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Analysis of the Supply Chain Management Advantages of Tesla and the Impact of the Epidemic

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Abstract: In contemporary society, where the energy crisis is becoming more and more serious, the energy transition of automobiles is imminent. By studying the background of Tesla, its production strategy, battery technology, supply chain, marketing network, and operation mode under the epidemic, combined with the comparison of traditional car companies, this paper hopes to provide relevant suggestions and improvement methods to the energy transition of traditional car companies, which can make the electric vehicle industry develop more rapidly.

Keywords: Tesla, car industry, strategy, battery technology, supply chain, marketing

1. Introduction

Tesla Inc. is an American electric car and sustainable energy business based in Palo Alto, California. Its mission statement states that the company aims to "accelerate the world's transition to sustainable energy." Elon Musk is the company's current CEO and previous chairman.
In this academic paper, Tesla's supply chain management is the focus of the study. The study will focus on four aspects of Tesla's battery, logistics management, and retailers. Ultimately, the study will analyze how Tesla has been affected by the pandemic, especially in the supply chain.

2. Background of Research

In recent years, countries around the world have enacted many policies on emissions based on the importance of environmental protection. For example, one California policy predicts a 1 billion tons reduction in CO2 emissions by 2045 [1].

As international oil prices continue to rise, the cost of using fuel cars rises. In this condition, the electric car consumer base continues to grow.

As the leading electric car brand, Tesla holds a significant market share. A report says that in the United States, Tesla has even caught up with BMW in luxury car sales [2]. In addition, Tesla is reported to be the fastest-growing brand in the world in 2021. That is why the case of Tesla's supply

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chain management deserves to be researched.

3. Production Strategy

In order to study Tesla's supply chain management, the first step is to analyze its production strategy. Three levels of strategy are presented below: Vertical integration, Product development, and Technology-driven.

Vertical integration. Unlike other car companies that typically outsource 80% of their components to suppliers and focus only on engine manufacturing and final vehicle assembly, Tesla's product strategy can integrate vertically, including product components and the placement of charging equipment. This integrated approach to operations leverages sales margins and effectively manages the supply chain.

Product development. Tesla has a well-established growth strategy for product development. It has gradually developed from a single product line of Roadster to the current four product lines of model 3, model Y, Model X, and Model S, which cover different price ranges. In addition, Musk claimed that in 2023, Tesla would open two new factories to start new products such as the Semi, Roadster 2, and Cybertruck [3]. Tesla also has many product developments in areas other than cars, such as solar charging panels and EV charging stations [4]. Tesla can make huge profits through the development and iterative update of these products.

Technology-driven. As a high-tech company, Tesla is mainly focused on technological innovation. This is reflected in both autonomous driving and battery technology. Take Autopilot, for example; Tesla develops much of its assisted driving technology, while Toyota prefers to outsource (using Mobileye or ZF's technology). By April 24, 2020, Tesla released a software upgrade that indicates that Tesla will have complete autopilot. It means that cars will no longer need to be controlled by humans in the future.

4. The Suppliers of Tesla Batteries

In the beginning, Panasonic was Tesla's battery supplier, distributed in the United States & China& Japan. LG battery became one of the suppliers in 2019; the main business is distributed in Europe. In 2022 CATL and BYD will become its battery supplier, responsible for most of the battery supply in China, and the blade battery provided by BYD will be used for the first time in the Tesla model Y.

The Diversity of New Energy Vehicle Batteries and the Uniqueness of Tesla. In terms of electric cores, only cylindrical cores are designed with a safety valve; the gas produced by the cores, when working, the safety valve can be opened to release when the air pressure is too high, so it is safer. The other two types of cells（square complex shell cell & soft pack cell） are not designed with safety valves.

The battery cell can be understood as the core component of the battery. However, it is only a separate component and cannot be directly said to be the battery; some brands of the battery warranty are the warranty of the battery cell rather than the battery pack. After all, the battery cell is a semi-finished product and cannot be used directly as a battery. It needs to be coordinated by the internal circuitry and shell of the battery to work properly. The electrolyte inside the battery works when the cell plays the role of the top and bottom; without the power cell, there is no way for the battery to complete the internal electrode reaction. Round cell volume and capacity are not large, but the battery's high energy density is the advantage. Because of this advantage, the design of retaining round cells was passed down in Tesla. Tesla's own 4680 battery is the latest single-cell cylindrical battery. 4680 battery is Tesla's new generation of cylindrical battery with a diameter of 46mm and a height of 80mm. Compared to the 2170 battery, energy increased by five times, power increased by five times, and range increased by 16%, while the cost was reduced by 14%.

