Research on Sustainable Development of Chinese New Energy Vehicle Enterprises --- Based on Consumer Psychology and Range Anxiety

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Abstract:

In the past few decades, more and more people tend to buy new energy vehicles due to serious environmental pollution, rising oil prices, restricted measures from the government, high car utilization costs, and other problems. However, compared to traditional oil-driven vehicle, new energy vehicle also has many disadvantages, such as range anxiety, public prejudice etc. Because of this background, this article will focus on the issue of consumer psychology and range anxiety to new energy vehicles, discussing what kind of vehicle Chinese consumers tend to buy, how consumer psychology influences car purchase behavior, as well as the causes and solutions of consumers' range anxiety of electric vehicles, which will help Chinese new energy vehicle enterprises better achieve sustainable development.

Keywords: Sustainable development, Chinese new energy vehicle enterprise, Consumer psychology, Anxiety of electric vehicle range

1. Introduction

Since the first vehicle was invented in 1886, vehicles have been widely used in almost every country in the world, and have become an indispensable part of the whole country and society. In other words, we can not live without vehicles in this fast-developing world. Actually, for a very long period of time, vehicles were powered by traditional energy such as gasoline and diesel. As the number of vehicles surged, more and more vehicle exhaust was discharged into the air, which to some extent has caused some serious environmental issues in some countries and regions. Therefore, new energy vehicles have started to be focused on.

In the 21st century, with the breakthrough of lithium-ion battery technology, the range of electric vehicles has been significantly improved. Electric vehicle companies are springing up in these two decades, especially in China, such as BYD, NIO, Xiaopeng Motors, Geely Automobile and so on. Under the background of globally and nationally green development and low-carbon life, Chinese new energy vehicle companies seem to have a wonderful development prospect. But there is no doubt that there are many problems still exist in Chinese new energy vehicle companies, such as anxiety about electric vehicle (EV) range, difficulty finding a charging pile, serious damage to public charging piles, consumers' prejudice and disapproval of new energy vehicles, slow charging speed, low retention rate and batteries for electric vehicles being damaged easily.

In view of these existing problems, and in the following article, the topic about anxiety about electric vehicle range and consumer psychology will be highly discussed.

2. Related Concepts

2.1. New energy vehicle

It refers to those cars that use non-traditional vehicle fuel such as battery as a source of power. There are many kinds of new energy vehicles: Battery Electric Vehicles(BEVs), Plug-in Hybrids(PHEVs), Fuel Cell Vehicles(FCEVs) and so on. These vehicles use less or no use of gasoline or diesel.

2.2. Consumer psychology

It refers to the specific psychological activities and thinking ways that generated by consumers in the process of contacting a certain goods and deciding whether to buy it or not. It includes 3 main procedures: The procedure of consumer realize goods; The procedure of consumer generate interest and emotion and The procedure of whether consumer finally decide to buy this goods. And these 3 main procedures are owing to the different age, gender, occupation and hobbies of consumers. Hence, in a given economic conditions, consumers' specific choice of goods is mostly decided by the consumer psychology[1].

2.3. Range anxiety of electric vehicle

It refers to the driver's fear of his/her vehicle has incapable energy storage(fuel, especially battery capacity) to cover the road distance needed to reach its intended destination and cause driver and occupants trapped in the

mid-way. Range anxiety seemed to be one of the major psychological barriers to large-scale public adoption of electric vehicles.

3. Research Methods and Research Procedures

First, this article will adopt Document Research Method; Theory Analysis Method; Data Analysis Method and Questionnaire Method. Through search for and sum up some useful, official or governmental websites information, encyclopedias, documents, journals, newspaper articles and dissertations on the Internet. Second, introduce the history, status quo and problems of Chinese new energy vehicle, let readers have a rough understanding of it. Third, make a well-designed questionnaire about consumer's consuming psychology, consumer's thoughts and concern about new energy vehicle, and then collect, analyse and compare these data. Fourth, according to the respondents answer and questionnaire data, sum up these data and evaluate them. Lastly, this article will draw some conclusions and give some specific advice to enterprises and consumers.

