

Electric Cars - Disruptive Innovation in the Indian Auto Industry

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However these did not have any market relevance. After the industrial revolution and the advent of machine driven industry, disruptive innovations have occurred from time to time that have changed the market dynamics for existing technology based products.

Henry Ford's mass produced model T was a disruption to the horse drawn carriage market in the 1900s. Since then the internal combustion engine (ICE) based cars have ruled the world. A whole marketplace of dealers of cars and spares, petrol filling stations, car insurance and financing agencies has been existing all over the world. However with the emergence of Tesla in 2003 in the US co-founded by Elon Musk, Martin Eberhard, Mark Tarpennig and others, the sea change in the auto industry began. The Electric battery operated car or EV now became available for use with Tesla's Roadstar model in 2008. It may be mentioned here that electric cars had been in existence since 1880s and were in fact the preferred mode of personal conveyance in the USA in the early years of the 20th century. However the relatively slow speed and range of the electric cars, better roads and the abundant availability and low prices of petrol since the 1920s resulted in the adoption of Internal combustion engine based cars globally.

The acute problem of pollution and the high price of petrol have now, after nearly 80 years, pushed some manufacturers to look for an alternative to the petro driven cars. Tesla, followed by Nissan of Japan, BYD of China and Renault of Japan have begun to offer electric battery operated

ABSTRACT

The re-advent of Electric Cars from 2008 onwards after almost eight decades of neglect is set to cause a fundamental change in the auto industry worldwide, including in India. The traditional value-chains in the auto industry is going to be disrupted in a big way affecting the nature of demand for car batteries and components. The major auto manufacturers and their suppliers are apprehensive and only just beginning to make plans to meet the coming change in the market from ICE to Electric Cars.

Keywords: Disruptive innovation – electric car- market – benefits – disruptions- auto industry–manufacturers-strategies

1. INTRODUCTION

The term Disruptive Technology was first used by Harvard Business School Professor Clayton M. Christensen in 1997 in his book 'The Innovator's Dilemma'. In business theory, a disruptive innovation is an innovation that creates a new market and value network and eventually disrupts an existing market and value network, displacing established market-leading firms, products and services.

Disruptive Innovations in technology have occurred down the ages in human history and all of these have played an important part in the progress of human civilization. In a way discovery of fire and the wheel are perhaps earliest examples of disruptive technological innovations that have changed human society.

passenger cars since 2008 and have seen their demand growing worldwide. A Total of 5.1 million electric cars have been sold as of December 2018 worldwide.

The Indian Electric Car market: The automobile market in India has been seeing a spurt in demand since the year 2010. The Indian electric car market size was valued at \$71.1 million in 2017 and is projected to reach \$707.4 million by 2025, witnessing a CAGR of 34.5% during the forecast period.



India sold an estimated 2,000 EVs in 2017. In the year ended March 2019, only 3,600 units of electric vehicles were sold in India or just about 0.1 percent of the 3.3 million diesel and gasoline cars sold in the country over the period, according to industry data. EVs may account for about 7 percent of sales in India by 2030.

In FY2019, total EV sales in India crossed the 7,50,000-units mark and reached a total of 7,59,600 units (see sales table)

below). This includes electric two-wheelers (1,26,000), electric three-wheelers (6,30,000) and electric passenger vehicles (3,600),

EV sales in India

| Segment | FY2019 | FY2018 |
|--------------|----------|--------|
| e-2-wheelers | 1,26,000 | 54,800 |
| e-3-wheelers | 6,30,000 | NA |
| e-4-wheelers | 3,600 | 1,200 |
| TOTAL | 7,59,000 | 56,000 |

Benefits of Electric Cars:

- 1. Cheaper to run:** Electric cars will have much less running costs. The cost of electricity to charge an Electric Car works out to about a third of the cost of petrol per kilometer.
- 2. Cheaper to maintain:** A battery electric vehicle (BEV) has a lot less moving parts than a conventional Petrol/Diesel car. There is relatively little servicing and no expensive exhaust systems, starter motors, fuel injection systems, radiators and many other parts that aren't needed in an EV. Batteries do wear out so replacement batteries will eventually be needed. Most car manufacturers warrant EV batteries for around 8 years.
- 3. Less pollution:** Driving an EV helps to reduce harmful air pollution from exhaust emissions as less and less Petrol/Diesel will be consumed with the adoption of more EVs and an EV has zero exhaust emissions. If renewable energy is used to recharge EVs, for example from solar PV system, then greenhouse emissions can be reduced even further.
- 4. Much less oil consumption:** There adoption of Electric vehicles will mean less oil consumption and the growing use of Electric Cars will play out over the next 40 years to cause a substantial decline in oil demand which will keep oil prices low.
- 5. Technology benefits:** Electric vehicles will be able to innovate faster. Compared to internal combustion engine vehicles, electric vehicles have a significant advantage - battery technology developments are faster than those of the engine technology on gasoline-based vehicles. With Autopilot Capability customers will be able to summon a car anywhere they want using a smart device. Uber could partner with driverless cars and ferry passengers. Charging stations could operate like ATMs and cars could charge by themselves. Cars would also be able to capture more data from in built logs and predict failures in advance .In addition, the trend of packing electronics in today's automobiles shows that innovations in electronics will outpace other innovations. The amount of electronics in an electric vehicle is high compared to conventional vehicles. It offers opportunities for more innovations. The electric car of the future will be a true computer on wheels and will change the character of the automobile.

Govt. of India's policy and initiatives on electric vehicles:

In 2013, the National Electric Mobility Mission Plan (NEMMP) 2020 was established, under which an incentive scheme, Faster Adoption and Manufacturing of Hybrid and Electric Vehicles (FAME), was launched in 2015-16 with an initial outlay of Rs. 75 crores, to reduce the cost of hybrid and electric vehicles and to encourage their penetration in the market. This outlay was increased to Rs. 895 crores later.

The FAME scheme offers a subsidy on the retail price of passenger cars. These subsidies range from INR 11,000 – 24,000 for mild hybrids, from INR 59,000 – 71,000 for strong hybrids; and from INR 60,000 – 1, 34,000 for electric vehicles. Subsidies are also available for two-wheelers, three-wheelers, light-commercial vehicles and buses.

The subsidy from the FAME scheme is not the only incentive mechanism that impacts the market for hybrid and electric vehicles in India. The Central Government of India and some state governments, such as the Government of National Capital Territory of Delhi (NCT of Delhi), provide tax incentives that treat hybrid and electric vehicles preferentially over conventional technologies.

The government has begun some groundwork on the infrastructure front. On March 5, 2019 the Modi-government revealed details of the second phase of the Faster Adoption and Manufacturing of (Hybrid) and Electric Vehicles (FAME) scheme. In this, the government planned to infuse Rs 10,000 crore over three years from April 1, 2019 for infrastructure development and encouraging faster adoption of electric vehicles.

Under FAME-II, the government will give upfront incentives on purchase of electric vehicles, infrastructure development, including charging stations. As part of the FAME-II, the government stated that it will set up 2,700 charging stations in metro cities and some of the one million-plus towns, offer EV purchase incentive to 10 lakh two wheelers, 5 lakh three wheelers, 55,000 four wheelers and 7,000 buses.

India's government is not only serious about clean mobility but is in a hurry to get there. India is planning to mandate cab-hailing companies like Ola and Uber to "convert 40 percent of their fleet" of vehicles to electric by April 2026, according to a report by Reuters. If implemented, this will be the first major step by the Modi government to reach its goal of converting India into a 100 percent electric vehicle nation by 2030.

Disruptive Impact of Electric Cars:

The transformation from internal combustion engine (ICE) vehicles to EVs has significant implications for the existing automotive industry supply chain. The advancement in EVs will lead to profound changes across the automotive value chain, including technology, manufacturing systems, distribution and aftermarket service and support. EVs are less complex to manufacture as compared to ICE vehicles with far fewer moving components.

1. Battery:

The present ICE cars run on Lead- Acid Battery and Indian manufacturers such as Exide are almost completely concentrated on this product. However the EVs use other type of Batteries. On the basis of battery, the Indian electric car market has been classified into Lithium-Iron-Phosphate (LFP), Lithium-Nickel-Manganese Cobalt Oxide (Li-NMC), and others. The "others" category includes other Li-ion based batteries, such as Lithium-Titanate oxide (LTO) battery, Lithium-Nickel-Cobalt-Aluminum oxide (NCA) battery, nickel-metal hydride (NiMH) battery, and lead acid battery. LFP battery-based electric car was the largest category in the market, contributing over 65% sales volume in 2017, owing to the benefits such as high current rating, thermal stability and safety levels, and long cycle life. So with the increase in Market of Electric Cars manufacturers have to

shift to Lithium-Iron –Phosphate or LFP batteries leading to changes in production processes and material procurement plans. The battery cost constitutes more than 50% of the value of the vehicle itself. This will result in a weakening of the control for OEMs. With new technologies emerging in the Battery segment, OEMs need to heavily invest and promote indigenous R&D in this regard to keep up with the demand for cost-effectiveness and better operating ranges for EVs from the Battery.

