Research on the Development of Intelligent Manufacturing Headquarter Base in Grand Bay Area of Guangdong, Hong Kong and Macao

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Research on the Development of Intelligent Manufacturing Headquarter Base in Grand Bay Area of Guangdong, Hong Kong and Macao

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Abstract. Combining the opportunity for the introduction of the outline of development planning in the grand bay area of Guangdong, Hong Kong and Macao, to promote the cconstruction of intelligent manufacturing headquarters base in .grand bay area of Guangdong, Hong Kong and Macao. Through to the modern manufacturing and innovative factors analysis of the city, we think that intelligent manufacturing headquarter base in Grand Bay Area of Guangdong, Hong Kong and Macao concentrated in the Guangzhou Shenzhen scientific and technological innovation corridor includes Dongguan ,Huizhou and Foshan. All in all, the institutional and resource advantages of Guangdong, Hong Kong and Macao shall be brought into full play,. the first-class intelligent manufacturing headquarter base of will be jointly built and shared.

1. Introduction

The grand bay area of Guangdong, Hong Kong and Macao refers to the urban agglomeration composed of two special administrative regions of Hong Kong and Macao and nine cities of Guangzhou, Shenzhen, Dongguan, Zhuhai, Foshan, Huizhou, Zhongshan, Zhaoqing, and Jiangmen in cities of the Pearl River Delta, which is an important space carrier for China to build a world-class city cluster and participate in global competition and it is one of the four bay areas in the world, which is on a par with New York bay area, San Francisco bay area and Tokyo bay area of Japan. The grand bay area of Guangdong, Hong Kong and Macao covers an area of 56,000 square kilometres, with a population of 66 million. In 2017, the GDP of the bay area exceeded 10 trillion yuan, the total scale of GDP has surpassed Russia's and ranked 11th in the world, matching South Korea's, making it the most economically active region in the country.

The construction of the grand bay area of Guangdong, Hong Kong and Macao has been included in 19 reports and government work reports, and has risen to national strategic level. Promoting the construction of the grand bay area of Guangdong, Hong Kong and Macao is conducive to deepen exchanges and cooperation between the mainland and Hong Kong and Macao, which is of great significance for Hong Kong and Macao to participate in national development strategy, enhance competitiveness and maintain long-term prosperity and stability.

Combining the opportunity for the introduction of the outline of development planning in the grand bay area of Guangdong, Hong Kong and Macao, facing Hong Kong and Macao, relying on Hong Kong and Macao, highlight the key points, the cooperation will be deepened, “Development Plan of the Grand Bay Area of Guangdong, Hong Kong and Macao” is taken as the starting point, to promote the construction of intelligent manufacturing headquarters base in .grand bay area of Guangdong, Hong Kong and Macao.

2. The sit selection of intelligent manufacturing headquarter base in grand bay area of Guangdong, Hong Kong and Macao

In terms of research innovation ability, there are 16 of the world's top 500 enterprises and more than 30,000 state-level high-tech enterprises in grand bay area of Guangdong, Hong Kong and Macao. According to “The 2017 Global Innovation Index Report”, the innovation index of Guangdong, Hong Kong and Macao ranks second in the world. The data now stands at Guangzhou and Shenzhen of GDP is now nearly to Hong Kong levels on the 2017s， but still below that Hong Kong GDP. Levels. the manufacturing industry have begun to move the Chinese inland as the cost of labor and land rises on Hong Kong since the 1980s. Annual real Value Added of Manufacturing Industry of Hong Kong fell from 23.7% of GDP in 2003 to 1.66% in 2016. It is have advantages that are service areas such as finance, logistics, tourism and consultation. Hong Kong research strength is very good, and the big bay area in other cities have an advantage in terms of manufacturing.

2.1. The Core Cities of Advanced Manufacturing Industry

From the point of advanced manufacturing industry, the pearl river delta cities are divided into three levels, the first level of Shenzhen, the added value of advanced manufacturing industry in the $80 billion/year; The second level of Guangzhou, Foshan, Dongguan, Huizhou, advanced manufacturing industry added value at around $20 - $40 billion/year. The added value of other cities as the third level, advanced manufacturing industry under $10 billion/year.

Table 1. Value Added and Ratio of Advanced Manufacturing Industry by Pearl River Delta City (2016).