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Although the 4680 batteries have been produced by Tesla, it does not meet its batteries demand and still need to be provided by external suppliers. Indeed, the proliferation of battery systems in response to decarbonization across a range of industries and spaces is transforming economic relations all along the production network, raising several areas of public and policy concern: from the availability of mineral raw materials such as lithium, nickel, and cobalt, to bottlenecks in LiB manufacturing capacity [5]. Since 2021, Tesla has searched worldwide for enough nickel and has reached purchase agreements with several nickel suppliers. In addition, the company continues pushing for advances in raw material processing and battery manufacturing methods. For example, in January, Tesla said it would buy 75,000 tons of nickel concentrate from a project developed by Toronto-listed Talon Metals. Earlier, Tesla agreed with BHP Billiton, the world's largest integrated mining company, to buy material from its operations in Australia. Tesla also agreed to buy nickel from a mine in New Caledonia, which commodities trader Trafigura partly owns.(Martins, Livia Salles.)

5. Supercharger

Tesla's charging pile and charging technology is also its core technology, the cooling technology in the charging cable can ensure that it will not overheat during the charging process, which is a very significant point compared to other new energy vehicles. You can fully charge the car with the Supercharger within 50-80 minutes, this charging speed is far superior to other new energy vehicles, and Tesla Supercharger is widely distributed， which means no worry about mileage. The charging power is inversely proportional to the remaining energy of the battery.

6. Tesla Logistics Management Versus Traditional Car Companies'

Tesla adopts a unique supply chain and logistics management approach compared to traditional car companies. Tesla has a reliance on in-house expertise to produce selected parts for the manufacturing process and direct selling to the consumers.

By contrast, the model used by traditional car companies includes the reliance on suppliers to produce critical components for the manufacturing process and the use of franchised dealers to sell to customers.

Tesla uses in-house expertise for the manufacturing of car components. In the traditional supply chain model, automakers rely on suppliers to deliver the needed components [6], including parts critical to the production system. However, the in-house manufacturing of electric cars has enabled Tesla to retain control over the production of components. As a result, traditional car companies might stall their operations in the event of unforeseen component problems.

If a problem in the supply chain happens to critical components used in car manufacturing, this will affect the delivery time of finished products to customers.

The major companies using the traditional supply chain model suffered due to the shortage. However, Tesla used its in-house production strategy to maintain operations and build its competitiveness in the industry [7,8]. Thus, using in-house expertise to improve manufacturing efficiency emerges as Tesla moves from the traditional supply chain model.

Tesla's direct selling model. Tesla uses direct selling to the customers, which is a change in the supply chain model used by traditional car companies. Tesla can quickly get customer feedback, which is considered to be Tesla's most significant advantage over its competitors. Consumers, Tesla's direct sales model also has the opportunity to reduce the purchase cost for consumers because it eliminates franchised dealerships, shortens intermediate links, and simplifies the purchase process. Hence, Tesla's move of selling directly to the customer emerges as a way of moving from traditional supply chain operations.

Traditional car companies produce components for car manufacturing. Supplier dependence in

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the supply chain model leaves the companies dependent on suppliers to deliver critical components that facilitate the manufacturing process [6]. If a supplier delays delivering the needed parts, there is likely to be a delay in delivering the products to waiting customers. Thus, the dependence on suppliers for car manufacturing parts remains a significant aspect of traditional car companies' supply chain and logistics management.

Traditional car companies sell models. Traditional car companies sell car units to customers through franchised dealerships. This approach avoids selling directly to the customers [7]. The result of indirect selling to the customers is limited contact between the manufacturer and the customer, where customer feedback reaches the manufacturer at a slower pace. The manufacturer depends on the dealerships as an intermediary in communicating with the customers. The choice of selling through dealerships further includes higher costs than selling directly to customers. The choice of partnering with franchised dealerships adds to the complexity of the supply chain and increases the costs of delivering the products to the target customers.

7. Retail Network

Direct sales. Tesla sells directly to consumers. Unlike other traditional car companies,

Tesla does not use a franchised dealer model but owns all of its stores, giving carmakers more leeway than most to manage their retail approach. It has built an international network of company-owned showrooms, mainly in urban centers. More importantly, it creates a better customer buying experience. “Unlike car dealerships, Tesla showrooms have no potential conflicts of interest. Customers deal only with sales and service staff hired by Tesla”(Kristina). [9].

Online sales. In addition to its stores, Tesla has transformed the traditional auto dealer network. "It has created a new multi-channel model for buying cars, including online and Apple-like retail stores" [10]. Online stores offer potential customers the opportunity to buy cars directly online. Tesla takes orders through its website and sells cars directly to customers. They do not have a storefront, so they do not have to go to a dealership. You do not have to go anywhere when there is a Tesla you order online. Tesla pays the same price online as it does in stores. You can order and submit all essential documents offline from home. Customers are assigned a Tesla consultant at a local store to help manage the pre-shipment process. Some Tesla advisors will work at the central virtual store, helping online buyers in specific markets without being assigned to physical stores. Instead of renting expensive space in malls and shopping districts, Tesla rents space in parking lots, warehouses, and other locations to manage its test-drive fleet and distribution centers. This streamlining of the transaction process eliminates the expensive rent Tesla has to pay to set up shops in malls.

