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Power and Fuel – A Study on Consumer Perception on Electronic Vehicles in Karnataka a Case Study of Shimoga City

Mr. Naveen H. N[1] and Prof. H. N Ramesh[2]
Research Scholar, Institute of Management Studies and Research, Shankaraghatta, Shimoga, Karnataka, India[1]
Professor, Institute of Management Studies and Research, Shankaraghatta, Shimoga, Karnataka, India[2]
naveen.hnmba@gmail.com and hnrameshku@gmail.com

Abstract: *Consumers are the powerful forces in shaping the Marketing programmes and strategies. Marketing activities are designed around the consumer's needs and satisfaction and perception. For this reason manufactures should understand aware of consumer perception before offering and while producing the products to the targeted consumer. The main objective of this study is to analyze the consumer perception towards electronic vehicles in shimoga city. And it has been observed since 2017 that electronic vehicles and automotive companies have taken major steps and research activities towards producing electronic vehicles with major companies are focusing economic and environment friendly vehicles while producing their vehicles. and in this changing and in the current dynamic market scenario, consumers are constantly looking and interested to buy better eco-friendly products along with cost-efficiency to it. In this study in order to reach study objectives data have been collected from secondary source to know the perception of the consumers towards electric vehicles*

Keywords: Consumer perception, and E-vehicles. Automotive Industry in India

I. INTRODUCTION

Every day we come across so many topics and articles that mention the importance of electric vehicles and how this generation is getting depleted from the fossil fuels and governments around the world are implementing policies to acknowledge electric vehicles to reduce dependence on crude oil, reduce greenhouse gases and improve air quality .since last 8years , the Indian auto industry recorded a record 24.6% sales of commercial vehicles, these numbers are enough to make us to take our first step and do something about it. Today India is one of the top ten automotive markets in the world and given its burgeoning middle class population with buying potential and the steady economic growth, Accelerating automotive sales is expected to continue. In the last couple of years, there has been a lot of discussion around the prices of fuel- apart from the deregulation of petrol prices. Moreover the threat of disruption of supplies from the Middle-East has heightened the debate on energy security and brought the focus on to alternate drive train technologies. The potential for alternative technologies in automobiles such as electric vehicles (EV) in India, as in the case of many other comparable markets, depends on improved battery technologies, driving ranges, government incentives, regulations, lower prices and better charging infrastructure.

There seems to be a lot of interest on the part of Internal Combustion Engine (ICE) based manufacturers to adopt electric technology, not just supplemental to the ICE but as a stand-alone offering. There are also specialized EV manufacturers that have come up all over the world. While many of the factors that influence the EV market are understood intellectually, we carried out a consumer survey to study perceptions and expectations of potential for alternative technologies in automobiles such as electric vehicles (EV) and hybrid EV. Assessing future demand for electric vehicles was somewhat challenging since it meant testing consumer preferences for a product with which they are largely unfamiliar. For this reason, we focused on uncovering consumers‟ familiarity with EV technologies and products; with their opinions around price, brand, range, charging, the infrastructure, and the cost of Customers Perception on Buying of Electronic Vehicles. The data is collected from the Customers who are willing to buy EV in the city of Shimoga. The study also knows the level of customer awareness towards government's e-transportation

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initiatives in India. The aim of this paper is to capture the opinions, feelings and perceptions of the awareness and likelihood of purchasing vehicles in order to maintain environmental sustainability.

II. CONSUMER PERCEPTION

Marketer ability is to satisfy the consumer need, depends on his ability to understand the consumer in terms of his needs, perception, attitude, personality etc. Perception is the process by which an individual select, organize, and interpret sensations or stimuli through his sense organs i.e. The Immediate response of receptors to the sensory. Such as - seeing, hearing touches smell and taste. Basic stimuli may be in the form of light, color, odor, texture, and sound **(**Nnamdi, Madichie2018).Perception is a psychological process where in an individual receives information from the environmental stimulus through sense organs. And making the meaning of coherent picture of the worlda consumer behavior and attitude towards a goods and services is based on his perception. In marketing management, consumer perception of products and services and corporate images play an important role in consumer purchase decisions. Consumer perception study in marketing Management provides information on what a consumer thinks about a brand or a company or its offerings. This information enables the marketing firm to incorporate consumer information while designing a marketing offer.

