CONSUMER PERCEPTION AND SATISFACTION TOWARDS E-VEHICLES IN HARYANA

Dr. Abhishek[1] and Sumit Bhardwaj[2]

Abstract-
Electric car brands that stay adaptable, creative, and dedicated to sustainability will be well-positioned to prosper in the increasingly competitive environment as the electric vehicle market continues to change. Electric vehicle manufacturers have the opportunity to spearhead the transition to a more environmentally friendly and sustainable mode of transportation by integrating these tactics and remaining aware of changing consumer preferences and market trends. The main objective of this work is to find consumer perception towards E-vehicle in Haryana State. All of the variables' reliability test scores were found to be above 0.89, indicating that the data acquired for analysis was trustworthy and should be used for more research and analysis. Following this, a chi test and a T-test analysis were performed, and it was determined that there is a significant association between the dependent and independent variables.

Keywords: Electric Vehicle, Consumer Perception, Consumer Satisfaction, Types of Electric Vehicle etc

Assistant Professor, Faculty of Management and Commerce, Baba Mastnath University, Rohtak
[2]Research Scholar, Department of Management, Baba Mastnath University, Rohtak

I. INTRODUCTION

The increasing levels of air pollution in Indian cities were a source of worry for manufacturers. Among the top 100 most polluted urban areas in the nation, World-Nation, are over 25 major Indian cities. Although there are many different sources that contribute to air pollution in cities, transport infrastructure plays a critical role. Transport discharges are crucial when there is little division. Because of the well-established negative effects of poor air quality on both human health and the economy, producers are hoping to lessen their environmental impact in a few ways.

In addition to being viewed as a viable option for transport, a few national governments have effectively updated their plans for innovation development. Indigenous governments are moving quickly to promote electric vehicles as a viable and environmentally friendly option for transportation, as well as a workable way to reduce air pollution in cities. There are a few overseas instances of best practices and approaches to problems. For instance, China has embraced hybrid vehicles widely for commuting and riding. In the UK, big cities like London are offering incentives.

Although electric three-wheelers have become somewhat popular in India, there is still very little electrical power distribution. There were two-wheelers, four-wheelers and an armada of vehicles for urban transportation. Even without technological investment, testing indicate that electric motorcycles will be commercially viable by 2020, and if the government provides incentives for charging forces and infrastructure, electric four-wheelers will emerge as a major breakthrough by 2030. The introduction of electric vehicles excites the administration. The ambitious target of being all electric by 2030 has also been established by the Minister of Defence Power. Alternative programmes, in particular, have scared the auto sector with the Minister of Road Transport and Highways' strong statement to the Society of Indian Automobile Manufactures (SIAM) annual gathering. In any case, formulating strategies would involve input regarding the scope of assistance needed, recommendations for government budgets, necessary approach tools, and leveraging the private sector.

In an effort to reduce carbon emissions from fossil fuels and address the fatal air pollution in its cities, the Indian government is pushing for a quicker adoption of electric vehicles, with the goal of having at least 15% of all vehicles on the road be electric within five years, beginning in 2018.

The widespread use of electric vehicles (EVs) may help reduce issues like global warming, environmental pollution, and oil dependence. Nevertheless, even though numerous governments have put in place robust promotion strategies, the market penetration of IV is still quite low at the moment. With 1.33 billion citizens, India is one of the (second) most populous nations on Earth. The country's population is growing at a rate of 1.1% annually. If things continue this way, it is expected to become the world's most populous nation in the next 20 years. In addition, the emergence of commercialization and industrialization has stimulated job opportunities and contributed to the growth of urbanisation. India's rapid urbanisation is expected to result in 500 million people living in urban areas by 2030. This, together with anticipated and current financial trends, would likely lead to increasing incomes for Indian families, which will in turn increase the need for adaptability. India's automobile industry, currently ranked fourth globally, must rise to the third rank by 2021.

II. INTRODUCTION OF ELECTRIC VEHICLES

An electric vehicle (EV) is a car that runs on one or more traction motors or electric motors. An electric car can run entirely on electricity obtained from sources outside of the car using a collector system, or it can run on petrol converted into energy using a battery, solar panels, fuel cells, or an electric generator. Electric vehicles include those on roads and trains, electric spacecraft, electric aeroplanes, and electric watercraft. When electricity became a popular method of motor vehicle propulsion in the middle of the 19th century, electric vehicles (EVs) gained popularity because they were more comfortable and easier to operate than gasoline-powered vehicles. Internal combustion engines dominated the propulsion of cars and trucks for almost a century, although electric power continued to be widely used in other vehicle types, like trains and smaller vehicles of all kinds.

