

EXAMINING TAIWAN'S ELECTRIC VEHICLE MARKET WITH THE BUSINESS MODEL OF JAPANESE ELECTRIC VEHICLES

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Abstract

With the increasing awareness of environmental and climate crises in all circles of society, electric vehicles are gradually gaining more attention in various countries. Although the price of electric vehicles remains higher than that of gasoline vehicles, many countries such as EU countries, the United States, Canada, Japan, South Korea, and China have gradually begun to enforce relevant policies and measures in response to environmental protection, driving the evolution of the automobile industry. Taiwan enjoys a number of competitive advantages in developing the electric vehicle industry, but the domestic automobile industry is limited by the following factors: Market size and development path; The government's policy goals for new types of vehicles are not clear enough; The current supporting measures are not comprehensive enough and may hinder the development of Taiwan's electric vehicle industry. Therefore, this study primarily aims to analyze the customer value proposition, profit formula, key resources, and special processes of the Japanese electric vehicle business model, in order to shed light on the development direction of the electric vehicle business models in Japan and Taiwan. Japan and Taiwan have a lot in common, both are located in East Asia and both have high-tech industries. This study thus refers to the business model of electric vehicles in Japan and provides relevant policy suggestions for the future development of the business model of the electric vehicle industry in Taiwan.

Keywords: pure electric vehicles, development of the electric vehicle industry, business model

Introduction

In recent years, energy and pollution issues have attracted global attention, and reducing plastic products and pollution sources has become a trend. Such international trend has encouraged an urgent need for energy transformation. Among them, renewable energy, energy efficiency and electrification are the three cornerstones of future energy structure transformation. The technologies adopted in the three areas have been under development at this stage, accelerating scale expansion and boosting cost competitiveness. In 2015, at the United Nations Climate Conference in Paris, there was a global consensus to reduce greenhouse gas emissions and limit the rise in the Earth's surface temperature to "well below 2°C". As climate change accelerates, societal expectations of actions to reduce carbon challenges increase.

In the light of this, most countries have begun to enforce a number of policies and measures, such as building charging stations and subsidizing the construction of charging stations, and new facilities or residential and commercial buildings are required to reserve space for charging piles/stations in order to promote the electric vehicle industry. Governments have promoted the development of the electric vehicle industry and related industries through multiple channels and realized the vision of green energy transportation. At present, most car manufacturers have not achieved the economy of scale due to the limitation of vehicle batteries. Additionally, the price of electric vehicles is very high, so it is

hard to increase sales volume. Even if the governments can stimulate people's purchase intent for electric vehicles by demonstrating the pilot program, it is still a challenge for car manufacturers to directly sell electric vehicles to the mass market.

Therefore, the main purpose of this study is to analyze the customer value proposition, profit formula, key resources and special workflows of the Japanese electric vehicle business model and put forward relevant suggestions for the future business model of Taiwan's electric vehicle industry in order to develop a feasible electric vehicle business model applicable in Taiwan.

Literature Review

Electric Vehicle Industry Development

The development of electric vehicles can be traced back to the 1830s. After Ányos Jedlik, the father of the Hungarian direct current motor, invented the electromagnetic rotation device, Thomas Davenport developed and manufactured the first electric vehicle driven by direct current (Morimoto, 2015). With the rapid development and maturity of internal combustion engine technology in the 20th century, as well as the application of oil exploitation, electric vehicles are only used in battery loading devices such as golf carts. It was not until the 1990s, with the gradual depletion of petroleum resources and the emergence of environmental protection issues, which the mainstream market for global automotive development refocused on electric vehicles (Yu, 2013). In Europe, in addition

tion to improving traditional engines, the development of core technologies also pivots on electric vehicles. The United States regards hybrid power, including electric power, biomass energy, and fuel cells, as the focus of electric vehicles development (Boulanger, Chu, Maxx & Waltz, 2011); In Asia, the developments of electric vehicles are dominated by Japan and focus on pure electricity, hybrid fuel and fuel cells as power sources for new types of vehicles. In terms of market maturity and consumer acceptance, the world has taken electric vehicles as the short-term development goal.

