focus on 100% adoption of electrical vehicles. This study looks at various measures within the life cycle of an electric vehicle impact on environmental emissions and recommends appropriate policies for a specific social and economic group that were appropriate for the Indian market.

14. Kumar and Padmanaban (2019) proposed a comprehensive overview on the “Electric Vehicles for India: Overview and Challenges” the govt. of India has come up with aspiring ideas of introducing the EV's to the Indian market and confine pace with the evaluation of EV's internationally. the national electric portability journey plan 2020 has accompany an in-depth report on the EV's. India features a vast challenge in shifting the conveyance sector from ice engines to electric vehicles. this needs tons of designing study and growth. government plans like fame and few other plans got to be updated regularly to stay pace with the event throughout the planet. the

facility electronics electric motors should be planned for Indian conditions.

- ReportLinker (April 30, 2020) proposed a comprehensive overview of an article named- “India Electric Vehicle Ecosystem Market: focus on Vehicle Type, Propulsion Type, Battery Type, Charging Infrastructure, and Separator Demand – Analysis and Forecast, 2019-2030”

In the Indian electric car market environment analyzed by BIS Research, the EV market is expected to grow at a strong CAGR of 43.13% during the rainy season from 2019 to 2030. With the influx of local battery manufacturers such as TATA Chemicals and BELEL in addition to importing batteries from international players, the battery market for electric vehicles is expected to grow at a cumulative CAGR of 60.15% during the forecast period. Although the Indian automotive industry is facing a sharp decline in FY2019, the market for electric vehicles is expected to continue in the coming years.

RESEARCH METHODOLOGY

A research plan requires developing efficient ways of gathering the appropriate information. Research Methodology discusses the design, type, and answering the objectives of the research. This structure of Questionnaire

DATA COLLECTION METHODS - The data collection is succeeded by using a research tool which is as follows:

Survey – The respondents are citizens of India and focusing on the sample size where the citizens are more

eager on automobiles and electric automobiles. It also includes the environmentally friendly who feels EV's are the future as the carbon emissions have exceeded and have to be bought down to its limit.

Review of Literature – Mentioned in Literature Review above.

Various cities or areas of India which is the most populated cities in India and has to face the abrupt fall in breathing the fresh oxygen. So, focusing on the urban areas where these issues are faced and time preferred is anytime as the need for change is perfect anytime. It's necessary to understand the perception of consumers and make-believe in understanding the lacunas and have the research a useful way to modify certain areas for electric automobiles.

The research is held through a survey by taking the help of google, google forms throughout the possible areas of India. Distributing or forwarding the Questionnaire to various citizens of India.

Inclusion – It is considered that the sample size represents the universe that is India. Even the citizens who don't have vehicles but are willing to purchase the vehicle these respondents are also represented. Student's perspective is also included as they are the roots for the future.

Exclusion –Technical Aspects are not much involved as it just justifies the basic features and needs of the consumer.

SAMPLING-

Sampling Details

In **Non-Probability Sampling**, there may be cases where certain human units will have fewer options because judgment, discrimination, and usability of respondents are considered as a means of selecting sample units.

With the use of the **Snowball Sampling** method, responses were collected. Snowball Sampling is a multi-step sample in which a random number of sample units (respondents) are randomly selected. Later, additional sample units are selected for the transmission process. This means that selected respondents initially provide addresses to additional respondents to complete a survey form.

DATA ANALYSIS METHOD –

The method used for analyzing the data is the Statistical Analysis Method. The following are the tools and materials used for Analysis:

Websites- for analyzing the AQI and other factors such as the previous vehicle attempts, etc. and Google Scholar for Review of Literature (ROL).

Google Forms – As the research is on survey-based and has used google forms as a tool for data collection makes a step easier to collect the information through the wide aspect to increase the number of respondents.

IBM SSPS–A tool used to analysis and present the data which is collected to perform two-tailed test.

One Sample, Two-tailed HypothesisTest - Two-tailed tests concerning single mean when the variance of the population is unknown and the sampling size is large.

