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Innovation Model Analysis of New Energy Vehicles: Case Study of Tesla

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Abstract: As environmental pollution worsens, New Energy Vehicles (NEVs) are an effective solution to improve air quality. NEVs have made significant technological and marketing advancements, and Tesla is a model for developing NEVs. This study explores the innovation of NEV technology and marketing, using Tesla as a case study to determine how to use NEV technology and marketing effectively. Tesla's breakthrough occurred in 2013 when they turned a loss into an $11.2 million net profit, and their success continued to skyrocket. We analyze Tesla's marketing model, after-sales service, promotion methods, funding sources, and core competencies to identify their unique advantages in the business model and strategic portfolio. This study provides a useful reference for the innovation of NEV technology and marketing.

Keywords: new energy vehicles, technological innovation, Tesla

1. Introduction

With the development of new energy vehicle technology, promoting new energy vehicles has become a mainstream trend in the contemporary era due to the increasing importance of environmental protection by domestic and foreign health organizations [1]. In the context of environmental degradation and scarcity of crude oil, it is a natural trend to develop the new energy vehicle market, which can not only say goodbye to the era of excessive fuel dependence but also achieve the goal of energy saving and environmental protection [2]. The rapid development of new energy vehicles is not only to solve the ecological problems of automobiles but also an innovation of technology and marketing models. As a benchmark brand of pure electric vehicles, Tesla has refreshed the concept of new energy vehicle manufacturing, opened the idea of new energy vehicle manufacturing, and explored a new segment of the new energy vehicle market [3]. The innovation of its new energy vehicle technology and marketing model has received much attention from the industry. This paper explores the technology and marketing model innovation of Tesla's new energy vehicles from the perspective of technology and marketing models. As a leader in the new energy vehicle industry, Tesla's invention in technology and marketing model of new energy vehicles has received much attention from the industry. This paper will discuss the technology and marketing model innovation of Tesla's new energy vehicles from the perspective of technology and marketing models.

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This paper aims to investigate the significance of studying the innovation of technology and marketing model of new energy vehicles, using Tesla Inc. as an example. The importance of this research is to provide a deep understanding of the development trend of the new energy vehicle industry, guide future development, and promote the industry's growth.

2. Literature summary

In the critical period when new energy vehicles are the new species of the fourth revolution in the auto industry and the battle of the inflection point of new energy vehicles recognized by the industry in 2025, domestic and foreign auto brands must do well in brand innovation. Based on this, scholars at home and abroad have explored and studied the creation of new energy vehicles. Wang analyzed the patent application situation and battery safety technology of the new energy vehicle battery technology of Toyota Motor Corporation in Japan and found that the patent application data is phased [4]. Electric vehicles are a pointer to a sustainable future of transportation, and the electric vehicle industry is in a state of explosive growth. Tesla Motors has fully grasped and capitalized on this growth trend by adopting a distinctive and innovative strategy and business model [5].

3. Marketing advantages

In vehicles selection, purchase, and after-sales, Tesla developed the first D2C dealership model, replacing the prior 4S dealership model, establishing shorter and more direct user access. Through offline stores to cultivate consumers and strengthen the user experience. There is no expectation to perform at the offline experience stores, which are situated in bustling streets and malls where the high-end luxury brand is present. Customers can complete product customization and prepayment immediately on the official website if they have the desire to purchase more. The prepayment before manufacturing purchase model satisfies the requirements of each customer group and provides a satisfying product experience.

Since 2010, when Mercedes-Benz launched smart group buying, auto e-commerce has become an important sales channel. After over three years of brewing, 2014 became a year of full-blown auto e-commerce, surprisingly hot despite weak dealer sales. vehicles e-commerce will become a normalized sales channel for future vehicles sales, including new vehicles, used vehicles, spare parts, and after-market e-commerce. In 2014's "Double Eleven", Tmall's overall turnover reached 57.1 billion, with over 50 vehicles brand manufacturers and 300 models participating and over 50,700 vehicles ordered. "Double Twelve" immediately followed, with Dongfeng Peugeot offering a 7.5% discount on Tmall, Geely Panda's limited-time purchase, and other promotions. According to the "2014 Auto Consumer Behavior Survey Report", consumer enthusiasm for online auto shopping has improved but is still not high due to cautious and conservative buying attitudes and concerns about quality and after-sales service. Two major problems need to be solved in the future development of automotive e-commerce: changing consumer attitudes towards online vehicles purchases and improving online sales and after-sales service quality. The O2O model has been adopted by many auto manufacturers, including brand flagship stores on Taobao Tmall, partnerships with professional auto websites such as Auto House, and some manufacturers building their brand websites. The transaction process of the O2O mode is that customers place orders through the official websites of auto brands. The websites generate orders for customers' purchase information and send them to physical auto dealers to provide complementary products and services to customers. The reasons for choosing the O2O model include access to many references' information for auto consumers, better prices, more choices, and credible information.

