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Sustainable Supply Chain of New Energy Vehicles: A Case Study of Tesla

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Abstract: There has been a deepening link between new energy vehicles and sustainable development strategies in recent years. The ecological impact of CO2 emissions from vehicles has been noted. Although developing new energy vehicles faces problems such as high project costs, a backlog of slow-moving models, and a lack of technical maturity and raw material availability. However, developing new energy vehicles is indispensable and can be better promoted by combining sustainable supply chains with renewable energy sources. It can be found that sustainable management of the supply chain is an indispensable factor for Tesla to become a representative company in the new energy vehicle industry. But at present, new energy vehicles still face the problem of high costs; the lack of maturity of technologies such as batteries and chips. But optimizing the supply chain will undoubtedly impact the development of new energy vehicle companies.

Keywords: sustainable supply chain, new energy vehicles, Tesla

1. Introduction

According to the International Energy Agency, sales of electric vehicles manage to more than triple to an all-time high of 6.6 million by 2021. This results from government regulatory restrictions, which will give rise to more environmentally friendly forms of transport. It is worthwhile to focus on managing the electric vehicle supply chain.

The "green" economy, also known as sustainable and inclusive urban industrialization, can create synergies, such as separating economic expansion from environmental damage, creating jobs, and promoting clean energy development. Business owners will be able to create complex and elaborate SCM (supply chain management) plans by incorporating the SSCM (sustainable supply chain) concept into the SDG (sustainable development goal), which will make supply chains more reliable, efficient, and environmentally responsible. This will make supply chains more reliable, efficient, and environmentally responsible. As a result of this synergy effect, economic activity should increase.

Supply chains are sustainable if they integrate ethical and ecologically responsible business practices into a practical and competitive model. Full transparency throughout the process is

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essential; sustainability activities entail everything from raw material sourcing to product returns and recycling operations. We have witnessed the negative impact of the coronavirus on global supply chains. Before the outbreak, the main drivers for supply chain process improvement, digitization, and investment were cost reduction and productivity improvements. These drivers are still very important, but as the epidemic has generated difficulties involving politics and economics in multiple areas, these factors threaten the competitive position in the global market. It is even difficult for many companies to exist because they need to meet their customers' requirements. In this situation, SSC offers a cleaner, smarter, and more environmentally friendly supply necessary for the industry and humanity.

At present, new energy vehicle enterprises mainly face the following problems: firstly, the enterprises themselves lack a perfect project cost management system for new energy vehicle development and have not yet formed a standardized internal and development process to budget and control costs accurately; secondly, the lack of adequate market research easily causes new vehicle projects to deviate from market positioning and fail to accurately hit the needs of users, producing unsold models and increasing the inventory backlog. This not only increases the operating costs of the company but also reduces its profitability of the company. The third new energy vehicle as a new industry is a high-tech industry, with some important core issues such as new energy vehicle chip technology is not mature enough, as well as the battery production raw material reserves are not abundant, and the upstream raw material prices are still to be broken. This paper explores how sustainable management can influence cost reduction and efficiency, risk prevention, and energy price management.

2. Literature Review

Good production has long been more than just a single factory, especially in today's rapidly developing field of new energy vehicles. The production process is often scattered around depending on the different components, making it possible for money and materials to be linked in a larger area. At the same time, the individual producers are affected differently because of their location in the supply chain in different places.

More and more organizations, especially NGOs, are now becoming aware of the environmental and social issues that exist in the supply chain. This has forced companies to consider more costs to create a healthier and more sustainable supply chain. With this in mind, we look at the current literature available.

Firstly, sustainability management is familiar, as we can even find it described in philosophers' writings and popular culture, such as films and books [1, 2]. As we move into the new century, more and more scholars are beginning to focus on the issue of sustainability. The Brundtland Report systematically proposed a definition of sustainability as meeting the needs of the present without compromising the resources of future generations [3]. In the early debates that people had about sustainable management, given that the term was beginning to develop, much research was stuck in curiosity, and there were many examples of environmental and public health issues that were overhyped and eventually ignored by many after additional evidence and insights were gained [4]. This trend steadily increased until the development of factories, where chemical pollutants directly destroyed the space in which humans lived - global warming - and the public and private sectors finally realized that unrestricted development was not feasible [5-7]. Seuring and Müller define sustainable supply chain management (SSCM) as "the management of logistics, information, and financial flows and the SSCM is defined by Seuring and Müller as "the management of logistics, information, and financial flows and the cooperation between companies in the supply chain, taking into account the objectives of customer and stakeholder needs in terms of the economic, environmental and social impacts of sustainable development" [8]. In SSCM, companies can