Google Sheets – As the respondents responding to the google forms will be viewed in google excel sheets. That

Population	India (Universe)
Sampling Size	505 elements
Sampling Frame	500 responses
Sampling Error	5 (responses recorded twice)
Sampling Technique	Convenience Sampling- Snowball Sampling technique

gets updated in every response.

MS Excel – For various Charts, Pie-charts, and graphs for an optimal lookout for visualization.

METHODS USED IN FRAMING QUESTIONNAIRE-

- Continuous Data for various questions such as Age, on average travel in Km; hours are taken to charge the EV, etc.
- Interval / Likert Scale for measuring the prioritizes of beneficiaries in features of the electric vehicle.
- Description Scale for selecting the various options such as Gender, Occupation, and Qualification.

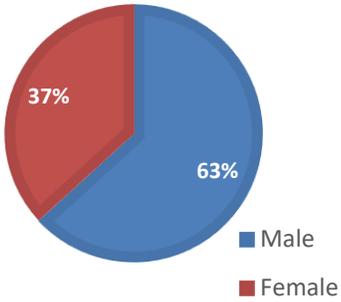
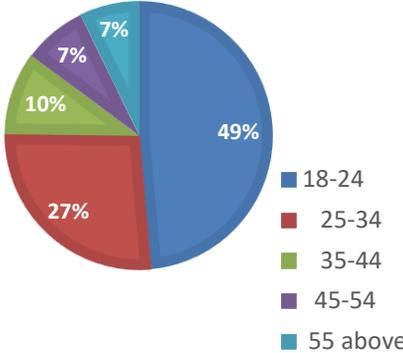
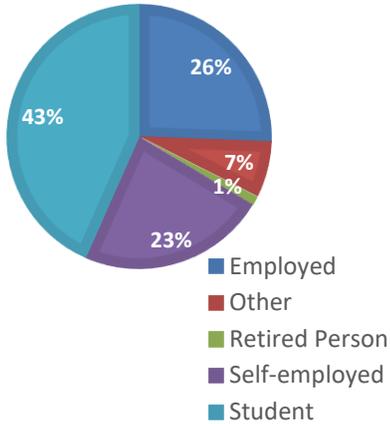
RATIONALE

In this research topic of an electric automobile, the consumer's perception matters were in this survey the consumer can clear the doubts of the electrical vehicle before purchasing it and have the questionnaire which will make the intervals in their satisfaction levels and also can give the opinion on the improvement sectors for increasing the volume sales and decrease the excess carbon-di-oxide emission. An environmental aspect is also a part that emphasis the respondent's importance on EV's in a country like India. It also focuses to resolve through making some assumptions and identifying the responses. India which can be said as cost-effective can quality effectiveness it also derived efficiently through the questions in the survey.

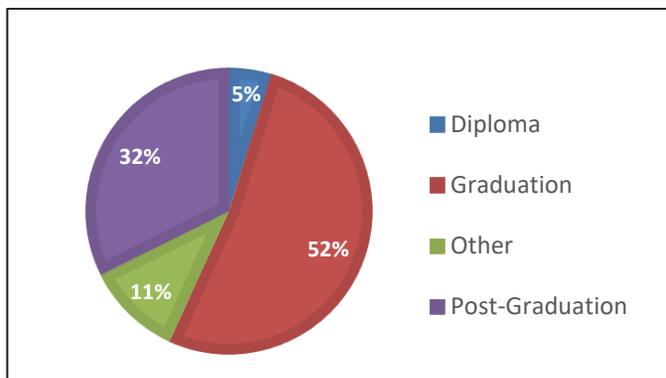
Logically, the perspective to have brief research on consumer behavior towards electric vehicles in the Indian Market which is a eutrophic market of automobiles.

