

Thoughts on the Laws of Automobile Industry Development

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Abstract: The automobile industry has accumulated numerous globally accepted laws since its emergence over 130 years ago. China's automobile industry is currently facing a strategic opportunity for industrial transformation and upgrading, so it is necessary to strengthen the research on the laws of development for the automobile industry to avoid impulsive actions. We consider nine laws of development from the aspects of technology, market, and talent; the complementary relationship between transformation and upgrading; the characteristics of capital-, technology-, and labor-intensive industry, and the requirements of innovation and collaboration, to guide and promote the sustainable development of China's automobile industry.

Keywords: automobile industry; laws of development; sustainable development

As an essential support for building a powerful manufacturing country and a fundamental pillar of the national economy, the automobile industry plays a vital role in promoting scientific and technological revolution and industrial transformation. The steady and sustainable development of the automobile industry is related to people's daily travel, the circulation of resources, and the rise of the Chinese society. The *Mid- and Long-term Development Plan for the Automobile Industry 2017* emphasizes that China will strive to enter the ranks of the world's automotive powers after ten years of continuous efforts [1].

1 China urgently needs to strengthen its understanding of the laws of automobile industry development

The automobile industry in China has seen nearly 70 years of rapid growth, primarily since the reform and opening of the country. In China, the automobile industry has developed supporting facilities, increased technology levels, increased production capacity, created abundant product types, and seen continuous market expansion and gradual improvement of marketing networks. The Chinese automobile industry has established a testing base that has an elevated level of science, technology, education, and talent training [2]. According to the statistics from the China Automobile Industry Association, China ranked first in automobile production and sales in the world for ten consecutive years, from 2009 to 2018, becoming a competitive country in the automobile industry. However, China's automobile industry remains large, but not strong, and there is a large gap between China and Germany, the United States, Japan, South Korea, and other automobile powers.

On the one hand, the situation of low-quality development of the automobile industry is grim. The ability of independent innovation is weak, and the growth of parts and components lags. The lack of robust automobile enterprises, low brand premiums, and the difficulty of "going global" will exist for a long time. On the other hand, the contradiction between the automobile industry and social development is aggravating. The contradictions of the waste of energy resources, traffic congestion, environmental pollution, road safety, and the rapid growth of the

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automobile industry are becoming increasingly prominent [3].

Currently, the new generation of information and communication, new energy, new materials, and other technologies have accelerated the integration with the automotive industry, which has brought about profound changes in terms of the production of automotive products. Additionally, the in-depth implementation of “Made in China 2025” has created new opportunities for China’s automotive industry to stand out. Since 2014, many new automobile manufacturers have entered the automobile industry. The latest trends of smart, electric vehicles draw companies into the industry. According to incomplete statistics, there are more than 200 original automobile manufacturers in China, and the number of new businesses is still growing. New energy and intellectualization have appeared too fast and have overheated momentum, which brings hidden dangers to the health and sustainability of the development of the industry. Traditional automobile companies and new automobile companies must determine if they will benefit from the strategic opportunity of industrial transformation and upgrading. Both types of companies must have a clear understanding of industrial development, grasp and respect the objective law of industrial development, avoid impetuous practices, and examine the automobile industry from a macro perspective.

2 Thoughts on the laws of development in the automobile industry

The objective law refers to the intrinsic, essential, and stable inner-relations among objective things. Its existence and function are not transferred by human will. The automotive industry has existed and developed for more than 130 years. During this time, the industry has been accumulating, precipitating, and summarizing data, which has been formulated into the acceptable and recognized laws of the global automotive industry. The development of the industry and the renewal of knowledge will also bring about new laws. Even so, the automobile industry needs to respect the scientific and objective law and requires scientific judgment and decision-making. Based on the analysis of the development process, observation, and research of the automobile industry domestically and abroad, this study attempts to summarize the development law of the automobile industry, as shown in Fig. 1.