4. Chinese new energy vehicle enterprises history and status quo

4.1. History

With the increasingly serious environmental pollution, many countries around the world have begun to accelerate the development, production and application of new energy vehicles, not excluded China. Consequently, under the background of this, some native new energy vehicle enterprises began to appeared and developed in China.

From the foundation of People's Republic of China in 1949 to 1978. In this period, China is a very poor and underdeveloped country, the production and technology of vehicle is very backward, the main reason for producing car is to foster the development of industrialization. Hence, almost all vehicles in China run on fuel. Afterwards, from 1991 to 2010, owing to reform and open policy in China, all Chinese new energy vehicle industry started at this stage, so Chinese government issued a lot of measures to encourage the development of new energy vehicle in China, such as reduce related taxes, provide financial subsidies and give policy assistance. Chinese new energy vehicle industry has begun to develop fast, and some Chinese new energy vehicle enterprises born during this period, such as BYD, this enterprise was born in 1995.

However, new energy vehicle is not popular among Chinese people until 2012 or later. After 2012, with the development of communication technology and high-tech touch screen phone, and with the development of the Chinese economy, and with the increase of Chinese people's income, and with the surging demand of private vehicle, and with the entry of Tesla into Chinese market in 2012. New energy vehicle has become popular in China. Therefore, during the time after 2012, many Chinese new energy enterprises established: NIO in 2014; Xiaopeng Motors in 2014; Leading Ideal in 2015; GAC AION in 2017 etc.

Until 2023, China has over 30 main new energy vehicle enterprises and until August 2023, there are 1,016,013 new energy vehicle related enterprises founded and registered in mainland China.

4.2. Status quo

4.2.1 Retail volume, output, holding number

Since the Chinese government has launched the " Demonstration, Promotion and Application Project of 1,000 energy-saving and new energy Vehicles in ten cities" in 2009, Chinese new energy vehicle have started the marketization process, China's new energy vehicles holding number is continuing rising, and retail volume and output are also rising except there is a slight fall in 2019. Especially from 2020 began, retail, holding and output number all were crazily increasing. And in a recent year of 2022, China's new energy vehicles output and retail volume are 7058 thousand and 6887 thousand respectively. And have increased 96.9% and 93.4% respectively, remaining the world's first for eight consecutive years[2].

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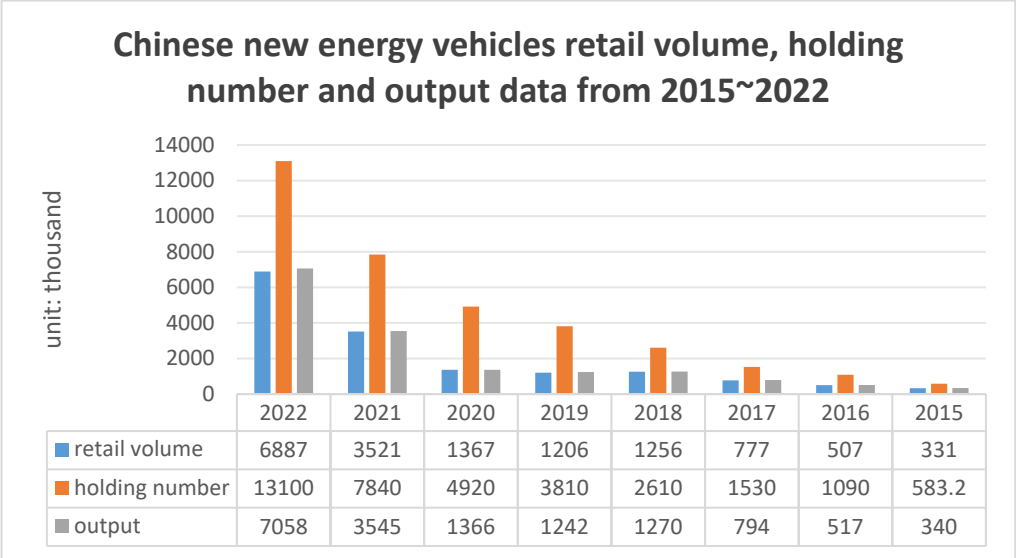