DATA PRESENTATION AND ITS ANALYSIS

Data Presentation- No. of responses - 500

<p>Gender Distribution Male – 316 Female – 184</p>	
<p>Age Distribution (in years) 18-24 243 25-34 133 35-44 50 45-54 38 55 above 36</p>	
<p>Occupation-wise Distribution Employed 128 Student 217 Self-Employed 115 Retired Person 6 Others 34</p>	
<p>Data Presentation</p>	

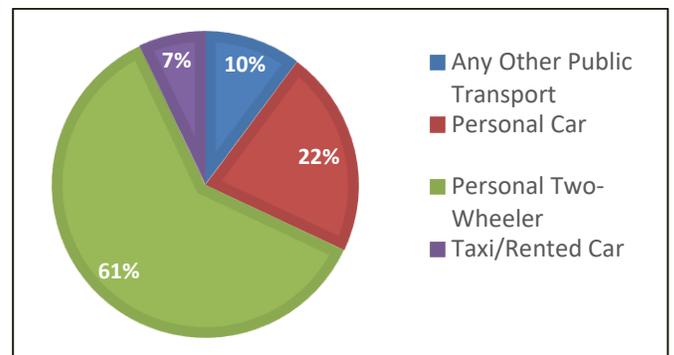
Education Qualification				
	Frequency	Percent	Valid Percent	Cumulative Percent
Diploma	24	4.8	4.8	4.8
Graduation	260	52.0	52.0	56.8
Other	54	10.8	10.8	67.6
Post-Graduation	162	32.4	32.4	100.0
Total	500	100.0	100.0	



Education Qualification Distribution

In this, the qualified respondents are maximized in completing their Graduation which is 52% of 500 that is 260 amongst them. Other leading is Post-Graduated with 32.4% of 500 which is 162 covering the sample size. The Diploma respondents are equal to 4.8% that is 24 respondents and others which include uneducated or unknowledgeable respondents, 11th-grade students, which is 10.8% of 500 that is 54 respondents, and shows equal concern to the research.

Which Vehicle do you prefer for the daily commute?				
	Frequency	Percent	Valid Percent	Cumulative Percent
Any Other Public Transport	51	10.2	10.2	10.2
Personal Car	109	21.8	21.8	32.0
Personal Two-Wheeler	305	61.0	61.0	93.0
Taxi/Rented Car	35	7.0	7.0	100.0
Total	500	100.0	100.0	



Mode of Transport Distribution

In the above pie-chart, it is analyzed that the usage of personal two-wheeler and the personal car is much more compared to any other public transport and rented a taxi or car. As that differs according to the numbers 61% use personal two-wheeler and 21% of 500 use personal cars for transportation rather than other public transport and rented cars or taxis which is 17% in total of 500 respondents.

Through this, it's clarified that the customers use personal vehicles for transport rather than any other and this is where the attention should be dragged as it's also important to have an EV as a personal vehicle and not only in public transport.

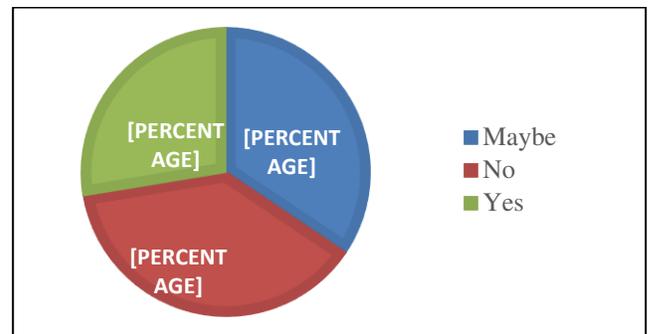
As we see in the above pie-chart that the maximum respondents are traveling in an about 1to 10 km on daily basis resulting 35% of 500, and 26% at the second maximum with 10-20 km which is substantial to support that the people who use fueled vehicle for short distance purpose can adopt the EV as a mean to travel for their daily commute.

On average, how much do you travel in a day?