Electric Vehicle Development in India

The UK has declared that from 2030, new petrol and diesel vehicles would not be sold. In addition, the UK is attempting to create the infrastructure required for electric cars (EVs) as part of its green agenda. A shift of this magnitude might have implications for the worldwide green movement. The Indian government is also interested in switching to electric cars from fossil fuel-powered ones. The government's ambitious target of getting all cars electric by 2030 was set in 2017. But the auto industry's resistance and concerns about job losses forced the government to abandon the plan.

According to a non-OECD (Organisation for Economic Cooperation and Development) forecast, India will rank among the top global contributors to petroleum consumption and growth. According to a survey published by the India Brand Equity Foundation (IBEF), India's oil imports increased significantly from US $70.72 billion in 2018–2019 to US $87.37 billion in 2019–2020. The Indian economy benefits greatly from the contributions made by PSUs and private sector businesses in the oil and gas industry. In order to boost electric mobility in India, the Indian government established the Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME) plan in early 2019. According to a report by Invest India, all activities throughout the petroleum industry value chain contribute about 15% towards India's GDP. The plan will cost one trillion rupees. The Indian government is pushing for electrical vehicles at the same time that the car industry is upgrading from Bharat Stage IV (BS-IV) to Bharat Stage VI (BS-VI) fuels. The main brains behind the Indian government's policies, Niti Ayog, have recommended that by 2025, electric vehicles, particularly those with two and three wheels and displacements under 150 cc, should be allowed on Indian roadways. As

a net oil importer, India spends a large portion of its oil imports; in 2018–2019, it imported INR 7.83 lakh crores (US $112 billion). According to the Federal Think Tank, NITI Ayog, a complete transition to electric vehicles might save the significant amount of money spent on oil imports. One of the factors driving the adoption of electric vehicles is the decrease in oil imports, in addition to the advantages of lower air pollution. The production of the batteries for these electric vehicles is a sector that needs to be developed in order to support the widespread adoption and use of electric vehicles. There are currently no large-scale or reasonably priced battery production plants in India. An additional component is the sufficient availability of charging stations, which requires favourable infrastructure.

Electric Vehicle Status in Haryana

Over the past ten years, Haryana has seen a sharp rise in the number of vehicles. Traditional fuel-powered cars are the main cause of pollution in the environment and pose health risks. This makes the investigation of alternate energy sources necessary. All throughout the world, electric cars are becoming more and more popular. The car industry is likewise moving away from traditional fuel-based technology and towards eco-friendly solutions as a result of the rapid depletion of fossil fuels. In order to encourage the use of environmentally friendly automobiles in the nation, the Indian government introduced The Faster Adoption and Manufacturing of (Hybrid &) Electric Vehicles in India (FAME Scheme) in 2015 as part of the National Electric Mobility Mission Plan (NEMMP). Given this context, it is essential that the state government develop an electric car policy.

Vision

- To promote clean transportation
- To ensure environmental sustainability by reduction of pollution
- To increase energy efficiency and conservation
- To generate employment in state.

Electric Vehicle Charging Infrastructure

- The Haryana government plans to create charging infrastructure as a profitable enterprise within the state.
- The State will encourage Public Sector organisations to establish charging infrastructure. The state would make land available to these Public Sector Undertakings (PSUs) in defined regions at a discounted rate.
- Public spaces and buildings must have developed charging infrastructure, with guarantees of regular electric supply, outlets for charging, etc.
- Infrastructure for quick charging and battery swapping will be available for electric vehicle (EV) mobility on major highways with high vehicle density every 50 km.
- The state will offer electric vehicle charging infrastructure for new apartments, high-rise structures, and technological parks (EVs). However, under the PPP model, the State will support the development of a secondary market for the disposal of batteries from electric vehicles (EVs).
- Clean fuel and renewable energy-based charging/battery swapping stations for solar or hydrogen-powered fuel cells are encouraged under the legislation.

Advantages of Electric Vehicles

Energy is saved with electric cars

Energy efficiency is the quantity of energy from a fuel source that is converted into real energy for moving a car's wheels. AEVs are far more efficient than conventional gas-powered cars. Compared to

gas-powered vehicles, which convert 17–21% of their energy into vehicle movement, AEV batteries convert 59–62% of their energy into vehicle movement. Accordingly, filling up at a petrol station does not add as much to the actual vehicle power as charging the battery of an AEV.

