

Powering The Future A Vision For Electric Mobility

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Abstract

The study in this paper is to enhance the existing body of literature on Electric Vehicles by organizing current knowledge and extrapolating specific implications for future research. This study particularly scrutinizes the rationale behind investments in Electric Vehicles and addresses inquiries concerning their utility, as well as the advantages and drawbacks associated with their usage. It endeavors to evaluate Electric Vehicles as a viable investment opportunity or as vehicles for divestment. The literature review highlights predominant models that center on consumer preferences for Electric Vehicle purchases, with a focus on cost minimization. Additionally, this paper delves into essential considerations driving consumers to opt for electric vehicles, primarily their reduced environmental impact when compared to conventional fuel-powered vehicles. Furthermore, the paper underscores the significance of government initiatives and policies in fostering consumer decisions related to the purchase of electric vehicles.

Keywords: *Electric Vehicles, Environmental Impact, Government Policies.*

Introduction

The global automobile industry plays a pivotal role in the world economy. However, the competitive dynamics within this industry are significantly influenced by the uncertainties surrounding climate change policies (Al-Alawi, B.M., & Bradley, T.H. 2013; Bastida-Molina, P., Hurtado-Pérez, E., Peñalvo-López, E., & Moros-Gómez, M.C. 2020) The escalating CO2 emissions from conventional vehicles have reached alarming levels. In light of swiftly advancing technologies and evolving business models, it is imperative to explore innovative and substantially different approaches to deliver clean, cost-efficient, and safe mobility services (Alarfaj, A.F., Griffin, W.M., & Samaras. 2020; Cai, H., & Xu, M. 2013). These approaches should also generate employment opportunities, diminish reliance on oil imports, and optimize urban land utilization while minimizing environmental impacts and health hazards. India, a rapidly advancing nation, stands at a critical juncture to make such a transition towards novel mobility solutions. There is an urgent need to mitigate CO2 emissions from vehicles, potentially by embracing eco-friendly alternatives such as electric vehicles. India, ranking as the fourth largest automobile market, witnesses an annual sale of approximately 3.5 million

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passenger vehicle units (Bennett, R., Kottasz, R., & Shaw, S. 2016; Doucette, R.T., & McCulloch, M.D. 2011).

The nation's advantageous factors include a youthful demographic, a cost-effective labor force, and a strong foothold in digital technology (Canepa, K., Hardman, S., & Tal, G. 2019). Notably, passenger vehicles constitute roughly 16% of the total vehicles in circulation, while two-wheelers account for 76%, with the remaining portion shared between three-wheelers and commercial vehicles. Recent years have witnessed a significant shift in the competitive dynamics of the automobile industry due to heightened uncertainties surrounding climate change policies. (Hoekstra, A., Vijayashankar, A., & Sundrani, V.L. 2017). This transformation underscores the pivotal role that companies can assume in mitigating global CO₂ emissions through innovative technological advancements. Given the intricate nature of innovation within this sector, which stems from its interplay with market forces, this study embraces a socio-techno-economic transition perspective (Krugger, J. 1993). Its aim is to elucidate the types of technological innovations pursued by automobile companies to reduce CO₂ emissions from their products amidst a period of regulatory ambiguity.

Literature Review

This paper is grounded in a comprehensive review of peer-reviewed journals focusing on Electric Vehicles (EVs). The research extensively incorporates literature on EVs and zero-emission vehicles from diverse databases, including Emerald, EBSCO, Science Direct, Elsevier, JSTOR, and Google Scholar. The search yielded a pool of over 40 papers spanning the period 2009-2022, incorporating terms such as Electric Vehicle (EVs), Electric car, and Electric vehicle charging station, complimentary mobility services, Total Cost of Ownership, Cost of Minimization, and zero emission. Subsequently, 33 papers aligned with our research scope were meticulously selected for in-depth examination (Franzò, S., Nasca, A., & Chiesa, V. 2022; Javid, R.J., & Nejat, A. 2017; and Wu, G., Inderbitzin, A., & Bening, C. 2015). Each of the chosen papers underwent a thorough analysis of variables, methodologies, and findings. In addition, this paper delves into government initiatives and policies, drawing upon authoritative sources such as NITI AAYOG reports, Ministry of Power reports on electric vehicles for environmental sustainability, government policies for the auto sector, and Bureau of Energy Efficiency reports. Furthermore, the paper explores diverse models for profit maximization and cost minimization specific to electric vehicles (Ghamami, M., Kavianipour, M., Zockaie, A., Hohnstadt, L.R., & Ouyang, Y. 2020; Jenn, A., Lee, J.H., Hardman, S., & Tal, G. 2020). Significant contributions to the field of electric vehicles have been made by numerous authors. The early success of these products can be attributed to three key factors which are buyer inclinations, energy efficiency of items, and Governmental directive. Eco-conscious consumers, known as eco-consumers, have emerged as influential early adopters of environmentally friendly products (Doucette, R.T., & McCulloch, M.D. 2011; Wu, Y.-C., & Kontou, E. 2022). However, it's important to note that eco-consumers constitute a minority among automobile consumers, as the majority still prioritize vehicle cost. (Narassimhan, E., & Johnson, C. 2018; Yi, H., & Feiock, R.C. 2020). Companies, as opposed to households, tend to accurately assess these costs. Additionally, eco-innovations often receive support via Governmental directive. Authorities have implemented various policies to promote their adoption, including grants to manufacturers, subsidies to consumers, as well as requirements for their manufacturing. The unregulated charging patterns of extensive electric vehicle fleets can exert profound repercussions on the distribution grid. Addressing the concurrent challenges of accommodating massive filling and discharge of electrical automobiles while ensuring the power grid's safe functioning has garnered significant study attention in recent years. In line with this research direction (Cai, H., & Xu, M. 2013; Jenn, A., Lee, J.H., Hardman, S., & Tal,

G. 2020) introduced a systematic filling and discharge scheduling model for electric automobiles. Developed an ideal scheduling plan by using relaxation methods and second-order cone transformation in this model.

