

# Observations and Reflections on Electric Automobile Industry Developments

**Zhiqiang Lv**

*Beijing Polytechnic, Beijing, China*

**ABSTRACT.** *This thesis is an attempt to correctly understand status quo of markets and technologies, to study choices between technology introduction and self independence on R&D, to retrospect on reasons why the domestic auto industry and especially electric automobile developments have thus far reached a decent scale but still lagged behind in terms of technology levels, to learn from experiences of other domestic industries with competitively advantaged technologies, to explore patterns of technology evolution and R&D management systems in electric automobile industry, so as to be better prepared for the upcoming artificial intelligence automobile times and to implement the strategy of promoting domestic developments with help of a technology driven automobile industry.*

**KEYWORDS:** *markets, technology introduction, self owned technology, artificial intelligence automobile*

## 1. Introduction

History of rechargeable electric cars can be traced back to 1881 when they were invented, earlier than fuel cars. For certain years, they even became the preferred choice for car manufacturing. However, their shortcomings such as the short mileage of continued voyage compared adversely with fuel cars. Thanks to continued technology improvements, fuel cars eventually surpassed electric vehicles as they were more convenient and more affordable for use.

Sometimes things go round and round. With the pressure of ecological environment and the reduction of traditional energy reserves and other social problems, new energy vehicles have again become a new development direction of the automobile industry, among which electric vehicles stand out because of their practical technology.

According to the regulations on automobile investment management in China, from January 10, 2019, plug-in hybrid vehicles that previously belonged to the life cycle of new energy vehicles will be classified into the category of combustion vehicles. Only pure electric vehicles belong to the category of true new energy vehicles.

## 2. Status quo of China's automobile industry

In the 1980s, China's reform and opening up policy ushered in the development opportunity for automobile industry. A number of joint ventures with foreign manufacturers were established to enhance the level of manufacturing technology, to optimize production organization and management, to establish a complete industry chain and to realize the leap-forward development of the auto industry. Up to now, China has been the world number one for 10 years in terms of production volume. As shown in the Fig.1.

The overall development of China's automobile industry offered opportunities to electric vehicles similar to the traditional combustion engine vehicles: the market size is large, the production and sales are ranked the first in the world. Even better than the fuel cars, electric motor vehicles boasted with sales volumes accounting for nearly half of the global volume in the past four years. As shown in the Fig.2 [1].

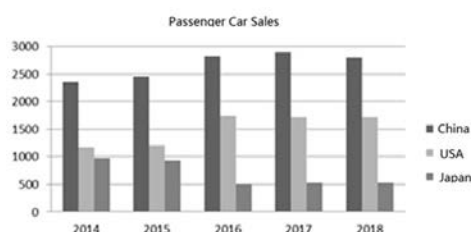


Figure 1. Passenger Car Sales

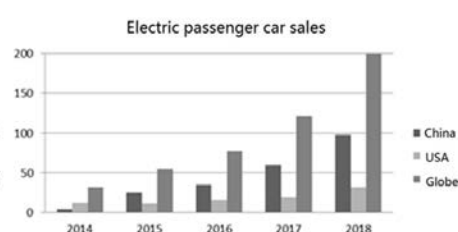


Figure 2. Electric Passenger Car Sales

However, large market scale, high production and sales, do not mean high technical levels. Take cars as an example. In the latest sales statistics, only two domestic models have entered the top 20 in terms of cumulative sales from January to June 2019, ranking 14th and 20th. In the statistics of the top 20 cars in each subdivision category, from mini cars to intermediate cars (that is, brand value, technical level, sales price and profit from low to high), the number of local brand models in the list reduces as it goes up the hierarchy. One month of deviation may be due to market fluctuations, but the cumulative sales allow us to see the real situation. Local brand names are an absolute hegemony in mini car market, accounting for less than half in small car category and a small number in compact and mid-size cars, while they can hardly be found in large and luxurious cars categories

The models with advanced technology and strong profitability are basically controlled by foreign brands, while many domestic brands are crowded in the low-end product area. This means that the core technology is still in the hands of foreign investors, and the high profits are also attributed to the foreign side of the joint venture. The market is indeed ceded, while the transfer of technology has not happened as expected.

