Research on the Intelligent Development Path of Chinese Technology Manufacturing Enterprises Based on the Perspective of Anti-globalization

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Abstract: Affected by the financial crisis and the game between great powers, "anti-globalization" has become the mainstream trend of future development. How to break through the existing technical barriers and the encirclement of "anti-globalization" factors to successfully realize the intelligent strategic transformation has become an urgent problem to be solved at present. Based on the relevant theoretical literature, this paper investigates and analyzes the development status of China's science and technology manufacturing enterprises under the background of "anti-globalization", and puts forward the opportunities and challenges in the development path of China's science and technology manufacturing intelligent process reengineering based on the research conclusions of the intelligent development path of manufacturing industry. Finally, this paper gives some suggestions on intelligent development under the background of "anti-globalization" of China's S&T manufacturing industry. This paper attempts to explore the reference path of intelligent transformation of Chinese technology manufacturing enterprises, and believes that effectively combining the creation of smart cities with the "globalization" of digital economy is one of the main ways for enterprises to seek breakthrough development under the current background. In addition, enterprises should gather intelligent decision-making advantages to achieve intelligent strategic development of digital economy and biological and artificial intelligence integration. This paper provides a reference for the future research on the in-depth integration of the development of new artificial intelligence technology and science and technology manufacturing industry.

Keywords: Anti-globalization; Intelligentization; Technology Manufacturing Enterprises; Path of Development

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1 Introduction

Looking back at China's reform and development path over the past four decades, globalization and capital transfer from Western developed countries such as the United States are undoubtedly the main driving forces for China's sustained and healthy political and economic development. Gao Bo (2022) [1] believed that globalization is a process in which the achievements of the industrial revolution spread to the world, the market economy is the development mechanism of globalization, and the amount of well-being brought by globalization

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depends on the architecture of the global governance system and its operation efficiency. In the process of globalization, China obtains the capital, technology and resources needed for economic development through the global factor market, and at the same time provides the power source for the global economy-the huge market demand. Therefore, globalization will be a win-win situation for the development of the world economy for a long time to come.

With the impact of the global financial crisis since 2008 and the unexpected occurrence of the global COVID-19 epidemic since 2020, the import and export trade of Chinese enterprises has suffered a huge impact. In addition, the "chip crisis" started during the Trump administration has a serious inhibitory effect on the development of China's high-tech manufacturing enterprises. Gao Bo (2022) [1] believes that "anti-globalization" is another manifestation of globalization. It aims to seek win-win results for participants in globalization, constantly reduce the cost of globalization governance, and build a new order of globalization. "Anti-globalization" is not the same as "anti-globalization". "Anti-globalization" is the retrospection of the process of globalization to the improvement of the world order. Qu and Yang (2022) [2] believed that with the booming of a new round of scientific and technological revolution and industrial transformation, the adjustment of global production structure continues to deepen, and the influence of production localization tendency in developed countries gradually emerges.

The mask crisis triggered by COVID-19 has exacerbated the trend of "industrial reshoring", although for a period of time global trade has increased due to the degree of mitigation of the epidemic between different countries and regions. The development of "anti-globalization" will still be the mainstream for a long period of time. In addition, the normalization of Sino-US competition, the new economic alliance led by the US and Europe -- regional de-China, and the uncertain direction of the Russia-Ukraine war all have a profound impact on the medium and long term development strategies of Chinese science and technology manufacturing enterprises. Similar to the realization of digital and intelligent transformation of industries with high dependence on foreign trade of small, medium and micro enterprises, it is inevitable to fall back if they do not advance against the current. Figure 1 below shows the export statistics of domestic small, medium and micro foreign trade enterprises from January to September in 2022. The distribution of foreign trade dependence can be seen from the figure: The RCEP area, including ASEAN, accounted for 35.3 percent of exports, becoming an important pole of export growth.

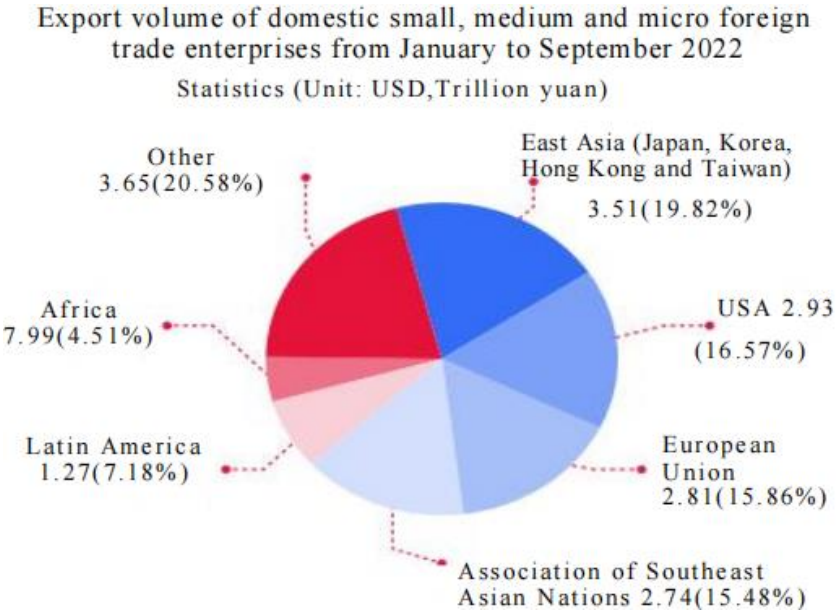

Figure 1 Export volume of domestic small, medium and micro foreign trade enterprises from January to September in 2022

With the liberalization of domestic COVID-19 prevention and control policies and the end of the COVID-19 crisis, we should give full play to the advantages of domestic and international double

circulation to promote the gradual recovery of domestic industrial manufacturing, the recovery of consumer services, and the development opportunities of digital economy to gradually form a virtuous cycle, which is conducive to enterprises to cope with the process of "anti-globalization" and realize digital transformation. This paper takes the intelligent transformation of Chinese science and technology manufacturing enterprises as the research blueprint, studies the development opportunities and challenges of this type of enterprises under the trend of "anti-globalization", and explores and finds the development path of intelligent transformation for reference.

2 Theory and Literature Review

Manufacturing industry refers to the activity of manufacturing raw materials into finished products or final products that can be used or sold through physical or chemical treatment through labor, machinery, tools, etc. Science and technology manufacturing is usually considered to be related to the traditional manufacturing industry and belongs to the high-end manufacturing link. This paper considers that science and technology manufacturing belongs to the digital and intelligent reference product of the new round of industrial revolution, and is an industrial cluster that combines digital, intelligent, intelligent energy and efficient input and output, which is different from the traditional labor-intensive manufacturing industry. A new technology enabling industrial group covering traditional manufacturing and emerging digital industries.

There are many definitions of digital transformation. Accenture believes that digital transformation refers to the digital model of physical products in the virtual space, including product information throughout the life cycle from product conception to product delisting. The transformation from a traditional enterprise to a digital enterprise requires changes in corporate culture, strategy, operations, organizational structure and partners. SAP believes that digital transformation is more than a technological transformation. It delivers value, generates revenue and improves efficiency in new ways by completely reimagining customer experiences, business models and operations. This paper holds that the intelligent transformation of science and technology manufacturing industry refers to the information interaction technology, AI intelligence, data, computing power center, energy interaction center and so on covering and dominating the design, raw material supply, production process, enterprise management, sales service and other aspects of enterprise operation of processing and manufacturing enterprises. And based on the data analysis and mining generated by each link to control, monitoring, detection, prediction and other production and business activities, in shortening the research and development cycle, improve order response agility, improve product quality and production efficiency, reduce energy consumption, timely response to customer needs and other aspects of empowerment. It is to improve the integration and collaboration within enterprises, between enterprises and between enterprises and customers to achieve the double improvement of efficiency and value.

Gao Bo (2022) [1] believes that globalization reshapes the world economic geography, and all countries and regions are deeply integrated into the global industrial chain, value chain and innovation chain. Since the 1990s, a production division system of global industrial chain and global value chain (GVC) dominated and controlled by international large buyers or multinational companies has been constructed in the world. Globalization has promoted the diffusion and dissemination of new ideas, which has promoted the convergence of developed countries.

"Anti-globalization" disrupts the global division of labor, threatens the stability and security of the global supply chain and industrial chain, and leads to increased technical barriers and insufficient impetus for scientific and technological innovation because it hinders global technology sharing and collaboration. "Anti-globalization" is a double-edged sword for intelligent manufacturing technology enterprises.

