Research on "Industrial Internet" to promote the development of Advanced Manufacturing Industry in Guangdong, China

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Abstract. As a major province in China's manufacturing and Internet industries, Guangdong has taken the lead in promulgating local industrial Internet support policies and supporting enterprises to "build platforms, log in platforms, and use platforms." Guangdong has taken the lead in promoting the development of the Industrial Internet. The policy system for the development of the Industrial Internet is becoming more and more comprehensive, Advanced Manufacturing Industry industries are developing in a coordinated and in-depth manner, and urban integration and application innovation are active. Guangdong Province further exerted the advantages of resource aggregation and industrial clusters, to boldly explore and innovate, and gave better play to the role of demonstration and leadership, making the Industrial Internet a new engine to promote the development of Advanced Manufacturing Industry and build a province strong with manufacturing.

1. Introduction

Guangdong has become a major manufacturing province in China. In 2018, the province's industrial added value reached 32,30.516 billion yuan, accounting for 10.59% of China's industrial added value of 30,516 billion yuan. Since the reform and opening up, Guangdong Province has continuously promoted the upgrading and transformation of the manufacturing industry, and realized the transformation from “province with large amount of manufacturing” to “strong province with manufacturing”. The Advanced Manufacturing Industry has been developing steadily, and new energy has been bred and continuously developed, pushing Guangdong's industrial economy to advance to a high-end[1]. In March 2018, the People's Government of Guangdong Province issued a notice on the implementation of Guangdong's "Internet + advanced manufacturing” and development of industrial Internet implementation plan and supporting policies and measures to support enterprises "log in the cloud and the platform" to implement digital network intelligent upgrades and development and promotion of industrial Internet benchmarking demonstration application, promote the ecological innovation and development of the Industrial Internet, and make the Industrial Internet a new engine to promote the development of Advanced Manufacturing Industry and build a province strong with manufacturing[2].
2. Development of Advanced Manufacturing Industry in Guangdong

Compared with traditional manufacturing, Advanced Manufacturing Industry refers to a general name for manufacturing with continuous absorption of high-tech achievements in electronic information, machinery, materials, and modern management technologies by the manufacturing industry, and the application of these advanced technologies to the overall process of manufacturing such as R & D, design, production, online testing, marketing services and management, achieving good economic returns and market effects. At present, the Advanced Manufacturing Industry in our province is roughly composed of two parts: one is the new industry formed after the industrialization of emerging technological achievements, and some of these industries are basic and leading; The other part is traditional manufacturing industry promoted to Advanced Manufacturing Industry after incorporating Advanced Manufacturing Industry technology and other high-tech, especially information technology.

2.1 Development Trend of Advanced Manufacturing Industry in Guangdong

Guangdong Province is still in the process of industrialization. Compared with advanced countries or regions, there is still a large gap. Industrial development faces constraints such as lack of core industrial technology, low level of industry, and imperfect industrial chain. At the same time, constraints on resource and environmental factors have become tighter, comprehensive costs of enterprises have risen, overcapacity in some industries, and increasing international and domestic competition have all urgently demanded to accelerate the development of Advanced Manufacturing Industry and to drive the province's manufacturing structure adjustment and transformation and upgrading.

The number of Advanced Manufacturing Industry enterprises above designated size in Guangdong increased from 13,386 in 2011 to 28,347 in 2018. The number of enterprises increased by 1.12 times, with an average annual increase of 11.31%. With the rapid increase in the number of enterprises, the proportion of Advanced Manufacturing Industry continues to increase. In 2018, the added value of the Advanced Manufacturing Industry industries above designated size reached 1822.453 billion Yuan, with total assets of 6575.2563 billion Yuan at the end of the year, taxes and extra on main business of 94.1203 billion Yuan, and total profits of 458.3273 billion Yuan, and the annual average number of all employees is 6.2309 million; Increased by 8.45%, 11.24%, 6.74%, 7.13% and 1.15% over 2011 respectively.