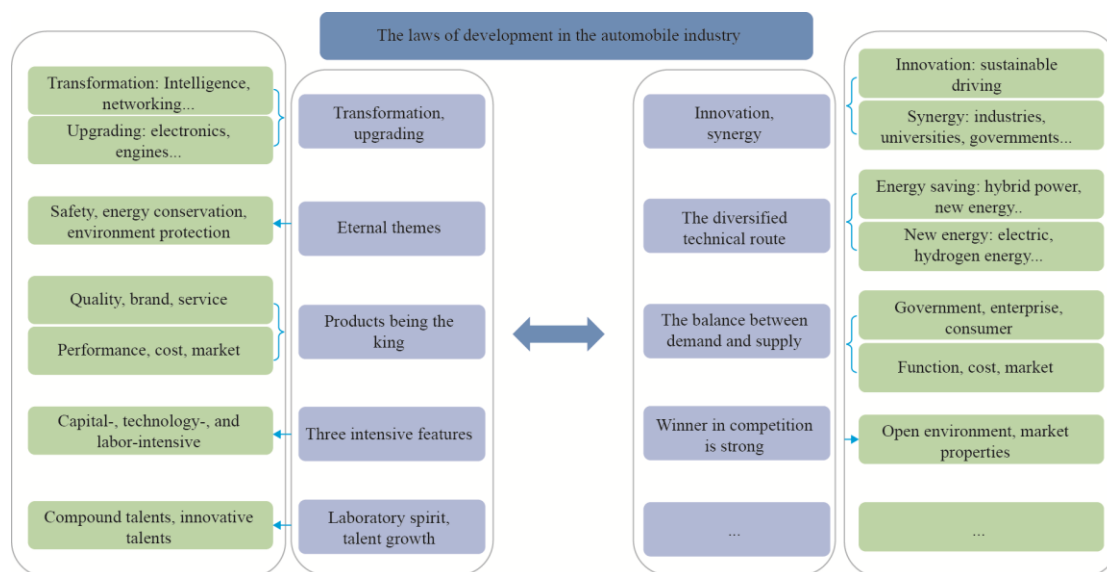


Fig. 1. The law of development in the automobile industry.

2.1 Transformation and upgrading complement each other

The history of automobile development is that of continuous technological change and innovation. The emergence of the automobile hub is synchronized with the improvement of technology. The birth of the car made Europe a car manufacturing hub. The large-scale production of the T-Type car made the United States the world’s auto hegemon. During the two oil crises of the 1970s, Japan’s low fuel consumption, small cars enjoyed great popularity. Combined with the correct development of strategic achievements, Japan became a strong country in automobile manufacturing. In the past few decades, the goals of China’s automobile industry have been concentrated in upgrading the industry. This upgrading includes improving the efficiency of internal combustion

engines, improving the transmission efficiency of transmission systems, reducing wind resistance systems, and improving the level of electronic devices. However, in the past four or five years, fundamental changes have taken place. The global automotive industry is pursuing the transformation of intelligence, networking, weight reduction, and energy diversification. The automobile industry has gradually become the leader and driver of technological innovation. In the coming decades, the power of diesel engines and new energy vehicles will be diversified. The upgrading in the functionality of fuel-engine cars will continue. China's auto industry still needs to strengthen the research on critical technologies, such as supplementing the shortcomings of electronic technology, automatic transmission technology, and engine technology. The industry must persist in strengthening technology upgrades while promoting industrial transformation effectively.

2.2 Safety, energy conservation, and environmental protection are the eternal themes of the automotive industry development

Since its inception in 1886, the car has remained the most complex mass-produced civilian product. There are both hardware and software in a vehicle, accounting for tens of thousands of parts. The car has a design life of more than ten years. It must go through various weather and seasons, requiring simple maintenance, high reliability, and low cost. Safety is always first in the automotive industry, which is the basis in the design, production, management, use of automobiles. With the continuous increase in automobile production and possession, the energy consumption and environmental problems faced by the automobile industry are becoming increasingly prominent, and the automobile industry must develop in an environmentally conscious direction. Electric vehicles may be the market mainstream, or intelligent networked cars may become top performers. No matter how the situation develops, the three eternal themes of safety, energy conservation, and environmental protection in the automotive industry will not waver.

