



A Comprehensive Review on Electric Vehicle Marketing

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ABSTRACT

Early in the twenty-first century, new businesses were established to benefit from the absence of major automakers from the EV industry, including Tesla Motors in the United States, Think in Norway, BYD in China, and REVA in India. All these new manufacturers have altered the trends of the auto industry by releasing one or more EV models globally. Considering the Indian scenario, which has a long way to go, the article provides the current Indian EV market, market players in two and four-wheeler with modern improvements, as well as the state of Indian road transportation today. Governmental actions and policies are discussed. To understand the reality on the ground, a case study from the viewpoint of the consumer is presented. The topic of EV charging tariff is raised. The essential policies, promotions, and challenges for the Indian market's expansion are discussed along with sensible solutions and the overall situation.

Keywords: Electric vehicle, public policy, Technology adoption, Indirect network effects, Panel data modelling, policy design.

1. Introduction

Some of the world's earliest small-scale electric automobiles were developed by inventors in Hungary, the Netherlands, and the US, but it wasn't until 1900 that vehicles run on electricity became widely used in the US. 28% of automobiles had electric motors. Approximately two thirds of all vehicles were electric. Subsequent development of ICE dominated the market because of its cheap cost IC engine technology. Despite numerous efforts, the problem of pollution had spread over the entire world and support for technologies and alternative/hybrid fuel. It couldn't be until the introduction of the first hybrid electric vehicle, minimize environmental emissions the Toyota Prius market in Japan in 1997. There were sold around 18,000 units simultaneously. When BYD is present in China, Reva is present in India, and Tesla is present in the US introduced their models to both the market started to dominate the IC engine industry around 2000, a revolution occurred. A signal to switch to an electric vehicle. Tesla's semi-truck has recently entered a product on the market having four independent, highly powerful and swift motors and offers the best energy efficiency per mile. Electric vehicle worldwide. Over 1,70,000 vehicles were delivered in record numbers of thanks to (EV) sales in December 2017, and the increase was 67% from the same month in 2016.

2. Literature review

It has been suggested that increasing the use of electric vehicles (EVs) could help to lessen the consequences of climate change by consuming less gasoline and emitting fewer greenhouse gases. This study assessed the market share of electric vehicles, the existence of government incentives, and other key socioeconomic factors. Cross-sectional/time-series (panel) analysis was used for this investigation. An aggregated binomial logit share model was developed to predict the modal split between EVs and conventional vehicles for many U.S. states from 2003 to 2011. The findings showed that the market share of electric vehicles per state was positively correlated with urban highways and government incentives, but adversely correlated with energy prices and EV use. According to sensitivity analysis, the adoption rate of electric vehicles is primarily influenced by the price of power. Additionally, the examination of the temporal trend model revealed that the adoption of electric vehicles has been rising with time, which is compatible with ideas regarding the diffusion of new technologies.[1]

The Global EV Outlook, a yearly publication, examines and analyses current developments in electric mobility throughout the world. It is being created with the assistance of the participants in the Electric Vehicles Initiative (EVI). By integrating historical data with projections through 2030, the report addresses major topics of interest like the adoption of electric vehicle (EV) and charging infrastructure, energy use, CO2 emissions, and battery

demand. To assist decision-makers and stakeholders who are considering regulatory frameworks and market structures for the adoption of electric vehicles, the research presents policy recommendations that take lessons from successful markets into consideration. Updates to the models of electric heavy-duty vehicles slated for introduction in the following years as well as information on the progress of mega chargers are included in this version. It contrasts the suggested AFID targets with each electric vehicle's supply system. It also looks at the impact that EV use will have on government revenue from petrol taxes. Additionally made available for the first time are the Global EV Data Explorer and Global EV Policy Explorer, which allow users to interactively research global EV statistics, estimates, and policy measures.[2]