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4. Innovation strategy

4.1. Technology Innovation

The goal of Tesla is not to overtake the leading automaker in the world, but rather to correct several long-standing flaws in electric vehicles, change how consumers view them through innovative products, and force the major automakers to compete to improve their electric vehicle lineup. The company's mission is to "accelerate sustainable mobility by bringing mass-market-acceptable electric vehicles to market as soon as possible." This is both its ultimate goal and its main objective. Tesla has created a company strategy in "three steps" High-priced, low-volume vehicles are introduced to the super-wealthy; mid-priced, mid-volume electric vehicles are introduced to more moderately affluent customers; and low-priced, mass-produced vehicles are introduced to the general public.

Ideal has taken a different path than other pure electric vehicles brands, namely developing pure electric but staying within the add-on hybrid. Founder Li once said that the reason for establishing the first model as an extended-range hybrid was that there was no way to solve users' mileage anxiety under existing conditions completely. It's not that RISO doesn't want to cause electric vehicles, but it's waiting. Waiting for the fast charging technology of pure electric vehicles to be perfect and for the popularity of charging piles to increase gradually. The development plan for 2030 announced by Ideal Auto shows that Ideal Auto will not give up on the extended program hybrid and will also launch the 2nd generation extended program hybrid platform. RISO believes the comprehensive program is a good transition between fuel roads and electric vehicles. In the future, for those who do not have charging conditions and often drive long distances, the extended hybrid will remain the best choice.

4.2. Technical advantages

4.2.1. Dual motors

Tesla engineers have added an electric motor to the front axle on top of the rear-wheel drive Model S, transforming it into a dual-motor all-wheel drive Model S. Unlike conventional all-wheel drive vehicles, which use only one engine and transmission to disperse energy and sacrifice efficiency for traction, these vehicles use two motors to disseminate energy. The Model S's two motors independently and digitally control the torque applied to its front and rear wheels, providing better traction control. Additionally, the Model S's low center of gravity and dual-motor digital torque control significantly improve steering and traction. Tesla's goods benefit from a competitive edge that is unmatched in the market thanks to technological innovation and advancement.

4.2.2. Battery

Tesla makes use of a lithium-ion battery with nickel-cobalt-aluminum ternary cathode material, which is a specialized ternary material battery made by Panasonic. The traditional 18650 type lithium battery has some relative flaws that cannot be overlooked by its characteristics, such as being relatively sensitive to temperature, having poor consistency, etc., even though it is the best battery in the world. An extensive range on a single charge, stable and dependable performance, a high safety factor, and more charging cycles are requirements for batteries in electric cars. Tesla makes use of a lithium-ion battery with nickel-cobalt-aluminum ternary cathode material, which is a specialized ternary material battery made by Panasonic. The traditional 18650 type lithium battery has some relative flaws that cannot be overlooked by its characteristics, such as being relatively sensitive to temperature, having poor consistency, etc., even though it is the best battery in the

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world. An extensive range on a single charge, stable and dependable performance, a high safety factor, and more charging cycles are requirements for batteries in electric cars. The performance of most applications is constrained by the battery's power capacity in electric cars, making the battery the system's primary performance bottleneck. Tesla is confident that it can get around the barrier to profitability and rule the market to steer the future of the electric vehicle industry by investing in batteries and manufacturing them more efficiently and on a larger scale.

The traditional 18650 type lithium battery has some relative weaknesses that must be addressed by its characteristics, such as being relatively sensitive to temperature, having bad consistency, etc., even though it is the best battery in the world. An extensive driving range on a single charge, stable and dependable performance, a high safety factor, and numerous cycles charging times are required of batteries in electric cars. Active electrochemical materials, enhanced cell structure design, optimized module design, advanced fail-safe mechanisms and battery charge/discharge control, as well as Tesla's market-leading thermal management system and battery management system, are some of the company's solutions to the drawbacks of 18650-type conventional batteries. Higher energy store capacity per unit volume/weight, a higher charging voltage, and improved cell stability are all a result of the active materials and improved cell structure design.