Emissions from electric vehicles are lower Reducing emissions, which include fuel use, are an additional benefit of all-electric cars. Driving an electric automobile eliminates tailpipe emissions, which are a significant source of pollution in the United States, as they run on a rechargeable battery. Furthermore, because the rechargeable battery reduces the need for fuel, all energy can be obtained locally.

High-performance and low-maintenance automobiles are electric ones. Every electric car has a powerful motor that runs smoothly and quietly and requires less maintenance than an internal combustion engine. Because AEV motors offer strong torque and are quick, driving can also be fun. Compared to their gasoline-powered equivalents, AEVs are typically newer and have more digital connections to charging stations, enabling charging management through an app.

• Compared to cars with traditional combustion engines, BEVs have fewer moving parts, making them less expensive to maintain. An electric vehicle (EV) eliminates the need for costly equipment like fuel injection and exhaust systems and requires less maintenance overall. Compared to BEVs, PHEVs are more expensive due to their gasoline engine and maintenance needs, but they also have an electric propulsion system with fewer moving parts, which reduces the wear and tear on gasoline engine components.

EVs require less maintenance because they have fewer components than ICE vehicles. It is crucial to remember that service could be expensive at first because of the shortage of qualified specialists and the rather complicated technologies involved. Upskilling programmes and market maturity should lead to lower servicing costs, which will strengthen the case for total cost of ownership. The total cost of ownership (TCO) for electric vehicles can be supplemented by a number of auxiliary incentives for EV owners, such as income tax benefits, free parking, exemptions from road taxes, and exemptions from registration fees.

Although TCO benefits are anticipated to rise in the future, the current situation presents a number of obstacles in addition to high upfront costs that drive up TCO, such as higher insurance premiums which are roughly 50% higher than those of their ICE equivalents. A fifteen percent discount on EV insurance costs has been offered by the government. In the short term, this will help cut TCO; but, as the EV ecosystem expands and gains traction in India, insurance rates should eventually decline.

III. RESEARCH METHODOLOGY

The Electric Vehicles are necessary in the current stage of life because the population of the country is increasing rapidly. This will create need for more vehicles and the need of more vehicles will increase the demand for fuel. The continuous use of Fuel will make the shortage in supply of it. All these aspects provide a way for the introduction of Electric Vehicles. The introduction of Electric vehicles also an Eco-friendly invention this will reduce the pollution in the environment. The Rapid increase in the Electric vehicles leads to heavy competition in the market. By considering the above elements the study is made to identify the consumer preference and satisfaction towards electric vehicles in Coimbatore city. Hence, this work is based on consumer perception and satisfaction towards E-vehicle in Haryana. Hence, the main objective of this study is based on consumer perception and satisfaction towards E-vehicle in Haryana. Primary data is used to achieve objectives of present study. Data is collected with the help of various sources and is tabulated with the help of MS-Excel. Then further data analysis is done with the help of SPSS tool. Reliability statistics is analysed with all statements initially. Descriptive statistics with is used to achieve the first objective. T-Test is used for further analysis.

Research Design

The research design of the present study is descriptive cum exploratory in nature. By understanding the objectives and characteristics of the mentioned research design; a descriptive research design is employed for this research. A descriptive research design is concerned with the findings primarily. In the descriptive research design observational method, the case-study method and survey method were used. For this research, the survey approach was used to obtain respondents' data. This work is based on consumer perception and satisfaction towards E-vehicle in Haryana.

Data Collection: The study is compiled using primary data collection sources. It is collected with the help of various social media tools as well as by some sources.

Sample Design

It mainly consists of the following:

Universe of the Study: The Universe includes:

It refers to all the qualified respondents of a particular research. Universe of study is all male and female population of all areas of Haryana State which are using E-Vehicle or want to buy. The proposed research area for the study is the Haryana state. The selection of the districts, blocks and villages will be made through convenient method of non-probability sampling technique.

 Sampling Unit: The sampling unit for the study will be users of E-vehicle in Haryana state.

Distribution of Sample

The sample size required for this study was concentrated for men and women in Haryana, with 400 people of various age groups and the general public.

