



CONSUMER INCLINATION TOWARDS ELECTRIC VEHICLES IN VISAKHAPATNAM CITY

D. Pavan Nagendra^a, Dr. GK Patnaik Karakavalsa^b

^aGMR Institute of Technology, Rajam^a, pavan.d@gmrit.edu.in

^bVignan's Institute of Information Technology, Duvvada, Vishakhapatna^b

ABSTRACT

In this present world of smart and digital transformation, most recent research observation is in the shift from fuel vehicles to electric vehicles. The cities are becoming more cosmopolitan in terms of life style and living standards and on the other hand, people want to have go-green in their daily life. In this context electric vehicles are gaining momentum and popularity, even governments also providing necessary encouragement towards the development of manufacturing units pertaining to electric vehicles. Even though, the roads and infrastructure is not meeting the standards, but there is a change in the mindset of the consumers, either they are using or wish to use electric vehicles. The new age customers are delighted to experiment and explore the latest innovations and inventions in the market. As the tendency leading to the latest developments in the target segment emerging with new product development and futuristic features. There is a huge scope for creativity in bringing a range of products that not only environment friendly but also provide ultimate satisfaction to the users in terms of performance and durability. In connection to this, any product in the market tastes success when it reaches to more number of customers. Therefore customer awareness is the essential, even for increase in the sales volume for the electric vehicles. Hence this paper attempts to understand these awareness levels by observing how the target consumer is inclined to purchase and re-purchase in specific to electric vehicle market segment.

Key Words: New age customers, the latest innovations and inventions, futuristic features, sales volume

INTRODUCTION

With all the enabling elements mentioned as follows, we can only wish that the move from gasoline-powered automobiles to electric vehicles will be quick and significant. The shift towards the adoption of electric vehicles may not be extremely large and robust.

- Expanding EV charging infrastructure
- Government measures that encourage the purchase of EVs
- Enhancing the infrastructure
- Extension of the EV range
- Lowering the cost of the EV
- Informing consumers of the advantages of EVs

- Giving consumers additional EV options
- Putting in place severe pollution standards

Additionally, the nation is anticipated to have one of the economies in the world that is growing the quickest and has a sizable customer base for the adoption and use of electric vehicles. This may entice international businesses to invest alongside domestic ones like Mahindra in the manufacture of electric automobiles.

Objectives of the Study:

1. To understand the EV market and Consumer Awareness
2. To study the readiness of consumer to accept EVs
3. To know whether the consumer inclined to purchase EV
4. To relate demographic features with buying of EVs

Methodology:

Data Collection: Standard approved methodologies define data collection as the process of acquiring, gauging, and analyzing precise insights for research. Making ensuring that correct and data-rich data is acquired for statistical analysis to enable data-driven decision-making is the most crucial purpose of data collecting.

Primary Data: Primary data are facts gathered by a researcher from first-hand sources utilizing methods like surveys, interviews, or experiments. The compilation was done with the research topic in mind, using only original materials. In contrast to the phrase secondary data, existing information is utilized.

Secondary Data: The knowledge that has been obtained by someone other than the user is referred to as secondary data. Census data, data gained by government organisations, administrative data, and records initially congregate for different research goals are common sources of secondary data for social science investigations.

Limitations:

- 1) The information provided by the respondents may not be accurate
- 2) The study is confined only to two wheeler EVs
- 3) Suggestions provided in the study is purely academic in nature

REVIEW OF LITERATURE

D. Barapatre (2016) One of the ten largest automobile trade in the world now is India. Has a middle-class demographic that is rapidly growing, has the potential to buy, and is seeing consistent economic expansion. But throughout the last two years, petrol costs have increased by more than 50% on 13 different levels. In India, there may be a demand for alternative automotive technologies like electric cars (EV). Although the initial cost is around 1.5 times higher than that of ordinary IC engines, environmental costs are increasingly more important than vehicle costs. This report's goals are to detail the technology behind electric car production and to lay out the advantages of the electric engine over internal combustion engines.