4.2.3. Intelligent

The most intelligent service that most Tesla users are drawn to is Over-the-Air Upgrade. Similar to today's smartphones, owners can access the newest features of their cars from any location with an internet link. The conventional method of human update was reversed by this extremely clever integrated application. The navigation service, voice navigation, cruise control, collision avoidance assistance, reversing assistance enhancement, speed assistance, intelligent temperature presetting, automatic emergency braking, blind spot alert, valet mode, and 3D navigation have all been updated in China four times since 2014.

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However, the safety risks of autonomous driving have also been identified. In an independent driving situation, the driving task becomes a passive monitoring task instead of an active operation task. This monotonous driving condition can easily lead to the driver's inability to concentrate and even enter a sleepy state. Ergonomic studies have shown that drivers are objectively unable to maintain a high concentration level for long periods when the automated driving system is working. 25% of drivers show fatigue after 15 minutes of using the automated driving system. This state of passive exhaustion will decrease driver alertness or quick reaction ability in the face of emergencies. In the L2 autonomous driving process, L2 autonomous driving also requires the driver to intervene quickly after detecting an abnormality. However, from the perspective of emergency prediction, due to human limitations, the driver's brain and cognitive load demand surge when he is suddenly asked to take over the vehicle control. This driving load characteristic of jumping from very low to a very high degree directly impacts the switching process's safety.

To solve the safety problem, it is first necessary to establish a "level-appropriate" regulatory path to conduct legal policy research for different levels of autonomous driving. As scholars have said, only when the nuances of the different levels of autonomous driving technology are understood and responded to appropriately and targeted legal policies can they be developed. Because of the

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significant differences in human-machine interaction across different levels, the resulting legal policy challenges are both familiar and individual. Therefore, it is essential to go deeper into the factual level of autonomous driving technology in the actual operation process, identify the regulatory elements of different levels, and develop "level-appropriate" legal policies while establishing a market access testing system. China should build a more compatible autonomous driving market access testing system to cover L2-level autonomous driving. There are two key areas to focus on: Establishing unified L2 independent driving system testing standards, assessing and managing the safety of separate driving functions, and ensuring that they are not unreasonably dangerous—Strengthen the regulation of vehicle remote upgrade (OTA) technology.

Instant updates of OTA must be tested for access, and manufacturers must only carry out the upgrade iteration of autonomous driving systems through OTA on their own with testing; secondly, there is also a need to regulate autonomous driving promotional terms. It is essential to accurately communicate independent driving features and provide reasonable guidance on the scientific use of autonomous driving systems. Recently, some countries have begun to pay attention to this issue. Germany banned Tesla from using expressions such as "Full Potential for Autonomous Driving" and "Autopilot Inclusive" for allegedly misleading consumers. The Korea Fair Trade Commission has also investigated false advertising of Tesla's Autopilot.

Given the complexity of autonomous driving technology, consumers are prone to misunderstandings. To strictly regulate the obligation of manufacturers to provide consumers with truthful information, we need to focus on three aspects: (1) requiring manufacturers to specify the level of autonomous driving by uniform national standards; (2) requiring manufacturers to clearly and exhaustively explain the ODD of autonomous driving and ensure safe operation within the ODD, or else bear product liability; and (3) strictly regulating the ODD of autonomous driving. Liability; ③ Strictly regulate the propaganda of autonomous driving. China should regularly publicize cases of new types of false propaganda to regulate new kinds of false propaganda in a targeted manner. For L2-level autonomous driving systems, manufacturers should be explicitly prohibited from using terms such as "fully autonomous driving capability" and "AutoXXX". In addition, a supervision and management system combining administrative supervision, social supervision, and industry self-regulation should be built, and corresponding specific systems and supporting measures should be formulated to effectively improve the efficiency of monitoring false propaganda for autonomous driving [5].

The ability to establish relationships with other entities is a key feature of intelligent vehicles; a vehicle should communicate with the traffic center, other vehicles, pedestrians, signal lights, and other entities. Tesla currently has a mobile client software that is authorized, and the owner can use the app to manage the car in real-time. The vehicle is lost, the owner should have brought the key, the phone can open the door, and a remote application can locate the vehicle and help with car recovery.

4.2.4. Safety

According to Tesla marketing manager and die-hard car enthusiast Ted Milentino, selecting the right metal components is the first step in creating one of the safest automobiles in North America. Tesla's batteries are heavy, so the body weight must be reduced to make up for the weight of the heavy batteries. As a result, Tesla turned to Space X and utilized its cutting-edge rocket technology, making the Tesla cars the only all-aluminum vehicles in North America.