Plug-in electric vehicle (EV) adoption and charging station investment are related, hence there are indirect network effects in the EV market. We demonstrate how feedback loops created by indirect network effects on both sides of the market could affect how rapidly a new technology spreads using a stylised model. Indirect network effects are seen on both the supply and demand sides of the market, with those on the EV demand side being stronger, according to our empirical analysis, which is based on quarterly EV sales and the installation of charging stations in 353 metro areas between 2011 and 2013. The federal income tax credit of up to \$7,500 for EV customers had an impact on about 40% of EV sales between 2011 and 2013, with feedback loops accounting for 40% of those that growth. a proportional expenditure system However, giving funding for the construction of charging stations may have more than doubled the rate of EV adoption.[3]

Electric vehicles, an uncommon means of transportation, are becoming more common in today's traffic jams and on roads. Such a fashionable wild is always in high demand. Additionally, there are many explanations for it, so it is not surprising. Many people started to consider whether to buy the typical automobile for us, further cut costs, and buy an environmentally beneficial item because the rise in the price of oil and gasoline as a result of the economic crisis. There will be more than 120 different electric car types available by 2020. These are excellent devices. The internal combustion engine will appear dated in comparison to their surroundings. This project's goal is to assess the business's present activities and offer to construct a practical marketing strategy built on the demands of the contemporary market. The company Faraday Future, a maker of electric vehicles with steady growth rates, was selected as the study's focus. For all individuals interested in electric automobiles, business owners, and other interested parties, the information is pertinent and helpful.[4]

Since Toyota invented the hybrid electric vehicle, nearly all the major automakers now make hybrid vehicles. Currently, several automakers are getting ready for the 2011 commercial releases of battery-powered electric vehicles. The fight to rule the electric vehicle market has once again begun. However, there has been a very lengthy history of scientific advancement in the field of electric vehicles, and a wide range of technological solutions are currently under development. We conducted two related case studies to better understand the development of electric vehicles. In the first case study, we examine General Motors' 40-year history of creating electric automobiles. Our attention is drawn to the goals of each advancement, the technology used, and the external causes that motivated each effort. The findings indicate that in the first 20 years, investigating new technologies is the primary goal. Only in the past 20 years has there been talk of introducing an electric vehicle on a commercial scale. In the second case study, we examine electric car propulsion technologies and product architectures that have recently been disclosed by both established automakers and up-and-coming players. The findings demonstrate that product architecture changes can create a niche market for electric automobiles.[5]

3. Methodology

To In the US, the EU, and mainly China during the year 2016. Tesla Model S, Toyota Prius Prime-PHEV, Nissan Leaf, and BAIC EC 180 are a few of the most popular vehicles. The scenario in India is unique because the market share of EVs and PHEVs is now only about 0.1%. Almost all cars today depend on fossil fuels for propulsion. These emit greenhouse gases into the atmosphere, which pollutes it and contributes to global warming. India's transportation industry is expanding rapidly. India imports almost 70% of the oil it needs each year. Therefore, it is critical to look into possible explanations and problems for the creation of environmentally friendly, sustainable transportation options systems. One of the brightest, most environmentally friendly. The current scenario of road transport sector can be highlighted as

- 524 million tonnes of oil equivalent in terms of energy consumption
- The vehicle to human ratio is 1:56:3.
- Energy consumed per person: 442 kg of oil equivalent.
- CO₂ emissions total 1730 million tonnes.
- 2016 saw the sale of 25,000 (all) and 2000 electric vehicles (cars)

