



A study of Concept of e vehicles in India

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Abstract

As the world's oil reserves deplete, several researchers are looking at alternative energy sources for hybrid cars. There is growing worry about the negative impacts of driving with fossil fuel. Battery, fuel cell (FC), super capacitor (SC), and photovoltaic cell (solar) are only some of the alternative energy sources being researched for use in automobiles. The future generation of transportation may use hybrid electric vehicles (HEVs) that draw power from a combination of various renewable energy sources. This paper delves into the many facets of HEVs, including their EMS, power conditioning, and propulsion systems. HEV also encompasses disciplines such as DC machine and vehicle system. The simulation and experimentation-based type models and techniques are described in depth. This table, along with the cited sources, summarizes the performance of different HEV system combinations. Diverse hybrid electric vehicle sources, models, energy management systems (EMS), etc., from various researchers are surveyed in this work. Based on this comprehensive analysis, it is clear that current technologies have the potential to provide satisfactory HEV performance; nevertheless, improvements are needed in areas such as dependability and intelligent systems. Consequently, many factors, challenges, and problems related to creating a sustainable next-generation hybrid vehicle have been brought to light in this review.

Key Words

Electric Vehicle, Attitude, Economic Benefit, Environmental Concern, Social Influence, Self-image, Behavioural Intention

Introduction

After more than a century, the car industry is getting ready for a major overhaul. The recent increase in the price of fossil fuels and the environmental damage caused by their emissions have made it necessary for people to alter the ways in which they travel. Internal combustion engines drive the industry for the time being, but the shift to electric cars is slow (EVs). Electric



vehicles (EVs) are propelled by electric motors and include a portable energy storage device such as a rechargeable battery to keep the electricity going. These automobiles are quieter and produce less emissions of harmful gases than their counterparts. Both economically and in terms of R&D investment, the automobile industry has risen to prominence as one of the world's leading sectors. Each year, more and more technology additions are made to automobiles in an effort to make traveling in them and crossing the street safer. In addition, there are more cars on the road, so we can go swiftly and easily. But this has led to a significant rise in urban air pollution (including PM, NOX, CO, SO₂, and other pollutants). Road transportation is responsible for over 70% of transport sector emissions, and the transportation sector as a whole is responsible for nearly 28% of total carbon dioxide (CO₂) emissions, as reported by the European Union. Consequently, most developed-world governments are pushing for the adoption of EVs as a means to reduce emissions of harmful chemicals like carbon monoxide and other greenhouse gases. In particular, they provide special measures like free public parking and free use of highways to encourage environmentally friendly and economically viable modes of transportation. Compared to conventional cars, electric ones have the following benefits:

- They produce no exhaust emissions, which means they are completely pollution-free (NO₂). And while if making batteries has a negative impact on carbon footprint, the manufacturing methods themselves are generally more environmentally friendly.
- The engine components of an EV are simpler and fewer in number, which results in lower costs and easier upkeep. The engines may function without a cooling circuit, making them smaller and easier to transport. Additionally, a gearshift, clutch, or noise-cancelling components are unnecessary additions.
- As a result of having fewer and simpler parts, these automobiles are more reliable. In addition, electric vehicles are not subject to the deterioration that occurs as a result of engine explosions, vibrations, or fuel corrosion.
- When compared to the upkeep and fuel requirements of conventional internal combustion cars, the costs associated with electric vehicles are far more manageable. Electric cars have a far lower cost of operation per mile than their conventional counterparts.
- Traveling in an EV is more relaxing because of the lack of engine noise and vibrations.

Existing EV-Related Surveys

Several factors relating to the manufacturing, implementation, and marketing of electric cars have advanced considerably during the last decade. There has been an uptick in both research



and associated job postings and policy suggestions for electric cars. Here we offer a brief summary of the most important issues surrounding EVs that have been discussed in the existing body of literature. The most obvious deviations from this survey are also underlined. There have been a number of reports written on electric cars; some of them examine broad topics like the history of the technology, while others classify vehicles into categories based on their design and the specs of their motors, or assess how they will affect the electrical grid. Example: Yong et al. discuss the development of EVs from the mid-19th century up till the current day. They also sort automobiles according to the configurations of their powertrains. Finally, their research investigates how charging EVs affects the power system. Richardson, like others, investigates how electric vehicles (EVs) may alter the necessary levels of productivity, efficiency, and capacity in the nation's electrical grid. In addition, he examines electric cars' effects on the economy and the environment. Habib et al. provide an overview of electric car charging techniques and assess how they affect electricity grids. “The authors also evaluate simultaneous and asynchronous charging, as well as delayed loading and strategic charging. Finally, they analyze the financial returns of V2G technology in relation to different pricing strategies.

