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Development Status of Intelligent Passenger Vehicles in China

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ABSTRACT

The rapid development of global intelligent connected passenger vehicles is driven by policy and technology. In this process, China intelligent connected passenger vehicles have made great progress in national policy, market scale and technological development. This paper summarizes the development status of China's intelligent passenger vehicles from the above three aspects, and concludes that the development of China's intelligent passenger vehicles is in an unprecedented period of opportunity, under the mutual promotion of policy, market and technology, it is bound to continue to grow rapidly. At the same time, we should strengthen the breakthrough of policy, market and technology in the bottleneck problem, and truly realize the long-term leading in the field of intelligent network automobile.

INTRODUCTION

Development Overview

Against the global general background, a relatively rapid development trend has been maintained in the field of intelligent connected vehicles in terms of both market size and development of various technical aspects, and all the major economies and countries around the world have stepped up their layout in policy, economy as well as science and technology according to their own development and the external environmental trends, hoping to lead the trend in the development of intelligent connected vehicles (Xingzhou & Qing, 2011:55).

At the same time, compared with traditional vehicles, intelligent connected vehicles, as the final form of future vehicles, have significant regional characteristics in development, testing and sales. In the actual product development and implementation, various industry resources are needed to be involved, due to the influences of national policies, infrastructure, regional traffic conditions, regional driving habits and cultural differences.

Therefore, communication giants and new vehicle manufacturing power, etc. constantly emerge, while traditional automobile companies accelerate their transformation. China, as the largest automobile market in the world, has obvious advantages in policy guidance, market space, industrial base and information technology, especially in communication technology.

By virtue of a combination between policy guidance and market advantages, China will inevitably go an intelligent connected vehicle development way in a different style from other countries and with Chinese characteristics Chinese auto industry (2009:12).

Policy acceleration, promoting industry implementation

Starting from *Made in China 2025* issued by the Ministry of Industry and Information Technology in 2015, China has continuously accelerated the policy layout of intelligent connected vehicles in the national top-level design.

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In September 2019, the State Council issued the *Program for National Transport Development*, further consolidating the top-level design of the development of the Chinese intelligent connected vehicle industry.

The *Program* re-emphasized the need to strengthen R&D input in intelligent connected vehicles (intelligent automobiles, automatic drive, vehicle-road collaboration), and that an independent, controllable and complete industrial chain should be formed by 2035.

Enterprise layout, accelerating automobile transformation

"Cold winter" and "lane changing and overtaking "came up most frequently in the automobile industry in 2018 and 2019. Against the background of slowing global economic growth, more than ten years' high-speed growth of Chinese automobiles have stopped. After the annual sales volume exceeded 28 million units, resulting in the worldwide largest market size, the production and sales volumes of automobiles have been declining from July 2008. It takes time to prove whether the "cold winter" of the automobile industry has come.

However, both our country and the enterprises agree that the automobile industry has changed from an incremental market to a stock market and from high-speed growth to high-quality development, and entered a critical period of adjustment, transformation and upgrading.

In order to achieve "lane changing and overtaking" of the Chinese automobile industry, it is a must to take the initiative to make arrangement by firmly centering on the development trend of "new concepts" of electrification, intelligentization, connection and sharing (Feng, 2020:11).

Size of Intelligent Passenger Vehicle Market in China

Around the globe, passenger vehicles are an important part of automobile sales, and the annual sales amount contributed by passenger vehicles exceeds one trillion US dollars every year. In 2018, the total global sales volume and amount of passenger vehicles were 57 million units and 1.3 trillion US dollars respectively. It is expected that the market size of passenger vehicles will reach 1.5 trillion US dollars by 2022 (Fig. 1).

At the same time, China is the largest automobile market in the world. In 2018, the Chinese passenger vehicle market had a size of about 510 billion US dollars, and a sales volume of about 24 million units accounting for about 40% of the global total sales volume, acting as an automobile bellwether.

Although the growth rate tends to slow down, the steady market size growth trend won't change. It is expected that by 2022, the Chinese passenger vehicle market will have a size of up to 630 billion US dollars and a sales volume of up to 29 million units (Domestic new energy passenger vehicle sales ranking (2021:2).

