

A STUDY ON CONSUMER PERCEPTION TOWARDS ADOPTION OF E-VEHICLE IN SANGLI CITY

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ABSTRACT

E-Vehicle is a solution to lot many problems such as pollution, increasing the fuel rates, deaths due to pollution etc. Combustion engine automobiles generate a variety of pollutants. The amount of fugitive emissions from fuel, their source, and other factors such as the type of vehicle and how well it is maintained are all included in the pollutants that come from automobiles. Hydrocarbons and carbon monoxide are the main pollutants produced by gasoline-powered automobiles, whereas oxides of nitrogen and particulates are the main pollutants produced by diesel-powered vehicles. E-Vehicle generates zero pollution, saves money as lesser cost for charging and no fuel needed. EVs offer a practical way to cut overall greenhouse gasses emissions and decarbonize on-road transportation when they are charged with clean electricity. Due to the significant energy and environmental benefits of high vehicle economy, low exhaust emissions, and less reliance on petroleum (electricity production has a wide range of fuel options), vehicle electrification is a game-changer for the transportation industry. In the evolution of the energy system, the electrification of vehicles is a disruptive force that fundamentally alters the roles of many industries, technologies, and fuels in long-term transformation scenarios. There is little doubt that EV charging will have an influence on the power sector in terms of overall energy use, demand profiles, and supply-side synergies. The E-vehicles availability and adoption is a challenge as the cost of E-vehicle and the infrastructure facility available at present in India restricts consumer to adopt it. This paper tries to explore the consumer perception towards E-vehicle purchase decision in Sangli city.

Keywords : E-Vehicle, Consumer Awareness, Consumer Perception, Infrastructure Facility, Purchase Decision.

Introduction

According to the studies, air pollution has a negative impact on economic output in addition to threatening human health. In India, the negative health effects of air pollution are increasing. Air pollution was responsible for 1.67 million deaths in India in 2019, accounting for 17.8% of the country's total deaths. In India, the economic loss due to premature mortality attributed to air pollution in 2019 was US\$ 28.8 billion, while the economic loss due to morbidity owing to air pollution was \$ 8.0 billion. In 2019, the economic loss due to lost output due to premature mortality and morbidity caused by air pollution amounted to 1.36 percent of India's GDP. In India, the cost of air pollution is \$26.5 per capita.

In fiscal year 2020, passenger vehicles and two-wheelers dominated the Indian automotive market, with over 3.4 million and over 21 million units produced, respectively. Domestically, about 21.5 million automobiles was projected to be sold in 2020. According to a study conducted by the Center for Science and Environment in Delhi, CO₂ emissions on Indian roads are anticipated to reach 1212 million tonnes by 2035, up from 208 million tonnes in 2005.

Electric vehicles are being viewed as a viable mode of transportation, and a few national governments have successfully updated their innovation development goals. Electric vehicles are the best solution for the overall problem of deaths due to air pollution, increasing CO₂ emission etc. E-Vehicles provides a suitable needed facility for customers in return the environment friendly as well as CO₂ reduction will be a great achievement which will not only solve the problem of air pollution but also there will be a huge reduction in the death rate. It's possible only when a majority and dominant population start adopting E-Vehicles. It can be possible when government provides a good facility / subsidy in the cost of E-Vehicles.

Literature Review

A number of studies have been carried out to understand the consumers awareness and adoption of EVs. The attributes researched and the factors studied are; the cost of EV, range anxiety, battery cost, incentives offered, availability of charging points, time required to charge, distance travelled on each charge. A few studies have been highlighted.

The authors, Garling A and ThogersenJohn,(2001) argue that replacing traditional vehicles with electric vehicles can reduce local pollution and greenhouse gas emissions from the transportation sector. They also contend that the user of an electric vehicle pays a hefty price for these societal benefits in terms of pricing, availability,

speed, and acceleration. The authors believe that to finish the diffusion process, supportive national policies and skilled marketing are required. Based on a consideration of current and future expected qualities of electric vehicles, as well as a review of data on early adopters, the article outlines a two-phase strategy for marketing electric automobiles.