On this basis, the newly developed electric vehicle industry has not been able to get rid of the "strong market, weak technology" situation. Foreign automotive

research institutes have issued reports for two consecutive years, which comprehensively compared the competitive situation of the world's seven major automotive powers (China, Germany, France, Italy, the United States, Japan and South Korea) in the field of electric vehicles. In terms of technology and R&D investment, China has even gone backwards, from the bottom third to the bottom second. Technical level, research and development capabilities still cannot match the market position[2].

The reasons behind was for decades that the industry including the development of electric cars, emphasized too much on the scale of production and market capacity expansion, believing in a big market that will naturally attract technology and investment, and inadvertently overlooking the core technology research and development investment. The lack of a complete set of self-owned technology system resulted in a bigger industry scale rather than a more competitive sector. The reality is cruel, and we must learn from the lessons of the past, change the guiding ideology of development, attach importance to technology research and development and investment, especially in the current environment of international trade disputes, mastering independent technology has become the foundation of any industry.

### **3. Technical confidence and technical autonomy**

To build its own technology system, it is not necessary to go abroad to learn advanced experience, there are perfect examples for learning at home.

#### **A. China's high-speed rail**

China's railways were also relatively backward in the early days. In 1978, the railways were only 50,000 km long, a third of their current operating mileage, and trains ran at an average speed of 48 km/h. The number of trains was less, so a ticket could be difficult to obtain, basically every day was like the Spring Festival travel rush.

During the 10 years from 1997 to 2007, the speed of railway passenger transport was accelerated for six times, which paved the way for the development of high-speed railway, and prospectively reserved the talent team and pre-research technology needed for the development of high-speed railway.

From 2004 to 2007, high-speed railway technology from abroad was introduced successively.

To narrow the gap with foreign advanced level in the shortest time, foreign technology was imported like the auto industry, but the railroad people took a different path. On the basis of solid digestion and absorption of foreign technology, we have cultivated the determination and ability of independent innovation, gone through the stages of introduction, digestion and absorption, improvement and innovation, and independent innovation, and finally established an independent technology system with fully independent intellectual property rights. I have mastered the whole process from r&d, design, manufacturing to testing, cultivated

domestic equipment suppliers, improved the whole industry chain of high-speed railway equipment, and got rid of dependence on foreign debugging, materials and components[3].

China's first high-speed rail started on July 4, 2005. By the end of 2018, in just 10 years, it has built the fastest high speed rail system across the wide region and climate condition of the largest difference, with operation in more than 29,000 kilometers, accounting for more than two-thirds of the global high-speed operation mileage, and totaling more than other countries. It began to export the whole system, the whole industry chain of the project.

In an article titled "China's new industrial revolution", the British Broadcasting Corporation (BBC) once regarded the construction of high-speed railway as a sign that China is carrying out the new industrial revolution. Due to the unique culture of China and the diligence and innovation of Chinese people, China's high-speed railway technology can be rapidly applied and lead the world.

### **B. Communication industry**

In the 1990s, an individual family had to pay an initial installation fee of 4,000 to 5,000 yuan for a fixed-line telephone. In 1995, according to the national bureau of statistics, the average annual salary of the national employees was 5,500 yuan. Why is there only one phone a year? Because of the backward communication industry, such as program-controlled switches. There were no manufacturers in China, and almost all of them were monopolized by Europe, America and Japan. At that time, seven countries provided eight types of switches for the Chinese market, which was called the hept-ocs. Most of the equipment was operated by foreigners, making it extremely expensive to purchase and use. As for mobile phones, the price was sky-high. It took about 20,000 to buy the first batch of mobile phones.

Faced with the international giants in the monopolized market, Chinese communication enterprises started from developing simple technologies to produce marginal products, to developing complete sets of equipment, and gradually approaching and surpassing the performance of foreign equipment, and finally completing the replacement. The immediate feeling of consumers was that the cost of communication equipment and use dropped significantly.

In the field of mobile communications, China was initially left behind in 1G (the first generation of mobile communication technology) competition. It strived for breakthrough and development in 2G and 3G era, and became one of the leaders in 4G era. In the the oncoming 5G era it will further lead technology development, and will finally have considerable say in the field of technical standard and patent technology. China now has two of the world's four biggest makers of telecommunications equipment, a dramatic change from 30 years ago[4].