Qu Zhenning and Yang Danhui (2022) [2], on the basis of summarizing previous studies, introduced GVC participation as the core index to measure the degree of economic globalization from the perspective of manufacturing localization and technological change, so as to construct a multi-country general equilibrium model against the background of "anti-globalization," and concluded that “in the future, In the process of accelerating the optimization of the industrial base and the modernization of the industrial chain, with the increasingly perfect domestic supporting system, the degree and effect of import substitution in China are expected to be further improved and improved, and the local proportion of final products and intermediate

products will continue to rise, which is conducive to the formation of a high-quality domestic cycle. And then create conditions for the cultivation of regional value chain with closer cooperation". Manjiang Xing, Dae-Won OH and Chi Gong (2022) [3] argued that the process of digital integration of traditional industries should be accelerated, the degree of integration between digital economy and traditional industries should be improved, and the construction, management and protection of digital value system should be strengthened. At the same time, we should attach importance to the innovation and development of traditional theories, promote the innovation and development of the wisdom process of energy economy, actively promote the globalization process of innovation, and promote the globalization process of industry and economic trade. Finally, make full use of existing technology concepts to stimulate the innovation integration degree of digital economy, such as metaverse concept, virtual technology, AIOT, etc.. Madhok (2021) [4] believed that anti-globalization was regarded as the de-integration of politics, economy, trade, technology, culture and other fields on a global scale. In addition, the COVID-19 epidemic has a certain hindering effect on the process of globalization. Ge Xiaohong and Xing Manjiang (2020) [5] believed that the development of the COVID-19 epidemic has gradually shown a trend of normalization, which has caused a sharp impact on the global geopolitical and economic environment, resulting in the rapid growth of manufacturing and processing industry costs and the rapid decline of market demand. The outbreak and development of COVID-19 has triggered a new round of anti-globalization, with most transnational investment and scientific and technological cooperation businesses having to be reduced or terminated in advance, further worsening international economic and trade cooperation. As the negative impact of the epidemic in China receded, the recovery of domestic consumption led to the recovery of market economic vitality and confidence, which helped accelerate the recovery and remodeling of global supply chains and value chains. In 2023, the role of the domestic market in the recovery of the global economy will be greatly strengthened. It can be seen from the statistics of the Ministry of Commerce that this role plays a significant role in the economic recovery of the RCEP agreement members and the Belt and Road economic regional members.

The process of globalization started in the 1990s. Yuan Zhonghua (2021) [6] believed that the reconstruction of global value chain is a dynamic and complex system engineering. The trend of "anti-globalization" may make the supply chain show a trend of diversification, promote the generation and deepening of new value chains, and promote the reconstruction of corresponding international trade rules. Xu Hao and Dai Liang (2022) [7] analyzed the development path of China's automobile manufacturing industry against the background of "anti-globalization." The automobile manufacturing industry is in a benchmark position in the manufacturing industry due to its unique industrial relevance, scientific and technological concentration, high demand for labor, strong income elasticity, and its high level of scientific and technological innovation to feed back to the national economy.

From the perspective of world history, economic globalization and free trade are always accompanied by "anti-globalization" and trade protectionism. "Anti-globalization" cannot deny the vitality and contribution globalization has brought to the world economy. In the long run, globalization will remain the main theme of world economic development. "Globalization" has broken the regional limitation and provided unlimited possibilities for the future of the world. The development of the digital economy, as now advocated, will bring new opportunities to globalization. Kuang (2022) [8] believed that "globalization" is an objective existence due to the improvement of social productivity and the continuous improvement of quality and capacity of production socialization. The emergence of the phenomenon of "anti-globalization" is based on some stage problems that cannot be solved in the process of globalization, such as the widening gap between the rich and the poor, the failure of economic development dividend to benefit the people, and the dilemma of global governance caused by populist ideology and political and economic crisis. In addition, the road of development and innovation based on the factor endowment theory cannot bring new vitality to the world economy or avoid the continuous expansion of the gap between the rich and the poor. Since 2019, following the pace of the United States in the process of "anti-globalization" manufacturing reshoring, Western countries have also taken relevant measures to reshoring manufacturing industry and reduce investment and foreign trade in order to maintain their own industrial chain. For example, Japan has launched a plan to "recall" some Japanese companies, and Kudlow, chairman of the US National Economic Council, has encouraged US companies to return and relocate to

Southeast Asia to fight China's globalized industrial chain.

This paper attempts to explore and explain the characteristics of "globalization" and "anti-globalization", and take it as an opportunity to carry out the research on the development path of intelligent transformation of science and technology manufacturing enterprises in our country, and try to build the corresponding intelligent framework structure to explore the road of strategic rise of science and technology manufacturing industry.

3 Investigation on the Current Situation of China's Technology Manufacturing Enterprises

China's manufacturing industry employs more than 99 million people every year, plays a positive role in the growth and stable employment of the national economy, and plays a pivotal role in the national economy. However, China's traditional manufacturing industry has always had problems such as unbalanced industrial structure, a large number of enterprises but few famous enterprises, and a lack of core technology, which is called "big but not strong" in the market. At the same time, China's manufacturing industry is also facing the double attack of the transfer of low-end industries to Southeast Asian countries and the return of high-end manufacturing to developed countries.

After more than 40 years of reform and opening up, China's manufacturing industry has been able to initially meet the needs of domestic and international markets, but the overall comprehensive quality of the manufacturing industry is not high, and there is still a breakthrough to be made. From 2010 to 2017, the labor-intensive manufacturing industry developed steadily on the whole, and its operating revenue accounted for 28.2% of the manufacturing operating revenue in 2017, up slightly from 26.7% in 2010. In 2018, as China-US economic and trade frictions gradually heated up, the growth rate of added value of major labor-intensive manufacturing industries such as agricultural and sideline food processing industry and textile industry began to slow down. In addition, the outbreak of COVID-19 in 2020 had a great impact on consumption and production, and the proportion of labor-intensive industries decreased to 22.4% in 2021. Figure 2 shows the industrial structure changes of China's manufacturing industry from 2010 to 2021. Since 2013, high-tech industries (including pharmaceutical manufacturing, computer, communication and other electronic equipment manufacturing) have accelerated their development, accounting for 15.5% of the manufacturing industry in 2021, up from 10.9% in 2013. With the popularization and application of digital technology, the growth of computer, communication and other electronic equipment manufacturing is particularly prominent, accounting for 12.9% in 2021 from 8.7% in 2013. The proportion of equipment manufacturing industry (including metal products industry, general equipment manufacturing industry, special equipment manufacturing industry, railway, ship, aerospace and other transportation equipment manufacturing industry, electrical machinery and equipment manufacturing industry, instrumentation manufacturing industry, metal products, machinery and equipment repair industry) increased from 27.9% in 2013 to 30.2% in 2021. This was mainly driven by the faster growth of the automobile manufacturing industry, whose share in the manufacturing industry increased from 6.4% in 2013 to 8.5% in 2021.

According to the calculation method of Wang (2017b) (Zhi Wang, et. Measures of Participation in Global Value Chains and Global Business Cycles, Working Paper.). Using the input-output table data of the Asian Development Bank database, this Paper calculates China's manufacturing industry as a whole and 14 sub-industries. It is found that from 2000 to 2021, the global value chain status of China's manufacturing industry as a whole is rising in the fluctuation. In 2016, it reached the stage peak (0.970), with an increase of 1.25%. In 2018, due to the impact of China-US economic and trade frictions, the status of China's manufacturing industry in the global value chain decreased, and gradually recovered in 2019. From 2020 to 2022, it fell slightly due to the impact of the epidemic. In 2023, as China's economy re-bloomed, this index is expected to recover 2019 or usher in new breakthroughs. In view of the increasingly severe external environment abroad and the inevitable impact of domestic economic recovery and anti-globalization trend, the digital and intelligent transformation of China's manufacturing industry is still the most urgent problem at present. It is necessary to pay attention to top-level design and strengthen investment in infrastructure and basic science and technology research and development. Figure 3 shows the PMI index of China's manufacturing industry in the past year, the business activities of related types of

enterprises, and the overall new orders of the manufacturing industry. In April and December 2022, the PMI index was 47.4 and 47.0 respectively due to the impact of the number of new orders, becoming the lowest level of the year.