Table 1: Descriptive Statistics based on Age Factor

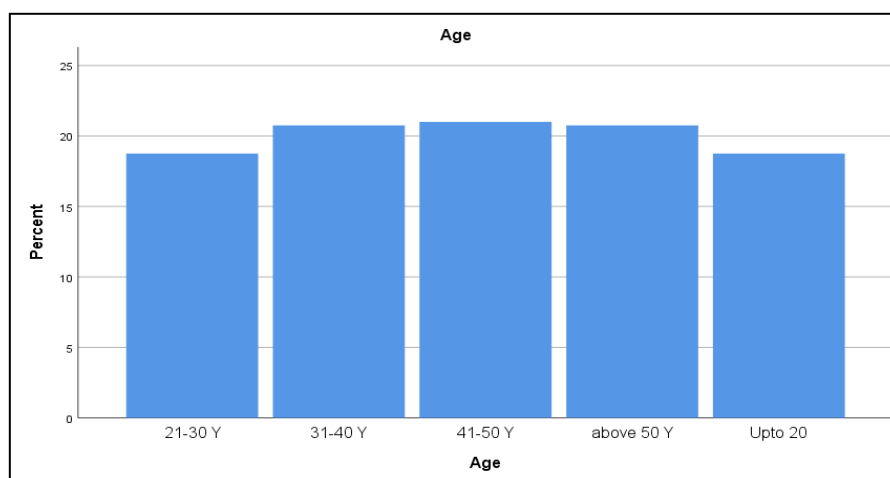| Age					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	21-30 Y	75	18.8	18.8	18.8
	31-40 Y	83	20.8	20.8	39.5
	41-50 Y	84	21.0	21.0	60.5
	above 50 Y	83	20.8	20.8	81.3
	Upto 20	75	18.8	18.8	100.0
	Total	400	100.0	100.0	

Fig 1: Descriptive Statistics based on Age Factor

Above table and figure show the descriptive Statistics on Age Factor. This survey is done to study assessment procedure related to consumer perception and satisfaction towards E-vehicle in Haryana. . Total 400 respondents provided their responses with the help of structured questionnaire. In this, 18.8% are from age upto 21-30 Years, 20.8% people are from 31-40 Y age, 21.0% are from 41-50 Y age, 20.8% are from above 50 Y age and 18.8% are from upto 20 Year.

Table 2: Descriptive Statistics based on Gender Factor

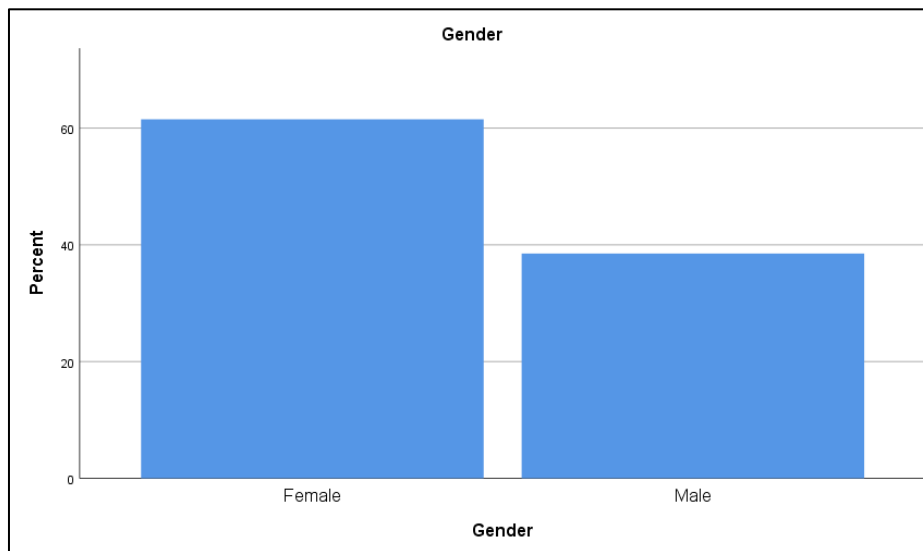| Gender					
		Frequency	Percent	Valid Percent	Cumulative Percent
Valid	Female	246	61.5	61.5	61.5
	Male	154	38.5	38.5	100.0
	Total	400	100.0	100.0	

Fig 2: Descriptive Statistics based on Gender Factor

Above table and figure shows the Descriptive Statistics on Gender Factor. This survey is done to study assessment procedure related to consumer perception and satisfaction towards E-vehicle in Haryana. . Total 400 respondents provided their responses with the help of structured questionnaire. In this, maximum 61.5% are from female category and 38.5% are from male category.

IV. DATA ANALYSIS

Objective: To examine the consumer's perception towards E-vehicles.

H_01: There is no significant relationship with consumer's perception towards e-vehicles with their responses.