2.1 Stages of Consumer Perception

Consumer perception is a process by which consumers sense a marketing stimulus, and organize, interpret, and provide meaning to it. The marketing stimuli may be anything related to the product and/or brand, and any of the elements of the marketing mix

- **Sensing**: Characterized by the physical senses, consumer uses this stage to accumulate 'knowledge' about a product, service, or brand. This may apply to facts such as clothing sizes, but also product smells, taste, and touch.
- **Organizing**: During this stage, consumer make sense of the information they attained, interpreting its value based on context, personal beliefs, perceptions of themselves, and other highly subjective factors. At this stage, consumer will categorize the object of their critique and compare it to other objects within their chosen categories. For example, a consumer hoping to buy a winter coat may prioritize coats by price, but also color and thickness, during the organizing stage.
- **Reacting**: consumer will act based on the sensing and organizing stages, but also internal and external stimuli ranging from personal history to online reviews. Although each reaction and its contributing factors are different, buyers tend to go through similar processes of evaluation before making their decision.

III. AUTOMOTIVE INDUSTRY IN INDIA

The automotive industry in India is one of the larger markets in the world and had previously been one of the fastest growing globally, but is now seeing flat or negative growth rates. India's passenger car and commercial vehicle manufacturing industry is the sixth largest in the world, with an annual production of more than 3.9 million units in 2011.Chennai is home to around 35-40% of India's total automobile industry and for this reason it is known as the Detroit of Asia. It is on the way to becoming the world's largest Auto hub by 2016 with a capacity of over 3 million cars annually. The majority of India's car manufacturing industry is based around three clusters in the south, west and north. The southern cluster consisting of Chennai is the biggest with 35% of the revenue share. The western hub near Mumbai and Pune contributes to 33% of the market and the northern cluster around the National Capital Region contributes 32%. Chennai, with the India operations of Ford, Hyundai, KIA, Renault, Mitsubishi, Nissan, BMW, Hindustan Motors, and Daimler Chennai accounts for 60% of the country's automotive exports. Gurgaon and Manesar in Haryana form the northern cluster where the country's largest car manufacturer, Maruti Suzuki is based. The Chakan corridor near Pune, Maharashtra is the western cluster with companies like General Motors, Volkswagen, Skoda, Mahindra and Mahindra, Tata Motors, Mercedes Benz, Land Rover, Jaguar Cars, Fiat and Force Motors having assembly plants in the area. Nashik has a major base of Mahindra & Mahindra with a UV assembly unit and an Engine assembly unit. Aurangabad with Audi, Skoda and Volkswagen also forms part of the western cluster. Another emerging cluster is in the state of Gujarat with manufacturing facility of General Motors in Halol and further planned for Tata Nano at their

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plant in Sanand. Ford, Maruti Suzuki and Peugeot-Citroen plants are also set to come up in Gujarat. Kolkata with Hindustan Motors, Noida with Honda and Bangalore with Toyota are some of the other automotive manufacturing regions around the country.

IV. ABOUT ELECTRIC VEHICLE

During the last few decades, environmental impact of the petroleum-based transportation infrastructure, along with the peak oil, has led to renewed interest in an electric transportation infrastructure. Electric vehicles differ from fossil fuel-powered vehicles in that the electricity they consume can be generated from a wide range of sources, including fossil fuels, nuclear power, and renewable sources such as tidal power, solar power, and wind power or any combination of those. An electric vehicle (EV), also referred to as an electric drive vehicle, uses one or more electric motors or traction motors for propulsion. Three main types of electric vehicles exist, those that are directly powered from an external power station, those that are powered by stored electricity originally from an external power source, and those that are powered by an on-board electrical generator, such as an internal combustion engine (a hybrid electric vehicle) or a hydrogen fuel cell. Electric vehicles include electric cars, electric trains, electric Lorries, electric aero planes, electric boats, electric motorcycles and scooters and electric spacecraft. Proposals exist for electric tanks, diesel submarines operating on battery power are, for the duration of the battery run, electric submarines, and some of the lighter UAVs are electrically-powered. Electric vehicles first came into existence in the mid-19th century, when electricity was among the preferred methods for motor vehicle propulsion, providing a level of comfort and ease of operation that could not be achieved by the gasoline cars of the time. The internal combustion engine (ICE) is the dominant propulsion method for motor vehicles but electric power has remained commonplace in other vehicle types, such as trains and smaller vehicles of all types. A hybrid electric vehicle combines a conventional (usually fossil fuel-powered) power train with some form of electric propulsion. Common examples include hybrid electric cars such as the Toyota Prius. The Chevrolet Volt is an example of a production Extended Range Plug-In Electric Vehicle.

