Research on the High-Quality Development Path of New Energy Vehicle Industry in China

Yongkang Liang*, Weifeng Zhang*
School of Economic Management, Baoji University of Arts and Sciences, Baoji 721013, China

*Corresponding author e-mail: ykliang85@163.com, zwf918@163.com

Abstract. This paper analyzes the current development status of the new energy vehicle industry in China, and then summarizes the problems from the aspects of core technology, quality, marketing, and supporting facilities. On this basis, it also proposes four paths for the high-quality development, including key technology innovation, industrial policy reform, supporting facilities construction, and long-term development planning. The conclusion provides a theoretical reference for the high-quality development of the new energy vehicle industry in China.

1. Introduction
At present, China's economy has shifted from a high-speed growth stage to a high-quality development stage. Manufacturing is the main body of the real economy and the key to driving high-quality economic development [1]. The new energy vehicle industry is one of the strategic emerging industries in China. Actively developing the new energy vehicle industry is of great significance for ensuring energy security, solving environmental problems, developing a low-carbon economy, and realizing the vehicle industry power strategy. In recent years, with the strong support of national policies, China's new energy vehicle industry has a good development trend, but there are still some problems. This paper intends to reflect on the current development status of China's new energy vehicle industry, analyze the key common problems, and propose the paths of high-quality development, in order to provide a theoretical reference for promoting industrial development.

2. Present Situation Analysis
In the global economic strategy, the development of new energy has become an important consensus of all countries in the world, and it is an important way to deal with future energy and environmental issues. New energy vehicle is the main direction of the development of vehicle industry. All countries in the world hope to get the opportunity in the current round of vehicle industry reform, and they are actively promoting the transformation and upgrading of the vehicle industry. China has listed the new energy vehicle industry as one of the strategic emerging industries and has given strong support to the development of the new energy vehicle industry. The new energy vehicle industry chain is long (see Figure 1), and the economic driving effect is obvious. The upstream industry includes various raw materials and three core components (batteries, motor and electric control). The midstream industry includes the whole vehicle manufacturing of new energy vehicles of various types. The downstream industry includes charging facility, marketing, operation, and post market service.
In recent years, China's new energy vehicle industry has developed rapidly and achieved the largest single market in the world from the initial industrial scale. The sales volume of new energy vehicles in China increased from 18,000 in 2013 to 1,256,000 in 2018 [2], as in Figure 2. By the end of 2018, the global sales of new energy vehicles exceeded 5.5 million, of which China accounted for more than 53% [3]. China's new energy vehicle industry has huge market potential and strong development momentum.

At present, China's new energy vehicles products have performed well in technical indicators of energy consumption levels and battery system energy density. This industry have significant effects on investment, employment, taxation and energy conservation. However, a number of problems still exist in China's new energy vehicle industry, including core-technology gap, low-level product performance, insufficient consumer demand and insufficient supporting facilities, etc.

3. Problem Analysis

There are some problems of new energy vehicle industry in China, which need to be paid enough attention.

3.1. Core-technology Gap

The key core technologies and components are still the short boards of the development of China's new energy vehicle industry [4]. In terms of energy consumption level, the overall energy consumption level of pure electric passenger cars is still far behind that of the international mainstream products. In terms of driving range, the driving range of products is in the same range as international mainstream products, but there is a lack of high-end products. In terms of battery technology, excluding energy density, there are lagging behind foreign advanced technology in terms
of safety, consistency and equipment manufacturing. In terms of fuel cell technology, the mass production of fuel cell passenger vehicles has not yet been realized, and the gap with foreign countries is very large. In terms of intelligent technology, there are gaps in R&D investment, road test mileage and key components.

3.2. Lack of High-quality Products
In recent years, the new energy vehicle industry has experienced explosive growth in China, however, the quality of products have not attracted enough attention, there are lack of high-quality products, and the safety accidents is obviously in an increasing trend. The essence of new energy vehicle safety accidents is the thermal runaway [2]. The quality and safety problems of new energy vehicle products should be paid attention to by enterprises and relevant research institutions, and new safety features such as collision safety, regenerative braking, electromagnetic field and acoustic sensing need to be further studied. Both vehicle manufacturers and parts suppliers should strengthen quality control from the aspects of product design, manufacture, verification and use.