2.3 Products being the king is the golden rule of the industry

Cars are highly competitive products that have reliable market attributes. Quality products, like bestselling models, need to be accumulated. Not only quality, brand, service, management, but also R&D team and system capabilities are all necessary for the formation of useful products. Valuable products require continuous innovation and need to accumulate and precipitate. Quality products require precise positioning of market segments, detailed market research for customer groups, and benchmarking of equivalent products. Quality products require a high degree of balance within functionality, cost and market requirement. They takes time and patience. Valuable products are the core competitive advantage, and there are no shortcuts to the development of quality products. For example, Toyota's 7-meter Coaster series is popular in many countries around the world for its reliability and cost-effectiveness. Reviewing China's own car companies, there is still no comparable product. As a big automotive industry country, China's vehicle production capacity and innovation capacity still are a long way away compared with the advanced international level. It is necessary to build products that can compete at the global level.

2.4 Capital-, technology-, and labor-intensive are the characteristics of the automotive industry

Up to now, the three intensive features of the automotive industry have not changed. In terms of technology, automobiles are the carriers of various innovative technologies. Intelligent networks and AI have spawned new materials, and new manufacturing technologies have spawned the development of new automotive industries. In terms of capital, the investment of the automotive industry is vast, highly intense, and continuous. Whether it is a traditional automobile company or a new company preparing to enter the car manufacturing industry, it is necessary to realize that the auto industry has three intensive characteristics and prepare accordingly. The Guangzhou Auto Show has always been the best demonstration time for each car company. However, at the Guangzhou Auto Show in 2018, only six new vehicle manufacturing companies participated, and only two of them produced new cars. Many new car manufacturing organizations are still in the concept stage. There is no sales revenue, and they solely rely on financing to maintain their operations. Local governments should curb the invest impulses of setting up projects for new energy vehicles, intelligently networked car projects, and vehicles, only focused on GDP. After years of growth and development, the China Pearl River Delta, the Yangtze River Delta, and the Bohai Bay area have formed a good foundation for automobile industry development. These regions are more in line with the capital-, technology-, and labor-intensive requirements of the auto industry. In these areas, the conditions for participating in the competition are sophisticated, and the location advantages are apparent.

2.5 The laboratory spirit and talent growth

The transformation and upgrading of the auto industry, whether it regards the technology or the business model, requires talents. In the new technological revolution period, cross-border integration will become the norm. Innovation is the core driving force for development in enterprises and industries. Compound and innovative talents adapted for cross-border integration will become indispensable talents. Japan has produced 18 Nobel Prize winners in the past 18 years, and one of the famous scientists believes that “Metrology is the closest science to the Nobel Prize.” Metrology broadly refers to laboratory science. Without the long-term efforts and failures in the laboratory, it is impossible to achieve academic achievements. In other words, it is the persistence that helps thousands of scientists to explore the truth. Like other industries, the automotive industry needs thousands of scientists who are persistent and dedicate their lives to science. In the future, whether it regards system construction or environmental creation, the strategy of automobile construction and development must be formulated and implemented around such talents. The industry must create optimal conditions for the growth and encouragement of such abilities and strengthen the structure of laboratories and talent teams.

2.6 Innovation and synergy

The development of China’s auto industry has benefited from the reform and opening of the country. Since 1978, China’s auto industry has seized the opportunity and achieved remarkable success by introducing technology and open cooperation. Gradually, China has built an auto industry system with a scale and level to rival competition. Currently, China’s auto industry is at a pivotal moment, where it is moving from large to strong and stable. Now, China’s auto industry should decide to strengthen independent innovation, continuously improve its brand influence, make great strides into the international market, and be sublimated in extensive international cooperation. Collaboration is not only the synergy among different industries, disciplines, and the auto industry chains, but also that among the industry, universities, and the government departments. It is a technological innovation system that establishes cross-border integration under the government’s guidance. All the above aspects promote technological innovation in automobiles. There were many successful cases in the history of cars. For example, the Partnership for a New Generation of Vehicles (for short, PNGV) program was launched by the United States in 1994, and it is a typical government-led alliance. The program combined industry, academia, and research. The plan proposed a new generation vehicle with a fuel standard of 3 liters per 100 kilometers of fuel consumption. It also aimed to introduce new energy vehicles and lightweight vehicles. After more than ten years of challenging work, the above problems have been solved. The traditional automobile industry needs to be transformed and upgraded. It cannot be completed without high-level, cross-border cooperation. In the agreement, each side of the industry, academia, research and government plays its unique role with its advantages and complements each other. Only through collaborative innovation and joint operations, it is possible to make significant breakthroughs in core automobile technologies. The Chinese automotive industry can seize the unprecedented opportunity which intelligent networked cars provided through collaborative innovation and joint operations.