	2022	2021	2020	2019	2018	2017	2016	2015
retail volume	6887	3521	1367	1206	1256	777	507	331
holding number	13100	7840	4920	3810	2610	1530	1090	583.2
output	7058	3545	1366	1242	1270	794	517	340

Figure.1 Retail, holding and output data of Chinese new energy vehicle from 2015~2022

4.2.2 Charging piles and its geographic distribution

Charging piles are the facility that charge electric vehicles, It's role are similar to gas station, and it's indispensable for electric vehicle. According to the data from China Charging Alliance, from 2018 to 2022, the total holding number of charging piles increased from 777,000 to 5,210,000 and it has increased approximately 7 times during this 5 years. «C:\Users\Administrator\AppData\Local\Temp\Chart_mkxdzj3m.pdf»

Figure.2 China's accumulated holding number of charging piles

Charging piles are divided into private pile and public pile. Public charging pile refers to charging piles that provide charging for social vehicles. It's also continue growing. From 331,000 in 2018 to 1,797,000 in 2022. «C:\Users\Administrator\AppData\Local\Temp\Chart_nvs0nhhi.pdf»

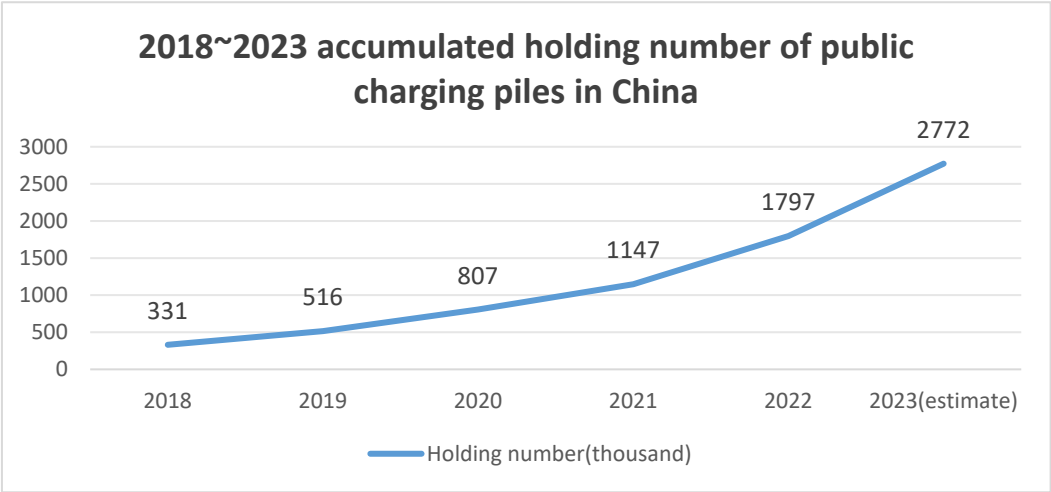

Figure.3 China's accumulated public holding number of public charging piles

However, with the development of new energy vehicles, especially battery electric vehicles, people's demand for charging piles is continuing grow. Although China's charging infrastructure is accelerating these years, it is still lags behind the growth rate of vehicles. By the end of 2022, the number of public charging piles in China has reached to 1.797 million, and 3.413 million charging piles were built with vehicles. The total vehicle-pile ratio was about 2.5:1, further decreasing from about 3:1 in 2021. At present, the ratio of the total number of new energy vehicles to the total number of public charging piles in China is about 7.3:1, and public charging piles are relatively scarce. Moreover, the distribution of public charging piles does not completely match the distribution of new energy vehicle ownership, and the car-pile ratio of some provinces and cities is greatly higher than the average level, especially in less developed regions such as Guangxi province and Henan province, where the ratio exceeds 10:1[3]. But, in the future, as new energy vehicles become more widely available in China's vast rural areas, the vehicle-to-pile ratio in these areas will become increasingly unbalanced in a short future.

