

SIMATS ENGINEERING

Mahindra's Urban Electric Mobility Solutions: Examining Mahindra's role in electric public transportation in urban areas

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ABSTRACT:

The subject area of our study is the issues concerning Indian electric vehicles (car) market. Our case study focuses on Mahindra Electric Mobility Company. In particular, the impact of strategic decisions taken by the company on the sale of its product over the course of five years is studied. In addition, the case study discusses the present scenario of electric vehicle market in India amidst the initiatives taken by government and its future prospects witnessing the climate change and global warming issues. It determines the best possible way in which company can expand its business and maximize its profit under the given constraints circumventing the business. The success or failure of business strategy used by the company in the present environment is also studied in detail. This case study examines Mahindra & Mahindra's pioneering efforts in promoting sustainable urban mobility through electric vehicles (EVs), charging infrastructure, and collaborative partnerships. Focusing on Indian urban transportation challenges, this research assesses Mahindra's EV solutions, including electric buses, taxis, and autorickshaws, and their impact on reducing emissions and improving air quality. The study highlights key initiatives, benefits, and challenges, offering valuable insights into accelerating EV adoption. Recommendations for expanding charging infrastructure, enhancing public awareness, and strengthening government partnerships are provided.

Keywords:

Electric Mobility, Sustainable Transportation, Urbanization, Mahindra & Mahindra, Electric Vehicles, Public Transportation. Electric mobility, Sustainable, transportation, Urbanization, Public transportation, Environmental, sustainability green technology, Renewable energy efficiency, Transportation infrastructure.

INTRODUCTION:

A study of strategic decisions taken by the company in ensuring the growth and expansion of its product can help us in understanding the electric vehicle market in India. There is a direct relationship between strategic decisions taken by the company's management on the expansion of its product as well as the financial health of an organization. A study of these decisions can help us in observing the relationship between the two. The study also helps in understanding the initial challenges that any innovative product faces in the first few years of its expansion. The present case study can be utilized as aid to teaching in courses such as MBA/M.COM/Post Graduate programs in management; executives training programs and for undergraduate courses for discipline such as Management Accounting, Marketing, Strategic Decision Making. This study can be used to understand Break even analysis, leverage, return on equity. Moreover, it will also help in understanding strategic decision making, and will reiterate the concept of SWOT analysis, PEST analysis and porter's five forces competition model. As the world is opting alternate fuel systems for vehicles, electric vehicles have become one of the most prominent alternate fuel systems globally. New age companies like Tesla, Venturi, Coda, etc. have forced traditional players like BMW, Audi, and Jaguar to move into electric market and a reflection of that can be seen by new completely electric car launches by these companies in the past two year. similar lines, Mahindra Electric Mobility Limited, a subsidiary of Mahindra Group, acquired Reva Electric Car Company in 2012 to enter into consumer market of Electric Vehicles in India. Since then, the company has taken various strategic management decisions to ensure the viability of the product. Post the acquisition, the company revamped the car and came up with a new vehicle for consumer market named E2O.



Fig 1 (Growth of Electric Vehicles)

CURRENT METHODS:

Social Implications: In a world where climate change is one of the biggest threats globally, a substitution to fossil fuels have become a priority. The Indian government has also taken steps to encourage usage of electric vehicles giving subsidies on electric car purchases. Any change in government policy towards electric vehicles not only has an impact on EV business in India, but also on acceptability of electric vehicles as a primary source of transportation. Mahindra Electric as a company has tried to prove that a social change towards environment friendly vehicles can be taken, taking a small step towards reducing carbon footprint. A reflection of such efforts has been seen throughout the country, with various state and central government trying for electric public transport like busses, and it has been possible only because of strategic steps taken by Indian car manufacturers towards electric vehicles in India.

Expected Learning Outcomes:

Use of the strength weakness opportunity and threat (SWOT) analysis as a tool to aid strategic decision making to analyse the external factors affecting the company decision making, the political, economic, sociological and technological (PEST) analysis is performed. Porter's five competitive forces model is applied to determine the competitive intensity and attractiveness of overall industry. The impact of government policy in promoting sales of electric vehicles and the effect it had on demand for electric vehicles in India, leading to the sale of electric cars of Mahindra Electric, is also analysed in detail. Through this study we will also learn. Take over strategy used by Mahindra in getting into the electric market. How government policies have affected the sales and promotion of new technologies in electric vehicle market in India. How limitation of a resource has affected the government policy, which consequently has affected the B-to-B sales of Mahindra Electric vehicles in India. Competition faced by the company domestically by other Indian car manufacturers.