High energy efficiency, lower emissions, excellent performance, and little maintenance are just a few advantages that all-electric cars have. Limitations in range or duration (referred to

as "Range Anxiety"), the lengthy "re-fueling" period required, which delays a trip, higher initial purchase prices, and hefty battery replacement or recycling fees should they become necessary over the course of the vehicle's lifespan are also potential drawbacks.

Several factors can have a detrimental effect on the battery life of an electric vehicle:

High temperatures: Operating an EV in hot conditions might cause the battery to deteriorate. Long-term exposure to the sun while parking an electric vehicle can also have comparable degrading effects.

Overcharging/high voltages: Overcharging an EV might result in the battery's internal resistance increasing. Although overcharging is rarely a problem since most batteries have built-in battery management systems (BMS), it is still a good idea to avoid regularly charging your battery all the way to 100%.

Deep discharges/low voltages: Over time, battery capacity is reduced by regularly draining an EV battery to its maximum capacity or by entirely emptying an EV battery. high currents during discharge or charging. Routinely or often "pulling" too much electricity from a battery might shorten its lifespan. Avoid driving aggressively whenever you can to prevent sudden high current drains from your battery.

While avoiding these scenarios might help you prolong the life of your EV battery, all EV batteries will eventually deteriorate. The lifespan of today's batteries is intended to be prolonged (usually 8 years or 100,000 miles). Certain batteries may last 12 to 15 years in temperate regions, and 8 to 12 years in hard climates.

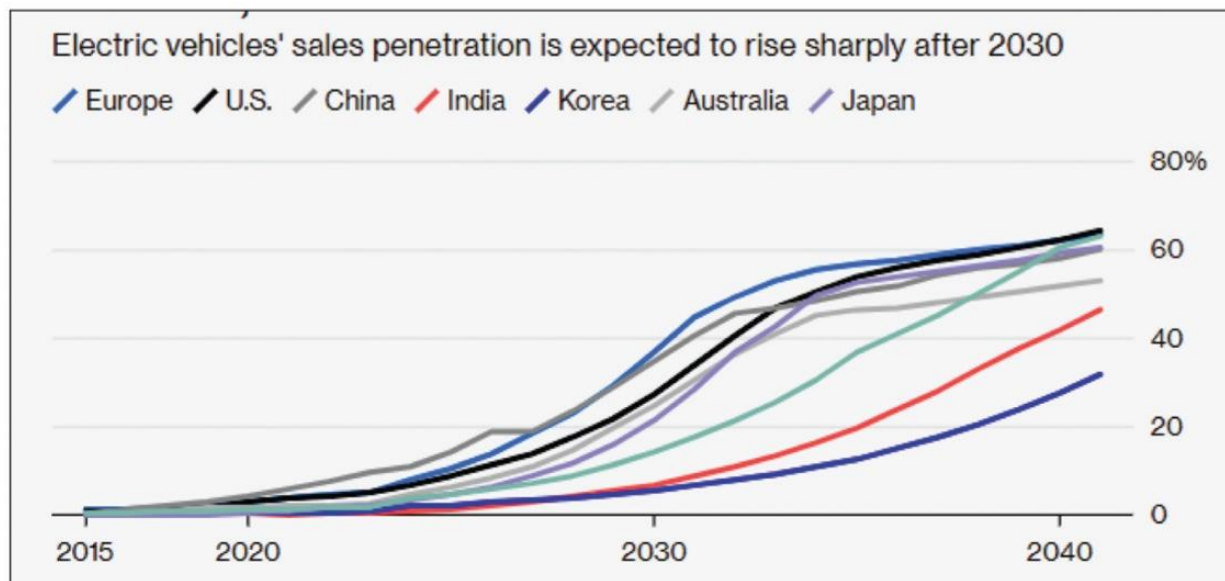


Figure 1. Projection of Electric Vehicles Source: Adopted from Bloomberg Opinion.