	Pearl River Delta	Shenzhen	Guangzhou	Foshan	Dongguan	Huizhou	Zhongshan	Zhuhai	Jiangmen	Zhaoqing	Shaoguan
100 Million USD	2044.23	794.11	366.76	236.41	226.61	162.63	72.34	71.11	69.02	45.24	15.97

2.2. The Agglomeration Cities of High-tech Manufacturing Industry

From the point of High-tech manufacturing industry, the pearl river delta cities are divided into four levels, the first level of Shenzhen, the added value of High-tech manufacturing industry in the at around $70 billion/year; The second level of Dongguan and Huizhou, the added value of high-tech manufacturing industry above $10 - $20 billion/year; The third level of Guangzhou and Foshan, the added value of high-tech manufacturing industry at around $5 - $10 billion/year; The added value of other cities as the fourth level, High-tech manufacturing industry under $5 billion/year.

Table 2. Value Added and Ratio of High-tech Manufacturing Industry by Pearl River Delta City (2016).

	Pearl River Delta	Shenzhen	Dongguan	Huizhou	Guangzhou	Foshan	Zhuhai	Zhongshan	Jiangmen	Zhaoqing	Shaoguan
100 Million USD	1207.55	698.21	166.09	106.69	76.52	54.41	44.08	36.63	12.57	12.35	2.63

2.3. Cities where innovation elements are concentrated

From the basic statistics on R&D Expenditure institutions under government departments at and above county level by Pearl River Delta City, the delta cities are divided into four levels, the first level of Guangzhou, on the R&D Expenditure to provide $126 billion in 2016; The second level of Shenzhen and Dongguan, on the R&D Expenditure in 2016 to provide above $ 7.03 and 5.44 billion; The third level of Huizhou on the R&D Expenditure in 2016 to provide 0.86; other cities as the fourth level, on the R&D Expenditure under $5 billion in 2016.

Table 3. Basic Statistics on Research and Development Institutions under Government Departments at and above County Level by Pearl River Delta City.

City	2015						
	Number of Institutions (unit)	Number of Employed Persons (person)	R&D Personnel (person)	Funds (10000 USD)	Government Appropriations (10000 USD)	Expenditures (10000 USD)	R&D Expenditure (100 million USD)
Pearl River Delta	167	21080	16667	213290	113314	200647	141029
Guangzhou	94	16923	13260	194867	99760	180950	126050
Shenzhen	5	2115	1915	9044	6535	8477	7038
Dongguan	9	676	550	4148	3653	6278	5442
Huizhou	24	552	346	1222	954	1208	860
Foshan	5	183	145	1147	620	988	275
Zhuhai	3	159	100	927	380	892	312
Jiangmen	9	181	127	778	614	763	502
Zhongshan	3	104	76	604	395	596	273
Zhaoqing	15	187	148	553	403	494	277

Taken together, our results reveal that intelligent manufacturing headquarter base in Grand Bay Area of Guangdong, Hong Kong and Macao concentrated in the Guangzhou Shenzhen scientific and technological innovation corridor includes Dongguan ,Huizhou and Foshan.

3. The developing emphasis of intelligent manufacturing headquarter base in grand bay area of Guangdong, Hong Kong and Macao

In the development planning of grand bay area of Guangdong, Hong Kong and Macao, the Pearl River Delta has a complete industrial system and a strong manufacturing base, making it a manufacturing center in the grand bay area. The Pearl River Delta has the natural advantage in manufacturing industry, and a large number of manufacturing enterprises were born in the Pearl River Delta. Among them, the appliance enterprises represented by Gree Electric Appliances have begun to implement the "automation technology transformation" and "machine replacement" on a large scale, moving towards the goal of "industry 4.0" and "intelligent manufacturing". Here, one out of every four smartphones in the world comes from Dongguan. Here, tens of thousands of innovative enterprises gather in Guangzhou and Shenzhen. Here, there are also Shenzhen Stock Exchange and Hong Kong Stock Exchange two major stocks... ...The modernization economic system has been gradually taken shape in the grand bay area.

3.1. Building intelligent manufacturing independent innovation demonstration area

Build the Pearl River Delta intelligent manufacturing independent innovation demonstration zone, take Guangzhou and Shenzhen two innovative cities as the intelligent manufacturing research and development innovation axis, focus on the construction of China (Guangzhou) Intelligent Equipment Research Institute, South China Intelligent Robot Innovation Research Institute, Guangdong (Dongguan) Intelligent Robot Collaborative Innovation Research Institute, Sino-Germany Industrial

Equipment (Reliability and Intelligent Manufacturing) Joint Laboratory and other new innovation platforms, to promote the integrative development of Pearl River Delta intelligent manufacturing ecosystem and innovation system.