Growing EV adoption, Increasing demand for fast charging, Advancements in charging technology, Integration with renewable energy sources.

Investment Opportunities:

Venture Capital Funding for EV Startups, Private Equity Investments in EV Manufacturing, Infrastructure Investment Funds for Charging Stations, Green Bonds for Sustainable Transportation Projects, Crowdfunding for Community-Based EV Initiatives.

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International Standards:

ISO 26262 (Functional Safety in Electrical/Electronic Systems), IEC 61851 (Electric Vehicle Conductive Charging System), SAE J1772 (Electric Vehicle Conductive Charging System), IEEE 1609 (Family of Standards for Wireless Access in Vehicular Environments), ISO 15118 (Vehicle-to-Grid Communication Interface).

National Standards (India):

AIS 004 (Electric Vehicle Charging Infrastructure), AIS 038 (Electric Vehicle Safety Guidelines), IS 15644 (Electric Vehicle Conductive Charging System), IS 16179 (Electric Vehicle Battery Safety Standards), Society of Automotive Engineers (SAE) standards, International Electrotechnical Commission (IEC) standards, Institute of Electrical and Electronics Engineers (IEEE) standards, Automotive Research Association of India (ARAI) standards.

Opportunities:

Growing demand for EVs in India (projected 30% CAGR by 2025), Government initiatives (FAME II, National Electric Mobility Mission Plan Expanding to international markets

PROLOGUE

With the population of around 1.33 billion, India is the second most populous country in the world and will become the first most populous in next twenty years witnessing the current growing rate of around 1.1%. Due to urbanization and commercialization, 500 million people

will be shifting to cities by 2030. This will lead increase in the demand for mobility. Today, in the era of Fourth Industrial Revolution (Industry 4.0), world is looking forward to new and sustainable mobility solutions amidst the fast technological advancements, rising environmental concerns, increasing oil prices, energy security, climate change, global warming, and changing needs of consumers. With increasing environmental consciousness around the world, the Government of India and authorities all around the world are promoting many eco-friendly technologies for the sustainable living. The objective is to reduce the carbon footprints emanating from the country. Many small steps and new initiatives have been taken in this regard by various stakeholders of the society. To drive this change, regulation has become the prime force. Ranging from energy audits to star-based labelling, the regulations enforced by the Government could be witnessed everywhere. Agreement on Climate change in Copenhagen is also one of the active moves in the same direction. 'Urban Renewal' programme is undertaken to emphasize on the need of energy efficiency and incentives are given to urban transport authorities for application. National Solar Mission and many other such initiatives are encouraging the use of renewable energy sources keeping in mind the alarming levels of pollution. Indian corporations have thus started focusing on energy efficiency. The automobile sector has now concentrated their manufacturing in producing electric vehicles and traditional companies based on internal combustion engines are buying smaller electric vehicle companies.

INDUSTRY SCENARIO

India stands on the fourth position with respect to the automobile industry. It will become third largest by 2021. The present contribution of automobile industry in Gross Domestic Product of India is 7.1%. Keeping in mind the sustainability criteria, it has become very important to develop an efficient public and personal transport system in the country. The technological advancement is leading to the disruption in the global automotive industry. Digitization, automation and new businesses model is revolutionizing the industry.

COMPANY PROFILE

The pioneer of EV technology in India is Mahindra Electric Mobility Limited. "They acquired a majority stake in the Reva Electric Car Company in 2010 to advance the design and production of electric cars worldwide. By integrating Reva's electric car technology with their own leading engineering, they build higher performance electric vehicles that satisfy customers' demand both for better lifestyles and a healthy environment. At Mahindra REVA,

they are constantly seeking solutions to issues that range from the kind of products that will define the future and the technologies that will go into these vehicles to the intelligence that these vehicles will possess and the way they will be manufactured. These questions are shaping their vision of the Future of Mobility. The advanced vehicles of the future will not only offer unmatched features, safety, and convenience. They will also be clever and environmentally friendly. The increasing fusion of electronics and IT with automotive technologies will give rise to vehicles with advanced intelligence and connectivity. Other developments in distribution models, financing options, flexible ownership models, personalization of vehicles and greater choices across the ecosystem will further alter the entire experience of interacting with the mobility ecosystem.