The integration of renewable energy sources (such as wind power, solar power, and biomass) into the realm of electric cars is another topic that has been explored in several publications. In their paper, Liu et al. provide an overarching perspective on the future of electric cars and clean energy. They zero in on solar and wind power and present a collection of works that can be broken down into three groups: (i) those that investigate the synergy between electric vehicles and renewable energy sources to cut down on energy costs; (ii) those that seek to boost energy efficiency; and (iii) those that seek to curb emissions. In contrast, Hawkins et al. review the research done on the subject of how HEVs and BEVs affect the environment thus far (BEVs). As evidence, they provide a study of 51 environmental assessments conducted during the cars' lifetimes (i.e., BEVs and HEVs). The writers include a wide range of factors, including greenhouse gas emissions, power generation, transmission, and distribution, car manufacturing, battery development, and service life, among others, in their study. Based on their findings, Vasant et al. argue that more plug-in hybrid electric vehicle (PHEV) infrastructure may be implemented with the help of daytime charging stations, as well as charging control and management systems. The novel economic model present in electric cars is considered by Shuai et al., taking into account both one-way and two-way energy flows, in a way that has not been done before (in which the EVs themselves are capable of providing



energy to the electric grid). In order to achieve this, they examine many varieties of EV charging stations, as well as several unidirectional charging and bidirectional energy commercialization strategies. Finally, they investigate the possibility of using these vehicles to store energy produced from renewable sources.

Review of literature

(Giridhar, 2015) studied Interpretive Structural Modeling Approach for Development of Electric Vehicle Market in India discovered, and Because of revolutionary shifts in IT and rising living standards brought about by the people of India, the automotive sector has been booming over the last several years. Crude oil, natural gas, fossil fuels, etc. are all feeling the heat as the rising market puts more demand on them. The supply and demand curves are starting to intersect, and things might become worse if something isn't done to replace the current catastrophe. One of the supplementary answers to the problems is the Electric Vehicle (EV). However, India's EV industry is still in its early stages when compared to that of industrialized and growing nations. The development of India's market for electric vehicles is influenced by several variables. Using an Interpretive Structural Model, this article explores the most important drivers for the growth of India's electric vehicle industry (ISM).

(Hannan et al., 2014) studied Hybrid electric vehicles and their challenges: A review” discovered, and In order to replace the depleting supply of petroleum globally, several researchers are looking at using hybrid cars to harness other energy sources. The increasing negative impacts on the environment from cars running on fossil fuels are a growing cause for worry. Battery, fuel cell (FC), super capacitor (SC), and photovoltaic cell (solar) are among the alternative energy sources being researched for use in vehicles. The future generation of transportation might use HEVs powered by combinations of these renewable resources. This research delves into the many facets of HEVs, including their energy management systems (EMS), power conditioning systems, and propulsion systems. It also encompasses DC machines and vehicle systems, both of which are closely connected to HEV. The simulation and experimentation-based type models and techniques are described in depth. In the table below, we describe the performances of HEV system combinations with supporting references. Diverse hybrid electric vehicle sources, models, energy management systems (EMS), etc., from various researchers are surveyed in this work. Based on the comprehensive analysis, it is clear that current technologies have the potential to perform HEV successfully; nevertheless, improvements are needed in areas such as dependability and intelligent systems. So many



aspects, obstacles, and concerns related to creating a sustainable next-generation hybrid car have been brought to light in this research.

(Khurana et al., 2020) studied “A Study on the Adoption of Electric Vehicles in India: The Mediating Role of Attitude” discovered, and Environmental pollution is a major problem all around the world right now. One of the most common sources of air pollution is the burning of fossil fuels, which produces toxic emissions. Globally, the promotion of electric vehicles (EVs) has picked up steam as a means to reduce the harm caused by the burning of fossil fuels and address environmental concerns (ECs). Several countries are offering financial incentives to citizens who make the move to EVs. As has been shown in previous research, there are a number of barriers to the widespread use of electric vehicles, including the high purchase price, the lack of convenient charging stations, and concerns about travel time and battery life. As of the year 2030, the government of India has mandated that only electric vehicles may be driven on public roads. This up-to-date article dissects the many variables that influence a consumer's decision to purchase an EV. Participants in the survey are actual Indian automobile owners. Structured Equation Modelling was used to do the data analysis (SEM). One of the most influential factors in people buying electric vehicles is their attitude, or ATT.