Electric vehicles can be roughly divided into the following categories:

1. Hybrid EV (HEV): This type of electric vehicles is driven by traditional internal combustion engines and electric motors and equipped with batteries and motors. The general hybrid vehicle does not have the function of external plug-in, and the benefit is limited.
2. Plug-in Hybrid EV (PHEV): This is an advanced product for hybrid vehicle, and the endurance in pure electric mode is usually less than 50 km.
3. Battery EV (BEV): This type of electric vehicles relies on batteries and electric motors as driving systems. There are no exhaust emissions, so it is the most environmentally friendly.
4. Extended Range EV (EREV): This type of electric vehicle is derived from a pure electric vehicle and is equipped with an engine and generator. When the battery power runs low, the engine will drive the generator to provide battery power. The power of

the engine is not directly transmitted to the mechanical structure, so it is regarded as a pure electric car.

5. Fuel-Cell EV (FCEV): Powered by the reaction of hydrogen within fuel cells. Only water is produced, so no pollutants are created (Ghosh, 2020).

Among the EV categories mentioned above, HEV have the largest share. It is mainly because of the high maturity of products and competitive cost performance. In contrast, the cost of PHEV and BEV is difficult to reduce because battery costs account for a large number of costs for these two EV types, and the governments need to introduce policy subsidies and complement measures to attract consumers. In addition, the development of pure electric vehicles is related to the penetration of charging stations of charging piles, and the improvement and penetration of charging facilities can decrease the travel restrictions of electric vehicles.

Business model

Depending on the type of business, enterprises can combine and deploy business models with different operating elements, so that enterprises can maintain a competitive advantage in the market and make stable profits. At the same time, their business models emphasize the effective deployment of resources and the creation of value, which is the key to successful operations. Enterprises must accurately identify the key dimensions of the business model, and operate with the most complete business model to achieve sustainable development.

Gebauer, et al. (2020) proposed that business models are the operating procedures that convert the invested resources into profits, and gaining profits is the main purpose of business model design. In recent years, international enterprises have widely adopted the business model developed by Bocken & Geradts (2020), because they believed that business models can connect business strategies, business organization and information system. Additionally, this business model can evaluate the factors in the external environment, such as competitiveness, regulatory environment, social environment, consumer demand and technological changes, so that the business strategic goals can be achieved. Meanwhile, they put forward the four major aspects and provide descriptions on the nine elements of the business model. Furthermore, they develop the "Business Model Canvas", and it is adopted by companies such as 3M, Ericsson, Deloitte, Telenor and other global businesses for business resources planning. Tykkyläinen & Ritala (2021) believed that business models can be employed to explain the value creation, business performance and competitive advantage of enterprises, and that business models can play a central role in explaining business performance. For social enterprises, Ojha et al. (2020) also proposed that resource deployment must include four major elements: identifying core competencies, identifying strategic assets, constructing core processes, and allocations.

From the above, it can be seen that the connotation and elements of the business model are quite diverse due to the large number of organizational types

of enterprises and the different competitive environments, which directly affects the success or failure of enterprise operations. According to Sjödin, et al. (2020), they suggested to identify the business models implemented by successful organizations, and further identify the key factors that will attract and retain revenue streams, and provide value for sustainable profits. They also believed that three major keys will influence business operations, including business models, operating environments and environmental changes. Müller et al. (2021) believed that organizations can have better business performance by understanding the combination of business models and imitating them. Teece (2010) also proposes that differentiated and efficient business models can make profits for companies. Therefore, all the organizations must pay attention to the importance of business model and accurately control the key points of business model in response to the ever-changing competitive market in order to operate sustainably and steadily.

Business model innovation

Business model innovation must examine the differences between the old and new models in the following four aspects: value proposition, value creation, value transmission and value acquisition. Moreover, it is a strategic dilemma within an organization that reflects the conflicts between seeking new business opportunities and making the most out of resources (Snihur et al., 2021).