As a total systems solution provider, they develop all our Electric Vehicle (EV) systems in-house and are pushing EV technology to the next step to create better energy management, faster charging, and advanced telematics. The company offers innovative electric vehicles and mobility solutions, technology licensing, and licensed manufacturing and distribution. They are well established as a major global player with the largest deployed fleet of electric cars on the road today. They have sold around 1,800 electric vehicles in Europe, and more than 1,700 are on the road across Asia and Central and South America. In total, they are present in 24 countries worldwide and growing. The Mahindra Group's manufacturing expertise and wide global distribution network will help Mahindra Reva scale up production and spread green technology across the globe. In 2012, they inaugurated a new plant in Bangalore, with the capacity to build 30,000 vehicles per year. In keeping with their commitment to clean technology, the plant received a Platinum rating from Indian Green Building Council (IGBC). The new facility harvests rainwater, uses natural light and ventilation, and harnesses solar energy for electricity and heating. With this clean manufacturing process of clean vehicles and a battery recycling program, their electric cars aim to have the lowest dust-to-dirt carbon footprints in the automotive world. In 2007, Reva was named one of India's Coolest Companies by Business Today. They received the 2008 Frost and

Sullivan Powertrain Company of the Year award for excellent sales volume, A STEP TOWARDS SUSTAINABLE GROWTH: CASE STUDY ON MAHINDRA ELECTRIC MOBILITY Journal for all Subjects: www.lbp.world 5 market penetration, and customer satisfaction. And in 2009, Business Week voted our founder and Chief Technology Officer, Chetan Maini, one of India's top 50 most influential people. In 2010, the Reva-i was crowned Car of the Year at the Overdrive & CNBC TV 18 awards. In 2013, they were named amongst

the Top 50 most innovative companies in the world by Fast Company”. In 2016, the company rebranded as Mahindra Electric Mobility Limited with the intention to reflect not just the business line of producing vehicles but also developing power train and integrated mobility solutions.

THE PESTEL ANALYSIS OF MAHINDRA AND MAHINDRA MOBILITY LIMITED

The company is facing new challenges in promoting and increasing the sales of its electric vehicles. The PESTEL analysis will help company to analyse its macro environment. It will also give insights about the factors favouring its growth and which are unfavourable for its growth. It comprises of political, economic, social, technological, environmental and legal factors surrounding the company and affecting it. Political Factors: The political factors consist of the government’s role in encouraging the growth of electric vehicles in India and influencing Mahindra Electric. It includes subsidies, grants and funding initiatives given to the company. The various initiatives taken by the government as discussed earlier are pro to the company’s growth. Government is also giving tenders to the company to produce the electric vehicles. Still, the incentives for the company to manufacture and sell EVs are still less as compared internationally. Economic Factors: These factors indicate the overall economic position of the country, industry and the company. Currently, it is still not very conducive for the growth of the company. Sales of the company are not increasing at very high speed. The purchase price of the vehicle is one of the main challenges for penetration. Social Factors: These are related to the attitude of the consumer towards Mahindra Electric. There is still lack of awareness about the electric vehicles in India. Consumers even if are willing to purchase the car are unable to because of high prices compared to the conventional vehicles. There is also perception of range anxiety among the consumers. Technological Factors: These consists of the innovation and technological advancements influencing the company. To make electric vehicles cost effective, the company will need to focus more on research and development and innovation. conventional vehicles (greater than 600 kms). There is lack of effective charging infrastructure. The cost of battery is too high. The technology advancement can only help in.

Legal Factors:

These factors consist of the various legislation of the country to support the initiatives taken by the company. The National Electric Mobility Mission Plan (NEMMP) 2020 was launched by the Central Government in 2013 to boost the manufacture of hybrid and electric vehicles in India and aims to achieve production of seven million electric vehicles by 2020.

This initiative has been complemented by the Government providing demand-side incentives through its Faster Adoption & Manufacturing of Hybrid and Electric Vehicles in India (FAME) scheme. Still,

Liquidity: The company's liquidity position has improved in the last 5 years as shown by increase in current ratio, from 0.67x in FY 2014 to 1.64x in FY 2018. However, in relation to FY 2017 the company liquidity position in FY 2018 has almost remain constant and in fact its quick ratio has declined to 0.54x in FY 2018. The company's cash position is lowest in FY 2018 Rs. 563 Lac.

