PESTEL and Porter's Five Forces Analysis of Automotive Industry: Growth and Advancements in the Lithium-Ion Battery

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Executive Summary

The automotive industry came to electric and greener mobility solutions in the 20th century. However, due to real-world applications of the electric vehicle being impractical, the idea was not able to grow and develop. In recent times, environmental awareness regarding ecological issues like air pollution and health scares due to carbon emissions from combustion engine vehicles has again caused a shift in the automotive industry towards electric vehicles. The practical implications of electric vehicles were different, in this instance, due to the advancements made in the field of electric energy storage units. The lithium-ion batteries are the prime form of battery development in the electric vehicle industry. The advancements within lithium-ion model have led to complete implementation of electric vehicle model exponentially. This report incorporates the PESTEL analysis and Porter's Five Forces analysis of the automotive industry in the light of battery advancements made in the form of lithium-ion batteries. The analysis is conducted to gauge the external environmental factors and industry variables related to the automotive industry and lithium-ion advancements. The analysis yields the meaningful conclusion that the industry is ripe for growth in terms of the electric vehicle model and lithium-ion implications. The external environmental variables and industry factors complement the growth of lithium-ion model comprehensively. The study makes meaningful recommendations for the future advancements in the automotive industry with the help of technological and process progressions within the lithium-ion model.

Contents

1. Introduction

The automotive industry globally has gone through immense technological advancements. The concern regarding environmental issues has caused a significant shift in the automotive industry (Calabrese, 2016). The automotive industry is currently undergoing one of the significant paradigms shifts of this specific industry in a long time. Battery advancements and battery's practical applications were the initial hindrances in the 20th century for the electric car industry. The road to lithium-ion batteries has witnessed considerable progression in mileage and overall efficiency of electric vehicles (Sun et al. 2019). The lithium-ion batteries can deliver fast charging, better efficiency and mileage as compared to the previous battery forms. This report aims to assess the automotive industry in the light of lithium-ion advancements with the help of PESTEL and Porter's Five Forces analysis.

2. PESTLE Analysis

This pestle analysis is conducted in light of the global lithium-ion battery progressions and its effect on the automotive industry. Pestle analysis aims to analyse the effects and also examine the opportunities (Helveston et al. 2017), that the lithium-ion battery advancements present to the automotive industry.

2.1. Political Factors

The governments all around the world have imposed certain legislative restrictions on manufacturing operations of the automotive industry due to the safety concerns associated with vehicles. The political factors, regarding safety concerns, complement the electric car industry (Chen, 2017). The safety of the electric vehicles and lithium-ion batteries make them a perfect fit for the legislative restrictions politically. Governments further have to comply with the environmental standards set by international legislative organisations. The development and growth of the electric car industry can help governments comply with the international standards set for environmental awareness. National Ambient Air Quality Standards (NAAQS) and National Emission Standards for Hazardous Air Pollutants (NESHAP) are two of the major legislative frameworks which are enforced internationally to preserve the outside air. These governmental and legislative frameworks and much more similar to them have become critical for the governments to incorporate into their legislative and environmental standards. In this aspect, the ecological footprint of the lithium-ion battery is minimal and close to zero when compared to the combustion engine, diesel, petrol and gasoline-based vehicles. The governments' contributions to the development of the industry have been immense. The Chinese government has already contributed a major $60bn to the

electric car industry and the battery advancements in this regard (Digalwar and Giridhar, 2015).

2.2. Economic Factors

The economic impact of the growth of lithium-ion batteries can be studied in two ways. The lithium-ion batteries are generally cost-efficient. The price of these batteries, even for the electric car developers is very low. The consumer price for these batteries also results in cost-effective mobility solutions. This cost efficiency has seen the electric car industry grow 30% in the year 2017 and 2018 (Ballinger et al. 2019). Research has found out that lithium-ion battery can provide an improved mileage over diesel and petrol-based vehicles. The relative mileage calculations have shown that lithium-ion batteries are 25-40% more energy-efficient as compared to combustion engine solutions (Verma et al. 2018). Fuel and energy efficiency, in this regard, is another significant economic factor complemented by lithium-ion batteries in electric vehicles. The investments made in this regard by the governments are highly critical and impact the overall automotive industry and its growth in a massive way.

2.3. Social Factors

The social factors complement the lithium-ion batteries and the overall electric vehicle model in the 21st century more than ever (Vaughan and Gibbs, 2019). Ecological awareness and the tendency to do actions regarding environmental issues is critically high at this time. It is now becoming a social norm or a social value around cultures and societies to be environmentally aware and live environmentally responsible lives (Ou et al. 2018). The lithium-ion battery advancements and the use of lithium-ion batteries in modern-day cars complement the socially acceptable way of living an environmentally responsible lifestyle. Lower carbon emissions, increasing usage of renewable energy as a source for battery charging and overall non-existent or minimal ecological footprint makes the usage of lithium-ion batteries socially more acceptable (Bloomberg, 2019). According to a recent estimation, lithium-ion battery will be a part of 90% of electric vehicles by 2025 (Zhang et al. 2018). The socially acceptable model and the responsibility that lies on individuals and businesses in terms of environmental contributions can be fulfilled with the help of lithium-ion batteries in their vehicles.