Home service. “In some areas, Tesla has hired mobile service support, mobile technicians who make house calls. In some cases, services are delivered remotely” [11]. For example, a new way to fix cars is to wirelessly upload data so technicians can see and fix the problem without touching the car. In some cases, services are delivered remotely. For example, suppose they cannot fix the car online. Tesla has Tesla Troopers. Tesla Rangers are a team of remote technicians who end up at your location -- home, business, coffee shop, or wherever -- and fix your car there.

Ford sales. Ford's retail network compared to Tesla's retail network. Ford differs from Tesla in allowing franchised stores, where Ford sells cars to customers through franchised dealers, just as traditional car companies do. This approach avoids selling directly to customers. Trust Ford is the largest Ford dealership group in the world, but it is interesting to note that Trust Ford is part of the Ford Retail Group and is wholly owned by Ford Motor Company. Ford is also beginning to change its retail network due to Tesla. Ford wants to start selling electric cars directly at a fixed price. Online sales will have a fixed price, eliminating the usual price negotiations and dealer discounts - which, like Tesla's direct sales of electric cars, are also moving to the Internet. However, Ford was still willing to keep dealers," We bet on Dealers," Ford CEO Jim Farley told dealers. We will not negotiate

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directly, "he told reporters after the meeting. Some explanation is in order.

8. COVID's Effect

Covid has deeply attracted people's attention as a synonym of this era. It has changed people's lives and affected many companies' operations, especially in their supply chain management. Respectively the increasing demand for microchips, difficulties met in demand forecasting, and adverse effects on importing and exporting.

Covid's Effects on Chips. Two main factors that lead to the shortage of microchips are the increasing demand for chips and the insufficient production capacity of microchip manufacturing. From the beginning to the end of the pandemic, the population of home working has quadrupled, from initially 5% to 20% at present [12]. Research shows that this has increased computer demand [13]. As a result, the sales of computers boosted the demand for microchips because chips are one of the most important parts of computers. It so happens that electric cars also need chips because each electric car is a giant computer. Therefore, to meet the chip demand for computers, the number of chips available for electric cars is much reduced.

During the pandemic, many factories worldwide have been restricted in working times. This leads to a limit on manufacturing, resulting in a lack of productivity [14]. For example, in China, Many factories can operate only three days a week. This is fatal, especially in a period of increasing demand. It makes the manufacturing of electric cars very limited.

Tesla - because of its unified, centralized supply chain management- found an appropriate and effective way to control its usage of microchips and successfully managed to grow profits despite chip manufacturing restrictions. When they learned of the shortage, they immediately told the production line to remove all the chips scheduled to be installed in the waist function of cars' front seats to save microchips. Later, when the number of chips is sufficient, some canceled functions will be reinstalled. Compared to Volkswagen, Tesla is doing very well. However, VW does not manage its supply chain in a unified way, and the production line and design cannot be updated in time, so Volkswagen has to stop production [15].

Covid's Effects on Demand Forecasting. The marketing strategy of the automobile industry is mainly offline marketing. The auto 4S stores were significantly affected when the pandemic broke out because most people chose to stay home instead of going out. This has caused many car companies to lose customers for weeks or even days. Due to the drop in transaction volume in a short time, it is difficult for the supplier to predict the transaction volume in the next stage, so it is difficult to accurately predict transactions from customers to the upstream of the supply chain. From downstream to upstream, the impact will become gradually larger and larger. This is called the Bullwhip Effect.

However, Tesla is an exception. Because of its unique retailer model: Online Transactions, they can still receive orders like usual. This can give them sufficient data support to help them get a more accurate forecast of the subsequent stage of sales and production plan.

Covid's Effects on Importing and Exporting. Covid has dramatically affected the transportation of international trade. Many countries close their board to prevent COVID-19 from entering their countries.

Tesla imports raw materials from countries all over the world. For example, it imports a vast of graphite from China [16]. Unfortunately, when the coronavirus was discovered in China, the Chinese board was closed imminently. This is an unexpected situation for Tesla because approximately 55 percent of its graphite is imported from China. This disturbs their production plan because of the lack of raw materials. Moreover, the shipment fee during the pandemic also increased, meaning more money is spent on it, and less is left for the R&D department.

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9. Conclusion

This article discusses Tesla's production methods, battery design, logistics chain, retail methods, and the epidemic's impact on Tesla's supply chain. In each section, we compare and contrast Tesla with traditional car companies. Tesla, as the leader in new energy vehicles, has a unique way of doing business and a robust supply chain that is an example for all major car companies, and in the era of the increasingly urgent energy transition, all major car companies should learn from Tesla's strengths combine their advantages to create more competitive products for us.

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