With the coexistence of old and new business models, Velu and Stiles (2013) study different mechanisms for resolving dilemmas and conflicts, and discuss the need to link and connect strategies with business models in the study of business model innovation (Afuah, 2014). In the case of coexistence of business models, different business models may have different competitive strategies, and it is logically necessary to go beyond the decision-making mechanism of the competition strategy level to resolve the conflict of resource allocation. Therefore, it is clear that value drivers guide the design of the manufacturer's main value activities and the type of the required resources, which in turn changes the transaction relationship between buyers and sellers and the value transmission carrier (Lüdeke-Freund et al., 2019).

In 2008, several authors (such as Clayton M. Christenson and others) from The Harvard Business Review pointed out that a successful business model can be built or renovated based on simplified traditional business models. The simplified business model consists of four elements: customer value proposition, profit formula, key resources, and special processes (Clayton M. Christenson, 2008). In particular, when organizations face major upheavals in the industry, such as technologies, organizational processes, resource integration, etc., the old business model may no longer be feasible or even hinder the operation of the organization. Consequently, the existing business model will need to be renovated (Johnson et al., 2008). According to the literature, business model innovation needs to combine four elements to create value (Figure 1).

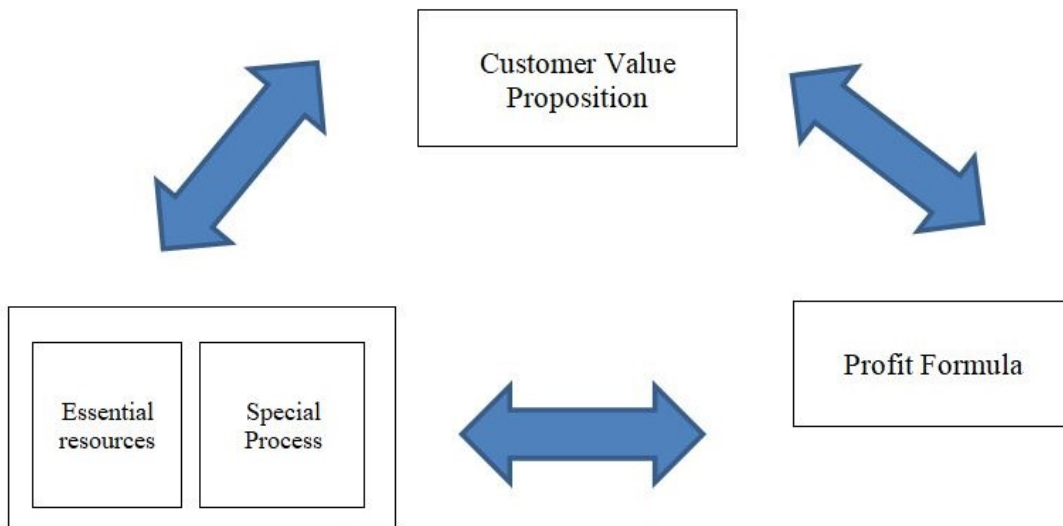


Figure 1. Business Model Innovation
Sources: Johnson et al. (2008)

Customer Value Proposition

Enterprises must provide products based on customer needs and deliver products to customers in the fastest way and at the lowest cost in order to achieve the goal of maximizing customer value. The point here is to understand which aspects of customer needs are not fully satisfied and to provide a combination of services and products at an affordable price, so that customers can easily complete the purchase.

Profit Formula

Enterprises need to establish an internal profit model, integrate the internal and external resources owned by themselves, propose a production model with the lowest cost or the highest value by considering cost, total income, profit margin or inventory turnover rate, etc., to calculate the maximum profit that the enterprise can obtain. Simply put, it is to define a business model which creates value for themselves and their shareholders, with a clear revenue model (revenue source = price * quantity), cost structure (direct cost + variable cost) and profit (profit alone), and can be used to calculate inventory, production lead time, capacity utilization rate, etc. Generally, companies will manage to increase sales volume, so as to lower prices (costs) and obtain higher profits.

