Influence of the Product Features on Consumer's Product Intention for Electric Vehicle

EV Marketing: Sub-themes: Product differentiation strategies for EVs

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ABSTRACT

In recent times there has been concern about the depletion of natural resources and the over-exploitation of fossil fuels. India emits around 7.2% of the world's total CO2 emissions. The Paris Agreement had an ambitious target to keep the Global warming below 2 degree Celsius.

India has adopted the ambitious plan of net zero by 2070 by adopting mobility in a sustained manner and thereby reducing environmental impact. The GOI has developed a muti pronged approach to meet the above targets. Transportation being one of the primary causes of global warming, the Government has planned to move from fossil fuel dependency to Electric Mobility. Many earlier schemes like FAME I & II, National Electric Mobility mission have been planned by GOI to encourage the adoption of EV vehicles both in the commercial sector and the personal vehicle segment.

This paper utilizes a significant amount of literature review to understand the personal preferences of the potential consumers for electric vehicle adoption. The paper not fully exhaustive does delve into the current reach on adoption of EV in specific through the prism of various theories like Theory of Reasoned Action, Theory of planned behaviour and few others to explain the adoption process of EV.

Keywords-Range, Price, Safety, Charging, Reliability

Global warming is a serious issue with impact on temperature and sea levels, glacier melting, changes in weather patterns and impact on human health.

One of the biggest contributors to Global warming is transportation which contributed to 23% of global CO2 emissions in 2021.In India the share of transportation is only 13% and the CO2 emissions per capita is 1.75 t. The Government of India has initiated many steps to combat the effects of Global warming by trying to reduce the dependence on fossil fuels and by increasing support for Electric Vehicles. At present due to the EV policy India has achieved 10.25 crore of total CO2 reduction (*Home | Ministry of Heavy Industries,2024*)

With anticipated doubling of renewable energy sources in India by 2030, the total life cycle GHG emission of BEV(Battery Electric Vehicle) will decrease by approximately 20 % .(Shet K & Moholkar, 2025).

Inspite of the apparent success the rate of adoption is not satisfactory as per the initial plans. The Government of India has launched many schemes like FAME and Productivity Linked Incentives to encourage the adoption and manufacture of EV vehicles respectively. Even after the second phase of FAME II with Budget of Rs11500 crore only 16 lakh vehicles have incentivised as of March 2025.

Global EV scenario

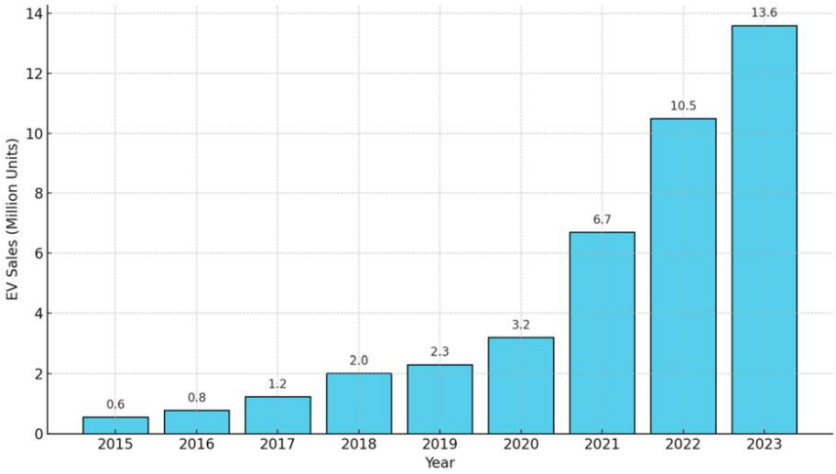


Figure 1. Growth of Global EV sales in 2023, Source IEA 2023

Around 17 million EV cars were sold in 2024 with 20% share of overall sales. China has clocked 11 million EV car sales in 2024.In US the EV car segment grew by 10% and Europe the sales did not record any significant increase though 20% of new car sales came from EV cars.In India share of EV car sales was 2% of total car sales in 2024.Indonesia and Thailand have more than doubled their EV car sales in 2024.On the whole the Electric car sales in 2025 are expected to exceed 20 million worldwide to represent more than one-quarter of cars sold worldwide (Global EV Outlook 2025,).