Author Varoon Senthil and others(2018) investigated the Indian market and sales strategy for the prospective electric racing vehicle niche. The goal of this research was to look into the viability of an electric car racing market in India, specifically with regard to upcoming Formula Student electric racing teams. Based on their approach to electric vehicles, the author has divided the target market into three divisions. The market potential of all Tier 1 and Tier 2 cities is investigated. This study also examined customer-centric and business-centric marketing methods that can be used to sell electric racing vehicles in the Indian market.

Researchers Jui-CheJu and Chun Yang(2019) developed a theoretical framework based on the Theory of Planned Behavior, Technology Acceptance Model, and Innovation Diffusion Theory to investigate the important elements influencing customers' decision to acquire an electric vehicle. The authors believe that applying the Key Factor Model developed in their study to customers' behavioural intentions about the purchase of electric vehicles is appropriate. The results of the Structural Equation Modeling analysis have been highlighted in terms of behavioural intention, attitude toward behaviour, and regulations.

A report on the prospects and scope for electric vehicles in India was published by Kesari Janardan Prasad and others(2019). Their paper began by discussing the scope and opportunities of electric vehicles in India, followed by the various policies and frameworks in place by the Indian government, case studies from around the world on electric vehicle adoption, and finally, how India could implement and benefit from the strategies at both the local and national levels.

In their research work, Mohamed M. and others examined the potential and difficulties in India. They researched several different kinds of electric vehicles, including ground-based, aerial, and maritime models. A study looks at how replacing internal combustion engines with electric ones can save consumers money and drastically reduce pollution. Opportunities for adopting electric vehicles are provided by the study. Opportunities including government programmes, batteries, industrial growth, and environmental advantages. Research also examines the difficulties.

The research article by K.W.E. CHENG, titled Recent Development in Electric Vehicle, attempted to examine the advancement of major electric vehicle components, including motor types, energy storage, charging systems, and charging networks. This study gives a summary of the recent work on electric vehicles in the region. The study discusses the creation and evaluation of several component pieces. Discussions also include the fundamentals of engine, steering, and braking design, as well as battery and charger technologies. And finally, a prototype electric car is shown in the study.

In their research publication, Wentao Jing and colleagues reviewed network modelling and discussed the need for additional study. This study presents a comprehensive review of works on electric vehicles and also discusses the current research gaps in theories, modelling methods, solution algorithms, and applications. Beginning with an overview of electric vehicle principles, market share, characteristics, and charging infrastructures. The investigations on the subject of network traffic assignment for electric vehicles and a lack of charging stations are then discussed in detail. The specific characteristics of electric vehicles, such as their limited range, must be taken into account when predicting their routing behaviour and constructing their charging infrastructure networks, we conclude.

Together with others, the author Rui Xiong attempted to track the development of research in electric and intelligent automobiles. They examined papers on lithium-ion batteries, advanced motor control techniques for EVs, wireless EV charging, increasing ride comfort, EV energy management, connected and automated vehicles, smart grids, electrical infrastructure, electrification of heavy-duty and off-road vehicles, and design optimisation for vehicle structure in this paper.

The paper seeks to explain the development of EV, its current situation, and Matteo Muratori and others' predictions for the future. This article provides a comprehensive and timely analysis of scientific studies looking into a variety of EV-related topics, such as: (a) a market overview of light-duty EVs and current adoption projections; (b) market opportunities beyond light-duty EVs; (c) a review of the cost and performance evolution for batteries, power electronics, and electric machines, which are essential to the success of EVs; and (d) the status of the charging infrastructure, with an emphasis on studies and measures that have; (e) a summary of how

EV charging affects power systems at different scales, from bulk power systems to distribution networks; (f) insights into studies of life-cycle costs and emissions that specifically focus on EVs; and (g) expectations for the future and connections between EVs and other emerging trends and technological advancements.

In his study, G Krishna sought to pinpoint customer perceptions and adoption hurdles for electric vehicles. According to the researcher, supply and choice of automobiles, difficulty to convert sales, and dealers' role are the three hurdles that have an impact on consumers' image. 2. Lack of trust in technology due to factors such as autonomous vehicles being unsafe, ecologically unfriendly, unreliable, and technological immaturity. 3. Adapting to technology Cost of ownership and purchase, infrastructure, range, and recharge time are the first three factors. 4. Desirableness the vehicle's soul and character, the repair, the culture, the lack of fun, the lack of good aesthetics, and the futuristic concept. Performance, Sound, Emotional Attachment, Bad Image.