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positively or negatively impact environmental and social performance by managing supply chain networks, evaluating suppliers, selecting transport modes and carriers, designing vehicle routes, locating businesses, and setting product packaging [9]. The systematic coordination of key business processes within an organization transparently integrates and achieves the convergence of social, environmental, and economic goals, thereby improving the long-term economics of the business and its supply chain [10]. Sustainability as an integrated concept is beginning to follow a similar trajectory, with the public and private sectors proposing or adopting new initiatives.

From this point of view, the development of new energy vehicles is inherently inseparable from sustainability, with the development of new energy vehicles reflecting, among other things, the requirements for greener product design [11-13] and cleaner process technology [14-17].

Most of the literature covering the supply chain for new energy vehicles focuses on battery technology and raw material issues. According to projections, the demand for electric vehicle batteries will reach 2018 GWH (gigawatt hours) [18], which has led to a rapid increase in the price of lithium necessary to produce new energy vehicles and the objective time of production of lithium ions, making the problem of uneven supply and demand even more pronounced. Lithium resources, conversely, are highly concentrated in certain regions, including China's production capacity, which accounts for more than half of the world market in export capacity.

3. The Importance of Sustainable Supply Chain Management for New Energy Vehicle Companies

According to the CO2 Emissions Report 2022 given by the IEA, China's CO2 emissions in 2022 will be about 11477 million tonnes, a 23 million tonnes decrease in carbon emissions compared to 2021. Among them, CO2 emissions from the power sector rose by about 2.6%, and CO2 emissions from the transport sector fell by 3.1%.

According to the data given by the Chinese public security authorities, as shown in Figure 1, in 2020, the country will have 372 million motor vehicles and 456 million motorists. After the epidemic, in 2022, the country's motor vehicle fleet rose to 412 million vehicles and 499 million motorists. The growth rate of motor vehicle ownership and the growth rate of drivers are relatively close to each other, with an average of two people per car, which side-by-side shows that China's car market has great potential.

Figure 1: Car sales in China.

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Figure 1 shows that despite declining sales after FY16, car sales will start to pick up from 2021 onwards. And based on year-on-year inventories, the production-to-sales ratio remains relatively stable.

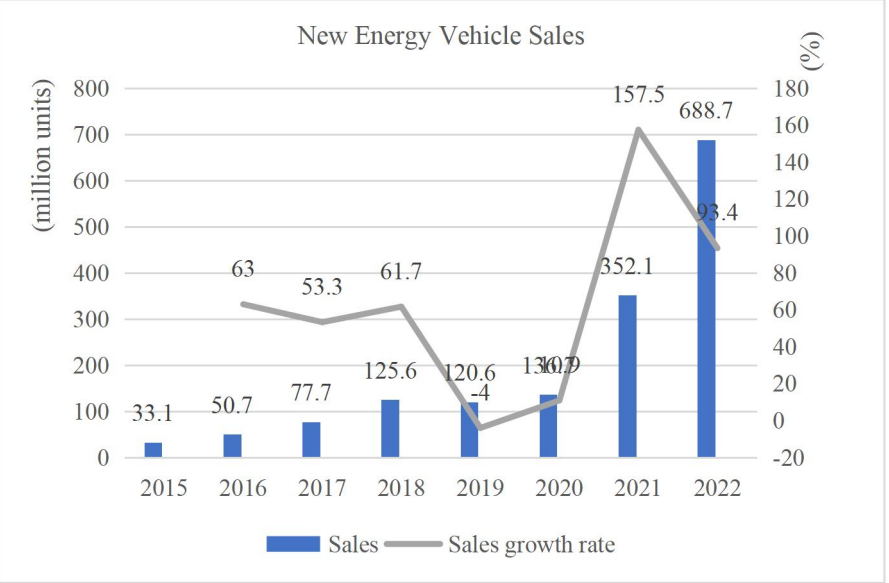

Figure 2: New energy vehicle sales.