Key Resources And Special Processes

Key resources refer to the resources required to produce products that meet customer value propositions, including

hardware (company's plant, equipment, etc.), software (personnel, technology, channels, etc.) or intangible brands, which must be employed and consolidated to produce the best production mode. Simply put, it is the resources necessary to produce attractive products based on customer value propositions. In terms of special processes, enterprises need to develop exclusive business processes, especially for the business details required to be carefully managed, such as business models, codes of conduct, process activities and design. Typically, companies need to integrate key resources and processes to create a sustainable, profitable, and differentiated business model based on profitability and customer needs. Among them, the cooperation of key resources and special processes will be the critical factors that determine the uniqueness and sustainability of the business model. If an organization can successfully coordinate key resources and special processes, it can generate synergies, deliver customer value propositions, and create value for the organization. Coordinating skills are thus essential to successful business models (Sjödin, et al., 2020).

The Business Model Of Electric Vehicles

From the current electric vehicle market, the development of electric vehicles is gradually improving. Moreover, the traditional automobile industry and related suppliers, such as battery manufacturers, power suppliers and other service providers, will inevitably be challenged in the future. Generally, the business models of the international electric vehicle industry can be divided into two

types: product-oriented and service-oriented (Skala, 2022).

(I) Product-oriented: The traditional automobile industry relies on product-oriented business models. To further clarify, the automobile organizations put much emphasis on selling cars over providing basic supporting services, such as: loans, insurance, inspection and maintenance, etc.

(II) Service-oriented: Different from the traditional business models in the past, this type of business model emphasizes the value of services and customer satisfaction. Even if the customers do not have the ownership of the vehicles, they can still enjoy the service (Cavicchi & Vagnoni, 2020). Additionally, service-oriented business models can be further divided into the following two sub-types.

Use-oriented services: In this type of business model, customers can access vehicles on a temporary basis without the need to purchase vehicles. These services may include mobility guarantee, car sharing, fleets and other services, so customers can enjoy using cars by renting. Result-oriented: In this type of business model, customers will be provided with ride services, and no other intermediaries are involved in this process. For example, taxi services fall into this business model. Similarly, automakers themselves can provide ride-hailing services by providing ride services with their own cars without the need to asking support from intermediaries.

At current stage, the development of electric vehicle technologies in various countries remains in its infancy. The low mileage of electric vehicles is a ma-

ior problem, and this is also the biggest concern of the public when purchasing electric vehicles (Mom, 2013). Apart from the battery capacity issue of electric vehicles, the public also need more public charging facilities and better vehicle performance to ensure the convenience and safety needs when driving electric vehicles (Luo, et al.2020). Therefore, it is necessary to illustrate customer value proposition and make plans for value chain and revenue model in order to develop a business model as a value creation tool for the electric vehicle industry or automakers (Reinhardt et al., 2020). Furthermore, in addition to targeting potential customers and articulating customer values proposition, the establishment of charging stations and related charging facilities is also important for formulating a business model suitable for electric vehicles. At the same time, the governments need to get involved, promote the development of the electric vehicle market, and drive the cooperation between relevant industries to map out the roadmap for the business model of electric vehicles.

Research Methodology

Research Structure

First, this study adopted the four major elements of business model innovation theory, including customer value proposition, profit formula, key resources and key processes. These elements will be employed to analyze the development of the Japanese electric vehicle industry based on the existing secondary data of the international electric vehicle market. Afterward, this study

refers to the business model of the Japanese electric vehicle market and the business model innovation theory proposed in *The Harvard Business Review* in 2008 (Johnson et al., 2008), aiming to explore the business model of Taiwan's future electric vehicle industry.

Research Methods

As the current development of the international electric vehicle industry is in the initial stage, there is a lack of systematic discussions on the development of electric vehicle business models. This study will use the research method for historical data to conduct in-depth analysis of the development status and business model of the Japanese electric vehicle market.

Sources

The main sources of this research data are from electric vehicle-related research institutions, including Taichung Municipal Government, Tainan Municipal Government, New Taipei Municipal Government, Automotive Research & Testing Center (ARTC), Chung-Hua Institution for Economic Research, Intelligent Electric Vehicle Technology Project (Department of Industrial Technology of Ministry of Economic Affairs, Taiwan) academic journals, media reports, the official website of automakers, professional online forums, library books, and journal papers, as well as related databases. After collecting research data from the above sources, this study aggregates and organizes these data to discover practical insights.