4.1 Electric Vehicle and Hybrid Vehicle (xEV) Industry

The Indian government intends to reveal the strategy for the development of domestic electric and hybrid cars (xEV) in the nation in April 2012. A conversation between The participation of different parties, including the government, industry, and academia, is expected. Between February 23rd and 24th following this round of deliberations, the policy's final outlines will be established. Petroleum, Finance, Road Transport, and Power Ministries are all participating in designing a comprehensive plan. Framework for the industry Along with these ministries, prominent automobile industry figures such as Mi' Anand Mr Vikram Kirloskar and Mr Mahindra (Vice Chairman and Managing Director, Mahindra & Mahindra).This responsibility also includes (Vice-Chairman, Toyota Kirloskar). The government has also suggested set up

4.2 Moreover, Electric Vehicles have many Advantages also. They are:

1. No gas or fuel required: Once charged no gas or fuel need to be bought. The cost of fuel is more when compared to electricity.
2. No emissions: electric vehicles are 100% emission free. So absolutely good for environment
3. Safe: no chances of blasting or catching fire in case of accidents.
4. Low maintenance: the engine in electric vehicles does not require lubrication, servicing etc.
5. No noise pollution: electric vehicles much quieter than other fuel vehicles.
6. No hassles of registration, pollution, certificate etc.
7. Convenient for cities which faces traffic problems.

V. ELECTRIC MOTOR

The power of a vehicle electric motor, as in other vehicles, is measured in kilowatts (kW). 100 kW is roughly equivalent to 134 horsepower, although most electric motors deliver full torque over a wide RPM range, so the performance is not equivalent, and far exceeds a 134 horsepower (100 kW) fuel-powered motor, which has a limited torque curve. Usually, direct Customers Perception on Buying of Electronic Vehicles current (DC) electricity is fed into

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a DC/AC inverter where it is converted to alternating current (AC) electricity and this AC electricity is connected to a 3-phase AC motor. For electric trains, DC motors are often used.

VI. ELECTROMAGNETIC RADIATION

Electromagnetic radiation from high performance electrical motors has been claimed to be associated with some human ailments, but such claims are largely unsubstantiated except for extremely high exposures. Electric motors can be shielded within a metallic Faraday cage, but this reduces efficiency by adding weight to the vehicle, while it is not conclusive that all electromagnetic radiation can be contained.

VII. MECHANICAL

Electric motors are mechanically very simple. Electric motors often achieve 90% energy conversion efficiency over the full range of speeds and power output and can be precisely controlled. They can also be combined with regenerative braking systems that have the ability to convert movement energy back into stored electricity. This can be used to reduce the wear on brake systems (and consequent brake pad dust) and reduce the total energy requirement of a trip. Regenerative braking is especially effective for start-and-stop city use. They can be finely controlled and provide high torque from rest, unlike internal combustion engines, and do not need multiple gears to match power curves. This removes the need for gearboxes and torque converters. Electric vehicles provide quiet and smooth operation and consequently have less noise and vibration than internal combustion engines. While this is a desirable attribute, it has also evoked concern that the absence of the usual sounds of an approaching vehicle poses a danger to blind, elderly and very young pedestrians. To mitigate this situation, automakers and individual companies are developing systems that produce warning sounds when electric vehicles are moving slowly, up to a speed when normal motion and rotation (road, suspension, electric motor, etc.) noises become audible.

VIII. REVIEW OF EARLIER WORKS

Few studies conducted on the domain are reviewed and the summary of the review is presented below.

- **Pritam K. Gujarathi, et al. (2018):** In their Study Indian Scenario is different because the current market share of EV/PHEV is around 0.1%. Presently almost all vehicles consider fossil fuel-based transportation. These pollute the atmosphere by the emission of greenhouse gases & causes global warming. The gap between domestic petroleum production and consumption is widening. India imports around 70% of oil required per annum. Hence there's an urgent need to investigate factors and challenges for sustainable and cleaner alternatives.
- **Pretty Bhalla, et al. (2018)** in their Study Choice of cars depends upon environmental concern, cost, comfort, trust, technology, social acceptance, infrastructure availability. These arguments have been tested for both conventional cars and EVs. They assume that these factors have direct influence on individual choice of vehicle. They found that EV manufacturers and Government have to invest more in social acceptance of the vehicle Customers Perception on Buying of Electronic Vehicles by creating more infrastructural facilities, putting more thrust on technology to create trust. The analysis depicts that the population is well aware of the environmental benefits. The responsibility lies on the shoulders of the Government and manufacturers to investing in the manufacturing of vehicles.
- **Mr. A. Rakesh Kumar, et al. (2019):** In their Study Global pollution is on the rise and each effort made, is to cut back the CO2 emissions and save the earth. One such effort is the introduction of EVs. The transport sector is one in all the largest emitter of CO2 and hence it's important to reduce it. The government has come up with ambitious plans of introducing EVs to the Indian market and confine pace with the event of EVs globally. The National Electric Mobility Mission Plan 2020 has included an in-depth report on the EVs. India encompasses a huge challenge in shifting the transportation sector from ICE engines to EVs. This needs lots of planning along with R&D. Charging infrastructure must be adequately built to deal with range anxiety. It's vital to form demand generation by making all government buses electric and offering tax exemptions for personal EV owners.