Anil Khurana (2020) According to a directive by the Indian government, all vehicles must be electrified by 2030. Following this, the Society of Indian Automobile Manufacturers (SIAM, 2017) published a white paper predicting that EV sales will account for 40% of new car

sales by 2030 and 100% by 2047. The nation has been independent for 100 years as of this significant day.

The cessation of sales of vehicles with internal combustion engines (ICEs) has been debated for 2021. Several nations have proposed expedited schedules for ICE sales bans in 2030 or 2035, and new regulatory objectives in the United States and the European Union focus for an EV share of at least 50% by that time. A number of OEMs have announced their plans to discontinue developing new ICE models and platforms, and several more have established a deadline for the end of ICE vehicle manufacturing. Over 45% of prospective automobile purchasers are considering an EV, consumer attitudes have also changed in favour of sustainable transportation.

Under presently anticipated regulatory objectives, we anticipate that global EV (BEV, PHEV, and FCEV) 1 adoption will reach a 45% level. Even still, the projection for EV growth falls well short of what is necessary to reach net zero emissions. By 2030, sales of passenger cars will need to be 75% electric vehicles, which is a huge increase over the industry's present trajectory and rate.

In our opinion, Europe will electrify the fastest and, in terms of EV market share, will continue to lead the world in electrification. Europe is a regulatory-driven market with favourable consumer demand trends. In addition to the target set by the European Commission, a number of countries have already committed to ending ICE sales by 2030, which calls for about 60% EV sales by 2030. In keeping with this, seven OEM brands have made a commitment to sell only EVs within the European Union by 2030. The most likely accelerated scenario predicts that consumer adoption would surpass regulatory goals and that Europe will hold almost 75% of the global EV market by 2030. By 2035, new automobiles must have zero emissions, according to the European Union.

By Praveen Kumar and Kalyan Dash, Potential Need for Electric Vehicles, Charging Station Infrastructure, and its Challenges for the Indian Market Instead of building a radical adaptation, India can invest in small-scale reinforcements to handle the load difficulties locally. Home charging ought to be promoted. Prior to putting in place the extensive charging infrastructure, proper planning for the area, population, traffic congestion, and safety should be taken into account. It is crucial to integrate activity in the transportation and energy sectors. Development objectives through various cutting-edge policies and programmers, such as the financial consumer incentives provided to electric vehicle users in the form of purchase subsidies, tax credits, discounted tolls, free parking, and access to limited highway lanes, would aid in the market's expansion. (Dash P. K., 2013)

Which Technology for an Urban Distribution Centre: Conventional, Hybrid, or Electric Vehicles? by Philippe Lebeau, Cedric De Cauwer, Joeri Van Mierlo, Cathy Macharis. Transit for goods has a big influence on urban mobility. Researchers looked at the possible application of electric vehicles in urban logistics operations. By utilising a fleet with a range of technologies, it may be possible to reduce last-mile costs. The researcher offered an EV fleet size and mix car routing task with time windows. The authors primary contribution was taking into consideration

the volatility in EV range. In the tiny van categories, electric cars are typically the most competitive technology. Diesel, which is also utilised in electric automobiles, has historically been the most financially viable alternative for large vans. (Philippe Lebeau, 2015)

Consumer preferences for electric vehicles: By Fanchao Liao, Eric Molin & Bert van Wee, The widespread use of EVs might help reduce issues like environmental pollution, global warming, and dependence on oil. However, despite governments undertaking aggressive promotion programmes, the penetration of EVs is rather low. With the intention of influencing policymakers and providing guidance for future research, In-depth analyses of studies on consumer preferences for EVs were provided. The researchers investigated the psychological and economic perspectives on customer desire for electric automobiles. In general, it is discovered that an EV's financial and technical characteristics, such as its cost of purchase and operation, driving range, charging time, vehicle performance, and brand variety on the market, have a substantial influence on how useful it is. The usefulness and marketing of EVs are also positively impacted by the density of charging stations. Tax reduction and incentive schemes have a significant influence. 2017's Fanchao Liao.