Indian EV Policy Framework

In support of fostering the adoption of battery-operated vehicles within the nation, the central authority has implemented a series of advertising initiatives over the past decade. These measures encompass monetary rewards for EV proprietors, the expansion of the general public EV charging infrastructure, and similar endeavors. The Ministry of Heavy Industries (DHI) launched India's main programme for increasing electric mobility in 2015: the quicker adoption and production of Composite and Electric Vehicles (Bennett, R., Kottasz, R., & Shaw, S. 2016; Franzò, S., Nasca, A., & Chiesa, V. 2022; and Kruger, J. 1993). FAME-II is now in its second phase. It will be implemented over a period of three years, starting on the first of April, 2019, and has a budget of 10,000 crores, of which 366 crores are carryover from FAME-I. A phased production plan has been developed to support the development of electric car manufacturing and the progress of electric mobility. This roadmap considers the existing state of the manufacturing ecosystem within the nation. It is a methodical process wherein an organised duty structure would gradually support the local production of electric cars, including their meetings, sub-assemblies, components, and supplies (Canepa, K., Hardman, S., & Tal, G. 2019; Ghamami, M., Kaviani-pour, M., Zockaie, A., Hohnstadt, L.R., & Ouyang, Y. 2020). The primary goal is to significantly increase value creation and capacity building in the nation.

Implementing tactics to achieve revolutionary mobility and starting phased production programmes for electric cars, their parts, and cells are the goals of the mission. The mission comprises many essential responsibilities, plan elements, and anticipated outcomes:

Various Roles:

- Formulate strategies to facilitate revolutionary technology and staged production plans for battery packs, electric vehicle parts, and electric vehicles.
- Develop a staged production process programme (PMP) designed to localise manufacture over the whole process of automobiles powered by electricity.
- The goal will use a unique "Developed in India" strategy for batteries and other electric car parts. determine the specifics of localization.

The Initiative will work with important state, department, and ministry partners to combine several projects to alter India's mobility landscape.

State Government EV Policies

The policies encompass various measures, including specific targets for electric vehicles (EVs, such as Kerala's goal of a million automobiles powered by electricity by 2023 and 7,000 e-buses by 2024), exempt from registration fees and road taxes (Andhra Pradesh offering complete refund up to 2024), support for the purchase and functioning of public transport vehicles during the viability gap, including exemptions from tolls, Fleet drivers may get free permissions and parking. Other measures include lower GST charges and zero-interest loans for Original Equipment Manufacturers (OEMs) in Karnataka, the establishment of outlets for charging, no cost or charge waivers in Gujarat, the promotion of EV charging Using green and solar energy sources in Madhya Pradesh, permitting gasoline stations in Maharashtra to set up

electric vehicle (EV) charging stations, promoting charging stations for electric vehicles in business and apartment buildings, and providing further incentives for scrapping old vehicles in Delhi (Bastida-Molina, P., Hurtado-Pérez, E., Peñalvo-López, E., & Moros-Gómez, M.C. 2020; Franzò, S., Nasca, A., & Chiesa, V. (2022), Narassimhan, E., & Johnson, C. (2018), Wu, Y.-C., & Kontou, E. 2022).

Additionally, Uttar Pradesh aims to provide single-window approval for the construction of battery disposal plants and EV production facilities. Domestic manufacturers may get supply-side incentives via the Production-Linked Incentive (PLI) programme, which is based on their additional income. It aims to attract foreign companies to establish manufacturers in India and promote the establishment of new factories or the expansion of existing ones by local businesses. Implemented on April 1, 2020, the PLI scheme was designed to provide financial incentives to promote domestic manufacturing of mobile phones and certain electrical parts. A 4-6% bonus on sales growth beyond the starting year of 2019–2020 was given to qualified enterprises. This incentive was available for five years after the base year. Notably, Under the PLI programme, businesses including Dixon Technologies, Wistron, and Foxconn have already started contract manufacturing.

Consequently, India now ranks second in the world for mobile phone manufacturing, behind only China. In addition, the Indian government lowered the income tax rate to 17% for newly established manufacturing businesses, which is a positive change from the 25% rate that applies to other businesses.

Conclusion and Future Scope

The paper extensively examines government policies and various models employed to calculate the total cost and profit maximization associated with electric vehicle utilization. The determination of costs and profits depends on the specific variables utilized in these calculations. The ongoing debate regarding whether electric vehicles should be considered an investment opportunity or an imprudent expense is a topic of significant discussion. Electric vehicles offer notable benefits to the environment due to their zero-emission nature, presenting a compelling case for their adoption as a sustainable transportation solution. However, their acceptance as a novel technology among the general populace has not progressed as optimally as expected. Despite concerted government efforts to encourage widespread electric vehicle usage through subsidies and purchase rebates, the question of whether investing in electric vehicles is a prudent decision remains subject to time's verdict. The forthcoming decade holds the potential to be a transformative period in the electric vehicle market. The segment is experiencing exponential growth, indicating that investments made in electric vehicles today are poised to yield substantial returns in the future. This evolutionary shift positions electric vehicles as a promising and worthwhile investment option, with the potential for significant profitability.

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