### **C. Enlightenment**

Successful rise of the above industries varies from each other, in terms of technology development path and the markets. So their success cannot be simply copied in auto industry. We should draw lessons from the way they face difficulties

and pressures, their perseverance and positive enterprising spirit, to inspire confidence and determination. It is crucial to make a technical system of electric vehicle industry to construct a complete industrial chain, to create excellent brands, and to produce popular products.

#### **4. Industry alliance**

With the confidence and determination of independent research and development technology, and equipped with input of various resources, is success inevitable? It's a question of methodology. Technology research and development across many related disciplines, the need for professional talents and scientific and reasonable management system, supplemented by the investment of large capital, domestic enterprises face these necessary conditions by themselves. It can be imagined that the pressure is huge, even difficult to bear. The best way is enterprise cooperation and joint tackling. Especially in industrial competition between countries.

##### **A. A teacher of the past and the future**

In the 1980s, the United States and Japan engaged in a brutal competition for the long-term monopoly position of the electronics industry. As a result, the United States achieved its goal and suppressed the Japanese industry, and Japan ushered in a lost two decades. One of the main reasons for this was that the US used a very hypocritical two-front approach. On the one hand, it exerted pressure on Japan through various means such as politics and economy, and tried its best to break up Japan's industrial alliance, and finally succeeded. On the other hand, he copied Japan's approach completely and established a "strategic alliance of semiconductor manufacturing technology in America" composed of 14 American manufacturers, using industry funds and government funds to develop new technologies.

##### **B. The stone of other mountains**

The causes and results of the trade war between Japan and the United States are not the focus of the discussion. The focus is on the enormous and irreplaceable role that industrial alliances play in promoting technological research and development, enhancing the strength of enterprises and establishing the status of industries.

Especially in the industrial competition among countries, great energy can be unleashed. Enterprises in the alliance gain advantages in the global market competition, and the country can also play a leading role in the industry for a long time.

In the field of electric vehicles, China should attach importance to the mode of industrial alliance and joint innovation to avoid the weakness of enterprises fighting alone. The spirit of enduring hardships should be encouraged to realize step by step research and development results, so as to make a breakthrough in the field of electric vehicles, with an independent technology system.

## 5. The age of intelligence

Modern society is transitioning from the age of information and Internet to the age of Internet of things. As the new Internet of everything and intelligence will come, big data and artificial intelligence will become the mainstream of technology, and the intelligent transportation based on these technologies is ready to emerge, and electric vehicles are an important carrier of intelligent transportation landing.

Among them, the mobile communication network, which can meet the requirement of high-speed and large-capacity information transmission, is the most important infrastructure. As the most critical equipment of the mobile communication network, the number of base stations determines the coverage rate and communication speed of the mobile network. According to the latest statistics, by the end of last year, there were 6 million 4G base stations jointly built globally, of which 4.4 million were owned by China, accounting for more than two-thirds. China is still expected to lead the way in the number of base stations for 5G networks, which will soon be commercialised, at least by more than 50 per cent.

In addition, China is also developing rapidly in the field of artificial intelligence. In the global field of artificial intelligence, China accounts for nearly 20%, second only to the United States. The total number of papers and citations in the field of deep learning ranks the first in the world, and the number of AI-related patents granted ranks the second in the world.

Fortunately, China has these industries with a leading position in the world, which provide a good foundation for the development of smart cars. The electric car industry must seize this opportunity and embrace the era of intelligence, so as to live up to its mission of becoming an automotive powerhouse.

## 6. Conclusion

Recently, a senior executive of a domestic automobile manufacturer said: "our future relies on good branding, while good branding can only be achieved with good products," I think it should be added that, the soul of the product is technology.

The only way for domestic electric vehicle industry to succeed is to make persistent efforts in carrying out cooperation with research institutes and universities, further securing massive investments, and building efficient technology research and development and management system. Technology development will be the key to business growth in the future and to meeting challenges for a long time against the uncertainties in the world trade environment.

## References

- [1] The state council information office of the People's Republic of China China's transportation development, 2016, 12
- [2] Huang shudong rise and fall of the great power renmin university of China

press 2012-0501

- [3] Roland berger and German automotive research institute Asia automotive engineering technology co., LTD., global electric vehicle development index 2018,8
- [4] Elsevier. Artificial Intelligence: How knowledge is created, transferred, and used