2.2 Continuous Optimization of the Development Structure of Advanced Manufacturing Industry

Guangdong promotes the construction of a province strong with manufacturing. Strengthen the manufacturing industry's technological innovation capabilities, cultivate world-class Advanced Manufacturing Industry clusters such as electronic information, green petrochemicals, automobiles, smart appliances, and robots, solidly advance the construction of advanced equipment manufacturing industrial belts, and vigorously introduce high-quality high-end equipment manufacturing projects. The development structure of Advanced Manufacturing Industry has been continuously optimized. Among the value-added of the Advanced Manufacturing Industry above the designated size in the province, the high-end electronic information manufacturing industry is 780.493 billion yuan, the advanced equipment manufacturing industry is 674.520 billion yuan, the petrochemical industry is 233.570 billion yuan, and the advanced textile industry is 194.953 billion yuan, new materials manufacturing 148.434 billion yuan, biological medicine and high-performance medical equipment 61.477 billion yuan; They accounted for 42.83%, 37.01%, 12.82%, 10.70%, 8.14%, and 3.37% of the province's industrial added value respectively. Among the total assets of the province's Advanced Manufacturing Industry industries above designated size at the end of the year, the high-end electronic information manufacturing industry was 2866.770 billion yuan, the advanced equipment manufacturing industry was 2483.133 billion yuan, the petrochemical industry was 591.017 billion yuan, the advanced light textile manufacturing industry was 777.125 billion yuan, and the new material manufacturing industry 541.334 billion yuan, with 338.423 billion yuan in biomedicine and high-performance medical devices; They accounted for 43.60%, 37.76%, 11.82%, 8.99%, 8.23%, and 5.15% of the province's total assets of industry above designated size at the end of the year[3].
### Table 1: Main Indicators on Advanced Manufacturing Enterprises above Designated Size (2018) 100 million yuan

| Item                                                      | Value-added of Industry | Ratio of Value Added to that province's total of Industry (%) | Total Assets at the Year-end | Ratio of Total Assets at the Year-end to that province's total of Industry (%) |
|-----------------------------------------------------------|-------------------------|---------------------------------------------------------------|-----------------------------|--------------------------------------------------------------------------------|
| The province's total                                      | 18224.53                | 100.00                                                        | 65752.56                    | 100.00                                                                         |
| Manufacture of Advanced Electronic Equipment and Communication Equipment | 7804.93                 | 42.83                                                         | 28667.70                    | 43.60                                                                          |
| Manufacture of Advanced Equipment                         | 6745.20                 | 37.01                                                         | 24831.33                    | 37.76                                                                          |
| Petrochemical Manufacturing                               | 2335.70                 | 12.82                                                         | 5910.17                     | 8.99                                                                           |
| Manufacture of Advanced Light Textiles                    | 1949.53                 | 10.70                                                         | 7771.25                     | 11.82                                                                          |
| Manufacture of New Materials                              | 1484.34                 | 8.14                                                          | 5413.34                     | 8.23                                                                           |
| Manufacture of Biological Medicines and Advanced Medical Equipment | 614.77                  | 3.37                                                          | 3384.23                     | 5.15                                                                           |

2.3 *The backbone of the Advanced Manufacturing Industry belt stands out*

Guangdong promotes high-quality economic development and deepens supply-side structural reforms. At the same time, the integration of manufacturing and the Internet will be accelerated to build a world-class Advanced Manufacturing Industry cluster. The backbone of the Advanced Manufacturing Industry is prominent. Shenzhen accounts for 656.483 billion yuan, Guangzhou 265.557 billion yuan, Foshan 225.058 billion yuan, Dongguan 204.377 billion yuan, Huizhou 122.179 billion yuan, Zhuhai 59.471 billion yuan, Maoming 52.381 billion yuan, Zhongshan 48.842 billion yuan, Jiangmen 42.425 billion yuan and Zhanjiang 28.845 billion yuan, Shantou 26.699 billion yuan; Jieyang: 23.431 billion yuan; Zhaoqing: 18.607 billion yuan; They account for 36.0%, 14.6%, 12.3%, 11.2%, 6.7%, 3.3%, 2.9%, 2.7%, 2.3%, 1.6%, 1.5%, 1.3%, 1.0% of the value added of Advanced Manufacturing Industry enterprises above the designated size in Guangdong, respectively[3].

![Value Added and Ratio of Advanced Manufacturing Industries by City (2018)](image)
3. Guangdong constructs "Industrial Internet" layout

3.1 Consolidate the foundation of the Industrial Internet
To meet the needs of enterprises with low-latency, high-reliability, and wide-coverage industrial networks, accelerate the construction and transformation of broadband network infrastructure, expand network coverage, and optimize backbone networks. Promote the deployment and application of new network technologies in the internal and external networks of enterprises, accelerate the construction of the Internet backbone network and metropolitan area networks in the province, and create a province with high-level all-optical network. Support industrial enterprises to transform the internal network of industrial enterprises with technologies such as IPv6, virtual private network (VPN), industrial passive optical network (PON), and industrial wireless, and upgrade industry corporate extranet with IPv6, software-defined networks (SDN), and new cellular mobile communication technologies. In the 5G research, carry out network technology experiments for industrial Internet applications, and coordinate promote the application deployment of 5G in industrial enterprises. In the Pearl River Delta region and key industries, apply new network technologies such as narrowband Internet of Things (NB-IoT), industrial process / industrial automation wireless networks (WIA-PA / FA), and 5G[4].