	Frequenc y	Percen t	Valid Percen t	Cumulative Percent
1-10 Kms	174	34.8	34.8	34.8
10-20 Kms	130	26.0	26.0	60.8
20-30 Kms	106	21.2	21.2	82.0
30-40 Kms	44	8.8	8.8	90.8
40-50 Kms	25	5.0	5.0	95.8
50-60 Kms	6	1.2	1.2	97.0
More than 60 Kms	15	3.0	3.0	100.0
Total	500	100.0	100.0	

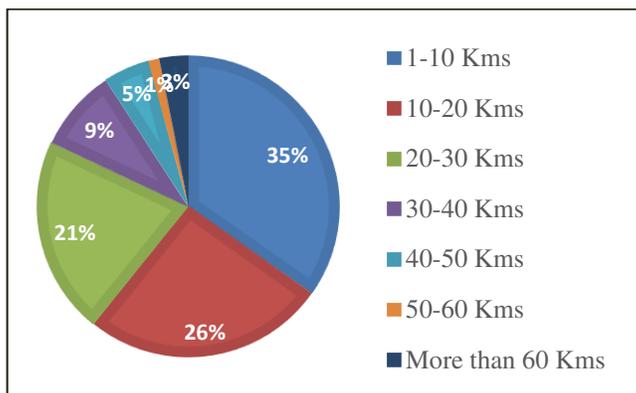
Do you have complete knowledge about Electric Automobiles?

	Frequency	Percent	Valid Percent	Cumulative Percent
Maybe	172	34.4	34.4	34.4
No	190	38.0	38.0	72.4
Yes	138	27.6	27.6	100.0
Total	500	100.0	100.0	



Knowledge about EV Distribution

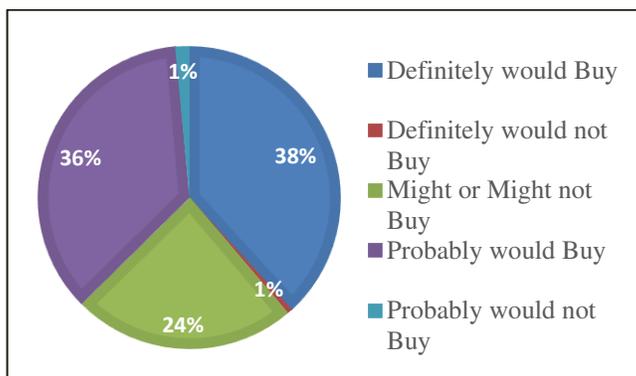
From the sample size of 500, the above pie-chart shows that 38% of the population that is 190 of them doesn't have the complete exact knowledge of Electrical Automobile. And 34% out of 500 which comes to 172 it is having incomplete knowledge which may be hazardous for the future growth of EVs in the market.



Travel (in kms)

If the Government provides electrical charging points like Gas or Fuel Station would you buy Electric vehicles then?

	Frequency	Percent	Valid Percent	Cumulative Percent
Definitely would Buy	191	38.2	38.2	38.2
Definitely would not Buy	3	0.6	0.6	38.8
Might or Might not Buy	119	23.8	23.8	62.6
Probably would Buy	180	36.0	36.0	98.6
Probably would not Buy	7	1.4	1.4	100.0
Total	500	100.0	100.0	



Prioritization of EV based on Station

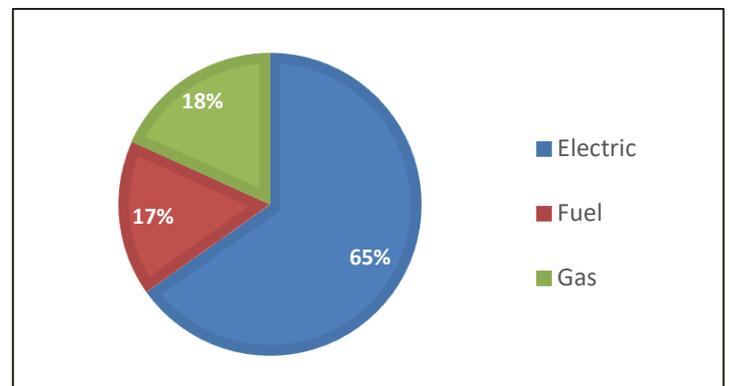
In the above pie-chart that simplifies the consumer's perception about electric vehicles when the effective and needful changes are made to build a proper infrastructure

for EV's to run on roads. The following are the results received from the consumers:

38% would definitely buy and 36% would probably buy or try the EV out of 500 respondents. 24% may or may not purchase the EV. Remaining 2% are in the sector of definitely won't buy and probably won't buy the EV.