Analysis and Business Model of Japanese Electric Vehicle Industry

Incorporating the four dimensions of the business model innovation theory, this section is organized based on the customer value proposition, profit formula, key resources and special processes in each region.

Japan

(A) Customer value proposition: The main target customers are the public and official fleets of public institutions.

(B) Profit formula: Japan is the most successful country in Asia when it comes to promoting electric vehicles. Japan's central government offers electric vehicles buyers with subsidies up to \$800,000 yen, which can save electric vehicle buyers half the price compared to the fuel vehicles buyers. If individuals or businesses build charging infrastructure, they can gain a subsidy of about \$200,000 to 1.5 million yen. In addition, electric vehicle owners can also enjoy 100% vehicle tax and weight tax reduction, 50% vehicle tax reduction and parking fee discount (Xue Qinduo, 2010).

(C) Key resources and processes: The two-phase EV/PHEV city plan announced by Japan's Ministry of Economy, Trade and Industry aims to encourage local governments to build environmentally friendly cities, and strives to promote the use of electric vehicles and the construction of charging infrastructure. Japan is expected to build 2 million charging stations nationwide by 2020.

Apart from announcing the promotion plan for electric vehicles in 2008, the local government of Kanagawa Prefecture took the lead in using electric vehicles as official vehicles in the public service system. It also began to build local charging infrastructure, and it is expected to establish up to 100 fast charging stations countywide in 2014. Moreover, it cooperated with 25 organizational units and 95 parking lots to build 1,000 general charging stations (which provide 100V/200V power) to complete the local electric vehicle plan.

In addition to the active promotion of charging infrastructure by Japan's central government, the four major domestic automakers (Toyota, Honda, Mitsubishi and Speedmaster) cooperated with 13 Japanese power companies to establish the CHAdeMO Association (Charging Network Development Organization, CHAdeMO) in Tokyo in 2010. This association takes the membership system of electric vehicles as a basis for promoting electric vehicles. Since 2012, the paid members can charge and replenish at fast charging stations under the association system (Chen Yuhui, 2013).

(D) The business model of the Japanese electric vehicle market: The country's sales model mainly focuses on the vehicle sales. Most of the automakers cooperate with dealers to sell vehicles, and the target customers are public institutions and the public. Because the standardization of electric vehicle batteries in Japan is not high, the business model of battery leasing is not quite feasible. That is why electric vehicle batteries are

currently sold to the public in the form of direct sales. Japan's central government, in cooperation with local governments, has initiated and promoted a two-phase EV/PHEV program in several large cities. Moreover, most automakers are actively seeking cooperation with local governments, hoping that local governments can encourage the public to buy electric vehicles. Therefore, local governments took the lead in promoting the use of electric vehicles in the public service system. Meanwhile, local governments also ask local public offices to replace the old fuel vehicles with new electric vehicles as official vehicles.

Some cities also start to adopt car-sharing practices. For example, the French organization Autolib promotes self-service electric rental services in Osaka Prefecture and works on a demonstration plan commissioned by Japan's Ministry of the Environment by rewarding users with eco-friendly points. Users can exchange these points for goods or services at 53 organizations such as restaurants, banks, and hotels to cultivate the habit of using electric vehicles (Xiao, 2013).

In recent years, the electric vehicle industry has provided various services such as vehicle sharing, vehicle leasing or battery leasing instead of selling vehicles. Driven by this trend, manufacturers tend to provide more durable and efficient products in order to improve the efficiency of resource use. This is the concept of so-called "product servitization": A company provides a function or service to replace a tangible product. The supplier's goal is not to sell products

but to provide better performance or solutions to meet consumer needs.

Business Model of Taiwan's Electric Vehicle Industry

This section explains the business model development direction of Taiwan's electric vehicle industry from four aspects of business model innovation, as the basis for the future development of this industry.

(1) Customer Value Proposition

At this stage, most families own more than one traditional fuel vehicle for long and short-distance transportation, which can be used for family travel or other purposes. However, vehicles are mostly used for short commutes, with an average daily distance of no more than 100 kilometers. There are more opportunities for vehicles to be used for short commutes than for long trips. Therefore, housekeepers only need a short-distance vehicle to meet their needs.