Regarding new energy vehicle development, as shown in Figure 2, China has led the world in sales for eight consecutive years, with explosive growth in 2022 due to policies and markets. The share of new energy vehicles reached 25.6%.

Therefore, according to the quantitative system built by Xin Long Xu & Hsing Hung Chen, the development of car companies is analyzed in four dimensions: investment in human resources, investment in R&D, investment in technology acquisition, and investment in environmental support. The impact of gearing and government support on innovation efficiency is insignificant. The main risks in establishing a well-developed supply chain link for new energy vehicle enterprises are currently:

Environmental risks. As new energy vehicles enter the market, consumer demand is becoming more and more diverse. Effects of lithium-ion batteries The rising demand for lithium batteries draws attention to potential issues in the supply chain for raw materials. The deployment of green technologies and innovation in the energy sector necessitates a large amount of raw materials, some of which are at significant supply risk due to the scarcity of some key metals used in lithium batteries, such as lithium, cobalt, and graphite. Government laws pertaining to new energy vehicles are also being modified. For instance, government subsidies are starting to be cut back, with the total anticipated to reach US$1.4 billion by the end of 2020. However, policymakers have awarded subsidies without considering their influence on the financial success of new energy vehicle firms [3]. They have done this out of sheer blindness. Subsidies only act as a transient boost to profitability.

Industry risk. The market for new energy vehicles is still in its infancy, therefore demand is quite unstable. Retailers encounter consumers and uncertain market demand as supply chain actors, which leads to riskier decisions and a significant dependency on capital in the new energy vehicle business. In supply chain management, nodal firms' capital issues may spread to other chain members, creating capital challenges for the whole supply chain.

Organizational risk. Due to the lack of certainty surrounding technological advancement, trailing revenue, receivables from the makers of new energy vehicles' collection of accounts, lengthy cycle

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durations, and capital restrictions. A serious cash flow problem could potentially result in bankruptcy.

Past researchers have discovered a considerable spillover impact between lithium battery share prices and new energy share prices in the face of these real threats. Even Nevertheless, the prices of lithium batteries barely affect the prices of new energy stock. The volatility of new energy vehicle firms is influenced by technological innovation, process improvements, dynamic pricing, legislative guidance, and consumer confidence.

Manufacturers of new energy vehicles are closely connected to the stock markets of their upstream suppliers, and stock market risks could result in similar volatility trends throughout the new energy vehicle supply chain. Therefore, in the future, new energy vehicle manufacturers and the government should concentrate on risk spillovers throughout the industry's supply chain.

Combined with the plummeting prices of the raw materials used in the production of lithium batteries, it is first expected that consumers will expect lower costs, and therefore the potential market will tend to expand.

Building sustainable supply chains is more mature in adopting socially and environmentally responsible supply chain efforts. This maturity allows them to reap the benefits of early investment with long-term returns, whether tangible, such as cost reduction, or intangible, such as reputation improvement. So with the requirements of a sustainable supply chain, establishing initiatives that include assessing employee satisfaction, customer satisfaction, government ratings of environmental performance, and even a company’s overall stance on corporate social responsibility are all actions that can help in inventory management, material handling, disposal, and logistics.

Business is an important part of social and economic development, and its role in economic growth cannot be ignored. The highest objective of an enterprise is to maximize the interests of investors, customers, employees, and the general public, and it must therefore be managed efficiently. Only when effective management is achieved can the various departments work together in a coordinated manner, can the work and tasks of each link be completed successfully within a limited time frame, and can the enterprise remain viable for a long time. With the development of society, the business management style of enterprises must also keep pace with the times to achieve the purpose of modern management of enterprises.

Modernization of enterprise management means making the management of an enterprise more modern and scientific through scientific ideas and techniques. With the development of enterprises and the changing times, a set of practical corporate management systems in line with the long-term development of enterprises is essential.

4. Case Analysis

At present, new energy vehicle industry mainly facing the following issues: firstly, the enterprises themselves lack a perfect project cost management system for new energy vehicle development and have not yet formed a standardized internal and development process to budget and control costs accurately; secondly, the lack of adequate market research easily causes new vehicle projects to deviate from market positioning and fail to accurately hit the needs of users, producing unsold models and increasing the inventory backlog. This not only increases the operating costs of the company but also reduces its profitability of the company. The third new energy vehicle as a new industry is a high-tech industry, with some important core issues such as new energy vehicle chip technology is not mature enough, as well as the battery production raw material reserves are not abundant, and the upstream raw material prices are still to be broken.