3.2. Building intelligent equipment industry base

Guangzhou focuses on building the core area of the Pearl River Delta robot and intelligent equipment industry, the development of intelligent manufacturing basic components such as industrial control, intelligent sensing, system chips and motion control, as well as industrial robots and intelligent equipment and so on.

Shenzhen focuses on building itself into a leading service base and international cooperation base of innovation base of robot wearable devices and intelligent equipment industry manufacturing base, prioritizing intelligent robot, intelligent wearable products, etc.

Dongguan takes Songshan Lake National High and New Technology Development Zone as the core area, focusing on the development needs of electronic information, electrical machinery, clothing, shoe making, wool weaving, furniture and other industries, to develop the "3 major equipment, 1 class workshop and 1 network", namely "3+1+1" special plan, among them, "3 big equipment" is industrial robot equipment of 3C manufacturing industry, intelligent special equipment of electronic information industry, high-end numerical control processing equipment, "1 kind workshop" is digital intelligent workshop, "1 network" is Internet of things.

Foshan City builds the Sino-Germany industrial service park and intelligent manufacturing demonstration base, focusing on the development of CNC processing equipment and materials manufacturing equipment, etc. Zhuhai focuses on the development of intelligent power grid equipment and unmanned ship and control system intelligent large harbor engineering equipment, focusing on the development of intelligent high-end medical equipment and printed circuit boards.

3.3. Implementing intelligent manufacturing pilot demonstration project

Guangzhou city pays attention to the implementation of intelligent transformation and demonstration applications in automobile manufacturing, bio-medicine, food processing, papermaking, petrochemical industry, logistics and storage. Shenzhen focuses on implementing intelligent technology transformation and demonstration application in 3C products manufacturing, biomedical, automobile manufacturing, port logistics and other fields, and constructing intelligent factory demonstration. Dongguan City focuses on intelligent information terminal manufacturing, furniture, textile clothing and other fields to implement intelligent technology transformation and demonstration applications. Foshan mainly implements intelligent technology transformation and demonstration application in automobile manufacturing, ceramics, furniture, building materials, hardware processing, solar cell and other manufacturing fields. Huizhou focus on petrochemical, 3 c products manufacturing, new energy automobile manufacturing, intelligent household in areas such as the implementation of intelligent technology application and demonstration.

4. Development proposals on intelligent manufacturing headquarters base of grand bay area of Guangdong, Hong Kong and Macau

4.1. Leading intelligent manufacturing headquarters base of grand bay area of Guangdong, Hong Kong and Macau with intelligent manufacturing standardization

In order to accelerate the comprehensive standardization of intelligent manufacturing of grand bay area of Guangdong, Hong Kong and Macau, build a comprehensive standard system for intelligent manufacturing and give full play to the role of standardization and guidance of intelligent manufacturing standards, Ministry of Industry and Information Technology and National Standard Committee jointly issued “Guidelines for the construction of national standard system for intelligent manufacturing (2018)”, which is the iteration on the basis of “Guidelines for the construction of national standard system for intelligent manufacturing (2015)” edition.

To the actualities that the Pearl River Delta intelligent manufacturing standardization is just in the primary stage, the unbalance of the industry development and other characteristics, based on the

foundation of the existing manufacturing industry, the "Guidelines for the Construction of National Intelligent Manufacturing Standard System (2018)" has been fully used for reference, and the intelligent manufacturing standard in key areas has been continuously introduced, to conduct comprehensive standardization verification test research, so as to achieve the full coverage of the basic commonality and key technical standards .The specific recommended measures are as follows:

First, choose the enterprises in the intelligent manufacturing headquarters base of grand bay area in Guangdong, Hong Kong and Macao for diagnostic investigation. Start with needs of the standardization of intelligent manufacturing in the field of machine tool equipment.

Second, through the domestic and foreign related intelligent manufacturing practice experience research, according to the national intelligent manufacturing standard system, tease out the development of key technical standards in line with the actual situation of enterprises in the intelligent manufacturing headquarters base of the grand bay area in Guangdong, Hong Kong and Macao, and establish the test verification system, verifies the developed standards in practice.

Third, in the formulation of key technical standards, special attention is paid to the development of data exchange standards, data security standards and communication protocol standards.

Fourth, assist enterprises to establish their own intelligent manufacturing standard architecture in two years.

Fifth, two parts of intelligent production and intelligent warehousing and logistics are selected as the breakthrough points, and relevant technical standards are formulated, so as to establish a technical standard system of intelligent factories.