The United States has higher population density, more cars per person, and higher emissions when compared to other countries. 1.7261 billion. An electric vehicle costs more to buy in India than a gasoline-powered vehicle, although this price difference can be contrasted to government incentives. As a result, EVs are far more affordable to operate than ICE vehicles. For two distances for both types of diesel and gasoline vehicles, as well as EV computations, and to get a sense of the viability and the estimation of actual capital and operating expenses in the Indian context, comparison analysis is displayed using data from the company's website. Consider a buyer who has the option of purchasing an ICE or an EV. The can be used to buy a car availability of an EMI that must be repaid month after month over a five-year period. An EV costs INR 6.5 Lakhs, compared to INR 6 Lakhs for a normal automobile. For 40 km and 100 km of both diesel- and gasoline-powered fully ICE vehicles, the fee assessment for five years is provided based on calculations from the agency website. If everyone had the option to buy a diesel ICE or EV, the EMI of an EV-based car in India might be slightly higher than one based on an ICE, but there is a reduction in gas and maintenance by setting INR 50000/- extra, the person will save about INR 61,500/- in 5 years, which isn't always profitable.

Table1: Indian statistics of vehicles

Year	Car	Two/Three-Wheeler	Commercial Vehicles	EV	PHEV
2008–09	14.15	89.28	5.49	0.37	–
2009–10	15.52	92.76	4.27	0.16	–
2010–11	19.70	115.52	5.78	0.35	–
2011–12	24.30	146.70	7.53	0.45	–
2012–13	27.70	166.28	9.02	1.43	–
2013–14	26.79	171.62	8.73	0.19	0.19
2014–15	31.80	196.70	10.0	0.41	0.48
2015–16	34.80	215.70	10.9	1.0	1.0

NOTE: Except for EV/PHEV, all numbers are in lakhs (in thousands)

4. Working and operation

Currently, only options available are plug-in hybrid electric vehicles, hybrid electric vehicles, and electric automobiles for sale in India (PHEV). However, the sale of electric automobiles is not particularly promising regardless of if EV, HEV, or PHEV can be more advantageous for India, due to the following factors:

- Compared to internal combustion engines, hybrid or electric hybrid vehicles are substantially more efficient at slow Indian driving speeds (ICE).
- While idling, HEVs and EVs use no gasoline, and the percentage of idle time in India has far more traffic (than the U.S. & Europe).
- Braking consumes a greater proportion of energy per Indian journey, approximately recovered in a regenerative braking hybrid electric vehicle (HEV).
- Compared to the US, India's average distance travelled is substantially shorter & Europe are enabling EVs to be much more practical and range-free an individual fee.
- Vehicle use and distance - The cycle patterns of urban driving have many starts and stops an electric car. Electric vehicles benefit from heavy traffic by delivering great efficiency.

Indian market participants and brands

There are certain market participants that have introduced EVs; nevertheless, XEVs (EV/HEV and PHEV) are offered but at a very high cost.

- EV
 - Mahindra Reva-e20 - INR 7.46 lakhs
 - EVerto - INR 9.22 lakhs
- Hybrid
 - Lexus ES300h - INR 55.27 lakhs
 - Toyota Prius - INR 45.23 lakhs
 - Toyota Camry - INR 37.22 lakhs
 - Honda Accord Hybrid - INR 37.35 lakhs
 - Maruti Suzuki Ertiga Diesel - INR 7.55 lakhs

The sale of E-rickshaws and two-wheelers has risen recently, it has been observed. Kinetic is the industry leader in the E-rickshaw sector, having sold over 10,000 units in the previous year.

Indian Government Initiative

Indian government has acted and established the National Mission for Electric Mobility after considering all the factors mentioned (NMEM2020). Two crucial objectives of the National Mission for Electric Mobility (NMEM) are interrelated objectives:

1. National energy security.
2. Expansion of indigenous production capabilities across the whole spectrum of electric car technology.

The action plan for Electric Mobility 2020, which aims to have roughly six to seven million vehicles on the road by 2020, was released by the ministry of heavy industries in January 2012. with a desire to support trustworthy, All-electric vehicles that are inexpensive, effective, and meet through government and industry, consumers performance, and price expectations cooperation for the development of domestic manufacturing technologies, necessary infrastructure, consumer awareness, and capacities.