The Model S also proves the advantages of aluminum material from the results of actual high-speed driving intense collisions. The Tesla Model S's body and chassis are mainly made of aluminum alloy, which naturally has better metal ductility than conventional steel and can, therefore, absorb impacts more effectively. While the cockpit is resistant to deformation, the body structure is

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strengthened with high-strength materials that can efficiently absorb energy when struck. The Model S further demonstrates the benefits of aluminum through the outcomes of real, high-speed collisions.

The Tesla's battery pack, which weighs the most of the vehicle, is placed underneath the chassis, which has two advantages for body safety: first, the Tesla's low center of gravity makes rolling over nearly impossible; and second, the Tesla battery pack is built to be extremely strong, which effectively adds another layer of protection for the car's interior. The Tesla Model S also has a "front trunk" design, which frees up enormous storage space for owners and serves as a buffer zone before a collision, thanks to the benefits of pure electric car technology.

Thousands of specially ordered advanced automotive lithium-ion batteries power the Tesla Model S. These batteries are unmatched by conventional batteries in terms of energy density, amazing cyclability, capacity stability, and DC internal resistance after countless charges and discharges. They also exhibit minimal effects of temperature and charging multiplier.

Except for the "double flash" lights and the controller for the passenger compartment, all of the buttons on the Tesla Model S electric cars' 17-inch central touch screen. Most importantly, a system that can be instantly updated automatically at any moment is hidden behind the touch screen thanks to Tesla's convenient "over-the-air upgrade" service. The Tesla mobile app can operate the vehicles without a key if necessary, but each time you unlock the car and input your account information, you must first locate the key. Tesla has numerous security components and a crucial relationship with the driver; this complicated design may not always be able to be opened even with a key. It is in a state of detection at any time, every few seconds to carry out a cycle, proportion, only under the conditions of security, proportional success to unlock, start.

4.2.5. Super Charging Station

It is a strategic facility that is devoted to layout and promotion. Tesla Superchargers represent the most advanced charging technology in the world today, taking only 20 minutes to fill half of the battery and charging much faster than most charging stations [6]. Tesla is the only manufacturer of long-distance electric vehicles because it has taken the initiative to build a national charging infrastructure for its goods. If other automakers build charging infrastructure and provide more practical services based on their current distribution methods, Tesla may eventually lose this advantage. But for now, Tesla is building on its already leading position by working with companies like EVgo (the largest operator of electric vehicle charging networks in the U.S.) to widen the gap with its competitors further.

For Tesla owners, the first home charging post is the most important charging technique. Tesla owners can take care of 99% of their charging requirements without leaving their homes thanks to the industry's first 95% super high home charging installation rate. 99% of everyday travel requirements for Tesla owners are within 100 km, which can be completely satisfied by convenient home charging. The destination charging pile is Tesla's most widely dispersed charging pile, and it can be found in large shopping malls, office buildings, hotels, bank offices, underground parking lots, and some well-known scenic locations across the nation. This allows owners to charge their vehicles on time when stopping for a break while traveling and helps to meet the various needs of Model S owners with regard to travel assessments. In China, Tesla has so far constructed more than 1,400 destination charging stations.

Although Tesla initially established a network of Supercharging stations, it is still constrained by power supply capacity, safety, and other aspects. There are few commercial complexes in third- and fourth-tier cities as in first- and second-tier cities, and the power system's spare capacity is limited. The power facilities (such as transformers and lines) need help to afford to access other Tesla Supercharger stations. Since 2017, more than 30 fire accidents have occurred one after another at

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home and abroad, causing significant losses such as casualties or property 2019, an explosion of a battery storage project in Arizona, U.S., directly led to the injury of four firefighters, two of whom were seriously injured; on April 6, 2021, the energy storage system of a photovoltaic power plant in South Korea caught fire and burned an area of 22m2, causing a total of about 440 million won (about RMB 2.58 million) loss; on April 16 of the same year, an explosion occurred in Beijing's South Fourth Ring Li-ion battery storage power plant, directly resulting in the injury of a firefighter and the loss of an electrician. To alleviate the trouble of electric system safety, Tesla can take charge of the electric power report if the power capacity is insufficient. If the property still has concerns, it can solve the problem by buying insurance and signing an exemption clause. Consumers and charging piles may contact parts of the insulation treatment to protect the personal safety of consumers[7]. The indirect electric shock protection system will cut off the power and end the charging process when the dangerous charged body is exposed. The charging pile output current is confused or even cannot be set, thus ensuring the safety of consumers [8]. During normal operation, the electric vehicle must be immediately connected to the charging station, so it must improve its insulation protection and detect the charging status of the electric vehicle in real-time and immediately turn off the power and stop charging if the battery insulation is damaged [9]. In addition, the charging station is new for the electric power system, and, inevitably, the water is not suitable for it. In essence, it is a need for a national standard to make requirements for charging network power systems and assessing facility safety. Tesla can participate in developing national charging standards with other new energy vehicle companies. Launch the corresponding national average.