5. Problems that Chinese new energy vehicle enterprises facing

Some problems listed below comes from the online resources and some problems comes from the responds in the questionnaire I made. In the questionnaire, all 100 respondents comes from China, comes from different age groups(18~23, 24~29, 30~39, 40~54) and different monthly income groups(none, ￥1~￥4999, ￥5000~￥9999, ￥10000~￥19999, ￥20000~￥49999, ￥50000~￥99999). They took participate in and filled the questions in the questionnaire. Through the responds from the questionnaire, It is obvious to find that there are some problems that Chinese new energy vehicle enterprises are facing now.

5.1. Problems

First, according to the questionnaire, there are two thirds of respondents don't own new energy vehicle even if they have at least one car in their home. This phenomenon indicates that people have some concerns about new energy vehicle in China. Like difficulty in charging, range anxiety etc.

Second, according to the questionnaire, there are 30% of total respondents choose to buy gas or diesel driven car if they don't have car, and 50% of total respondents choose to buy plug-in hybrids car in the same case, and only 20% of total respondents choose to buy Battery Electric Vehicle when they first buy their own car. This phenomenon shows that Chinese people's acceptance to Battery Electric Vehicle is not so high, they don't willing to quit fuel-driven car. However, They still tend to buy a vehicle that can be drove through charging because of environmental protection factor or cost saving factor.

Third, according to the questionnaire, in the topic about why you don't buy new energy vehicle, the most popular two reason is that afraid of wrong driving range distance will brings range anxiety and afraid of inconvenient charging and charge in a low-speed.

Fourth, some Chinese new energy vehicle enterprises rely much on the government's financial subsidies, policy subsidies and tax subsidies, resulting in insufficient innovation. Meanwhile, the subsidies for different industrial chains of some new energy automobile enterprises are not so reasonable. But this factor is not what I will discuss in this article.

6. Future outlook, suggestions and conclusions

6.1. Future outlook

On the whole, Chinese new energy vehicle enterprises have a good development prospects.

First, in recent 2 years, oil price in China is rather expensive, especially in 2022 and 2023. Take Chongqing, China as an example, on September 26, 2023, the diesel price is RMB8.17 per litre, and the gasoline price vary from RMB8.49 to RMB10.10 per litre. This oil price is obvious more expensive than many countries even some developed countries. So, for many Chinese people, traditional oil-driven cars driving cost is a little bit high. Moreover, the oil‘s price adjustment mechanism in China is not so transparent, it‘s hard to predict the oil price in the next adjustment period. So if the oil price continuing rise in the future, it will definitely foster the sales of new energy vehicles.

Second, With the development of society, the concept of energy conservation and environmental protection has been deeply rooted in the hearts of Chinese people, so more and more people are willing to buy new energy vehicles instead of oil-driven vehicles. Additionally, in the future, with the improvement of relevant technologies, Chinese new energy vehicles will become more advanced, more technological, more cost-effective. Attracting more people to buy them. And the related charging technology, driving range and public charging pile layout will also be improved. So, at that time, the sales quantity and holding quantity will significantly increase.

Third, Chinese new energy vehicle not only sells its new energy vehicle in China, but also export its car to other countries. From 2019 to 2022, the total export volume are 255 thousand, 223 thousand, 310 thousand and 764 thousand respectively, Chinese new energy vehicle exports hit the new high in 2022. And in the next few years, the demands of new energy vehicle in foreign countries will continuing rising because of the pressure from the environment. However, Chinese new energy vehicle enterprises are facing some problems such as lack of core technology, rise of global trade protectionism etc. So, Chinese new energy vehicle enterprises need to further improve the technical level, brand influence, product quality and improve supporting facilities, actively participate in the reform of international trade mechanism to expand its share and competitiveness in the global new energy vehicle market[4].