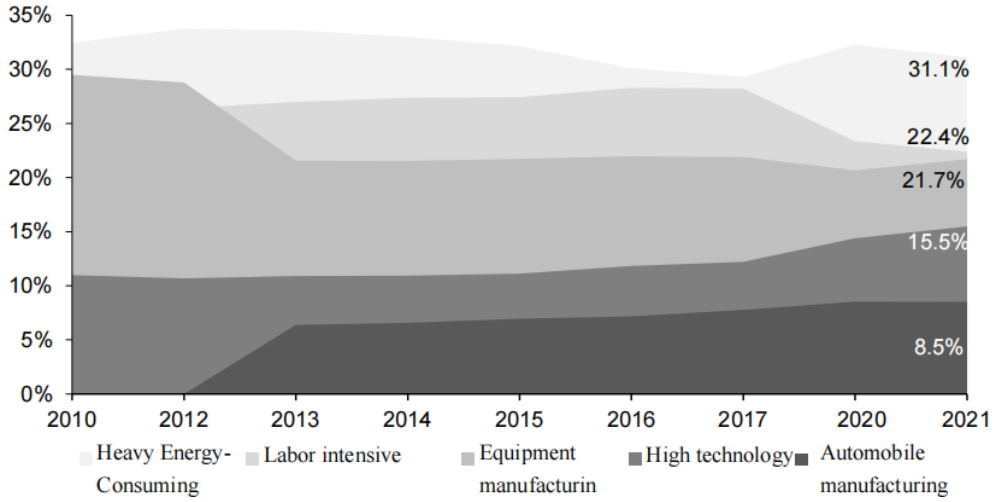

Figure 2 Changes in China's manufacturing industry structure from 2010 to 2021

Data source: China Industrial Statistical Yearbook, Bank of China Research Institute.

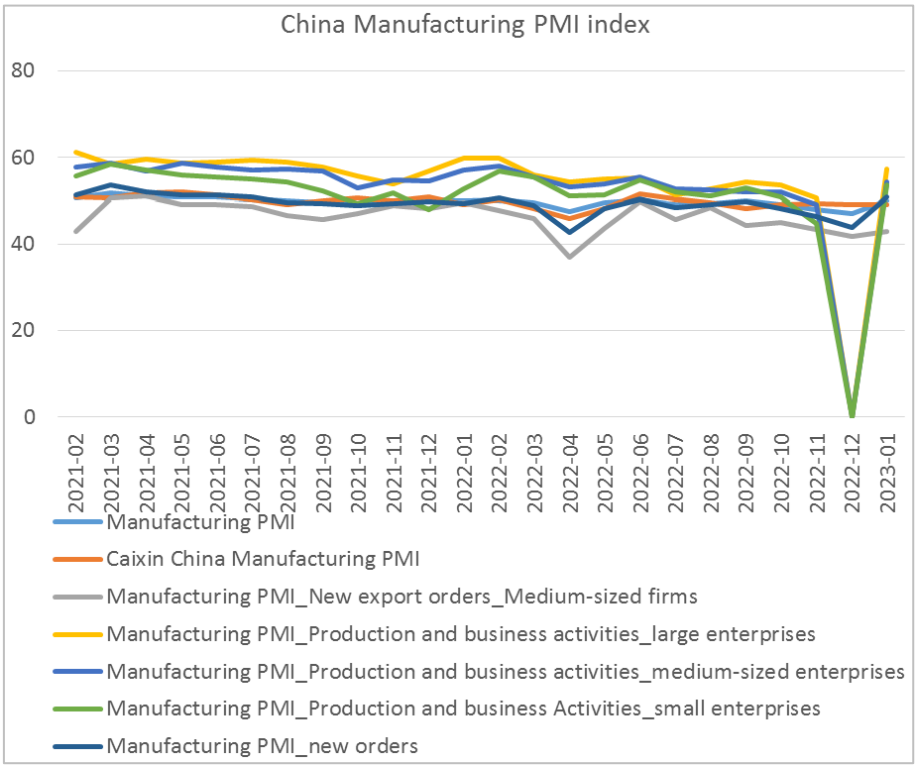

Figure 3 Changes in China's manufacturing PMI index from February 2021 to January 2023

Data source: National Bureau of Statistics of China, Caixin.

As the world's largest manufacturing country, China is the world's manufacturing and processing center, but it is not a manufacturing power, nor is it a science and technology power. Most of China's manufacturing industries are still in the low-end global value chain. Mr. Qu Xianming (2021) [9] proposed that manufacturing is

the main body of the national economy and the main battlefield of technological innovation. Rodney A. Brooks, A professor at the American Artificial Intelligence Laboratory, believes that there are a lot of opportunities for innovation in the current process of high-tech transformation of low-end manufacturing. In addition, China is a big consumer of industrial chips but not a strong country, and its international trade situation is not optimistic. Due to artificial trade restrictions, the global chip industry chain cannot obtain sufficient chips and related equipment supply in the international market, and the stability of the industrial chain and supply chain faces severe challenges, which also brings hidden dangers to the healthy development of the world economy.

In addition, according to the survey data of Sail Soft Data Application Research Institute, only 3.42% of China's manufacturing enterprises have formed a good internal data application atmosphere, and the enterprise operation and management have basically realized data support. However, 39.32% of the manufacturing enterprises said that they only started to use simple reports in the business system to support business management. In general, most of the data construction of domestic manufacturing enterprises is still in its infancy, with 64.96% of enterprises only completing the data coverage of the core business system, and only 10.26% of enterprises realizing the digital management of all businesses. The data construction of manufacturing enterprises has a long way to go.

Based on this background, how to improve the level of China's manufacturing industry and restore the confidence of manufacturing industry operation and investment has become an urgent problem to be solved at present, and the realization of digital and intelligent transformation of China's manufacturing industry has become the key to the success or failure of China's strategic goal of overtaking on curves in the future.

4 Intelligent Future Development Path

The digital revolution that has taken place since the beginning of this century is an opportunity.

With the integrated development of 5G, cloud computing, big data, artificial intelligence and other new round of industrial revolution technologies with traditional manufacturing, emerging industries have shown explosive growth, and emerging technology manufacturing industry has gradually stood on the historical stage. The wide application of new technologies has improved the intelligence level of manufacturing industry. The maturity and wide application of ChatGPT intelligent interaction technology in the field of artificial intelligence provide a new production management mode for industrial intelligent transformation.

Toubao Research Institute defines intelligent manufacturing as a new production mode based on the deep integration of the new generation of information and communication technology and advanced manufacturing technology, which runs through all aspects of manufacturing activities such as design, production, management and service, and has the functions of self-disease knowledge, self-learning, self-decision-making, self-execution and self-adaptation. On the basis of intelligent manufacturing combined with blockchain, AI, VR and other technologies, the concept of smart factory is proposed. Ge Xiaohong (2022) [10] believes that smart factory is the reshaping of enterprise production management process by using information technology combined with digital design and manufacturing process on the basis of digital factory. Realize the construction of efficient, low-carbon, energy saving, green, environmental protection and intelligent industrial revolution. Her also believes that intelligent chemical factories have certain independent behavior ability, which can realize collection, analysis, judgment, planning and other behaviors. The overall visual virtual technology can also be used for learning, reasoning and prediction, and virtual realization of design and manufacturing process. For the intelligent transformation of manufacturing industry, the integration and innovation of digital technology and traditional industrial technology plays a key role. Intelligent manufacturing opens a modern intelligent production path integrating industrial R&D and design + manufacturing and processing + service.

Since 2015, the Chinese government has successively issued the Made in China 2025 Development Strategy, the 14th Five-Year Plan for Intelligent Manufacturing Development and other policies to promote the development of intelligent manufacturing related industries, focusing on accelerating the intelligent transformation of industry. The Chinese government is committed to the implementation of industrial Internet, Industry 4.0, Made in China 2025& the integration of

innovation and development of the two, in order to lead the pace of integration and innovation and development of China's intelligent manufacturing industry, and promote the optimization and adjustment of the layout of intelligent manufacturing industry. However, in the short term, due to the bottleneck of AI technology research and development, artificial intelligence technology is expected to be difficult to achieve large-scale application in the industrial field. It is expected that in the next five years, the development speed of China's intelligent manufacturing industry will slow down slightly, and the growth rate of market size will slow down simultaneously. According to the Toubao Research Institute, the market size of China's intelligent manufacturing industry will reach 5.3 trillion yuan by 2025, with a compound annual growth rate of 13.9 percent in the next five years. In addition, the maturity of 3D printing, human-computer interaction, cloud manufacturing, industrial technology and digital twin technology will promote the optimization of intelligent manufacturing, so as to improve its penetration rate. At the same time, intelligent manufacturing has become a global trend, compared with some developed countries, China's intelligent manufacturing industry still has a large room for improvement. Figure 4 below shows the forecast of the market development scale of China's future intelligent manufacturing industry.