Tesla is a representative company of new energy vehicles. Tesla is now the strongest new energy vehicle brand.7 January 2021, Tesla’s market capitalization reached US$773.5 billion, and Musk became the richest man in the world with approximately US$195 billion in personal assets. Tesla

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has also faced many challenges in its development. The first is the risk of an overly long industry chain. Tesla has maintained the theme of new energy plus intelligence. Tesla has developed many new divisions. These require a lot of investment.And the subsequent development of battery raw materials, etc. The long industrial chain can enable enterprises to develop core technologies. The development of enterprises is of great help. Still, enterprises need to work on coordinating various aspects of the structure, failure in developing some core technologies in the industrial chain, or the Mo aspect of technology being surpassed by other enterprises.

Tesla also faces quality and safety issues. Compared to the traditional car industry, Tesla embodies a minimalist design style. Although some industry insiders and consumers have recognized this aspect, its rough quality and poor materials are also criticized by many people. In particular, the Tesla spontaneous combustion incident has declined consumers' impression of the Tesla brand. Experts say that aging batteries, design flaws, and impacts are all possible causes of spontaneous combustion in new energy vehicles.

In 2012, the company received a $10 million grant from the California Energy Commission to finance the production of the Model X. The company succeeded because the US government had approved the company's philosophy. The company received a low-interest loan of $46.5 million from the US Department of Energy in late 2008 to finance the Tesla Model S mass production. In 2012, the company received a $10 million grant from the California Energy Commission to finance the production of the Model X. Tesla has taken advantage of the government's incentives and subsidies for new energy vehicles to get financial support. Two: to create core technology support, Tesla's core technology has been developed from the battery to the development of charging devices and has obtained systematic results. With core technology support, Tesla stands out from the competition with other brands and has gained a larger market.

In the development of Tesla, the idea of sustainable management is applied. In its development, the company needs to take measures that jeopardize its development when faced with problems. Faced with difficulties, it strives to research core technologies and obtains more financial support with the help of policies to sustain its healthy development.

From 1928 to 2020, total energy consumption went from 571.44 million tonnes to 498.08 million tonnes of standard coal. With the development of industry and the progress of society, the demand for energy consumption is rising rapidly. At the same time, the share of primary and other energy sources in total energy consumption increased from 3.4 percent to 15.9 percent, while the share of coal fell from 70.7 percent to 56.8 percent.

In recent years, it has been noted that CO2 emissions from vehicles are severe pollution to the ecological environment, with an emphasis on environmental issues and the continuous development of the new energy vehicle industry worldwide. Several factors influence the supply chain of new energy vehicles in the ongoing development of new energy vehicle companies. For example, the preferential treatment of new energy vehicles and government subsidies, the range and cost of new energy vehicle batteries, and the maturity and completeness of technologies such as charging equipment.

At present, although the industry of new energy vehicles has a relatively broad development space, it can be found that there are still many technical deficiencies in the field of new energy vehicles, such as the battery range and the use of batteries, the inconvenience of charging, the lack of raw materials and manufacturing technology for vehicle manufacturing. In addition, the market environment for new energy vehicles needs to scale. The market for new energy vehicles has excellent potential for development. Still, the need for scale in the market environment will particularly impact the development of new energy vehicle technology. For example, the popularity of charging piles and improving charging methods will be important to developing new energy vehicles.

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5. Conclusion

The market for new energy vehicles continues to develop, and sales are growing yearly. As a representative company in the industry, Tesla is also facing problems such as a long industrial chain and quality and safety. By taking appropriate measures and applying the concept of sustainable management to improve the environmental impact of supply chain transport. It has become a representative company in the industry.

With the development of society, environmental pollution is intensifying worldwide, and people's consumption attitudes are becoming greener. Through sustainable management of enterprises, not only can unnecessary consumption and waste in production be reduced, but also the economic profitability of the enterprise can be improved, and the enterprise's image can be built up to bring economic benefits.

Research themes in sustainable supply chain management have expanded from environmental to social responsibility concerns and further to the circular economy at the macro level and global supply chains at the micro level, with particular attention in recent years to the impact on sustainable supply chains of the dynamic environment caused by the new crown epidemic, trade wars and emerging technologies.

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