Research Design

The type of research adopted is basically descriptive vis-a-vis exploratory. The authors have made the attempt to explore the motivating factors as well impediments towards the adoption of EV.

The present research endeavour aims at the two major objectives:-

1. To study the consumers perception towards E-Vehicle
2. To examine the factors influencing/impeding consumers to purchase E-Vehicle

Sample Design:

Population selected was from Sangli city. The selected sample are the respondents between the age group 18 to 55.

Result and Discussion

In this section the authors have made an attempt to present the primary source data and draw the inference

Age	No. of Respondents	Percentage
Bellow 18	0	0
18 - 25	35	35
25 - 40	54	54
40 - 50	11	11
Above 50	0	0
Total	100	100

Table 1. Age of respondents

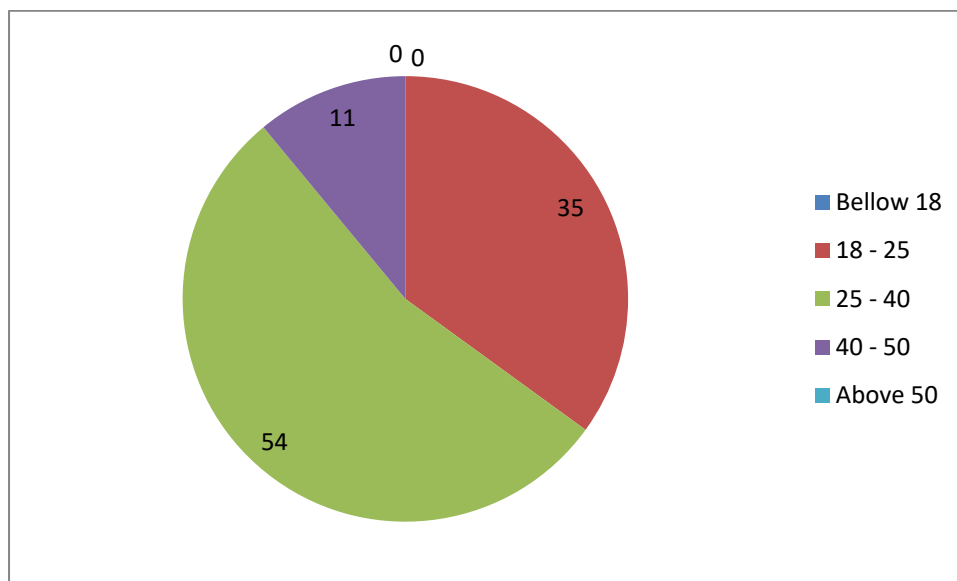


Figure 1. Age of respondents

Most of the customers interested in E-Vehicle are youth and middle-aged. Since the India's 70% of population is bellow 45 years which is reflected in the above table. Similarly these youth are found to be environment conscious with preference for zero pollutant vehicle (E-vehicle).

E-Vehicle Acceptance	No. of Respondents	Percentage
Yes	80	80
No	10	10
May be	10	10
Total	100	100