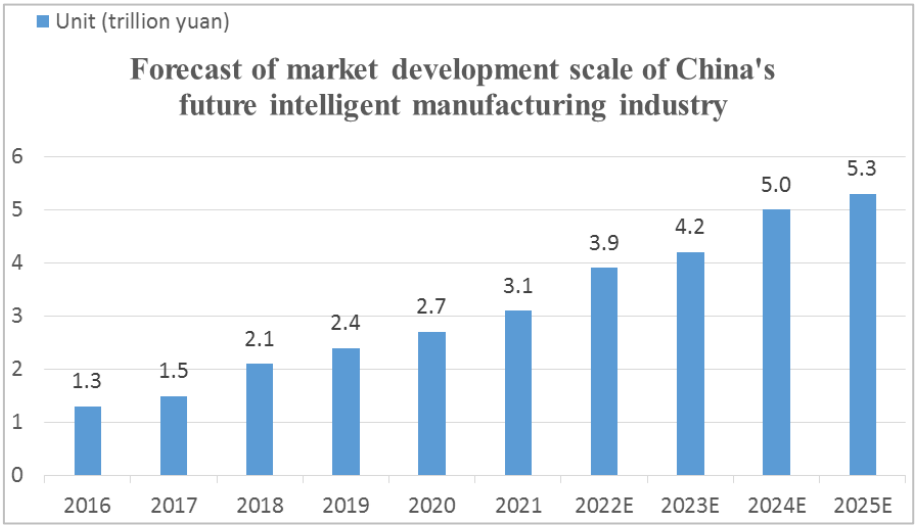

Figure 4 Prediction of China's future intelligent manufacturing industry market development scale

The overall manufacturing industry tends to be resource-oriented, and the foundry property related to computer communication is obvious. It is urgent to guide China's manufacturing industry to high-end and service-oriented through technological innovation. At present, China's intelligent manufacturing industry is facing many problems, mainly including the following aspects:

(1) R&D input and output are lower than expected. Intelligent manufacturing industry has high technical barriers, requiring a large amount of research and development investment. China's intelligent manufacturing is still in the early stage of development, the technical foundation is relatively weak, most enterprises in the industry are still exploring the trial and error stage, input and output time is relatively long. (2) The technical level in the industry is not uniform, and the mastery of core technology and innovative application ability are not enough to support the intelligent transformation of the industry. (3) Insufficient capital attraction capacity. There is a big difference between intelligent manufacturing industry and Internet industry. Intelligent manufacturing is a technology-oriented industry rather than a capital-oriented industry. The industry is more inclined to obtain sustainable and stable development through long-term research and development, and it is difficult to win market share through a large amount of capital injection. (4) Lack of talent momentum and innovation. (5) It is difficult to absorb and implement high-tech. Intelligent manufacturing involves a wide range of fields and many subdivided fields. There are great differences in production process and technology, production line configuration, raw materials and product types in various fields, so it is impossible to produce

universal solutions to meet customer needs in different subdivided fields. In the application process of intelligent manufacturing technology, it will face the pain point of too little sample size, so it is difficult to land. (6) "Anti-globalization" has both opportunities and crises. Global market share declines, supply chains are threatened or destroyed, resulting in enterprise production, research and development, sales and debt crisis, while promoting industrial intelligent restructuring.

According to the multi-country equilibrium model constructed by Qu and Yang (2022) [2], the market equilibrium condition meets the three-factor law that equilibrium price and distribution depend on the initial technological level, capital accumulation and investment assets of each country. Qu and Yang (2022) [2] concluded that among the factors leading to anti-globalization, the local proportion of final products reflects the market's preference for local products, which depends on the competitiveness of local products and largely reflects the orientation of trade policies, that is, the localization of manufacturing industry will intensify anti-globalization. The Belt and Road Initiative initiated by China is a new development opportunity for countries along the Belt and Road, as well as a special attempt in the process of globalization in disguise, which provides an opportunity for countries along the Belt and Road to realize complementary and coordinated development of advantageous industries. Stronger cooperation between RCEP and ASEAN member states will greatly promote economic and trade exchanges within the cooperation region and promote the digital development of new industries. After the epidemic, we should continue to strengthen the pattern of mutual development between the mainland, Hong Kong and Macao by relying on the double-cycle development strategy, fully improve and give full play to the role of Hong Kong as the center of resources, make full use of the strategy of local industrial restructuring in the process of "anti-globalization", intensify reform and opening up, accelerate the training and construction of talent teams, and accelerate the use and level of foreign capital introduction and absorption on the premise of maintaining the stability of foreign exchange. We will restructure financing channels in stock and other financial markets, promote reform of the registration system, increase support for IPO policies for science and technology enterprises, simplify government affairs, fully implement digital government affairs platform business, realize smart city construction, strengthen energy innovation and reform, realize the liberation of industrial raw materials and energy, and comprehensively increase the proportion of digital economy in GDP. We will use science and technology to promote innovative and integrated development of industries. Guo Xinran (2020) [11] believed that we should seize scientific and technological innovation and obtain a greater market share in the international market with good product quality and after-sales service. Li et al. (2020) [12] believed that highly skilled personnel were the backbone of the manufacturing production line, and it was urgent to build the echelon of skilled talents, build an innovation platform, strengthen talent training, actively carry out technological innovation and technological breakthroughs, and comprehensively improve the technical and skill level of skilled talents. After the financial crisis, the trend of talent return to China has gradually emerged, and this trend has gradually grown in the post-epidemic era. With the improvement of domestic policies, this trend will continue to pick up. With talent advantage, technological advantage will inevitably be achieved, and the trend of talent return is bound to bring new development opportunities to China's intelligent manufacturing industry.

Luo, Yi, Zhang et al. (2021) [13] believed that the Belt and Road Initiative is a major opportunity to strengthen the cooperation between China and developing countries, implement the strategy of import and export diversification, stimulate the development potential of domestic manufacturing market and strengthen international cooperation among developing countries through active opening up. In addition, Luo et al. (2021) [13] also believe that the signing of RCEP, as the world's largest free trade agreement, is an opportunity for China's manufacturing industry to realize industrial transformation and upgrading. Bu Guomiao et al. (2022) [14] believed that the construction of the new development pattern of "double circulation" brings opportunities of "new consumption," "new infrastructure," "new capital market" and "new industrial chain," which is conducive to the high-quality development of small and medium-sized science and technology enterprises. At the same time, the "double circulation" strategy is a strategic choice to reshape China's international cooperation and form new competitive advantages. Tong Jiadong, Xie Danyang, Bao Qun et al. (2017) [15] deeply discussed the development trend of globalization, the impact of "anti-globalization" on China's economy, and China's

countermeasures: In view of "anti-globalization," dialogue should be strengthened, relevant trade policies should be made more flexible, new multilateral trade agreements such as "The Belt and Road" and RCEP should be fully used to weaken the influence of "anti-globalization" factors, and the positive development of globalization process should be promoted as much as possible while the intelligent transformation process of local enterprises should be accelerated. Li Kaisheng (2017) [16] believed that in view of the current complex state of Sino-US relations, China should continue to firmly develop its comprehensive national strength, continue to demonstrate the intention of peaceful development, promote the policy of peaceful coexistence and peaceful competition with the US, and make rational use of international events to promote Sino-Us strategic cooperation. Xu Xiaoyong and Zeng Hengyuan (2018) [17] believed that in order to better cope with the negative impact of anti-globalization, more attention should be paid to the formulation and coordination of domestic policies and the improvement of domestic market policy arrangements while coordinating the economic contradictions between countries.

To sum up, this paper believes that the intelligent transformation of Chinese technology manufacturing enterprises is an inevitable development trend, which will continue to improve and develop for a long period of time in the future. Enterprises should accelerate the integration of the advantages of the existing policy environment, actively promote the reconstruction of market-oriented industrial value chain and the opportunities of future smart city construction, and gradually improve and surpass the achievements of the current industrial scientific and technological revolution with the new round of "anti-globalization" development trend. Figure 5 below shows the development opportunities of intelligent transformation of Chinese technology manufacturing enterprises under the background of "anti-globalization."