(Tu & Yang, 2019) studied “Key Factors Influencing Consumers’ Purchase of Electric Vehicles” discovered, and While global economic and technological development have undoubtedly pushed human civilization forward, they have also severely damaged the world's natural ecosystems. Therefore, people are giving considerable consideration to environmental sustainability. Using automobiles powered by alternative fuels is one way to combat environmental degradation. The General Office of the State Council of China has set a policy of pure electric driving technology since the publication of the "Energy Saving and New Energy Vehicle Industry Development Plan (2012-2020)". China now boasts the world's biggest electric car market thanks to its booming EV industry. As a result, studying China's EV landscape is crucial and may serve as a useful benchmark for nations throughout the world. Therefore, it is of utmost importance to create eco-friendly, energy-efficient, and smart electric automobiles. Using the theory of planned behavior (TPB), the technological acceptance model (TAM), and the innovation diffusion theory (IDT), this research examines the critical elements affecting customers' decision to acquire electric automobiles. The findings support the conclusion that the main factor model developed for this research may successfully predict customers' intentions to buy electric vehicles. Results from a structural equation modeling (SEM) analysis show that (1) consumers' ability to acquire the funds necessary to buy electric



vehicles has the greatest impact on their intention to make such a purchase, while (2) consumers' willingness to consider the advice of those in their social networks also has a substantial impact on their behavioral intention to buy an EV. Consumers' environmental consciousness and openness to new technologies also have a role in shaping their intentions for future actions. A more positive attitude toward the purchase of electric vehicles can be inferred from (2) when consumers believe that electric vehicles are more beneficial at the individual, environmental, or national level, or when consumers believe that the usage of electric vehicles is simpler and more convenient. Consumers see electric cars as innovative technologies that are just as convenient to use and affordable to use as conventional automobiles. Thirdly, about rules: Buyers of electric vehicles are not influenced by the views of their friends, family, coworkers, or superiors. Consumers' choice and purchase of electric cars may be informed by the elements that influence their decision to buy, which in turn can inform the design and development of electric vehicles that better meet customer desires. Therefore, in order to attract customers and support the sustainable growth of the car sector, the government and relevant manufacturers should think about expanding the visibility of electric vehicles and launching more attractive battery and charging programs.

(Mishra et al., 2021) studied “A Comprehensive Review on Developments in Electric Vehicle Charging Station Infrastructure and Present Scenario of India” discovered, and The global transportation industry is undergoing a period of transition, moving from cars powered by traditional fossil fuels to vehicles with zero or ultra-low exhaust emissions. It will need information technology (IT), smart distributed energy producing units, supportive government regulations, and a well-established network of charging stations (CS) to facilitate this shift. The purpose of this article is to discuss the most important considerations when making plans for electric vehicle charging station infrastructure. To better the design and effective operation of charging station infrastructure, the paper also gives key insights and improvements in planning and technology issues. The article discusses the current situation in India as it relates to the expansion of EV charging stations. This work is unique in that it gives a critical analysis of the research and advances in the charging station infrastructure, the challenges connected with it, and the efforts that are now going into standardizing it to aid researchers in addressing these issues.

Conclusions

A consumer's environmental consciousness and openness to new technologies also play a role in shaping their intentions for future actions. Developments in the area of EVs and associated



charging infrastructure are being pushed forward in large part due to the rapidly dwindling fossil fuels and rising environmental concerns. New and fast EV charging infrastructure that can reduce EV charging times, increased utilization of available renewable energies for EV charging, reduced reliance on the grid for EV charging, and the optimal location of charging stations have all emerged as primary research interests in recent years. While the studies do a good job of tackling the issue of how to get electric vehicles and renewable energy to work together to cut down on emissions, there are still some questions about how to build an EVCS infrastructure that is really environmentally responsible. It might lead to further land acquisition, deforestation, etc., all of which would exacerbate the existing issues. Developing EVCS using already-existing infrastructure like parking lots at companies, shopping malls, etc., is one way to deal with this problem. In addition, purchasing the existing filling station and retrofitting it to accommodate EVCS. The reasoning behind this is that it will be more lucrative to convert existing gas stations into EVCSs as the need for gasoline, diesel, and other fuels at the filling station declines with the rise in the number of EVs and their charging needs.

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