Table 2. Willingness towards accepting E- Vehicle

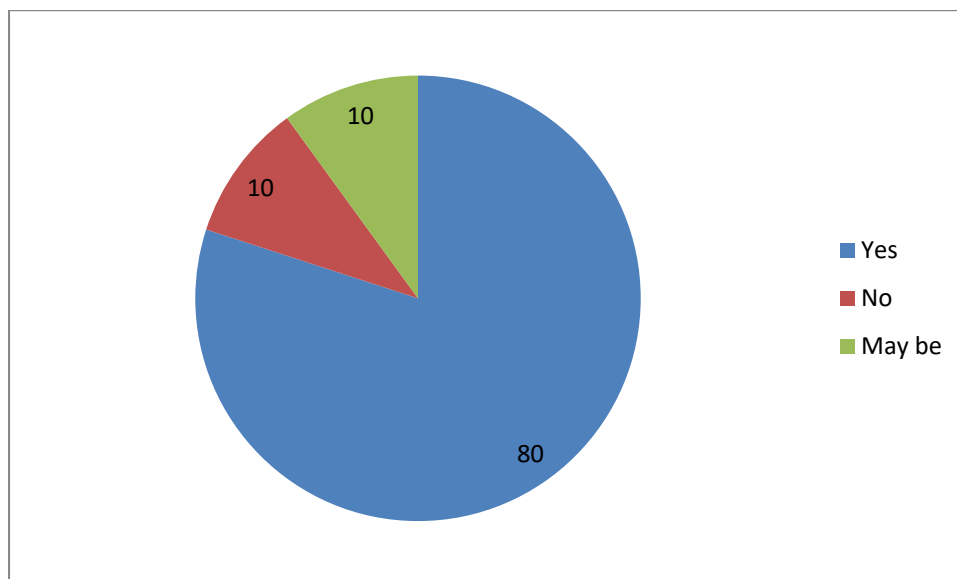


Figure 2. Willingness towards accepting E- Vehicle

Majority i.e. 80% of customers are ready to accept E-Vehicle.

The present climate change conditions is creating and awareness an interest among the youth to protect our mother planet by accepting pollution free vehicle. The above claims is confirmed through cross verification and informal interaction with respondents.

Expected Cost for E-bike	No. of Respondents	Percentage
up to Rs. 50,000	0	0
Rs. 50,000 to Rs. 70,000	30	30
Rs. 70,000 to Rs. 80,000	70	70
Rs. 80,000 to Rs. 1,00,000	0	0
Above Rs. 1,00,000	0	0
Total	100	100

Table 3. Expected Price Willing for E-bike

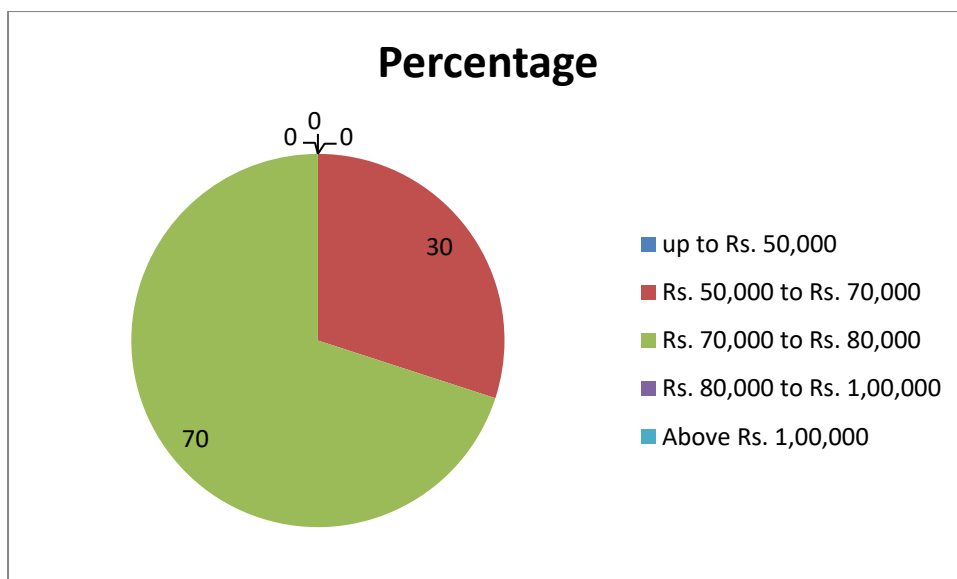


Figure 3. Expected Price Willing for E-bike

Expected Cost for E-bike : Customer expected price range is between Rs. 50,000 to Rs. 80,000 for E-Bikes.

With reference to table 1 and 2 as most respondents are youth and willing to accept E-Vehicle, at a same time they are also price sensitive. Hence, price is one of the major dominant factor in their decision making.