Table 3: T-test Analysis based on Sources for Getting Knowledge

One-Sample Statistics					
	N	Mean	Std. Deviation	t-value	P-Value

	N	Mean	Std. Dev	T-Value	P-Value
B. From what sources did you get the most of your knowledge about Electric vehicle: Newspapers?	400	3.96	1.211	65.315	.000
B. From what sources did you get the most of your knowledge about Electric vehicle: Magazines?	400	4.14	1.025	80.840	.000
B. From what sources did you get the most of your knowledge about Electric vehicle: Television?	400	4.14	1.054	78.639	.000
B. From what sources did you get the most of your knowledge about Electric vehicle: Internet Sources?	400	4.11	.993	82.662	.000
B. From what sources did you get the most of your knowledge about Electric vehicle: Outdoor Advertisements?	400	4.16	.993	83.752	.000
B. From what sources did you get the most of your knowledge about Electric vehicle: Personal Communication?	400	4.03	1.146	70.262	.000

Above table shows the Descriptive Statistics results based on T-test analysis. This survey is done to study assessment procedure related to consumer perception and satisfaction towards E-vehicle in Haryana. . Total 400 respondents provided their responses with the help of structured questionnaire. In this, the statement "sources did you get the most of your knowledge about Electric vehicle: Outdoor Advertisements" has highest mean value 4.16 that shows agree responses from respondents. All statements have p-value 0.000 which is less than 0.05, hence it shows that it rejects null hypothesis and there is a strong relationship between responses and observers value.

Table 4: One Sample Statistics based on Consumer Perception for E-Vehicle

One-Sample Statistics						
	N	Mean	Std. Deviation	Rank	T-Value	P-Value
C. consumer's perception: Electric vehicles are the, vehicles of future	400	4.06	1.130	5	71.800	.000
EV are much quieter than other vehicles	400	4.11	1.059	2	77.647	.000
EV are environment Friendly	400	4.09	1.059	4	77.179	.000
EV vehicle is same as fuel vehicle	400	4.10	1.000	3	82.071	.000
Cost to charge an EV is much less than fuel cost for fuel vehicle	400	4.19	.965	1	86.839	.000
Charging time is very low	400	4.02	1.136	7	70.733	.000
Travel Efficiency	400	4.06	1.060	5	76.583	.000
Comfort	400	4.04	1.075	6	75.141	.000
Durability	400	4.10	1.032	3	79.385	.000

Above table shows the T-Test analysis based on Consumer Perception for E-Vehicle. This survey is done to study assessment procedure related to consumer perception and satisfaction towards E-vehicle

in Haryana. . Total 400 respondents provided their responses with the help of structured questionnaire. In this, the statement "Cost to charge an EV is much less than fuel cost for fuel vehicle" has highest mean value 4.19 and highest T-value 86.83 that shows agree responses from respondents. All statements have p-value 0.000 which is less than 0.05, hence it shows that it rejects null hypothesis and there is a strong relationship between responses and observers value.

V. CONCLUSION

Customers are becoming more aware of a brand's dedication to sustainability and corporate responsibility in the quickly changing world of electric automobiles. Brands can obtain a competitive advantage by appealing to environmentally sensitive consumers by showcasing eco-friendly operations and participating in community projects. The basis for developing successful competitive strategies for electric car brands is an understanding of the existing condition of the EV market and the companies involved. The increasing need for electric cars (EVs) necessitates extending their range in order to allay prospective consumers' fears and improve overall usefulness. Manufacturers have various options for increasing EV range, which will increase consumer appeal and hasten the shift to more environmentally friendly modes of transportation. All of the variables' reliability test scores were found to be above 0.89, indicating that the data acquired for analysis was trustworthy and should be used for more research and analysis. Following this, a chi test and a T-test analysis were performed, and it was determined that there is a significant association between the dependent and independent variables because the value of p was less than 0.05 for every factor. The results of this study can potentially be utilized by electric vehicle manufacturers to develop their marketing plans. Air quality would improve and the environment will gain if customers are properly informed and India begins to switch to electric vehicles instead of gasoline-powered ones.

REFFERENCES

[1]   Philippe Lebeau, C. D. (2015). Conventional, Hybrid, or Electric Vehicles; Which Technology for an Urban Distribution Centre? The Scientific World Journal, 11.

[2]   Fanchao Liao, E. M. (2017). Consumer preferences for electric vehicles: a literature review. Transport review, 275.

[3]   Mohamed M, G. T. (2018). Study on Electric Vehicles in India Opportunities and challenges. International Journal of Scientific Research in Environmental Science and Toxicology.

[4]   Masurali.A, S. P. (2018). Perception and Awareness Level of Potential Customers towards Electric Cars. International Journal for Research in Applied Science & Engineering Technology.

[5]   Pretty Bhalla, I. S. (2018). A Study of Consumer Perception and Purchase Intention of Electric Vehicles. European Journal of Scientific Research, 362-368.