6.2. Suggestions

Until now, in China, consumers of car still have certain prejudice and resistance to new energy vehicle. According to the statistics from the China Ministry of Public Security, by the end of 2022, the number of motor vehicles had reached to 417 million, which has increased 5.39% compared to 2021. However, among the total motor vehicles, there are only 1.31 million motor vehicles are new energy vehicle, which accounts for 4.1% of overall motor vehicles. And in these 1.31 million new energy vehicles, the quantity of BEVs have reached to 10.45 million, which accounts for 79.78% of the total new energy vehicles quantity[5]. So, in this situation, Chinese new energy vehicle enterprises should take some necessary measures to keep sustainable development. Here are some suggestions that give to these enterprises:

First, these enterprises have a good mass base and mass recognition, so Chinese car buyers prefer to buy native new energy vehicle to foreign new energy vehicle such as Tesla. So, in this situation, these enterprises should do adequate market research in advance, then do accurate market positioning and market division, and finally make a perfect marketing strategy. Ensuring that they can precisely sell their new energy vehicles. Win the trust from no matter Chinese customers or overseas customers.

Second, these enterprises should have a better sales and after-sale services. For sales services, these enterprises should focus more on “details”, such as offer some special desserts or beverages; perfectly decorated offline physical store; warm buying environment; a sense of science and technology. Let customers feel comfortable and excited to consume. Then offline physical stores can try to develop a VR driving game, let customers experience the driving through VR and feel the sense of science and technology of new energy vehicle. For after-sale services, except traditional after-sale services such as free repairing. These enterprises should focus more on offline activities, such as organize car friends have a road trip, camping or have a dinner together. So, car buyers might get more useful information about their new energy vehicle through these activities and moreover, they can even attract more potential car buyers.

Third, these enterprises should maximally make a use of the video platform’s powerful influence such as YouTube, X, Meta, TikTok. Put some well-designed advertisements on these video platforms. Then these enterprises can create their official account, post some wonderful videos or advertisements on these platforms. Last these enterprises can consider cooperate with some influential bloggers or YouTubers, such as road trip blogger, travel blogger and car blogger. Let them publicize their new energy vehicles to enlarge the influence and attraction of new energy vehicle.

Fourth, also the most important, these enterprises should start to deal with the “range anxiety” problem, no matter

online or offline, it is easy to see that "range anxiety" is the biggest problem that car buyers worry about. Well, aim to this problem, these enterprises should let the most part of customers know a concept that most of times they just drive car go to work and go back home, even consumers take a short road trip in the weekends, the range is enough to cover the total road trip distance. Then, these enterprises should positively lay out more charging facilities, improve the charging speed, unite charging interface, reduce complex procedures for using public charging piles and maximum ensure public charging piles can be used. Last, even though these enterprises publicize consumers don't need to worry about range anxiety, some still worry about it. So, in this case, Chinese new energy should consider produce and sell more plug-in hybrids cars.

6.3. Conclusions

In conclusion, Chinese new energy vehicle market and its enterprises both have a good development prospects. For the domestic market and consumers, if these enterprises make a perfect, attractive and innovative marketing plan in advance, it will definitely foster the retail volume, ownership continuing increase in China. Moreover, if these enterprises and local governments positively foster the construction and layout of charging piles, positively tackle the problems that car owners facing, it will foster the retail and ownership volume. Charging-related problems are the biggest factors that hinder consumers to buy, once these charging-related problems solved to some degree, the retail and ownership volume will definitely increase. And for overseas market and consumers, its similar to domestic market and consumers, do well at marketing and solve charging-related problems.

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