Since most electric vehicles can only be used for short-distance travel, and they are mainly driven in cities, Taiwan is currently mainly sold to public agencies as official vehicles. After the relevant regulations are passed, electric vehicles will be gradually promoted to the mass market. At that time, the public can buy electric vehicles to drive in urban areas. In order to bring electric vehicles to the mass market, it is suggested that automakers can target customers who are housekeepers in the early stage, so as to meet their needs to handle household chores. On the other hand, it can start to expand the customer base to other sales

markets other than the household market, as a preparation for expanding the sales scale in the future (Lin e, 2011).

(2) Profit Formula

This section explores the future development of Taiwan's domestic auto industry. Due to the small scale and slow growth of the domestic automobile market, and the rising market share of imported vehicles in recent years, domestic vehicles have been crowded out by imported vehicles, which have affected the development of domestic vehicle manufacturing industry. As for new energy vehicles (including battery electric vehicles and hybrid electric vehicles), domestically produced battery electric vehicles are mainly locomotives. The domestic hybrid vehicle brands are dominated by Toyota, while Luxgen also produces electric vehicles (39 cars were listed in 2018). Other brands do not manufacture their own hybrid electric vehicles or battery electric vehicles for sale in Taiwan, which shows that new energy vehicles have not become the mainstream of Taiwan's manufacturing industry. This should be mainly because the production of domestically produced cars in Taiwan is controlled by the technology mother factory.

In terms of sales volume, the proportion of Taiwan's new energy vehicles in overall sales is still quite low, and the new energy vehicle market is still in its infancy. At present, the prices of HEVs launched by many automakers are also quite high (often NT\$1 million), which is NT\$200,000 to NT\$300,000 higher on average than that of gasoline vehicles of

the same specification. In addition to maximizing profits, automakers must also ensure that the price of electric vehicles can meet public expectations. Since people are generally reluctant to pay high prices for electric vehicles, they will only consider switching to electric vehicles unless the government implements subsidy measures. Generally speaking, the price of electric vehicles accepted by the public may be similar to (or even lower than) that of fuel vehicles of the same specification (Zhang & Zhang, 2011).

According to the profit formula, if Taiwanese electric vehicle manufacturers want to develop the private electric vehicle market, they can determine the price of their electric vehicles based on the customer value they want to provide. In addition, automakers can set target profit and cost structures in advance by using reverse profit and loss statements and their resources, and design a set of manufacturing and sales processes accordingly.

(3) Key Resources

In recent years, various automakers have successively invested R&D resources to develop the electric vehicle market. At this stage, the construction of charging infrastructure will inevitably become the key to the wide application of electric vehicles in the future. Therefore, charging infrastructure will be a key element in promoting the electric vehicle market. As shown in the "2011 Electric Vehicle Market Survey" released by Deloitte & Touche, one of the world's leading accounting consulting

firms, more than 90% of Taiwanese believe that the convenience of charging, mileage and charging costs are the most important considerations when they purchase or lease electric vehicles. About 66% of Taiwanese hope that the charging time can be lower than 2 hours (Zhang & Zhang, 2011).

At present, parking lots in Taiwan can be roughly divided into on-street parking spaces and public/private parking lots, including schools, parks, activity centers or gymnasiums. If a large number of charging infrastructure can be built in on-street parking spaces and public parking lots, it will be beneficial and more convenient for the public to charge vehicles. Both the government and automakers should invest resources to build charging infrastructure in order to increase people's willingness to buy electric vehicles. Moreover, in order to avoid the dilemma that electric vehicles run out of power on the highway and cannot find public charging stations, it is also important to build charging infrastructure at rest stops on domestic highways and fast-track roads.

The construction of charging infrastructure requires the cooperation of government subsidies and high-quality and stable electric supply from power companies. Hence, the active participation of the government is also the key to the wide adoption of electric vehicles by the public. The government or automakers should actively seek the assistance of power companies to cooperate in the construction of public charging stations, including the provision of fast and slow charging equipment. To popu-

larize electric vehicles on a large scale, it is necessary to build public charging facilities or install charging equipment at existing gas stations. Besides, these charging stations should adopt fast charging equipment to effectively reduce the time for electric vehicles outside to be charged outdoors, so that electric vehicles can be recharged in the shortest time. Moreover, these charging stations can provide battery replacement services, allowing the public to directly go to the service stations to replace the batteries (Song & Huang, 2010).