Indian Scenario

In 2013 the National Electric Mobility Mission Plan was introduced. The FAME-II incentivises both producers and customers for EV. The National Mission on Transformative Mobility and Battery Storage was created to ramp up the charging infrastructure to meet the targets for 2030.

(Goel et al., 2021) To facilitate the faster adoption of electric and hybrid vehicles, the Indian government introduced the Faster Adoption and Manufacturing of Electric Vehicles (FAME II) plan. The Government had planned installation of charging infrastructure and introduction of several incentives to promote the purchase of EVs. The cabinet approved 10,000 crores for FAME II in February 2019.Due to moderate level of achievement the Government of India announced the National Electric Mobility Mission Plan (NEMMP) 2020 to improve national energy security, reduce the negative environmental effects of fossil fuel-powered vehicles, and build up domestic manufacturing capacity.

The sale of BEV passenger cars has risen at a CAGR of 191% in the last four years, from 1019 units in 2019 to 73,282 units in 2023 (Kandpal & Trencher, 2025). EVs accounted for just 6.3% of the about 22.7 million new vehicle registrations in 2023 in India. The Indian government has set a goal of 30% EV sales by 2030. Due to the rapid growth of ICEV in India, The International Energy Agency has predicted that India will be responsible for one-third of the global growth in oil demand between 2023 and 2030.These patterns may hinder India's objective of reaching net-zero emissions by 2070. A budget of USD 231.67 million for FAME-II scheme and the production-linked scheme (PLI) for advanced chemical cells (ACCs) and auto ancillary companies have been approved.

Niti Ayog has estimated that 474 million tons of oil equivalent (MTOE) of oil usage and about 846.3 MTOE of CO2 emissions might be conserved yearly if India's EV sales growth is as anticipated by 2030.Niti Ayog estimates that 50% of four-wheelers will be EV by 2030.

Factors affecting EV Purchase intention

Researchers around the world and specifically in India have been trying to identify the factors influencing the consumer purchase adoption of EV.

The psychological angle like performance expectancy, effort expectancy, social influence, facilitating conditions and environmental concerns were explored (Samarasinghe et al., 2024)

This conceptual paper is focused on studying the influence of the 'perception towards EV product features and performance' on Purchase Intention for EV.

Consumer behavior theories, such as the Theory of Reasoned Action and the Theory of Planned Behaviour etc. provide a framework to analyse how consumers do information gathering, compare the alternatives, and make decisions to purchase.

Some authors (Barbarossa et al., 2017) attribute consumer's control over decision making, to the influence of family and friends, personal beliefs as significant contributors to EV adoption.

Psychological influence of discounted pricing, incentives and usage patterns (Zhuge & Shao, 2018) are also among the background influencers whilst evaluating EV purchase. Trust in EV (Ng et al., 2018) was suggested to be an important factor to the consumer

Research Objective

The research objective is to identify the underlying factors in the consumers decision making process while planning to buy a four-wheeler electric vehicle. The paper seeks to identify the features which are important to a potential customer of EV. The secondary research has tried to narrow down the specific product attributes of an EV which the customer is expecting. The identification of these factors would help the Government and the industry to focus their efforts on policy development and product development respectively. These measures will lead to increased EV adoption in India.

The main objective of this research is to analyse the role of product features in the consumers decision making process. There are a few critical product features of the EV which we can identify based on the review of literature.

Research Gap

However very few researchers that used **the theory of planned behavior to analyse the direct impact of the 'perception of EV product attributes'** on EV purchase intention in the Indian context.

Theory of Planned Behavior and Evaluation of Product features of EV

Many theories have been used to explain the intention to purchase EV. There has been substantial work by researchers using some of the commonly used theories -theory of planned behavior, the diffusion of innovation theory, the values-beliefs-norms theory, the technology acceptance model and the norm activation model (Ajzen, 1991, Stern et al., 1999, Venkatesh and Davis, 2000, Lane and Potter, 2007, Moons and De Pelsmacker, 2012, Egbue and Long, 2012, Skippon and Garwood, 2011, Wang et al., 2016).

Based on the scoping review (Yuriev et al., 2020b) TPB emerges as the most effective theory to explain pro-environmental behaviour.