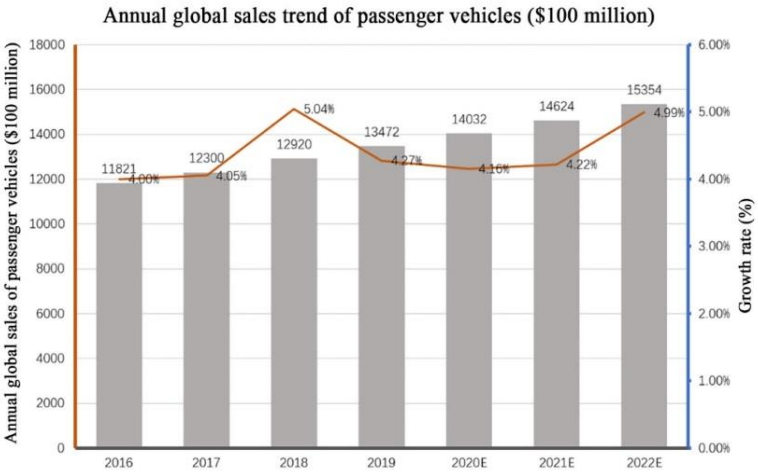

Fig. 1 Current Sales Amount of Global Passenger Vehicles and Forecast
Data Source: McKinsey

In China, in addition to the ever-growing market size, the consumption proportion of the post-90s generation in the automobile market has been increasing, and as they grow up, they have gradually played the central role in the market and become the main force of Chinese automobile consumption.

It is expected that the proportion of the post-90s generation in the Chinese market will reach 45% by 2020, when they will completely break away from its past image of "minority group" and rise to the central position in the market to truly become the main force of Chinese automobile consumption (Fig. 2).

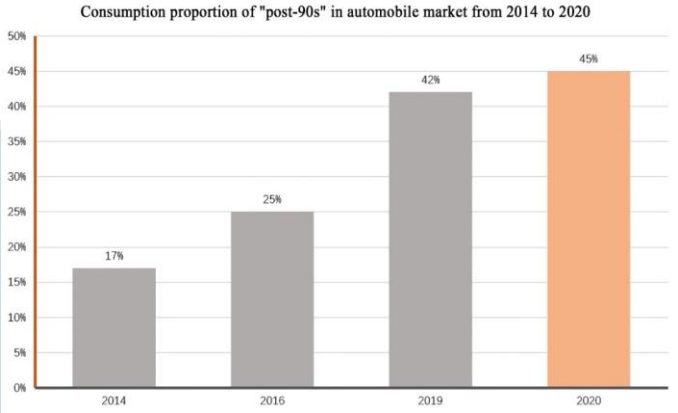

Fig. 2 Consumption Proportion of Post-90s Generation in Chinese Automobile Market

Data Source: Roland Berger

Under the above-mentioned development trend, in the future, the enterprises in the upstream and downstream of the automobile industry should, starting from the future development direction of automobiles, develop macroscopic strategies adapting to future development trends from the top-level design and strategic planning, in order to promote the development of the intelligent connected automobile industry chain; at the same time, they should take into account the changes in the needs of current consumer groups, conduct implementation with such utility functions as ADAS and L2, and through clever layout and design, resolve the temporary contradictions in the actual development, such as technology maturity and high price, automatic driving level and popularity among consumers.

Development Status of and Planning for Intelligent Passenger Vehicles in China

A combination between the forward-looking top-level design and the vast consumer market can lead to immeasurable impetus. Under the guidance of macropolicies, the enterprises in the upstream and downstream of the Chinese automobile industry chain have developed clear strategic directions and technical routes for intelligent connection in advance.

Specifically, the integrated automobile manufacturers, new automobile manufacturing power and Internet companies are the core of the industry chain, and thus their development status and future planning reflect the development status and future development path of Chinese intelligent passenger vehicles to a large extent. Starting from the latest cooperation mode of the industry chain and from two directions, i.e., intelligentization and connection, this section summarizes the development status of Chinese intelligent passenger vehicles in the past two years.

Complementary advantages, deep cooperation

Complementary advantages and deep cooperation are everlasting topics. Under the influences of national policy changes, technological upgrading, etc., cross-disciplinary cooperation and alliance between giants have become the current points of concern. Technologically, the enterprises in the upstream and downstream of the industrial chain have started to deeply cooperate through various modes to jointly promote technological progress.