2.7 Adhere to the diversified technical route

Enterprises are the backbone of the market and innovation. The choice of technical route must reflect the enterprises’ choices faithfully. In recent years, relevant departments of the Chinese government and industry management agencies have successively issued a series of planning policies and roadmaps for the automobile industry. However, the core of the strategies still revolves around the upgrading and transformation of the automobile industry and focuses more on energy conservation and new energy vehicles. The electric car is only one type of new energy vehicle. Developing new energy vehicles refers to creating electric cars and other types of alternative energy vehicles, such as gas-fueled vehicles, liquefied petroleum gas vehicles, and hydrogen-fueled fuel cell vehicles. The development of intelligent networked vehicles must also be diversified because multiple substitutions are in line with the national conditions. Numerous changes can meet China’s energy strategy to ensure energy security. Diversification conforms to the objective law, and the enterprises possesses the primary decision-making power and develop the technical routes through industry–university–research collaboration.

2.8 The automotive industry development needs a balance between supply and demand

General Secretary Xi believes it is necessary to develop products that meet various needs and make it a robust growth point. For example, low-speed electric vehicles refer to short-distance, miniature, electric cars, which are

good for short distance. Low-speed electric vehicles are in great demand. From the views of people's livelihood, energy conservation, and emission reduction, the development of this type of vehicle is the only way to improve motorized travel in China, especially in the small cities, urban-rural integration and rural areas. From the perspective of industrial promotion and development, the development of low-speed electric vehicles is a meaningful way to promote and standardize the development of new energy vehicles. The ever-increasing production of this kind of car also supports the development of high-end automobiles. There is such a market on the demand side, and the supply side must satisfy this market. This market also puts forth corresponding requirements for government supervision, and it is necessary to formulate standards for miniature, short-distance, electric vehicles in line with China's national requirements as soon as possible. The government, enterprises, consumers, and society all must support the balance between the demand side and the supply side.

2.9 The winner in the competition is formidable

Competition is a contest between economic entities for economic benefits under similar conditions. In the Sino-US trade, the shareholder's proportion is open, and tariffs are lowered. The auto industry is facing increasingly fierce market competition. For China's auto industry to be reliable, it must have some global enterprises. The only choice for Chinese auto enterprises is to face their competition. At the beginning of the 20th century, when China joined the World Trade Organization, the biggest worry in the auto industry was whether China's auto industry would be annihilated due to insufficient competitiveness. Under the innovation-driven strategy, many vehicles and parts companies with an international perspective have emerged. With the accumulation of technology and wealth, the Chinese auto industry should be confident and strong. In particular, the development of new energy vehicles and intelligent networked automotive technology has provided new opportunities for the development of China's automobile industry.

3 Conclusion

The global automotive industry is now amid an unprecedented technological revolution and industrial transformation. The automotive industry will undergo three significant changes. First, like Apple's redefinition of mobile phones, innovative technologies will redefine cars. Future cars should be resource-saving, environment-friendly smart products, tightly integrated with energy networks and the Internet. Future vehicles will be a united energy and information source. Second, there will be a deep integration between the automobile industry and other industries. The automobile industry will accelerate the coordinated development with new energy, new materials, and the electronic information industry. Third, the positioning and role of automobiles in society will undergo significant changes.

Due to historical reasons, the current position of China's automobile industry is still not in line with the status of a vast automobile country. There is a gap between the automobile powers and China. There is still much work to do in independent innovation and mastering core technologies for China. The automobile industry is now facing the most revolutionary technological changes in more than 100 years. It poses a severe challenge to China's automobile industry, and at the same time, it provides an essential opportunity for the development of independent brand vehicles. It has become an inevitable choice in the background of industrial upgrading, energy, environmental protection, and traffic safety. China's automobile industry should grasp and follow the objective laws, embrace the experience of traditional automobile development, greet the new technological revolution of the automobile industry with the pursuit of innovation and the will of the dominant country, and promote the transformation and upgrading of the automobile industry.

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