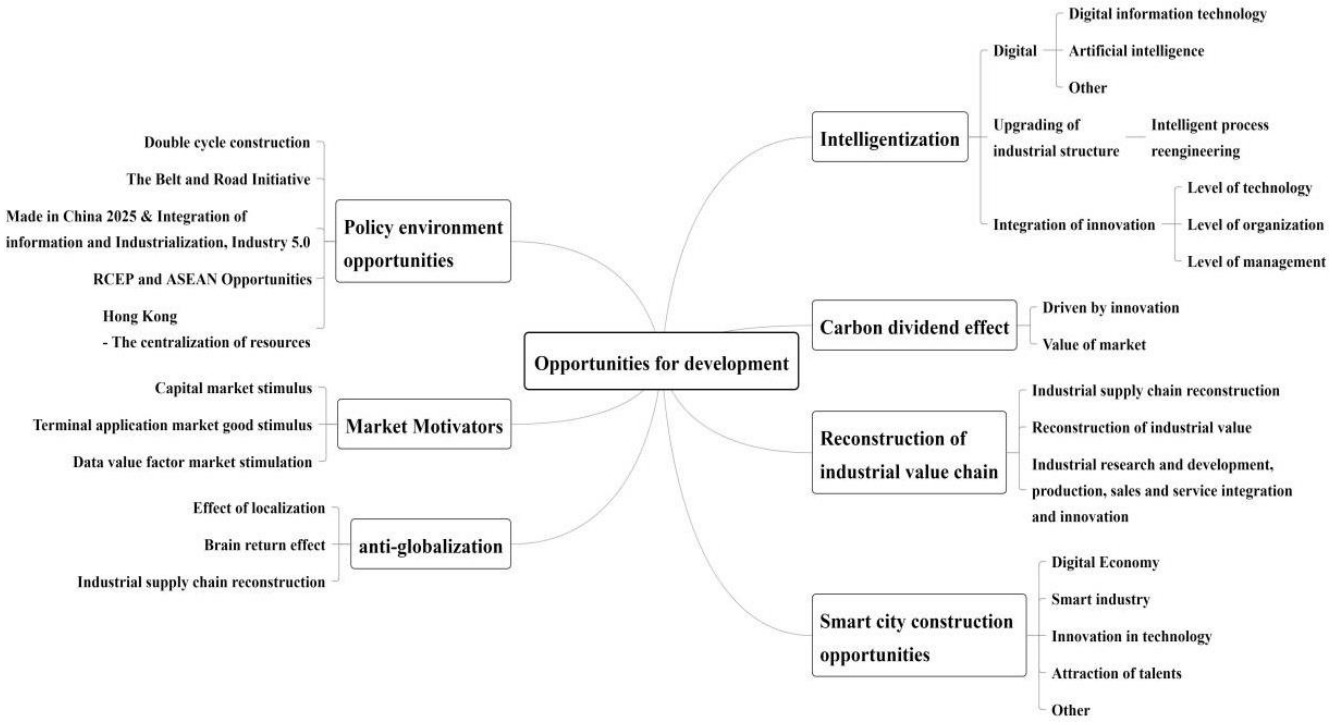

Figure 5 Development opportunities of intelligent transformation of Chinese technology manufacturing enterprises under the background of "anti-globalization

From the above figure, it can be clearly found that the current intelligent transformation and development opportunities of Chinese science and technology manufacturing enterprises. The trend of "anti-globalization" has created industrial localization, promoted the localization of industrial value chain, injected capital and talent advantages into the development of local enterprises, and provided opportunities for the reconstruction of industrial value. The carbon dividend effect reflects the market value drive, which provides driving force for industrial technology, organization and management innovation. The

reconstruction of industrial value chain provides a driving force for the reconstruction of industrial value and supply chain, and provides a driving force for the integrated innovation and development of product research and development, production, sales and service. The construction of smart city provides a historical stage, and the integration and innovation of digital economy and smart industry provides talents and market space. In addition, "carbon neutrality" will provide broad investment and development opportunities for China's industrial manufacturing industry. In the Blue Book of Zero-Carbon, China-Green Investment released by the Investment Association of China in 2022, it is predicted that zero-carbon China will give rise to seven investment areas and leverage 70 trillion yuan of green industry investment opportunities, including renewable resource utilization, energy efficiency improvement, electrification of end consumption, zero-carbon power generation technology, energy storage, hydrogen energy and digitalization." Carbon neutrality" is expected to restore China's advantage in the global system of industrial manufacturing, which is expected to reach a market size of nearly 15 trillion yuan by 2050 and contribute 80% of the cumulative emission reduction for China to achieve zero carbon emissions. With the development and utilization of new artificial intelligence technology, 6G information interaction technology and hydrogen energy, science and technology manufacturing will become an emerging enterprise power group, which will concentrate the most capital, talent and technology, and will be the foundation and beginning of the next round of globalization of the global economy.

The intelligent transformation of scientific and technological manufacturing enterprises focuses on process reengineering, but also on the practical application of the achievements of intelligent scientific and technological revolution. The intelligent development of human industrial civilization system will eventually realize the integration and innovation of biological intelligence and industrial intelligence. At present, most enterprises have realized management process reengineering -- initially realized enterprise operation and management (covering human resources, business planning, finance, procurement, after-sales service and product development and design), but most enterprises have not completed production process reengineering, artificial intelligence and other advanced technologies to participate in the production process support degree is not enough to meet the intelligent production process. Figure 6 shows the schematic diagram of intelligent production process reengineering. Enterprises can make corresponding adjustments and optimization according to the characteristics of their own production process in order to best meet the intelligent production process of enterprises.

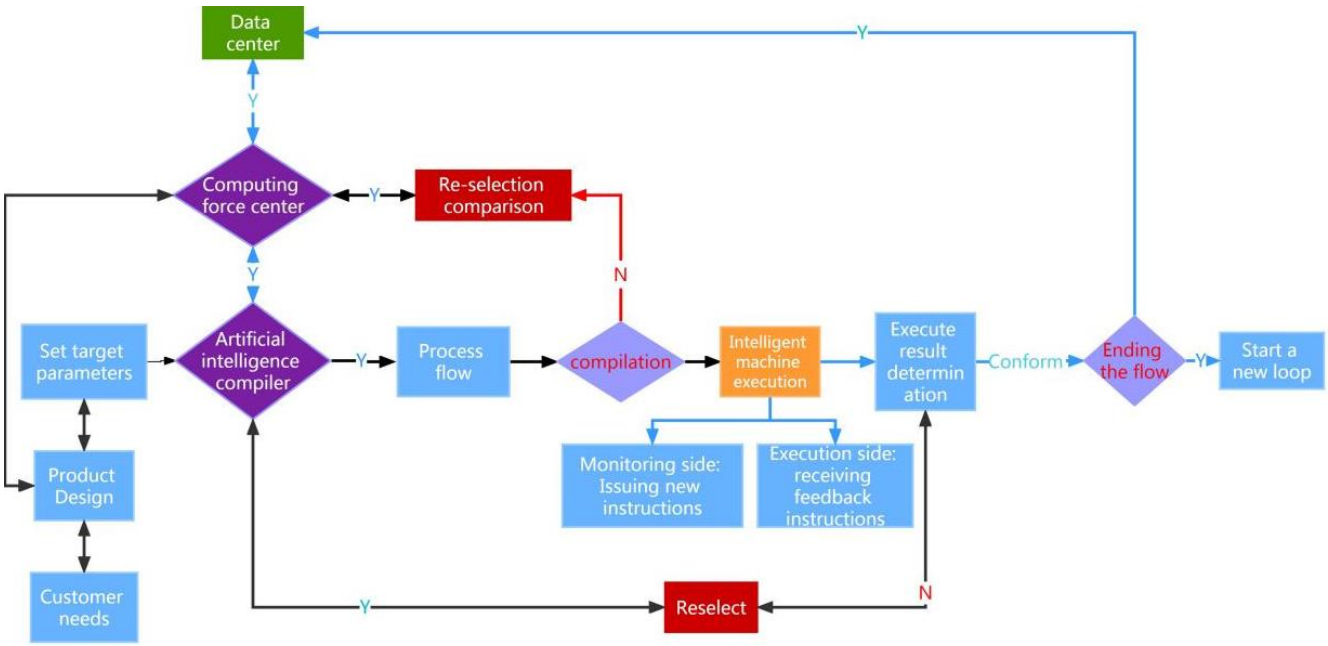

Figure 6 Schematic diagram of intelligent production process reengineering

To sum up, this paper believes that the current stage and the future period of intelligent transformation of Chinese technology manufacturing enterprises will be the key inflection point, which determines the final development direction, development scale and the final social benefit model of the manufacturing industry. This paper holds that we will further increase the scale of capital and technology agglomeration effect, make full use of the development trend of "anti-globalization" to reshape the pattern of domestic manufacturing industry, promote its quantitative change to qualitative change, and find a scientific and reasonable way of rapid development. The success or failure of the intelligent transformation of science and technology manufacturing enterprises is related to the change of the world pattern, and is the key factor for China to realize overtaking in corners, which will comprehensively affect the healthy development level of the national economy.