Expected Cost for E-bike	No. of Respondents	Percentage
Rs. 5,00,000 to Rs. 10,00,000	40	40
Rs. 10,00,000 to Rs. 15,00,000	50	50
Rs. 15,00,000 to Rs. 20,00,000	10	10
Rs. 20,00,000 to Rs. 25,00,000	0	0
above Rs. 25,00,000	0	0
Total	100	100

Table 4. Expected Price Willing for E-Vehicle Car

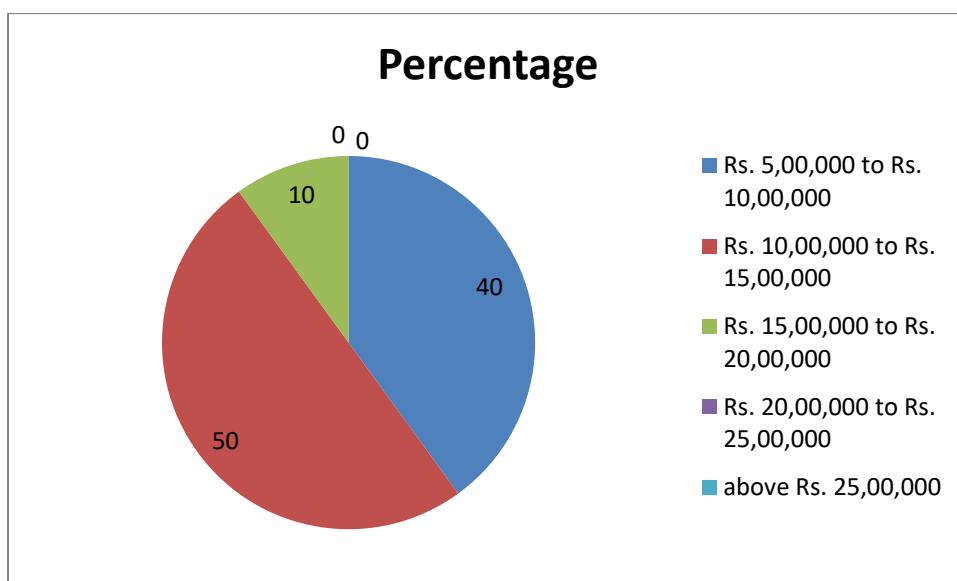


Figure 4. Expected Price Willing for E-Vehicle Car

Expected Price for E-Vehicle Car : 50% Customer expectations are between Rs. 10,00,000 to Rs. 15,00,000 price range for E-Vehicles i.e. cars and 40% Customer expected price range is between Rs. 5,00,000 to Rs. 10,00,000.

Out of the various decision making variables in the purchase of E-Vehicle car, price of the vehicle is a pre dominant factor.

Reasons to buy E-vehicle	No. of Respondents	Percentage
No Fuel / Save Fuel	90	90
Saves Money / No Fuel Cost	20	20
E-Vehicle is cheaper	80	80
No Carbon Emission	60	60
Looks Good	50	50
No Noise	30	30
Performs well	20	20