2.4. Technological Factors

Electric vehicles have minimal machinery. The durability and safety measures required due to the combustion engine, and it is highly risky and flammable parts have been decreased due to the inclusion of lithium-ion batteries (Godina et al. 2016). The safety concern has been reduced majorly due to technological advancements in the lithium-ion model. The significant

technological advancement which has been made due to the lithium-ion battery is the inclusion of self-driving into electric vehicles. The software needs minimal energy and the minimalistic model of the electric vehicle due to the lithium-ion battery has been able to incorporate the self-driving technology into electric vehicles and their user interface (Min et al. 2016). The latest Tesla models around the world can change lanes, self-drive on lane disciplined roads, turn and do all kinds of parking.

2.5. Environmental Factors

The lithium-ion battery's most significant contributions have been in the environmental friendliness department. The ecological footprint of the lithium-ion battery is minimal, and the carbon and greenhouse gas emissions close to none (Yang et al. 2018). Recently, efforts have been made to make the manufacturing process of lithium-ion batteries also energy efficient. The legislators are contemplating renewable energy sources for lithium-ion battery charging sources to make the whole electric vehicle model environment-friendly from its inception until its usage. The ISO standards 14000 and 14001 have been implemented all across the globe for environmentally sustainable activities and inputs in all ways of life (Berggren et al. 2015).

2.6. Legal Factors

The legal factors, in this regard, present the lithium-ion model and the automotive industry with several opportunities as well. The energy consumption legislations which are globally applicable can he helped with the help of energy-efficient solutions like the lithium-ion batteries. The recent focus has been on renewable energy in terms of the charging solutions for the electric vehicle industry (Dorn and Malcolm, 2017). If the charging stations can become completely renewable in their energy sources, it will further complement the legal factors of the energy consumption legislations. Legally, the governments have been able to give the electric car industry certain investment incentives in terms of tax covers, etc. (Min et al. 2016). These legal covers have been able completely due to the advancements made in the field of lithium-ion batteries.

3. Porter's Five Forces Analysis

Porter developed the five forces analysis for the environmental scanning for organisations, industries and business models. It portrays the strategic analysis for an organisation or an industry in the light of the external market factors (Shang and Feng, 2019). This part of the report aims to study the automotive industry and the advancements in the field of lithium-ion batteries through Porter's five forces model.

3.1. Competitive Rivalry

The lithium-ion batteries and the advancements, in this regard, have been contributing majorly towards the electric car industry (Mesbahi et al. 2017). It is a major technological advancement that contributes to intensify the industry competitiveness. The technological advancement is such that all the companies in the industry can take advantage. The race for a competitive edge in the electric vehicle industry is gained elsewhere. By 2025, it is estimated that around 90% of the electric cars will be running on lithium-ion batteries predominantly (FIgenbaum, 2017). The companies are trying to take an edge in their respective business models through self-driving technology, better designs and other aspects of the competition. The advancements in the field of lithium-ion, in this regard, has been complementing the competitive rivalry within the automotive industry. The competitive rivalry in the automotive industry related to lithium-ion battery advancements is currently moderate. The number of rivals is low, but some of them, like Tesla and Nissan, are well settled within the industry which makes the competitive rivalry in the industry currently moderate.

3.2. Bargaining Power of Suppliers

Seven battery manufacturers are dominating the lithium-ion battery supply in the electric car industry at this time. The notable observation is that the electric car industry is at its growing stages, and the number of electric cars is not anywhere near the peak of its development (Yeung, 2019). The bargaining power of suppliers is, therefore, not a concern for the industry. The major electric car manufacturers already have their in-house production units and contracts with major battery manufacturers. Panasonic has been the lithium-ion battery partner of Tesla since the last decade. The further development regarding battery supplier has been that companies like Tesla and Nissan want to start their battery manufacturing units by 2021 (Kibria et al. 2017). This step is taken to cut costs and bargaining power of the suppliers in this instance. Businesses have started to realise that as the competition intensifies, the lithium-ion battery manufacturing capacity of seven available manufacturers is not enough to serve every single company and it will eventually result in increasing the bargaining power of suppliers (Musonera and Cagle, 2019). Therefore, already established companies like Tesla and Nissan want to move their battery operations under their own brand's umbrella. The overall bargaining power of the suppliers is moderately high. The suppliers have started to develop a certain sense of exclusivity as the number of lithium-ion battery producers in the industry are currently very low. As the competition intensifies in the coming years, the bargaining power of suppliers will get even higher.