Lingzhi Jin, Peter Slowik, and the International Council for Clean Transportation: Electric vehicles continue to see early market growth, however, a variety of obstacles keep them from being widely used. The increased cost, relative inconvenience compared to range and recharging times, and customer confusion of the technology's applicability and availability are some of these barriers. The importance of this final aspect, sometimes known as "consumer awareness," cannot be overstated. 2017's Lingzhi Jin.

Study on Opportunities and Challenges for Electric Vehicles in India, by Mohamed M, G Tamil Arasan, and G Sivakumar, Internal combustion engines (ICEs) will be replaced with electric engines in a method that dramatically decreases pollution and benefits consumers. Many countries have embraced this method, which is good for the environment. The report noted the possibilities and challenges related to EV deployment in India. Batteries, businesses, the environment, and government efforts have all been thoughtful. With regard to these challenges, the cost of EVs, their efficacy in India, and demand for EVs were taken into consideration. The main goals of India's EV adoption are to lower greenhouse gas emissions and oil prices. The administration must take use of the opportunities at hand and create workable solutions to the issues. 2018 (Mohamed M)

India's Electric Vehicles: Overview and Challenges by Dr. Sanjeevikumar Padmanaban, Mr. A. Rakesh Kumar: Every effort is being made to limit CO₂ emissions and save the earth as global pollution rises. One such endeavor is the use of EVs. It's imperative to make reductions because the transport sector is one of the main CO₂ generators. In order to stay up with the global adoption of EVs, the government has created inspirational goals to introduce electric cars (EVs) to the Indian market. As part of the National Electric Mobility Mission Plan 2020, a thorough research of EVs is being conducted. India has a substantial barrier in its shift from internal combustion engines (ICE) to electric vehicles (EVs). This calls for substantial forethought as well as R&D. Range apprehension must be effectively addressed while designing

charging infrastructure. Demand generation must be created by electrifying all public transport and providing tax breaks to those who acquire EVs. 2019 (Mr. A. Rakesh Kumar)

“The Society of Indian Automobile Manufacturers (SIAM), along with its automobile manufacturers, aims to achieve new vehicle sales in the country to be hundred percent pure electric vehicles (battery electric and fuel cell vehicles) on the hundredth anniversary of India’s independence (2047), with a following roadmap (2017):

1. cleaner fossil fuel vehicles would be an essential stepping stone in this journey towards hundred percent pure electric;
2. Finally, all new vehicle sales to be pure electric vehicles All new vehicle sales for intra-city public transport fleets to be pure electric vehicles by 2030;
3. Forty percent of new vehicle sales in the country to be pure electric vehicles by 2030;
4. Sixty percent of new vehicle sales in the country to employ greener technologies like hybrids & other alternate fuels by 2030; to ensure smooth phasing in of pure electric vehicles and to sustain the transition to cleaner fossil fuel vehicles, the IC engine up gradation must continue over the next decade or so. Progressively by 2047.

In the process, the Indian automobile industry also aims to become a leading global hub for design, manufacture and export of pure electric vehicles supporting the ‘Make in India’ initiative.”

Electric car usage had been steadily increasing before Covid took the world by storm, especially in India. However, it would not be an understatement to claim that sales of electric cars have skyrocketed in the last two years. Electric vehicles of many kinds, including electric 2/3/4 wheelers and others, are swiftly gaining popularity. The ecosystem now includes both tech system integrators and automotive OEMs, who design and produce a variety of components. In the ecosystem for electric vehicles, tech entrepreneurs have also created several platforms and solutions. The discussion paper "The Future is Electric" examines the factors that have led to an increase in the adoption of electric vehicles in India, the overall architecture of EVs, the ecosystem's players, which include traditional auto OEMs and tier 1s as well as tech system integrators and tech startups, as well as suggestions for how to further strengthen the ecosystem and accelerate the adoption of EVs.