5 Challenges Under the Background of Anti-globalization

In the transformation of intelligent manufacturing in China from intelligent equipment to intelligent manufacturing process, intelligence should first obtain the liberation of energy supply mode -- solve the intelligent energy supply device, secondly complete the intelligent decision-making process of manufacturing process materials, and finally realize the intelligent manufacturing process of the whole set. The intelligence of equipment is more reflected in the characteristics of perception, analysis, reasoning, decision-making and control attached to the original equipment. The equipment collects data independently to realize optimal decision-making under digitalization and improve production efficiency. The intelligence of the process realizes the interconnection and intelligent choice of each intelligent manufacturing equipment, liberates energy supply, synthesizes new materials, and finally realizes the optimization of the process through the comparison of data simulation and intelligent selection of solutions, shortens the R&D and production cycle, improves production efficiency and reduces the specific energy consumption per unit of energy. The long-term goal of intelligent manufacturing is the intelligent revolution of production mode and even the whole industrial ecosystem. Therefore, it is the development trend of the future for a period of time to shift from the single use of intelligent manufacturing equipment to the intelligent production process.

Intelligent manufacturing industry involves a wide range of technologies, high technical difficulty and significant technical barriers. At the same time, talent barriers caused by talent scarcity and difficulty in obtaining customer resources make the entry threshold of intelligent manufacturing industry high. The participating enterprises in the field of intelligent manufacturing in China can be basically divided into three categories. The first category is the Internet giant enterprises represented by Huawei and Ali. The second category is new entrants in the field of intelligent manufacturing, which has certain technological advantages but lacks industrial application experience. The third category is traditional industrial automation enterprises, which transform from providing traditional automation equipment to intelligent manufacturing equipment suppliers. Traditional industrial automation enterprises have an industrial foundation in the industrial field and have a better understanding of the status quo and demand of the industry. They have more advantages in realizing the implementation of intelligent manufacturing technology, but are in a long-term disadvantage position in the cultivation of artificial intelligence talents.

China's intelligent manufacturing talents are relatively scarce. In 2020, China's intelligent manufacturing talent gap is up to 3 million. It is estimated that the gap will continue to expand in the future, because compared with the intelligent manufacturing field, Internet companies have salary, working environment and platform endorsement advantages, and Chinese artificial intelligence professionals prefer to enter Internet giant companies. At the same time, intelligent manufacturing requires cross-border integration of artificial intelligence and industrial technology, which is difficult for some artificial intelligence professionals. Internet giants often form partnerships with emerging smart manufacturing companies. Internet giant companies prefer to develop universal solutions, but it is difficult to achieve in the manufacturing industry. Considering the difficulty of input-output ratio and expectations, they prefer to cultivate ecological partners. Internet giant enterprises provide advanced technology and macro planning, while emerging intelligent manufacturing enterprises are responsible for in-depth industrial production links to

realize the specific application of technology. The division of labor and cooperation between the two, China's intelligent manufacturing competition pattern is currently dominated by international enterprises, the reason is that there is still a large gap between Chinese enterprises and international enterprises in the technical level. Intelligent manufacturing equipment and technology have a high degree of external dependence.

In the current post-epidemic era and the background of "anti-globalization" trend, China's intelligent manufacturing technology enterprises need to deal with many challenges while facing opportunities, from the external environment of the industry to the internal structural defects of the industry, which are all problems that the intelligent manufacturing industry needs to face and solve. Figure 7 shows the "anti-globalization" challenge of China's intelligent manufacturing technology enterprises.

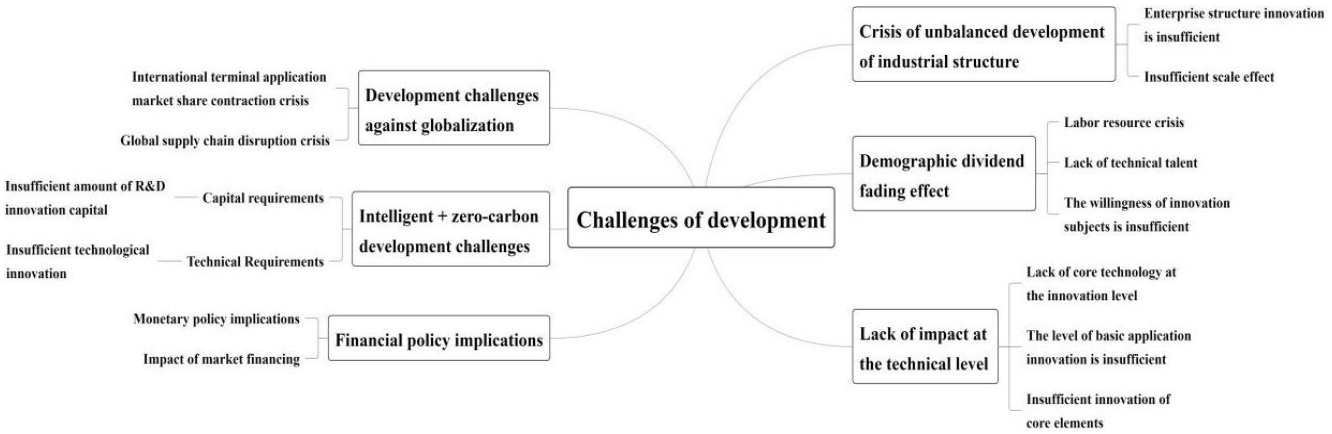

Figure 7 China's intelligent manufacturing technology enterprises face challenges under the background of "anti-globalization

(1) The "anti-globalization" industrial backflow: localization.

At present, the "anti-globalization" trend of industrial reshoring is less likely to be reversed in the next three to five years. Analysis of capital operation mode from the perspective of factor endowment and value flow: capital always likes to transfer from high-cost to low-cost regions, but this cannot change the current localization trend of industrial backflow. Many developed countries, such as the United States, Germany, Japan, etc., have gradually reduced the proportion of foreign industrial investment, and encouraged the implementation of the upgrading strategy of ontology industrial technology structure system. With the rapid development of digital economy, major countries in the world have adopted the implementation of new industry 5.0, 6G, ChatGPT, new material manufacturing, new energy and other core technologies as long-term development strategies. The comprehensive implementation of such strategies is bound to accelerate the process of industrial intelligent localization. Therefore, industrial backflow -- localization is both an opportunity and a challenge.

(2) Challenges of intelligent + zero-carbon industrialization.

COVID-19, political games between major countries and "anti-globalization" have had a slow effect on intelligent and zero-carbon industrial strategies. Under the complex and multiple backgrounds, the pace of intelligent + zero-carbon industrial strategies has been hindered, and there is a negative slowdown trend in talent, technology and organizational management.

Manufacturing is an important engine of China's economic growth and a major contributor to the country's energy consumption and carbon emissions. According to relevant information, global carbon emissions in 2020 were 35 billion tons, of which 12.5 billion tons were emitted by the power industry, 9 billion tons by industry, 7.5 billion tons by transportation and 4 billion tons by construction. Among them, industrial manufacturing accounts for nearly a quarter of global carbon emissions, making it the second largest source of carbon emissions after electricity. By the end of 2021, the total energy consumption and carbon emissions of China's manufacturing industry accounted for two-thirds of the secondary industry, and also accounted for one-third of China's total energy consumption and carbon emissions. As a large electricity user, the proportion of comprehensive carbon emissions of industry will continue to rise if the electricity consumed by production and manufacturing is included. In order to get rid of the

dependence on traditional fossil energy and achieve "carbon neutrality", in addition to vigorously developing renewable energy such as wind, light and water and reducing carbon emissions in the power industry, the transformation and development of "carbon neutrality" in the manufacturing industry is the top priority to achieve global "carbon neutrality".

In view of the above argument, it is necessary for China's manufacturing industry to realize the intelligent + zero-carbon industrial route. Therefore, pressure and challenge are full of meaning, do not seek breakthroughs will be eliminated by history.

(3) Financial policy challenges.

To some extent, the monetary easing policy accelerates the process of industrial and supply chain localization, that is, the monetary easing policy speeds up the release of market capital, which continuously transfuses the national economy and thus promotes capital investment. Secondly, abundant capital market helps to promote the upgrading and adjustment of local industrial structure, which accelerates the development effect of localized industrial agglomeration. Finally, the adjustment of financial and monetary policies and the competition of great powers restrict the free choice of market liquidity, resulting in the lack of development capital, restricting economic and trade activities, resulting in the increase of the proportion of uncertain factors in regional trade and economy, and causing a certain impact and block on regional and global financial markets.