Table 5. Reasons to buy E-vehicle

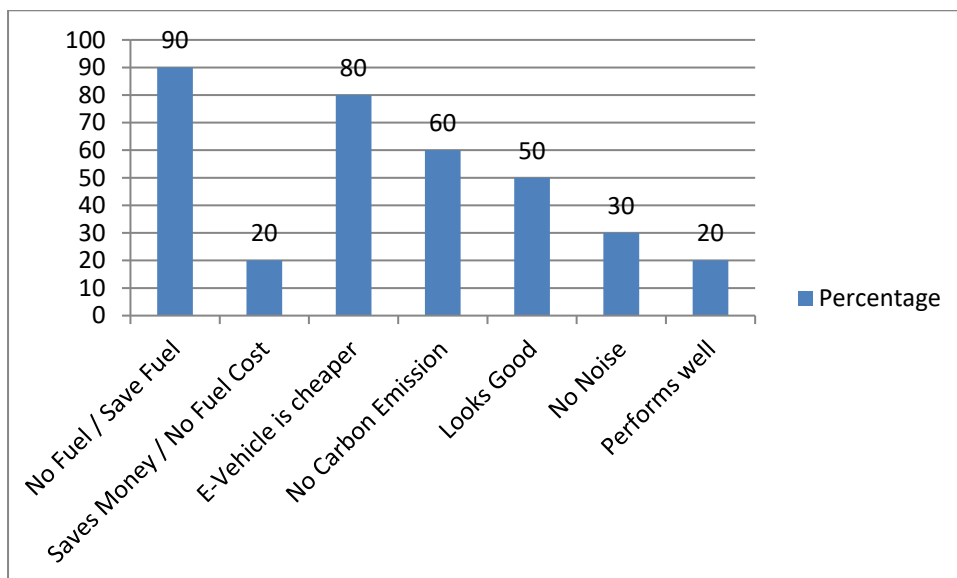


Figure 5. Reasons to buy E-vehicle

Reasons for buying E-Vehicle : 90% customers are ready to buy E-vehicle, as it doesn't need fuel and it saves fuel, 80% as its cheaper in transportation cost, 60% as it doesn't emits carbon

The respondents have a multi reason for accepting E-vehicle. Such as, fuel saving, saving money, no carbon emission and cheaper cost.

Problems in buying E-vehicle	No. of Respondents	Percentage
Less Charging Station	90	90
No Safety	20	20
Less Power of pulling as compared to Other fuel vehicle	20	20
Limited Variety	30	30
Charging is problematic	60	60

Table 6. Problems you feel in accepting E- Vehicle

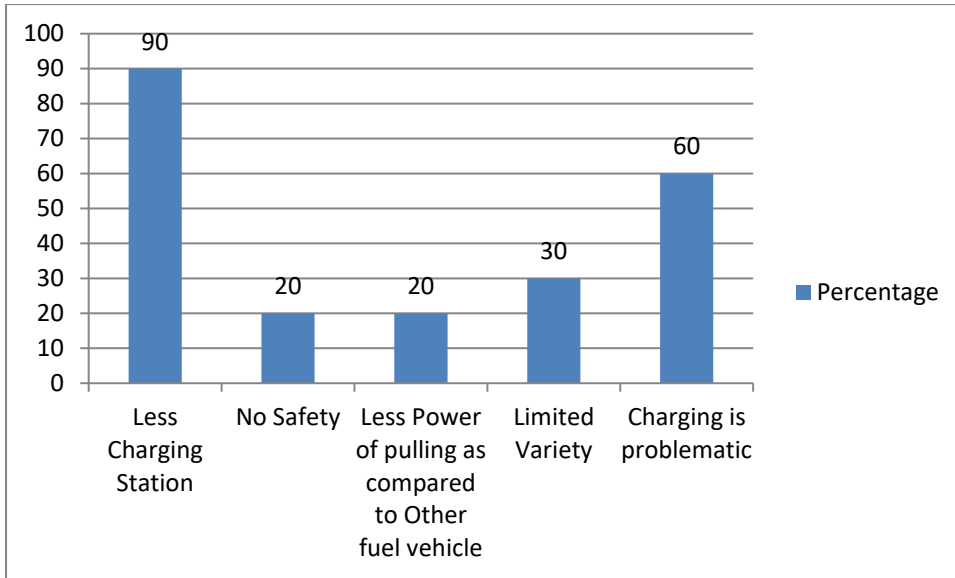


Figure 6. Problems you feel in E- Vehicle

Problems in adopting E- Vehicle : 90% customers feel biggest problem is less charging station.

With great interest in purchasing E-Vehicle respondents also have fear in accepting with inhibiting factors such as, less charging station, less power in pulling as compared with fuel vehicle, limited variety and no safety.

Present Cost	No. of Respondents	Percentage
Too High Price	50	50
High Price	20	20
Right Price	30	30
Low Price	0	0
Too Low Price	0	0
Total	100	100

Table 7. Present cost of Electric Vehicle (Bikes/ Cars) available in Indian Market