Throughout two years' accumulation, Apollo, the open source autonomous driving platform of Baidu has started to cooperate with many integrated automobile manufacturers such as BAIC Group, Changan,

Chery and FAW; at the same time, SAIC, Great Wall, NIO, etc. have also increased the prices for overseas self-driving solution suppliers. Besides, SAIC and GAC declared at the end of 2019 that they would start to establish a cooperative alliance in automatic driving (intelligentization), connection and lightweight, signaling a new trend that in 2020, more head automobile enterprises will choose to cooperate in developing self-driving technology with complementary advantages (Yan, 2020:23).

Intelligentization: bicycle intelligentization first

Intelligentization and connection, two development directions of intelligent connected vehicles, replace and interact with each other in the development. At the present stage when such new generation communication technologies as 5G have not popularized and infrastructure construction hasn't been completed yet, bicycle intelligentization is temporarily the dominant development direction of intelligent connected vehicles. In the following chapters of this article, the bicycle intelligentization development direction of some domestic automobile companies (traditional integrated automobile manufacturers and new automobile manufacturing power) at the current stage are simply summarized in comparison with some of the proprietary brand passenger vehicle models (mainly including cars, SUVs, MPVs and NEVs) of domestic state-owned traditional integrated automobile manufacturers (FAW, SAIC, BAIC, GAC, Changan), in order to clarify the development status of Chinese intelligent passenger vehicles at the current stage.

Considering that some automatic driving functions have been popularized, such as ESP body stability system and ABS anti-lock braking system, which have been included in regulations, these functions are not listed in the intelligent form comparison; considering that L0 level automatic driving is popular (such as FCW forward collision warning) and driving intervention is not carried out, this intelligent list is not included yet, but some OEMs will include some identification and monitoring functions (such as TSR road sign identification) in networked applications, and these functions will be classified into the comparison of networked status quo. In addition, the popular TCS traction control system and EBD braking force distribution system or other functions related to power machinery control are no longer within the scope of this intelligentization analysis.

Connection: reaching the turning point of industrial change

The commercialization of 5G communication technology accelerates the arrival of the turning point of the intelligent connection industry change. On the basis of the gradual improvement of the bicycle intelligentization level, in the future several years, it will be focused on to gradually improve the connection level of self-driving automobiles through V2X technology, and actively seizing the speaking right for 5G will become the key layout for domestic integrated automobile enterprises to construct a multi-dimensional 5G ecosphere.

Domestic communication giants such as Huawei, DTT and ZTE have deeply arranged communication chips, communication modules and solutions for the Internet of Vehicles, and are moving towards the commercial stage together with their partners.

Specifically, as a supplier able to provide C-V2X intelligent connected vehicle-road collaborative solutions "end to end" in the industry, Huawei provides the full series of self-developed chips, supporting vehicle-mounted OBUs, drive test smart cameras, communication RSU units and external cloud collaborative computing units as well as central level V2X-Server traffic management Ethernet, creating a traffic intelligent agent integrating the physical world of "vehicle-network-road" with the virtual world of "end, management, cloud".

Intelligent cabin is becoming an innovative carrier for vehicle enterprises to enhance experience. With the implementation of Roewe, Xpeng, etc., other brands, especially proprietary ones, will further keep up, and intelligent cabin is expected to further penetrate into the low-end market. Human-computer interaction technique is the core of intelligent cabin, with central control panels and voice recognition frequently used, while the application rate of emerging technologies is still low---they will be maturely applied by about 2025.

CONCLUSION

The technical characteristics of domestic intelligent connection are concluded and classified as follows:

Comparison of degree of intelligent connection: Internet companies > new automobile manufacturing power > proprietary brands of traditional integrated automobile manufacturers.

The intelligent connection technology for proprietary brand domestic passenger vehicles is widely used in new energy vehicles.

The launch of intelligent connected vehicle products will be under the following trends:

The introduction of L2 level products will be quicker and in a larger scale, the launch in the proprietary brand market will further extend to the low end, and the joint venture brands will continue speeding up their layout in the market above RMB 150,000 yuan.

L3 level products will be launched in 2020, and the proprietary brands are expected to be firstly launched. Major domestic enterprises have planned to carry out mass production of L3 level self-driving automobiles in 2020 and 2021. These listed automobile enterprises are featured by preferentially implementing new energy vehicle models, parking and high-speed scenes.

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