What do you think is cheaper and more qualitative for the long run?

	Frequency	Percent	Valid Percent	Cumulative Percent
Electric	326	65.2	65.2	65.2
Fuel	83	16.6	16.6	81.8
Gas	91	18.2	18.2	100.0
Total	500	100.0	100.0	



Distribution Fuel, Electricity and Gas

In the above pie-chart, the consumers' attitude is noted in order to make an optimal choice that which option looks cheaper to them were the observations came to be 65% of 500 respondents that is 326 agreed that electricity is much cheaper than fuel or gas. Otherwise, for Fuel and Gas, the frequency was 83 and 91 respective sharing 17% and 18% of valid percentage.

DATA ANALYSIS AND ITS INTERPRETATION

ONE SAMPLE, TWO-TAILED HYPOTHESIS TEST ON SPSS:

Report						
	Safety	Exterior	Mileage	Interior	Electricity Consumption Rate	Environment Friendly
Mean	4.81	3.84	4.47	3.75	4.45	4.55
N	500	500	500	500	500	500
Std. Deviation	.556	1.099	.725	1.126	.847	.773

Mean Report

One-Sample Test						
Test Value = 4						
	t	df	Sig. (2-tailed)	Mean Difference	95% Confidence Interval of the Difference	
					Lower	Upper
Safety	32.649	499	.000	.812	.76	.86
Mileage	14.489	499	.000	.470	.41	.53
Electricity Consumption Rate	11.884	499	.000	.450	.38	.52
Environment Friendly	15.861	499	.000	.548	.48	.62
Interior	-5.044	499	.000	-.254	-.35	-.16
Speed of the Vehicle	3.514	499	.000	.156	.07	.24
Exterior	-3.254	499	.001	-.160	-.26	-.06

One Sample, Two-Tail Test

FROM THE ABOVE TABLE-

Mean = Sample Mean

N= Number of Observations (Respondents)

Std. Deviation = Standard Deviation

Test Value = Assuming Population Mean

95% Confidence Interval = Assuming Alpha

t= t-value

df= Degree of Freedom

sig. (2-tailed) = p-value

ONE SAMPLE, TWO-TAILED TEST INTERPRETATION:

As the assuming alpha here is 0.05 (95% confidence Interval) and the assuming population mean is 4. Through the difference of t-value and t-test the test of hypothesis is performed. There are

certain elements that has to be understood for using IBM SPSS Statistics Tool such as:

1. The tool doesn't show numbers after 3 decimal digits. As the sig.(p-value) can't be zero but it is close to zero which can't be seen in the analysis above.
2. The Critical Value (the p-value from the t-table) is derived from the tool itself and not mentioned in the analysis above.

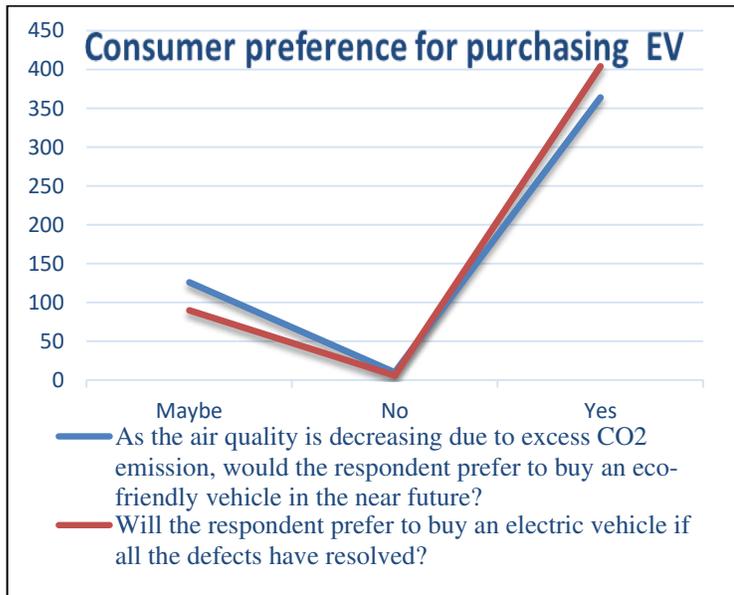
As the scale here says that 5 (Very important), 4 (Important), 3 (Neutral), 2(Not Important), and 1(Prefer not to say) So, the interpretation goes that as the safety, mileage, electrical consumption rate, environmental friendly, and speed of the vehicle have its t-value way less than its p-valueso the null hypothesis cannot be rejected whereas the interior and exterior have its t-value is more than its p-value so the null hypothesis is rejected.