3.3. Lack of Consumption Motivation
Despite the rapid development of new energy vehicles in China, the problem of insufficient consumer demand is also prominent. It is found that there are three types of factors influencing consumers' purchase intention. The first is the product factors, such as product quality, product price, and product use cost [5, 6]. The second is the consumer factors, such as perceived benefits, subjective norms, trust and perceived value [7, 8, and 9]. The third is the policy factors, such as fiscal policy and government promotion [10, 11]. The survey found that consumers who currently own new energy vehicles are still a minority, and the new energy vehicles have not been popularized yet [12]. There are many factors that deter consumers from buying new energy vehicles, such as high price, lack of power, high cost of use, short battery life and safety risks. In general, the degree of satisfaction of domestic consumers in China is ordinary which still has enough space for improvement.

3.4. Lack of Supporting Facilities
China's new energy vehicle industry is mainly restricted by the insufficient construction of supporting service facilities, which seriously affects the user experience and the promotion of new energy vehicles. First, the structural supply of charging infrastructure is insufficient, which is reflected in the overall supply shortage, the shortage of DC quick charging facilities, and the shortage of facilities in expressway service areas. Second, private owners have resistance to installing charging piles, because it is forbidden by many communities to install charging piles without permission. Third, the unified operating platform has not been formed between each charging facility, and there is no unified platform for querying, using, and paying. Fourth, the maintenance and management of supporting facilities are insufficient, the intelligent level of facilities is backward, and the parking spaces cannot be effectively monitored.

4. High-quality Development Path Analysis
In order to achieve the high-quality development goals of new energy automobile industry in China, this paper proposes four implementation paths.

4.1. Promote Core-technology Innovations and Optimize Technical Routes
Technological innovation is the primary driving force for the high-quality development of new energy vehicle industry. In the future, enterprises and research institutions should be encouraged and supported to increase investment in technological innovation, and the technological collaborative innovation system should be built. At the same time, with the guidance of major government projects, The technological routes of the new energy vehicle industry should be constantly optimized, the key core and common technologies must be focused on, such as power battery technology, electric drive technology, wheel drive system, motor control technology, wireless charging technology, automotive
lightweight technology, intelligent driving technology, etc. Through these measures, the technical foundation for the high-quality development of the new energy vehicle industry will be consolidated.

4.2. Accelerate Industrial Policy Reform and Optimize Policy System
At present, the new energy vehicle industry is moving from policy-led to market-led in China, the policies and regulations for the development of new energy automobile industry formulated by relevant departments have covered development planning, technology policy, access management, product development, parts industry, marketing network, investment management and other fields. In the future, on the one hand, industrial policy reform should be accelerated, special laws or administrative regulations for the new energy automobile industry should be formulated, and the replacement of industrial standards should be carried out in an orderly manner. On the other hand, the focus of policy support should be shifted from manufacturing and sales to R&D, consumption and use, and commercial operation. Through these measures, the policy system will be constantly optimized.

4.3. Strengthen the Construction of Supporting Facilities and Optimize the Consumption Environment
The third path is to strengthen the guidance of scientific planning and improve the development level of supporting facilities for new energy vehicles. There are four specific measures. First, the construction of supporting facilities in public areas should be accelerated, and infrastructure such as charging piles and hydrogen stations should be prioritized. Second, the development of intercity fast charging network should be accelerated to solve the anxiety of long-distance travel. Third, incentive policies should be issued to guide property owners to participate in the construction of charging facilities. Fourth, it is necessary to innovate business models, the charging facility operation service platform shall be established to enhance operation and maintenance capacity. Through these measures, the consumption environment of new energy vehicles has been constantly optimized.

4.4. Formulate Long-term Development Plans and Optimize Industrial Layout
The development of new energy vehicle industry needs to do a good job in top-level design and plan for the future development. In the future, the work of drawing up plans (New Energy Vehicle Industry Development Plan (2021-2035)) should be accelerated. The development direction of industrial cluster should be constantly optimized to form the industrial development pattern of large-scale vehicle manufacturing, high-end parts manufacturing and specialized post-market service. The industrial system of new energy vehicle manufacturing and three key parts manufacturing should be constructed to promote the high-quality development of new energy vehicle industry.

5. Conclusion
The new energy vehicle industry is one of the strategic emerging industries in China. Accelerating the construction of powerful vehicle country is an important way to achieve high-quality economic development. At present, China's new energy vehicle industry is in a stage of rapid development, and there is still a big gap compared with developed countries. Therefore, some measures should be taken to promote the high-quality development of China's new energy vehicles industry from the aspects of technology, products, supporting facilities and policies.

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