The ecosystem plan of Tesla takes into account the quality of each product's component. Existing study has shown that an industry's profits frequently lie in the growth-restricting barriers and components that lower system performance as a whole. The majority of applications in electric cars are performance-dependent on the battery's power capacity, making the storm a performance bottleneck for the entire system. Tesla is confident that by investing in batteries and producing them at a larger scale and more efficiently, it can overcome the bottleneck, effectively control the market, and thus determine the course of the future of the electric vehicle industry. Tesla's strategy also employs a systems perspective, taking into account the complete spectrum of auxiliary goods and services that customers will require in order to use its goods. As a result, Tesla is the only manufacturer of electric vehicles that can be driven long distances and has assumed the initiative in developing a thorough national charging infrastructure for its electric vehicle products. If other automakers build charging infrastructure and offer more practical services based on their current distribution methods in the future, Tesla might lose this advantage. But for now, Tesla is building on its already leading position by working with companies like EVgo (the largest operator of electric vehicle charging networks in the U.S.) to open the gap with its competitors further.

For battery configuration, different battery configuration methods will make specific differences in the internal energy conversion efficiency of the battery, which has a direct impact on the size and weight of the battery [9]. 2022 March The project covers the complete battery production process from paste preparation to battery Pack, material development, physical and chemical testing, electrical performance, and other laboratories. It is expected to be officially implemented at the end of 2022. It is reported that the sponge silicon negative cells developed by GACEA will be produced independently in this pilot line[10].

5. Conclusion

This paper has studied and analyzed Tesla's new energy vehicle company strategy, business model, and technological innovations. Tesla's unique core strategy of high gross margins and good cash flow has enabled it to invest heavily in charging infrastructure as it moves from high-end to low-end

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positioning; its critical resource capability of technological innovation has helped it to focus its investments on R&D spending, which has created a unique competitive advantage for Tesla, increasing sales and generating more cash flow, which in turn has strengthened technological innovation. The direct model gives Tesla an impressive free cash flow structure, which supports Tesla's strategy of developing more diverse models and building a unique business model to go further. Tesla's innovative model has resulted in beneficial cash flow and has influenced Tesla's individual investment decisions, ultimately impacting corporate value and future strategy. Looking at the global development of new energy vehicles, the change theme in the next phase will be intelligence based on electrification. The popularity of electrification will be driven by intelligence.

6. References

[1] *Tian, Y.: Tesla's expansion into the Chinese market impacts Chinese new energy vehicle companies: China Management Information Technology 23, 146-147 (2021).*

[2] *Zong, Y.: Research on the new energy vehicle marketing strategy's optimization strategy. National circulation economy 34,19-22 (2022).*

[3] *Sun, J., Dong, J.: Research on the strategic layout of Tesla. Times Automotive 17, 121-123 (2022).*

[4] *Wang, T.:Network analysis and model comparison of innovation in new energy vehicle battery industry. Journal of Beibu Gulf University 05, 100-108 (2021).*

[5] *Ding, Y.: Study on the promotion strategy of "Xiaopeng vehicles" in the circular economy context. Modern Trade Industry 10, 38-40 (2022).*

[6] *Zhang, F., Wang, Z., Zou, J.: Research on the promotion strategy of new energy vehicles in China - Based on the reference of Tesla's promotion model. Price Theory and Practice 09, 97-99 (2015).*

[7] *Zhang, S., Guo, K.: Exploring the marketing model of new energy vehicles in China. Hebei Agricultural Machinery 05, 61(2017).*

[8] *Li, R., Chi, Q., Qin, X.: Research on brand marketing and promotion of new energy vehicles in the new consumer environment--Tesla as an example. International Brand Watch 31, 53-57 (2021).*

[9] *Ke, S.: Analysis of new energy vehicle battery technology innovation. Agricultural machinery use and maintenance 12, 46-47 (2020).*

[10] *Wang, F.: Analysis of the marketing model of new energy vehicles in China. China Science and Technology Vertical 21, 1 (2014).*