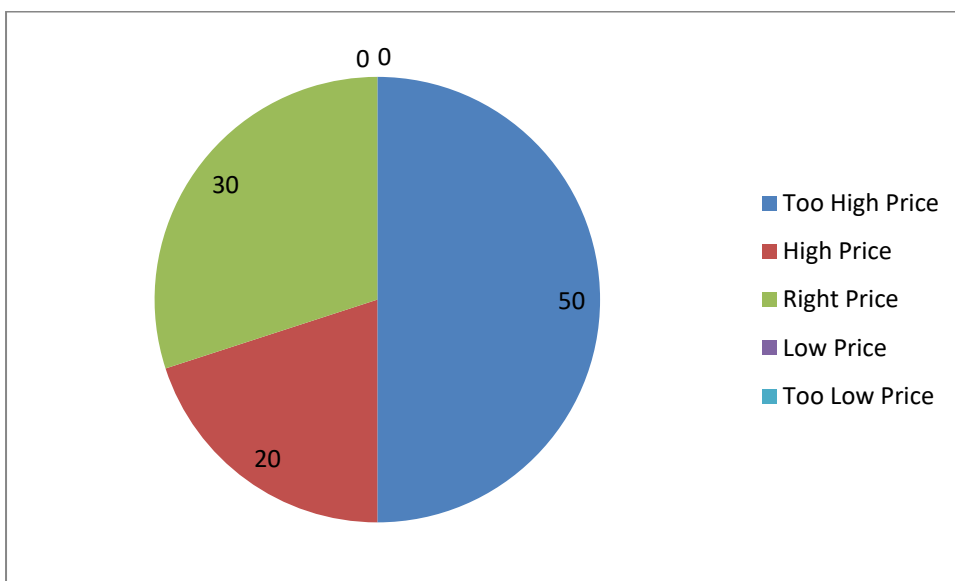


Figure 7. Present cost of Electric Vehicle (Bikes/Cars) available in Indian Market
Present cost of Electric Vehicle : 70% customers feel price is high

In order to increase customer interest towards E-vehicle and decrease pollution the price should be reduced. The government plays a vital role by providing subsidies the price can be reduced which in return can increase the customer interest to purchase E-vehicle.

Awareness of Subsidies	No. of Respondents	Percentage
Completely Aware	38	10
Slightly Aware	154	40
No Detail only heard	77	20
Not at all aware	115	30
Total	384	100

Table 8. Awareness of subsidies provided by government

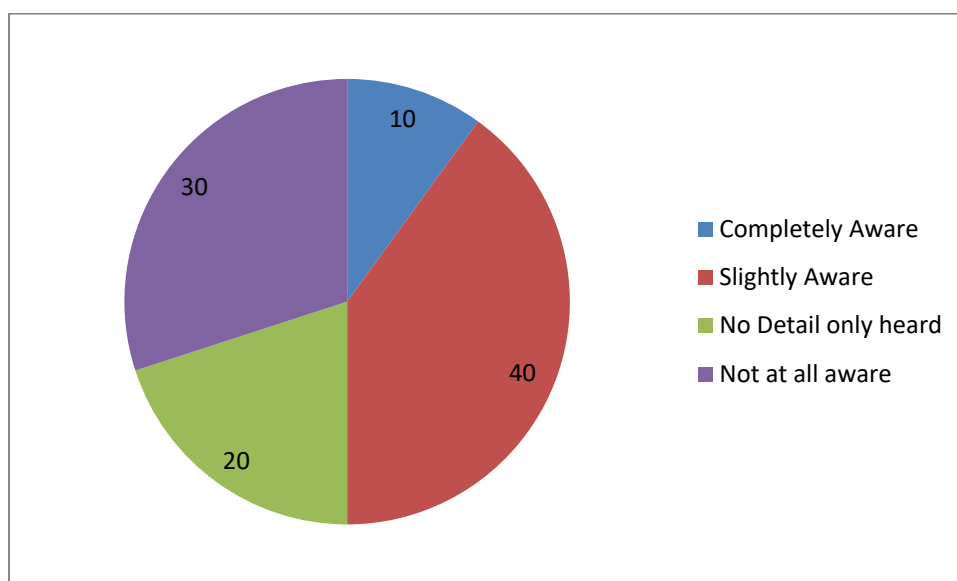


Figure 8. Awareness of subsidies provided by government

Awareness towards Government Subsidies : Customers are aware of subsidies at a same time same number of customers are unaware of it, hence government needs to promote its subsidy facilities. Proper channel need to be selected in order to reach customer and communicate and make them well aware of government subsidies which will benefit in price reduction and increase the sales.