This analysis showed that the safety, mileage, electrical consumption rate, environmentally friendly, and speed of the vehicle of the sample is not significantly different with the safety, mileage, electrical consumption rate, environmentally friendly, and speed of the vehicle of the population with the assuming mean equal for all i.e. 4 but the interior and the exterior of the sample is significantly different with interior and exterior of the population.

ANALYSIS OF FINDINGS.

As seen through out the survey, the respondents are interested for the Electrical Vehicles but the exact knowledge is not supplied as demanded or there are some

loose ends remaining in the working of retailing sector of the brands.



Consumer Preference for Purchasing EV

According to the above figure, from the survey performed the graph presents the consumer's preferences to purchase the EV as the vehicle for their daily commute which is between 350-410 respondents which are 76.8% on an average that the consumers will purchase the EV if the previous defects are resolved and as to buy an eco-friendly looking into the air quality scenario in India. Whereas, 60-180 respondents which are 21.6% on an average that the consumers may think of purchasing the EV. And very negligible respondents deny making a move on purchase of EV.

CONCLUSION

To the emerging trends in the Electric Vehicles, the changes in the features and facilities can lead to a tremendous increase in the sales of Electric Vehicles. Even certain aspects should be taken into consideration that the knowledge should be reached out to the consumers truly and completely. The consumers'

expectations and attitudes over the electric vehicle to prioritize the dimensions through the speed, mileage, safety, electrical consumption rate, and eco-friendly rather than interior and exterior of the vehicle.

As the analysis has resulted that the consumers are accepting the new mean of travel with the extracting facilities in the infrastructure that would be easy to perform it on the Indian roads. Facilities such as electric fuel stations at distinct places, etc.

An Electric Vehicle has been saving a lot of carbon-dioxide emissions, looking in today's scenario the consumers also feel to have a healthy atmosphere as life matters more than the toxic vehicle's surroundings. Even this is been a reason to have an Electric Vehicle at the residence.

In the analysis, there is a maximum response by the youth of the nation counting 43% of students which can bring the change in the lifestyle and improve the state of Air Quality. Various parts of India such as Delhi, Karnataka, Madhya Pradesh have AQI (Air Quality Index) higher and are probably ready to acquire the Electric Vehicle lifestyle in the commutation.

Thus, while concluding Electric Vehicle indeed has been adapted by the consumers emotionally and is having positive awareness to build up the atmosphere in the areas of their automobile. Consumer perception has dragged the attention towards the hidden parts of Electric Vehicles' practical approach towards the consumers.

RECOMMENDATIONS

As seeing through the Air Quality in various parts of India that is increasing tremendously and drastically and has to be in control, the carbon-dioxide emitted excessively from

the fueled vehicles majorly. Recommendations to the industry are as follows:

- The Industry where electric automobile have been driven by every entrant as we can see many lacunas in understanding of the features and facilities provided to the consumers.
- There should not be any lack of knowledge while presenting the vehicle.
- Should try to attract the population with required fields such as mileage and speed limit extension with its cost effectiveness.

Recommendations to the Government or the Population of India as whole are as follows:

- To make a law that at least the family who is willing to have vehicle or vehicles should have at least one automobile with them.
- Improvement of structure and infrastructure of Plug-ins to avoid the rejection reason for purchasing an EV.
- Have an initiative all over India also in small cities so that air quality doesn't get affected for long run.

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