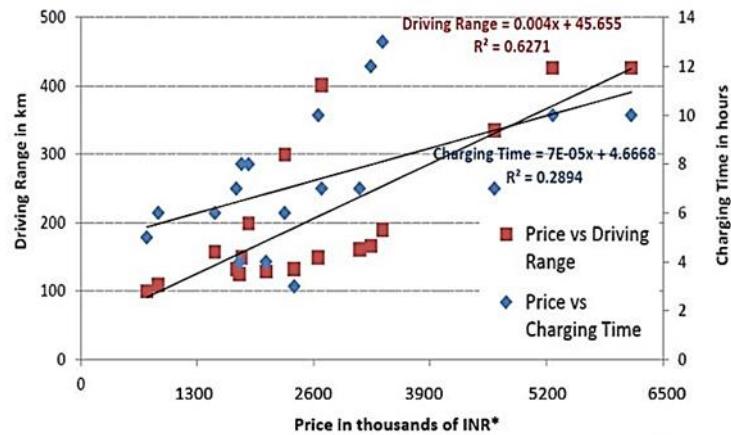


Figure1: Driving range, charging time, and cost of E4Ws for versions sold in India and internationally.

In the Indian market, conventional vehicles receive far more advanced features than the EVs that are offered. Less power and torque, fewer seats, a lower top speed, and a shorter range are a few of the drawbacks that must be considered. Despite the benefits of automated gearing, reduced fuel use, smaller turning circles, and greater ground clearance is noticed. Driving distance and charging time, and cost electrically powered four-wheelers (E4Ws) for Indian and international models are summarized. It is obvious that E4W is quite expensive. Price rises nonlinearly as the range widens. Additionally, there is nonlinearity between charging time and price.

Focusing Techniques and Likely Solutions

The following are some crucial areas on which India's EV development must concentrate:

1. converting public transportation (bus), taxis, and three-wheeled (auto) vehicles to PHEV. This is a vital prerequisite for advancing towards sustainable modes of transport. In addition to balancing emissions, it will lighten the burden on infrastructure.
2. The discovery of strategic subsidies for electric vehicles will be another important Customer barrier of the cost of electric automobiles. The inducement might be an electric vehicle subsidy programmed that eliminates the cost gap between traditional and electric automobiles with comparable performance levels.
3. the Infrastructure for Charging: The growth of the XEV market will coincide with the development of the charging infrastructure. However, generating motivation can be accomplished via an affordable grid-connected charging station that is promoted to a separate station for charging renewable (solar/wind) energy, an addition to gasoline pumps, bus stations, and state transportation charging allowing the creation of independent renewable energy charging stations.
4. System of electrical propulsion (EPS): Electrical propulsion systems (EPS) made in India are not yet offered by any Indian manufacturers; even REVA has a partnership with Italy for EPS. Consequently, encouragement and a good environment have grown among manufacturers. One of the essential jobs. creation of concise policies to assist the supply, production, and recycling of propulsion systems are all increasing. Advancement of motor technology and power electronics converter possible since India has a technical foundation, yet it is currently being employed development of an affordable Li-ion battery technology is difficult task because China and the USA have most of the world's lithium supplies. In additionally, shifting or replacing batteries Possibly one of the brightest and possible options in India.
5. Creation of Skilled Labour: One of the prerequisites is the creation of certified competent technicians and professionals, considering the safety and innovative technologies involved.

5. Conclusion:

The development of IC engine technology will continue to be in demand with automatic transmissions due to development, historical government policy execution, buying concerns among Indians, responsiveness to new technologies, and economics. Future demand for transmission vehicles will increase. expansion of hybrid fuel technologies will be constrained by price. transforming the standard vehicle into the retrofitting, a plug-in hybrid electric vehicle might have a huge market. In India, EV and PHEV have a bright future, however their present growth will be constrained, with policies and public awareness determining the limit. Creation. The slow lane will lead to sustainable transportation, due to the absence of an EPT manufacturer, a clear policy, and its implementation.

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