TPB explains the influence of three constructs (Ajzen, 2011) on the Purchase Intention. One construct is Attitude which refers to an individual's positive or negative disposition to the behaviour under study. Attitude in context of purchase intention towards EV can be explained as the intensity of an individual desire to buy EV.The term subjective norm broadly refers to the influence of family and friends on the purchase intention. The third construct Perceived Behavioural Control is the self-appraisal by the consumer of the practicality of the EV purchase within a given situation.

Psychological factors like attitudes towards purchase of EV vehicles play an important role in decision making. Values and motivations (Chu et al., 2019) and other authors have focussed on perception. There are two dimensions to perception one is the perceived performance vis-a vis ICE(Internal Combustion Engine) and the next is the perception regarding the effectiveness of EV in reducing pollution.

Any application of TPB in context of EV purchase intention must be reflected in the following statements.

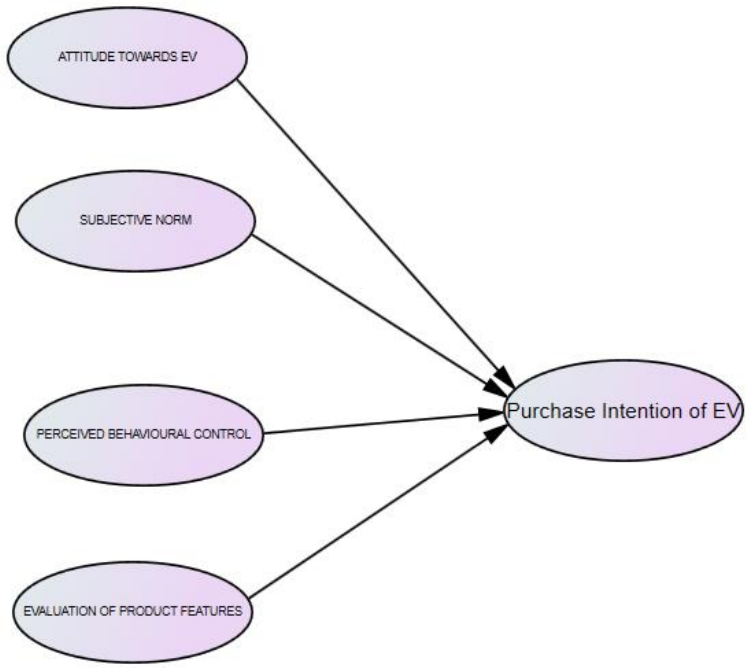
Attitude- "I believe that contributing to environment protection is my duty"

Attitude- "My decision to adopt EV will significantly reduce GHG"

Subjective Norm- "My friends and Family will support me if I buy an EV"

Perceived Behavioural Control- "I have the ability and willingness to pay more and make special efforts required to use an EV"

PROPOSED MODEL



Evaluation of Product Features of EV

Perception of price, maintenance and safety were considered as effective measures of purchase intention for EV (Jena, 2020). Performance (Rahma et al., 2024) is also viewed in terms of reliability, green trust and price sensitivity. Others have measured performance in terms of charger availability (He et al., 2022).

Range

The importance of range can be based on the study (Balasubramanian et al., 2024) influencing factors using the Push Pull and Mining theory. They scoured through twitter data using text mining tools and identified range as on area of critical importance whilst considering buying an electric vehicle.

Range is subjective as it directly related to the price of the EV. (*Latest Car News & Reviews - Upcoming Bikes & Cars in India | Autocar India)*. We can observe that the range of high-end vehicles in India is around 400 km on one full charge. The average range for all mid-range cars is around 200 km per full charge.

Price related

Price of EV is higher than ICE vehicles in most countries. In addition, consumers consider depreciation and energy prices whilst considering purchasing EV. Many authors have cited the policy introduced by respective governments to induce consumers to increasingly buy EV (Hakam & Jumayla, 2024)

The Total cost of ownership (TCO) is a concept where not only the purchase price, but the operating cost is considered. Though the purchase price is high, the lower maintenance and energy costs are to be considered. TCO balances the impact of the higher initial costs with the subsequent lower costs of maintenance and operation. They consider that only evaluating either purchase price or operating cost alone will not be a rational choice by the prospective consumer.