(4) Unbalanced development of industrial structure.

Manufacturing is not only the traditional tangible productivity, but also should include information data, computing power, energy and corresponding transmission manufacturing and other intangible productivity. At present, China's manufacturing industry as a whole is resource-oriented, and the foundry properties related to computer communication are obvious. It is urgent for the science and technology manufacturing industry to transform into high-end intelligence, cluster and service through core technology innovation. At present, the overall industrial value of the manufacturing industry is not obvious, due to the lack of capital input, insufficient R&D input and output, uneven technical level within the industry, serious shortage of core talents and core technologies, and low sharing rate of the world's industrial innovation and development level.

(5) The fading effect of demographic dividend is obvious.

In the past 40 years of development, China has cultivated a sound industrial base by relying on a huge labor base. In particular, labor-intensive industries have gained a lot of opportunities in the process of industrial migration and transfer from Western developed capital countries, thus accelerating China's accumulation of capital and technology. This is a golden period for the development of China's resource and labor-intensive industries. However, as the number of China's working population decreases year by year, another reason is that the popularity rate of higher education in China continues to increase, and the employment preference of the newly added working population also changes. Labor-intensive industries represented by manufacturing are facing the problem of labor shortage. Secondly, the survey report on the global flow of human resources shows that China has lost a large number of high-tech talents due to the unbalanced ratio of industrial resources and some other reasons. Although this trend has a certain trend of return due to the financial crisis, with the weakening of the impact of the global COVID-19 epidemic, this trend of return has been interrupted. The above reasons have led to the fading of China's demographic dividend, resulting in the shortage of labor in traditional manufacturing and processing industries. Among them, the problem of labor shortage is particularly serious in heavy industry with bad working environment. Heavy industry is in urgent need of relying on intelligent manufacturing technology to transform to alleviate the impact of labor shortage. Finally, the wages of employees in China's manufacturing industry are increasing year by year, and enterprises are facing the problem of increasing labor cost pressure. In order to reshape its competitive advantage, China's manufacturing industry needs to transform from labor-intensive to technology-intensive, and intelligent manufacturing has become the only way for the development of the industry.

(6) Lack of core technology.

The level of intelligent manufacturing technology is insufficient, the number of core technology levels is insufficient, and the number and quality of enterprises mastering core technology are insufficient. The existing level of technology cannot support the digital + zero carbon industrial path to achieve carbon neutrality. From the above discussion, it is not difficult to conclude that the lack of existing technology in the industry is mainly characterized by the lack of technology at the level of innovation and the lack of basic innovation, namely, the lack of innovation in applied basic research and the lack

of technological innovation in core elements. At the present stage, we should strengthen the investment in basic application theory research, standardize the intelligent level of the industry, break through the core technology, and integrate the innovation technology manufacturing industry standard industry 5.0.

In short, this chapter focuses on the competition, pressure and difficulties that China's science and technology manufacturing industry needs to face, and clarifies that talent is the foundation, integrated innovation is the way out, and intelligence is the future development direction.

6 Suggestions on Intelligent Transformation and Development

The trend of "anti-globalization" is more obvious, industrial and financial degradation has intensified local conflicts, black swan events have occurred frequently in the past and the future, and science and technology manufacturing has become the driving wheel of future development with the rise of digital economy. The road of intelligent transformation of science and technology manufacturing industry may not be smooth, setbacks and successes are the mainstream of industrial economy. To sum up, this paper summarizes and refines the development path of intelligent transformation of science and technology manufacturing industry, and summarizes the following suggestions:

(1) Industrial support policies should be continuous and improved continuously.

First of all, the initiative and intensity of industrial policy support should continue to increase output, and the consistency of industrial policy should be strengthened, so as to boost the confidence of industrial economic development. Secondly, the output of quantitative easing of financial and monetary policies should be coordinated to improve the service quality of banks and other financial institutions, promote inclusive digital finance, improve the financial guarantee service system of science and technology manufacturing enterprises, and the government should continue to provide balanced financial preferential services to straightened out the channels of blocked currency circulation. Finally, we should continue to promote multilateral cooperation mechanisms for win-win results, fully implement multilateral cooperation mechanisms such as the Belt and Road Initiative, the Dual Circulation Initiative and the RCEP initiative, give full play to Hong Kong's role as a resource center, strive to build a community with a shared future for mankind, realize economic development that benefits all, and promote economic and trade cooperation mechanisms among neighboring countries.

(2) Fully and continuously implement technology-integrated innovation output.

Establish and improve the mechanism for invigorating enterprises through science and technology, technological innovation, improve the mechanism for introducing and training talents, strengthen basic theoretical research, fully share the achievements of technological innovation, use technological innovation to promote the upgrading of industrial structure, and build an efficient mechanism for cultivation, education, learning, research and development, application and innovation.

(3) Process reengineering: the utilization of the concept of complexity-in-use.

Complexity-in-use is derived from the definition of complexity and difficulty of complex system and semantic dual dependency by professors Jiemin Muller and Janes Lauterbach, which shows that industrial digital transformation strategy adopts complexity heat map analysis to create the possibility of process reengineering. Leading innovation industry 5.0 standard, standardize the industry intelligent horizontal line. Referring to the schematic diagram of intelligent production process reengineering shown in Figure 6, the intelligent process reengineering of industrial production process is carried out in combination with the complexity thermal diagram.

(4) Integration and innovation of information technology + artificial intelligence to promote self-consistency and decision-making intelligence of enterprise systems.

The development of technology brings more possibilities for the upgrading of manufacturing industry. With the in-depth application of information technology, intelligent factory will gradually become a reality, which is reflected in the overall realization of self-consistency of factory system and intelligent decision-making of factory. The promotion effect of different technologies on intelligent factory is as follows: 5G/6G promotes the increase of overall connected devices and the reduction of delay in the factory; IoT, XR and other devices can enhance the coverage of factory monitoring on the one hand, and effectively realize interconnection on the other hand, promoting the integration of IT and OT; Cloud

computing and AI/ChatGPT jointly promote the intelligent and efficient analysis and utilization of the data accumulated in the factory to achieve the "intelligence" of the whole factory. The above also shows that: 1) Transformation and upgrading is the result of the superposition and integration of a variety of technologies, because technologies are complementary to each other, and the application of a single technology is limited; 2) Demand-side enterprises do not need to pursue a single technology to achieve transformation, and there is no one-size-for-all technology to help enterprises achieve transformation. As shown in Figure 8, the logic diagram of multi-type information technology superposition promoting the factory to become intelligent.