2. Infrastructure:

The ICE cars need petrol or diesel filling stations for fuel replenishment and thousands of such filling stations dot the length and breadth of the country. However running of EVs require a different kind of infrastructure. Electric Cars need charging stations from which they can charge their batteries.

The current state of EV infrastructure in India is pathetic. As per a report by consulting firm Ernst & Young (May 2018), there were only 222 charging stations with 353 charging points in whole of India.

So far, India's EV plans stayed only on paper because of this lack of infrastructure that electric vehicles require. Indian automobile companies have also not taken the leap to build EVs. After all, they have made significant investments to sell cars that run on fuel, as have their vendors. That makes it a big problem. If there's no infrastructure, EVs can't run on the roads but if there are no EVs, then setting up infrastructure will not be viable.

By asking cab aggregators to transform 40 percent of their fleets to electric by 2026, the government is trying to create a substantial market. If Indian companies don't build these EVs, cab aggregators may import them to remain compliant with the law. If that happens, car-makers will lose sales revenues.

The conversion will happen in stages – 2.5 percent by 2021, 5 percent by 2022, 10 percent by 2023 and 40 percent by 2026. This is expected to give both the industry time to supply vehicles and the government time to build the requisite infrastructure.

At present, Ola's fleet consists of around a million vehicles. By 2026, the fleet size is going to increase substantially. And 40 percent of that would be a good number. While Uber does not share details of its fleet, it officially disclosed that the American cab aggregator has around 300,000 active drivers in India who complete around 10 million trips a week.

That's a huge market that is being created by changes to regulations, which will force automobile companies to act to invest in infrastructure building.

3. Automotive parts business:

Automotive parts manufacturers will be significantly negatively impacted. Internal combustion engines (ICE), which are used in most cars, have more than 2,000 moving parts, while an electric vehicle has about 20, resulting in fewer breakdowns. They are much simpler and will trend to even more minimalism. That will have a dampening effect on global supply chains, parts distribution companies, a lot of OEMs, etc. Brake parts, Engine and Oil parts, Muffler/silencer, aluminium casting, transmission, cylinder blocks and cast iron manufacturers will have less and less demand and eventually may face closure of business in 20-30 years.

The Automotive Component Manufacturers Association of India (ACMA), the industry lobby that represents companies who do business worth Rs1.45 trillion, went to NITI Aayog in December 2018. The idea was to express concern to the government that a sudden move to large-scale adoption of electric vehicles (EVs) could lead to massive job losses.

The ACMA presentation said the ICE power train contributes to over 60% of the employment generation in the auto component sector, and that a switch to 100% electric could impact up to 5.6 million jobs by 2025-26.

4. Car dealership business:

Dealerships make the majority of their profit off of post-sales maintenance. Electric cars require a lot less post-sales maintenance. Dealership business models don't add up for electric cars, which is a key reason they are currently a significant inhibitor on traditional manufacturers' electric car sales. Tesla is leading the way in this as with so many other necessary transformations, but traditional ICE car manufacturers aren't willing or able to take on their powerful dealer networks. With the decline of ICE car manufacturers and the necessary transition from the survivors away from this distribution model, dealerships will be radically impacted.

Manufacturer's strategies for the emerging Electric Car Market:

According to a recent report by Infosys, the EV will indeed majorly disrupt the existing the automotive ecosystem. A senior industry executive said the automobile industry, unlike the electronics manufacturing industry, has not reinvented itself in the past two decades, which is why the prospects of disruption is making it jittery.

While demand for IC engine-run vehicles will be there in the next decade-and-a-half, a shift to electric vehicles will slowly but surely take place. In order to cater to this growing demand for EVs, component manufacturers would have to make new strategies for investing in their existing business and also increase capacity in new areas. According to Vivek Chandra Sehgal, chairman, Samvardhana Motherhood Group, a Noida-based auto component manufacturer, whether it is the core business or readying for technology-driven innovations like connected cars, self charging, electrification of vehicles, electronics for data logging, light weighting body parts etc. the concentration should be on providing solutions that the Electric car customers would need.

Indian automobile and component manufacturers have to reinvent their processes, invest in new technologies and collaborate with companies who have the requisite technologies, or run the risk of losing their position in the emerging Electric Car market.

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