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- **Philippe Lebeau, et al. (2015)**: In their Study Conventional, hybrid, or electric vehicles: which innovation for city dispersion focuses, Freight transportation significantly affects metropolitan versatility. Analysts researched the capability of incorporating electric vehicles into metropolitan operations processes. Armadas with various advances present a chance to diminish last mile costs. Specialists utilized electric vehicle time windows to represent the issue of armada size and vehicle steering. The creator's principal commitment was to make sense of the reach fluctuation of electric vehicles. In his fragment, electric vehicles are much of the time the most cutthroat innovation. In the enormous van portion, diesel has shown to be the most fascinating arrangement according to a monetary perspective, as the need might arise to head out longer distances to be serious. The truck fragment settles on mixture vehicles with lower running and fixed costs than diesel trucks.
- **Janardan Prasad Kesari, et al. (2019)**:In their Study Opportunities and Scope for Electric Vehicles in India, Developing an aggressive strategy for the adoption of EVs in India and ensuring a well-executed implementation is a challenge but vital for government. The geography and diversity of India will present problems that require thoughtful solutions. Public procurement is expected to be an important driver of growth of EVs, with the purchase of four-wheeled vehicles for government offices, three wheeled vehicles and buses for public transport. Investments by fleet operators such as Ola and Uber, and operators of food distribution services, are also expected to boost the initial growth of two- and four wheeled electric vehicles. However, the private EVs may take 5-6 years to gain popularity and acceptance.
- **Ghasriet al.(2014):**In their Study demand studies have explored the financial, technical, essential and political concepts of EVs to help governments and car manufacturers evaluate consumer preferences (Liao et al., 2017). Driving range, refilling time and owning costs have been identified as some of the factors influencing EV purchasing decisions some studies have used stated preference techniques to explore heterogeneity in consumer preferences when deciding to purchase an Electric vehicle.
- **Hoyer,Et al. (2008):** In their Study the innovation behind Electric vehicles exists for over a long time. Notwithstanding, because of the accessibility and the usability of burning motors, electric driving was required to be postponed. Today, unique (going back and forth) factors recuperate the interest in Electric vehicles. On the pushing side, the restricted oil supply and the rising consciousness of the natural impression of traditional ignition motor vehicles lead the way to cleaner Electric vehicle. On the pulling side, late improvements in battery innovation and electric engines make the Electric vehicle a substantial contester for regular vehicles.
- **Thiel et al., (2012)** : In their study it targets portraying and taking apart how vehicle drivers in the six countries France, Germany, Italy, Poland, Spain, and Joined Domain consider electric vehicles, how agreeable they are with the electric vehicle thought and its crucial features. 600 drivers on typical for all of the six Section States addressed the survey. The survey contemplated that European vehicle drivers see the entryways that electric vehicles could offer yet that different pre-fundamentals ought to be fulfilled to ensure that the vehicle drivers can consider electric vehicles a reliable vehicle choice
- **Neumann et al 2010)**: In their study Environmental perspective, increase in high CO2-emissions and depletion of Fossil reserves, the roll out of Electric vehicle can be perceived as a safety measure and future security. Technology to be used in the upcoming EV is very mature and uptrend leading to high distance coverage with efficiency and comfort.
- **Irena (2017)** in their study on electric vehicles technology brief in this study highlights that There are two main types of electric vehicles (EV): battery electric vehicles (BEV) that use only batteries for energy storage and must be plugged in to be recharged, and plug-in hybrid electric vehicles (PHEV) that have both batteries and liquid-fuel storage and refueling systems. And the study found that EVs will need to be competitive with conventional ICE vehicles in multiple markets and with a wide range of consumers within those markets (Fulton, Tal and Turpentine, 2016). And the study suggest that In every “beachhead” market for EVs around the world, policy makers have instituted a suite of incentives to encourage buyers to try this new technology. The main goals are to provide needed recharging infrastructure

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X. CONCLUSION

The responses for the questionnaire proved for the conclusion of research as the results were matching with what was predicted in that Consumers perception toward electric vehicles has a significant impact on their purchase intention. Limited driving range, high costs, battery issues, and a spotty charging infrastructure are the main challenges for electric vehicles and cause of this not getting enough attraction. Some customers are not aware about electric vehicles and its advantages to the owner as well as the Environment this will be the effect to the slow growth of EVs. Marketing of such products will really play an important role as a stepping foot towards Eco- friendly Environment. Electric Vehicles are definitely more environment friendly than internal-combustion vehicles. Batteries are being made to have a long life. When the EVs become more widespread, battery recycling will become economically possible. Research into other energy sources such as renewable file Is make the future look good for Electric vehicles and various companies should take initiatives to promote electric vehicles as a part of their corporate social responsibilities cause Some People are still unaware about electric vehicles and finally the future of the E- Vehicles is Green.

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