(4) Special Procedure

To improve the supporting measures for electric vehicles, the Taiwan government has established regulations and incentives to encourage automakers, parking lots or gas stations to proactively build charging infrastructure. On the one hand, it can encourage automakers or parking lot owners to build a certain percentage of charging infrastructure. Especially for public parking lots, the proportion of charging infrastructure should be increased year by year within a certain period of time. On the other hand, the government can provide free or discounted parking fees for electric vehicles to encourage people to buy or exchange electric vehicles, and then provide partial subsidies to the parking lot owners.

For electric vehicle users, household charging equipment is a fast and efficient charging method. Charging an electric vehicle in a garage or parking space at home not only saves you the trouble of finding a charging station, but it is also much cheaper to charge during

off-peak hours at night. Besides, automakers can actively provide home charging equipment through cooperative power companies, which can also increase consumers' willingness to buy and facilitate electric vehicle owners to charge at home. As long as the connection between information technology and the intelligent system of electric vehicles can be established, electric vehicle owners can easily obtain the information such as public charging stations or electric vehicle parking lots at any time.

Conclusions

This study will summarize the business model of Taiwan's electric vehicle industry based on the four dimensions of business innovation model:

- (A) Customer Value Proposition: Target housekeepers as the primary customer base to satisfy their daily needs, and then scale the market size to bigger markets to prepare for future sales market.
- (B) Profit Formula: Since the price of electric vehicles acceptable to the public will not be higher than that of fuel vehicles of the same specification, the government must provide subsidies to reduce the purchase price of electric vehicles and make the public willing to buy electric vehicles.
- (C) Key Resources: Ease of charging, driving range and charging cost are extremely important considerations when purchasing or leasing electric vehicles. Therefore, charging facilities

ties are a key resource to promote the development of the electric vehicle market.

- (D) Special Processes: By enforcing relevant regulations and incentives, automakers or parking lot owners can be encouraged to build a certain percentage of charging infrastructure. Besides, the government could subsidize to parking lot owners to encourage them to offer free or discounted parking fees to attract people to buy or replace electric vehicles. Additionally, after the information technology is connected with electric vehicle smart systems, the public can quickly obtain information such as public charging stations or electric vehicle parking lots.

The above are four key factors that are indispensable for the development of the electric vehicle market. Moreover, the construction of charging stations is another key to the expansion of the electric vehicle industry. Since the government is not the only organization capable of building charging stations, other brand-new business models are derived, such as providing charging services to generate charging revenue or collaborating with existing service providers (supermarkets, chain restaurants, parking lots or gas stations, etc.) to form strategic alliances.

In addition, although electric vehicles have energy-saving and carbon-reduction benefits, but the cost is higher than that of general fuel vehicles, the

government should take into account the difference between the price and tariff of electric vehicles introduced by various governments for the subsidies provided by the people and the car manufacturers in the future through tax reductions or purchase subsidies, etc., to provide car purchase subsidies to increase the public's willingness to buy and encourage consumers to use electric vehicles. In addition to encouraging automakers to develop more electric vehicles, the government must also educate the public to use more electric vehicles, with energy conservation and carbon reduction as the appeal, and encourage the public to buy electric vehicles to avoid the imminent depletion of crude oil, resulting in rising oil prices or fluctuating.

Although electric vehicles can save energy and reduce carbon, the purchase cost of electric vehicles is higher than that of fuel vehicles. Therefore, the government should reduce tax allowances or provide purchase subsidies, and learn from subsidies provided by other governments as a reference for future EV-related measures to increase the public's willingness to buy electric vehicles. Apart from encouraging automakers to put more emphasis on the development of electric vehicles, the government must promote the use of electric vehicles in the pursuit of energy saving and carbon reduction. By encouraging the public to buy electric vehicles, the fear that crude oil is about to run out and oil prices may suddenly rise or fluctuate can be avoided.

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