Harte et al. (1994) opine that price is of three dimensions with respect to decision making for electric vehicles. The first is the fuel prices, the second is the purchase price of the EV and thirdly the operating price for EV. Each consumer is guided by his priority from amongst the above dimensions. It is therefore imperative to understand the broad clusters of customers which can be framed based on the different dimensions of price. They prioritise the role of purchase price in the decision-making process. At this stage BEV are more expensive than ICE (Bharadwaj 2015).The TCO on the basis of we observe the cash outflow at INR130 K for petrol against the cash outflow for diesel at INR 150K.The breakeven point is four years for domestic charging based 2022 prices of electricity units @7 per unit (Sankaran & S, 2022).Swapping technology is likely to further reduce the TCO.

Charging Infrastructure

The ambitious plan to achieve 30% of electric Vehicles by 2030 in India must be supported by an adequate charging Infrastructure. Limited research has focused on the currently available charging infrastructure, access and affordability of charging in the Indian context. There is limited data on the availability of charging stations. Establishing charging stations requires space allocation, operation and regular maintenance. There are three layers of charging infrastructure, The first layer is charging at home and is time consuming process which typically takes 8 hours. The next layer consists of commercial charging stations which typically take 4 hours to charge and run on 240 Finally the DC fast chargers can charge the battery up to 80% in 30 minutes of so.

The other option in charging is the battery swapping mechanism. A depleted battery can be exchanged for a full charged battery. However very few players have started this service in India.

(P. Goel et al., 2021) There is concern with respect to the design, packaging and the components used in battery manufacture. A related concern is compatibility of chargers. Different manufacturers have different specifications for chargers which makes it impossible for interoperability. Commercial charging points need be developed which can charge the different types of charger options. Some researchers have voiced concern with respect to location of commercial charging facilities. Having the commercial charging facility in a densely populated location may not be economically and practically feasible. This will require that commercial charging centres be located at relatively less densely populated localities which means that EV owners will be required to travel to distant charging points for availing recharge. By balancing the sources of renewable energy, effective policy making and optimizing charging processes, can induce people to adopt EV (Zhang et al., 2023, Liu et al., 2023a, Min et al., 2023).

Safety of Electric Vehicles

As concern for EV adoption is the possibility of battery explosion either due to an accident or overheating. Indian weather conditions are typically hot and may give rise to overheating. Chances of an explosion are higher in case of extremely hot weather leading to the fire. Another area of concern is use of lithium-ion battery which tends to heat up faster than other battery technology. Another related safety aspect is the lack of noise which leads to accidents as both pedestrians and other motorists fail to perceive the proximity to the EV(Edwards et al., 2024). The common issues faced relating to safety are chemical and vehicle catching fire. Broadly it can be said that EV are on par with safety of ICE.Infact EV are higher in safety as they usually incorporate systems such as ADAS and crash-avoidance systems (Guzek et al., 2024).The customers may not be aware of the superior safety of the EV.The Government and the manufacturers must join hands in creating awareness in the general public.

Reliability of EV

EV have reduced moving parts and are less complex than EV making less prone to mechanical damage and wear and tear. The significant ease in driving because of single pedal and automatic transmission and direct linking of the motor to the EV gives rise to quick acceleration. The issue of reliability is related more to the battery pack and its subsequent decline in performance over time. Overcharging of battery may lead to degeneration of battery performance (Zhou et al., 2011). The life of the battery can be reduced substantially in case of sustained battery abuse which could lead to poor reliability. The replacement cost for battery is very high. Typically, the battery is priced between 35%-50% of EV cost (McDonnell et al., 2021). As reliability concerns are on the rise affecting the purchase intention many manufacturers are providing warranty of three to eight years and on road service 24*7. Such measures reassure the customer about the reliability of the EV.

Conclusion

This research is an attempt to understand the importance of product features affecting electric vehicle adoption in India. It has employed secondary data sources and undertaken a simple analysis of existing body of research and literature. This study provides a cross section of research papers to understand the impact of price, range, charging infrastructure, safety and reliability of Electric Vehicle. The review of literature has a balance of studies in India and from abroad. The research objectives were formulated based on the aim of this study, which includes mapping price points appropriate to Indian consumer sentiments. The literature related to range is expected to be useful for a bird's eye view of the consumers expectations with respect to safety, reliability, charging infrastructure and price.

Limitation

Research is focussed on the product features which addresses only the consumer's perspective towards adoption of EV. The paper purposely avoids an analysis of the policy initiatives and other Government initiatives which also have a significant influence of adoption process. This constraint can be addressed by future studies on the policy initiatives of the Government. The paper also stops short of identifying the differentiating strategies for EV.

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