Growth of Electric Vehicles: In the previous two years, sales of electric two- and three-wheelers have increased by double digits. but e-4W sales have increased by 150%. The government has set precise goals for EV adoption, which is likely to spur significant growth in the markets for batteries and charging infrastructure.

Reasons for increased adoption of EVs: Rising fuel costs, rising CO₂ emissions, the displacement of oil by EVs, various government initiatives, such as schemes and subsidies, new charging and battery swapping policies, significant technological advancements, a lower lifetime cost of ownership for EVs compared to conventional internal combustion engine (ICE) vehicles, and the introduction of new designs by OEMs to meet shifting consumer inclinations are just a few of the causes.

- 1. Ecosystem:** Tech system integrators, in addition to automotive OEMs, have developed into a crucial component of the ecosystem by creating and producing a variety of components. In the ecosystem for electric vehicles, tech entrepreneurs have also created several platforms and solutions.
- 2. Challenges and Recommendations:** The government must be clear about subsidies, there must be more players in the ecosystem, there must be a common electric vehicle policy, there must be targets, there must be infrastructure, there must be local manufacturing, there must be talent, there must be better battery, charging, and vehicle technology, there must be more awareness, and there must be higher prices.

CONCLUSIONS

A number of the suggestions incorporated the need for the government to establish uniform safety regulations, introduce more perks, develop a scrap page policy for straightforward e-waste disposal, and incorporate charging and battery infrastructure into IT platforms, encourage additional foreign investment by building a strong ecosystem, and raise consumer awareness.

REFERENCES

- [1] D. Barapatre, C. Kanfade, A. Bari, R. Nile, R. Wagh, R. Nimbalkar, 2016, Electric Vehicle, International Journal of Engineering Research & Technology (IJERT) IC-QUEST – 2016 (Volume 4 – Issue 30),
- [2] <https://iosh.com/media/9497/an-outline-paper-on-the-technology-of-electric-vehicles.pdf>
- [3] Anil Khurana, V. V. Ravi Kumar, and Manish Sidhpuria, 2020, A Study on the Adoption of Electric Vehicles in India: The Mediating Role of Attitude, Management Development Institute, Article Reuse Guidelines, Sage Journals, Vol 24, Issue 1, March 2020, pp 23-24
- [4] <https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/why-the-automotive-future-is-electric>
- [5] <https://community.nasscom.in/index.php/communities/engineering-research-design/future-electric-discussion-paper-electric-vehicles-india>
- [6] Dash, P. K. (2013). Potential Need for Electric Vehicles, Charging Station Infrastructure and its Challenges for the Indian Market. Advance in Electronic and Electric Engineering, 471- 476.
- [7] Philippe Lebeau, C. D. (2015). Conventional, Hybrid, or Electric Vehicles; Which Technology for an Urban Distribution Centre? The Scientific World Journal, 11.
- [8] Fanchao Liao, E. M. (2017). Consumer preferences for electric vehicles: a literature review. Transport review, 275.
- [9] Lingzhi Jin, P. S. (2017). Literature review of electric vehicle. International Council on Clean Transportation.
- [10] Mohamed M, G. T. (2018). Study on Electric Vehicles in India Opportunities and challenges. International Journal of Scientific Research in Environmental Science and Toxicology, 5

- [11] A. Rakesh Kumar, D. S. (2019). Electric Vehicles for India: Overview and Challenges. IEEE India, 5.
- [12] Rezvani, Z., Jansson, J. and Bodin, J., 2015. Advances in consumer electric vehicle adoption research: A review and research agenda. Transportation Research Part D: Transport and Environment, 34, pp.122-136.