Interested to buy because of govt. Subsidy	No. of Respondents	Percentage
Yes	231	60
No	38	10
Maybe	115	30
Total	384	100

Table 9. Buying E-Vehicle because of government subsidy

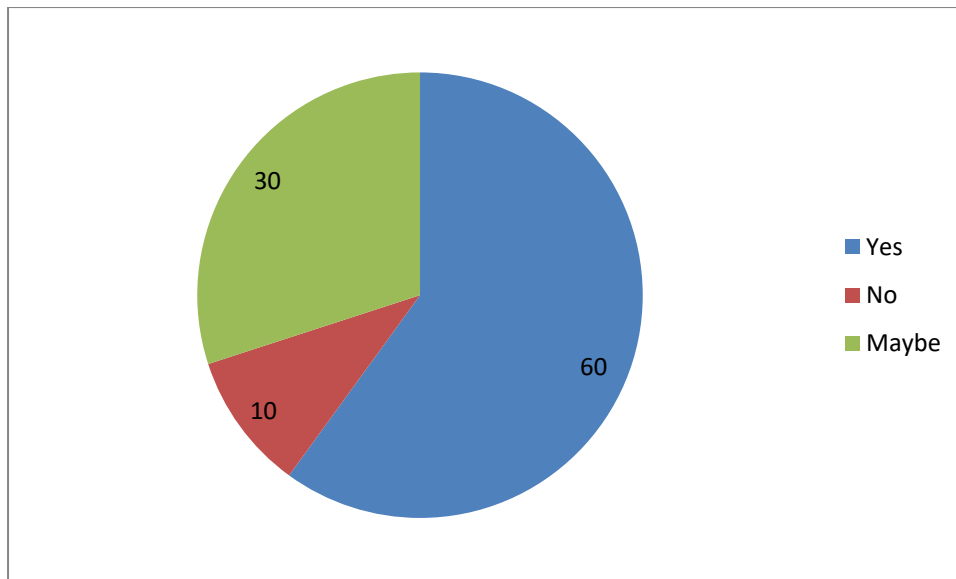


Figure 9. Buying E-Vehicle because of government subsidy

Ready to buy E-Vehicle because of government subsidy: 60% respondents are ready to buy E-Vehicle because of government subsidies. Government need to provide good subsidies as expected by customer and promote to make public aware which will increase the purchase intension

Finding

1. Respondents those who are attracted towards E-Vehicles are mostly between the age group of 18 to 40 age.
2. Majority of respondents that is 80% are ready to accept E-Vehicle
3. Customers expect E-bikes between the range of between Rs. 50,000 to Rs. 80,000 price range
4. Customers expecting E-Vehicle cars between Rs. 10,00,000 to Rs. 15,00,000 price range are 50% and expecting between Rs. 5,00,000 to Rs. 10,00,000 price range are 40%.
5. Most of the respondents that is 90% are willing to adopt E-Vehicle, as it saves fuel, no fuel needed and no carbon emission
6. Major impeding factor in adoption of E-Vehicle is less charging station, felt by 90% respondents.
7. Present E-Vehicle price in market is high, felt by 70% respondents
8. Awareness of government subsidies on purchase of E-Vehicle is very less that is 40%.
9. Respondents those who are ready to purchase E-Vehicle because of subsidy are 60%.

Conclusion

The country requires an alternative to gasoline and diesel automobiles. As a result, EV must be pushed. It has also been revealed in my current research. When we examine the data, we are certain in the impact of vehicles on the environment. And, to some extent, electric vehicles will provide a solution. Electric automobiles are expensive, with limited brand options and charging locations. Consumers are interested in electric vehicles. Even current electric vehicle owners are satisfied, but they demand additional amenities, elegance, and innovation. When it comes to it, businesses have failed and must improve. As a result, promise exists, but attention from the massive vehicle industry is required. They should determine the wants and requirements of Indian customers before producing electric vehicles. The government should implement tough pollution policies as well as policies to promote the use of electric vehicles. It will only be possible if the government lends a helping hand to electric automobiles

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