Volatility: The revenue of the company has remained volatile and shows increasing trend despite the nationwide decrease in demand for automobiles which is a positive sign. The company has been under the losses from last 5 years and by the income statement it can be interpreted the company needs to control its indirect cost to attain profitable figure while Mahindra & Mahindra's (M&M) stock price has exhibited significant volatility over the years. The company's shares have been sensitive to various factors such as global economic trends, government policies, and industry-specific challenges. For instance, during the 2020 COVID-19 pandemic, M&M's stock price plummeted by over 50% due to disruptions in global supply chains and a decline in demand for automobiles. However, the stock recovered sharply in 2021, driven by a rebound in demand and the company's efforts to expand its electric vehicle offerings. Additionally, M&M's stock price has also been influenced by the company's quarterly earnings results.



Fig 2 (electric vehicle manufacture)

TABLE 1: CLASSIFICATION OF FIXED COST AND VARIABLE COST OF MAHINDRA ELECTRIC MOBILITY LTD

Fixed Cost	Variable Cost
Employee benefit expense	Cost of material consumed
Finance cost	Purchases of stock in trade
Depreciation and amortization	Power and fuel
Rent, rates and taxes	Freight and forwarding charges
Insurance repair and maintenance	Excise duty on finished goods
Advertising and sales promotion	Sub-contracting expense
Legal and professional fees	Travelling and conveyance/Sales promotion
Payment to auditor	Communication costs
Provision for doubtful debts advances	
Miscellaneous and other expense	

Break-Even Analysis and Margin of safety: Break-even sales: The break-even sales is that level of sales at which the firm is situation of no profit no loss. At BES the firm's contribution is equal to its fixed cost. It can be calculated as: $BES \text{ (in units)} = \frac{\text{Total fixed cost}}{\text{Contribution per unit}}$ Or, $BES \text{ (in currency)} = \frac{\text{Total fixed cost}}{CMR}$ Margin of safety: It is the additional buffer of sale over and above breakeven sale. It is that level of sales till which the actual sales can fall before the profit becomes zero. $\text{Margin of Safety (in currency)} = \text{Actual sales} - \text{Break even sales}$



Fig 3 (Mahindra electric vehicle Logo)

CONCLUSION

Even after a lot of strategic decisions taken by company, the company is not able to achieve even the breakeven and is incurring losses. Revamping old model and launching of new models has also not led to substantial increase in its sales over five years. Still the company is spending and promoting the manufacture of electric vehicles is due its strong future vision of Shared and electric mobility. As government is increasing the incentives for the company such as reducing the rate of GST on electric vehicles from 12 to 5%, it is obviously going to be beneficial for the company. But in the price sensitive market of India, making EVs viable take more efforts. Constraints such as range anxiety, current infrastructure, high prices, battery package, and incentives to buy are major hurdles in adaption of electric vehicles in India. Effective charging spots, discounted or free parking, redesigning of urban infrastructure are prerequisites. The role of government is of utmost importance for both manufacturers and consumers. Government should provide more incentives to automobile companies to manufacture EVs at a greater scale and make consumers aware of its importance to use them. A proper policy framework needs to be developed. Research and development should be increased by the company. For successful implementation of mission, there needs to be a collective effort from different stakeholders. Skilled labour force is also required for manufacturing EVs. Mahindra Electric is sacrificing profits presently but the future prospects of the company are very bright even if its car is not moving yet.

REFERENCES

- 1) Newell, Richard, Daniel Raimi, and Gloria Aldana. "Global energy outlook 2019: the next generation of energy." *Resources for the Future* 1, no. 8 (2019).
- 2) Kumar, Ravi, Kuldeep Lamba, and Avinash Raman. "Role of zero emission vehicles in sustainable transformation of the Indian automobile industry." *Research in transportation economics* 90 (2021): 101064.
- 3) Bathla, Devesh, Shraddha Awasthi, and Raina Ahuja. "PESTEL Analysis of the Automotive Industry." *Applying Metallica to Measure Customer Experience in the Metaverse*. IGI Global, 2022. 143-160.
- 4) Hasan, Juweria. "Sustainable Business Practices in Automobile Companies, India—A Comprehensive Study." *DIVERSITY, EQUITY AND INCLUSION*. Routledge 381-394.
- 5) Desai, Hardik Bharathi. *Study on the Automotive Car Industry in India: scenario analysis and new future Business models*. Diss. Polytechnic di Torino, 2020.
- 6) Ravi, K., and P. Naveen Charan. "Scenario Analysis and New Future Business Models for the Indian Automotive Industry." *International Conference on Advancement in Manufacturing Engineering*. Singapore: Springer Nature Singapore, 2022.
- 7) Jahan, Tahsin. "Challenges and prospects of assessment development centre." (2022).