4.2. Speeding up overcoming key technologies in the intelligent manufacturing industry

Intelligent manufacturing has become a new trend in the development of global manufacturing industry, and intelligent equipment and production means will replace traditional production methods extensively in the future. At present, the Pearl River Delta is actively responding the launch of projects of speeding up overcoming key technologies in the intelligent manufacturing industry. The first is to break through the intelligent measurement and control new sensor robot CNC machine tool 3D printing and other fields, and initially establish a complete industrial system; The second is to promote the application of big data in manufacturing. Taking leading enterprises in the industry as the guider, big data technology is actively given full play to promote the intelligent decision-making level and the driving force and leading role of operation efficiency in production and manufacturing, supply chain management, product marketing and service.

4.3. Lay out of a number of intelligent manufacturing public service platforms and carrying out all-round application demonstration and promotion

Aiming at the characteristics of the advantageous industries in the Pearl River Delta, the government should launch a special project on intelligent manufacturing construction, establish and implement the technology roadmap for implementing intelligent manufacturing in the pearl river delta, and conduct research on the standard system and the development of key technical standards. Firstly, the equipment research institute of Guangzhou, Shenzhen, Dongguan, Foshan and Huizhou is taken as the carrier, set up various innovative design demonstration platforms including intelligent manufacturing design platform, intelligent manufacturing application and promotion center, intelligent manufacturing talent training center, etc. For example, the intelligent e-commerce demonstration platform for the new business model helps enterprises to promote products: Aiming at the intelligent management demonstration platform focusing on logistics informatization and supply chain management informatization, better meet the standards of reducing production cost, energy and material consumption, improving production efficiency and shortening product development cycle proposed by intelligent manufacturing. Secondly, select typical industries and regions or professional towns, set up regional and industrial application demonstration, and strengthen the establishment of intelligent manufacturing application service and training system. Finally, through the layout of intelligent manufacturing platforms in Guangzhou, Shenzhen, Dongguan, Foshan and Huizhou, the intelligent manufacturing technology innovation network platform is formed by research institutions,

universities, production enterprises and user enterprises in the Pearl River Delta with the advantage of intelligent manufacturing.

4.4. Relying on possession of numerous high-level universities in Guangdong, Hong Kong and Macao to accelerate the transformation of scientific and technological achievements

There are many high-level universities in Guangdong, Hong Kong and Macao. Among the top 500 universities in the world, there are about 10 in the grand bay area of Guangdong, Hong Kong and Macao, the world's top 50 universities account for four. The University of Hong Kong, the Hong Kong University of Science and Technology, the City University of Hong Kong and the Hong Kong Polytechnic University rank among the top 100 universities in the world; The universities in Macao developed rapidly in recent years; Zhongshan University, South China University of Science and Technology and other universities in Guangdong have strong comprehensive strength; In recent years, Shenzhen has actively introduced top Chinese universities such as Harbin Institute of Technology, Renmin University of China, Tsinghua University, Peking University and Chinese Academy of Sciences University to set up campuses or research institutes in Shenzhen. For the past few years, there have been many exchanges and cooperation between Guangdong, Hong Kong and Macao universities and research institutes, which have laid a good foundation for the construction of university clusters.

The grand bay area of Guangdong, Hong Kong and Macao is another reform and opening up in the new era. It is an integrated innovation that takes the lead of yong li's pioneering work. It is also an “offensive move” in realizing the transformation from high-speed development to high-quality development. Higher education is the key driving force, the main contributor and important source of economic hard power, cultural soft power and affecting smart power in the grand bay area. The development of university clusters in the grand bay area of Guangdong, Hong Kong and Macao is a key victory measure to determine whether the intelligent manufacturing headquarter base in the grand bay area of Guangdong, Hong Kong, Macao can achieves the expected target, and the key to become the base of intelligent manufacturing in the grand bay area of Guangdong, Hong Kong and Macao.

5. Conclusion

All in all, the institutional and resource advantages of Guangdong, Hong Kong and Macao shall be brought into full play, lay out a number of pilot projects in key industries and key technology areas, and fully mobilize the resources and strength of all parties. Taking leading enterprises as the carriers, universities and research and development power of scientific research institutions as impetus, accelerate the transformation of scientific and technological achievements and jointly promote technology research, development and application. The first-class intelligent manufacturing headquarter base of grand bay area in Guangdong, Hong Kong and Macao will be jointly built and shared.

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