3.3. Bargaining Power of Customers

The lithium ion-based electric vehicles are already economically very efficient. The electric vehicle industry is in such a stage of its lifecycle and growth that the consumer demand is continuously increasing. The social, ecological and economic trend regarding electric vehicles is on the rise (Comlorn and Hulsmann, 2016). The bargaining power of consumers in such a stage is very low. Consumers are looking for energy-savvy and environment savvy mobility solutions, and they are getting those solutions at an already competitive and lower price when compared to combustion engine vehicles. Furthermore, energy efficiency makes it, even more cost-effective (Bozhuk and Pletneva, 2017). Therefore, the bargaining power of the customers in lithium-ion battery vehicles is currently very low, which is highly favourable for the existing and new businesses.

3.4. The threat of New Entrants

Access into the electric vehicle industry and access to lithium-ion technology for new entrants in the electric car industry is relatively easy due to the relatively newer industry and the industry being in its inception days. Lithium-ion battery advancements have been enabled in the industry in such a way that everybody has access to this technology (Rong et al. 2017). With enough investment, the new entrants can also gain access to the highly prestigious technology. The differentiation, however, is based on relative and varied factors. The threat factor related to new entrants is practically mitigated due to the number of companies in the industry as well. The threat of new entrants is low as well in terms of lithium-ion advancements access.

3.5. Threat of Substitute Products

The electric vehicles and the lithium-ion battery, itself, are a brand-new concept and a substitute product. The threat for further substitutes at this stage is close to none. The battery advancements of decades have led to the most effective form of the lithium-ion battery (Kavanagh et al. 2018). Therefore, the lithium-ion battery model and the electric vehicles currently have no other threat of substitutes. The latest innovation perspective in terms of electric vehicles and lithium-ion battery model makes the threat of substitute products or product concepts practically impossible. The threat of substitute products, in this regard, is extremely low. The threat of substitute in terms of product substitutes is low as well as the threat of any newer technology is low as well. The lithium-ion is one of the most advanced forms of battery advancements made during the last decade; therefore, the threat of any substitute technology for the decades to come is extremely low as well.

4. Conclusion

The electric automotive industry has very favourable circumstances both for consumers and businesses. The advancements in the electric car industry have been able due to the progressions made in the lithium-ion battery. The electric car industry as an economic and environmental solution has been presented in the 21st century. The social, legislative and political acceptance of the whole electric business model has been globally accepted due to its zero-emission mode. The zero-emissions are made possible through the lithium-ion global progressions and its practical implications. In terms of the industry rivalry and consumers, the industry is in its introduction phase and just entering the stage of growth. Therefore, the consumer, demand, supplier and industry variables are also highly favourable. Also, the lithium-ion technology's ease of access makes it relatively more comfortable for the new businesses to enter and for the existing businesses to grow.

5. Recommendations

In light of the PESTLE analysis, Porter's Five Forces Model and critical analysis conducted above, the following recommendations are made regarding the use of lithium-ion batteries and their global implications:

- The lithium-ion batteries are currently considered to be resulting in zero emissions. The manufacturing process of such batteries, however, is not energy and resource-efficient yet. Businesses need to consider the manufacturing aspects of lithium-ion batteries, and they need to attempt to make the whole process energy and resource-efficient. The environmental factors, in this regard, can be highly complimented with the help of such practices. The complete environmental friendliness, in this regard, can help the electric car industry and lithium-ion battery advancements to grow furthermore.
- The lithium-ion batteries need the electric charge to work and operate. The charging stations are currently not completely energy-efficient as well as ecological footprint-free. Therefore, the companies need to incorporate the ecological friendliness into the whole business model and charging stations need to be based on renewable energy sources. The legislative, environmental and political balance that can be achieved through such a practice is far greater than the current favourable conditions.
- The lithium-ion battery progression has been able to reignite the electric vehicle industry in the 21st century as clean and environment-friendly mobility solutions. Businesses do not need to stop at this progression. Further research and development

progressions are required for the lithium-ion model to be perfected even more. These practices will be highly favourable for the new entrants and healthy competitive rivalry within the industry. Similar to the lithium-ion battery advancements, any technological advancement can be highly complimented in the whole automotive industry.

- The electric car industry and businesses within need to be ecologically and economically responsible for providing their consumer with the level of environmental friendliness that consumers seek in electric cars. The bargaining power of consumers can be further reduced and can be kept under immense control due to such factors. As long as the industry participants are able to provide the consumers with their required level of environmental friendliness, the consumer's bargaining power in such an industry can be kept under control and within favourable limits for the industry participants.
- The process of developing, consuming, charging, delivery and drive all need to be ecologically responsible for the consumers to participate in the sustainability of the environment.

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