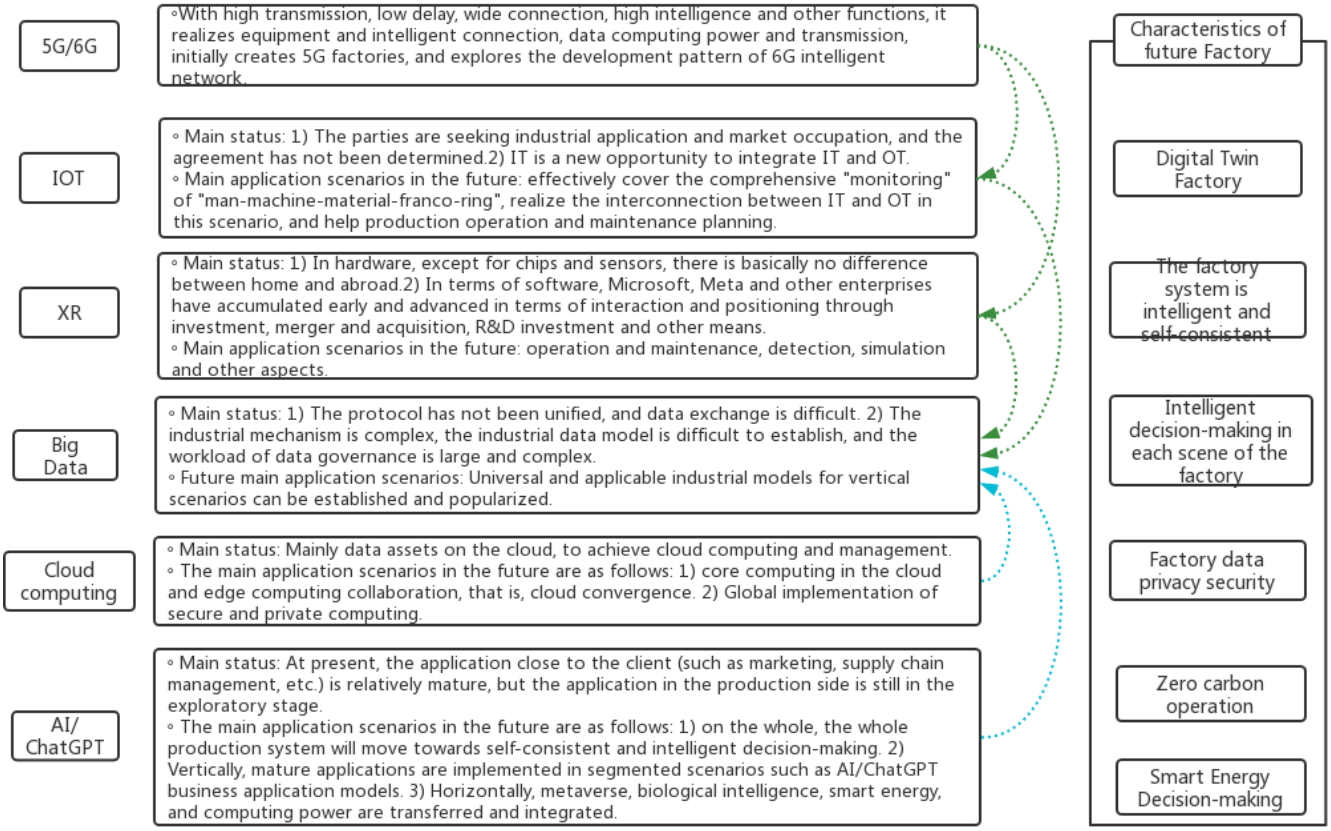

Figure 8 Shows that the superposition of multiple types of information technology promotes the factory to become intelligent

(5) High efficiency and low cost penetration of sinking market -- overall planning of intelligent transformation strategy.

Intelligence provides enterprises with the controlleability of the whole process of production and operation services. The boundaries of enterprise production and operation fields are gradually blurred, and the upstream and downstream manufacturers and end customer groups of the business are gradually close to the coverage of the field. Enterprises need to make overall plans to achieve high efficiency and low cost penetration of the sinking market, and finally realize the strategic intelligent transformation.

After intelligent transformation of large manufacturing factories, there are two main benefits: 1) Replication innovation ability output: some leading technology manufacturing enterprises are transformed from the demand side of intelligent transformation to leaders and services in this field or cross-field, and have the replication innovation output ability of comprehensive solutions for intelligent transformation. 2) Expand the sinking market: If large manufacturing factories from the market want to penetrate the sinking market, channels and joining are the first choices, but there are many problems such as "high cost of channel expansion and maintenance, weak policies and blind market". However, when the large manufacturing factory has the intelligent module service output capability, the strong technology manufacturing factory has the intelligent and strong control of its own upstream and downstream supply chain, and the double controlleability improvement of its own product output and quality. The strong technology

manufacturing factory can complete the strong intelligent transition when it sinks into the market. The completion of this transition not only helps to avoid the negative effect of anti-globalization, but also helps to gather and strengthen the position of enterprises in this field.

7 Conclusions

After the international financial crisis, the global value chain has shown a shrinking trend, and the "anti-globalization" feature of economic and trade has gradually emerged. For a long time in the future, the "anti-globalization" of economic and trade and the "globalization" of digital economy will dominate the changing trend of the world economic pattern at the same time. This paper mainly studies the development status, opportunities, crises and approaches of the "anti-globalization" intelligent transformation of China's science and technology manufacturing industry, and gives corresponding suggestions. From the perspective of anti-globalization, the first choice of China's science and technology manufacturing industry development model is to deepen the path of intelligent transformation. Secondly, we should make full use of the corresponding favorable factors of internal and external environment to actively create a large-scale and high aggregation effect market atmosphere; Third, make full use of smart city creation and digital economy "globalization" development driving force to improve digital + intelligent transformation curve overtaking, highlighting the development of biological intelligent cluster development advantages; Finally, we should reshape the talent leadership strategy and continue to deepen and expand the scale of talent introduction and absorption. The future intelligent transformation strategy of enterprises should give priority to the development of technical talents and artificial intelligence, which is the integration innovation of virtual and reality with the support of reproduction technology. It is not only the existing production process, but also includes research and development, service, presentation and extension related to "domain technology presentation". At the present stage, science and technology manufacturing enterprises should pay attention to the development of their own industrial cluster scale utility, and at the same time develop the sinking effect of treating enterprise market operation, strive to develop localized industrial clusters, create intelligent industrial chain, intelligent industrial research cluster with current ability, and then gather the advantages of intelligent decision-making. Finally, the development path of digital intelligent factory relying on digital economy and biological artificial intelligence technology will be realized.

References

[1] Gao Bo (2022). Transformation and Development of Globalization and China's Role. Journal of Zhejiang Gongshang University, No. 173 (02): 85-101. DOI: 10.14134/j.cnki.cn33-1337/c.2022.02.009.

[2] QU Shen-ning, YANG Dan-hui (2022). Manufacturing Localization, Technology Backfire and Economic Deglobalization. China Industrial Economics, No. 411 (06): 42-60. DOI: 10.19581/j.cnki.ciejournal.2022.06.021.

[3] Manjiang Xing, Dae-Won OH, Chi Gong (2022). Research on Smart City Competitiveness Model Based on the Integration of Digital Economy and Smart Energy. Journal of Korea Research Association of International Commerce, (12): https://doi.org/10.29331/JKRAIC.2022.12.22.6.277.

[4] MADHOK A, 2021. Globalization, deglobalization, and reglobalization: some historical context and the impact of the COVID pandemic. BRQ Business Research Quarterly, 24 (3): 199-203.

[5] Ge Xiaohong, Xing Manjiang (2020). Study on competitive strategy of roll manufacturing enterprises after epidemic normalization. Modern Business Trade Industry, 41 (36): 13-14. DOI: 10.19311/j.cnki.1672-3198.2020.36.006.

[6] Yuan Zhonghu a (2021). Reconstruction and climbing of China's manufacturing value chain under the trend of "anti-globalization". Macroeconomics, No. 273 (08): 71-80+106. DOI: 10.16304/j.cnki.11-3952/f.2021.08.007.

[7] Xu Hao, Dai Liang (2022). Research on the development path of China's automobile manufacturing industry against the background of globalization. China Market, No. 1103 (04): 6-8 + 93. DOI: 10.13939/j.carolcarrollnkiZGSC. 2022.04.006.

[8] Kuang Liehui (2012). The Manifestations and Roots of the Flood of Anti-Globalization Thoughts in Globalization. Journal of Urban Studies, 43 (02): 91-96.

[9] Qu Xianming (2021). Situation and task of China's manufacturing industry development. China Pulp & Paper Industry, 42 (05): 13-15.

[10] Ge Xiaohong (2022). Research on Location Evaluation of XT Roll Intelligent Manufacturing Plant Relocation. North China Electric Power University, 2022.05.

[11] Guo Xinran (2020). Research on the Development of China's Automobile Manufacturing Industry under the Sino-US Trade Dispute. Co-Operative Economy & Science, 2020 (18): 103-105.

[12] Li Fugui, Zhang Fei, Pan Min et al (2020). Discussion on the Construction of skilled talent echelon in Automobile Manufacturing Industry. Auto Time, 2020 (20): 35-39.

[13] Lu Mengyuan, Yi Xianqiao, Zhang Mingxiao et al (2021). Predicaments the Manufacturing Industry of China Faced with on the Background of Anti-Globalization. Special Zone Economy, 2021 (11): 109-112.

[14] Bu Guomiao, Zhao Bo, Zheng Shicheng (2022). High quality development of small and medium-sized technology enterprises under the background of "double circulation". Co-Operative Economy & Science, 2022 (12): 15-17.

[15] Tong Jiadong, Xie Danyang, Bao Qun et al (2017). The Talks on Paper of the Deglobalization and Transformation and Upgrading of Real Economy. China Industrial Economics, No. 351 (06): 5-59. DOI: 10.19581/j.cnki.ciejournal.2017.06.025.

[16] Li Kaisheng (2017). Accommodating China's Rise: World Order, Responsibility and Strategic Option of the U.S.. World Economics and Politics, No. 447 (11): 89-107+158-159.

[17] Xu Xiaoyong, Zeng Hengyuan (2018). Research on the transformation and upgrading path of China's manufacturing industry under the background of "anti-globalization". Journal of Chongqing University of Science and Technology (Social Sciences Edition), No. 253 (06): 35-38. DOI: 10.19406/j.cnki.cqkjxyxbskb.2018.06.011.