3.2 Build a System of Industrial Internet Platform

3.2.1 Speed up the construction of the Industrial Internet Platform
Through classified policies, synchronous promotion, and dynamic adjustment, a multi-layered and systematic platform development system is formed. It supports manufacturing enterprises, information and communication companies, Internet companies, telecommunications operators, etc., to take advantage of key technical areas such as industrial software, networking, cloud computing, big data, artificial intelligence, etc., leading to jointly build a cross-industry and cross-field industrial internet platform. Support industry platforms in vertical fields further enhance technical strength, give play to professional advantages, and better serve the digital upgrade of enterprises.

3.2.2 Improve the functions of the Industrial Internet Platform
Support the platform to strengthen internal cooperation, focus on breaking through key technical bottlenecks such as data integration, platform management, development tools, microservices frameworks, modeling and analysis etc., effectively integrate data resources such as product design, production process, equipment operation, and operation management etc., and aggregate shared design capabilities, production capacity, software resources, knowledge models and other manufacturing resources etc., accelerate the development of modular, low-cost, fast-deployed application services for different industries and scenarios, and explore business model innovation. Promote the development of emerging industries such as biomedicine, new materials and new energy vehicles. Launch the comprehensive upgrading of the industrial clusters in villages and towns in the core area of the Guangdong-Hong Kong-Macao Greater Bay Area. Actively construct Guangdong's advanced standards system, cultivate a number of world-class manufacturing brands, and speed up the construction of a province strong with high quality.

3.3 Promote enterprises to "log in the cloud and the platform"
Focusing on the interconnection of business data between enterprises, the goal of industrial chain and supply chain enterprise collaboration is achieved, promoting the company's core business systems and production equipment and products "log in the cloud and the platform". Through equipment interconnection, human-computer interaction, and data analysis, the optimization of production resources and accurate trading of manufacturing capabilities are achieved to promote efficient collaboration among supply chain companies. Focus on promoting 4,000 industrial enterprises to implement digital, network, and intelligent upgrades on the platform, driving 80,000 enterprises to "log in the cloud and the platform".
3.4 Implement the Industrial Internet Cooperation Model
Implement a focused action plan for the advanced equipment manufacturing industry belt on the west bank of the Pearl River, and focus on introducing a number of advanced equipment manufacturing backbone projects. Enhance the development level of the electronic information industry on the east bank of the Pearl River. Focusing on Advanced Manufacturing Industry clusters and strengthening industrial cooperation with the Greater Bay Area cities, Shenzhen, Guangzhou, Dongguan, Foshan, Huizhou, Zhongshan, Jiangmen and other Greater Bay Area cities have launched trials on Advanced Manufacturing Industry cooperation to promote electronic information, automobiles, electrical, mechanical equipment and other advantageous manufacturing industries cluster and develop in the Greater Bay Area, to build world-class Advanced Manufacturing Industry clusters with global influence and competitive electronic information centered on Shenzhen and Dongguan; Guangzhou, Foshan, Zhuhai, Zhongshan and other cities jointly build the advanced equipment manufacturing industry belt on the west bank of the Pearl River.[5]

4. Promote the Development of Advanced Manufacturing Industry with "Industrial Internet"

4.1 Building an Internet data centre
With the rapid development of emerging industries such as mobile Internet, cloud computing, and big data, the industry's demand for data centers is increasing. To meet future service needs of cloud computing basic resource capabilities, China Unicom has deployed ten cloud data centers in China. The South China Data Center is one of them.

The South China Data Center is located in Songshan Lake, Dongguan, a national high-tech industrial zone. It is designed and constructed in accordance with international T3 + standards, with a land area of 91.8 mu and a total construction area of 131,900 square meters. It will provide an installation capacity of 6,000 racks. Power is supplied from two 110KV substations with two mains each. The overall design and construction are based on the basic concepts of energy saving, green and environmental protection, and the overall PUE is controlled below 1.6. The data center's designed bandwidth is 900G, and it is directly connected to Unicom's 169 backbone network. At that time, the top ten bases will form an internal ring network and the security level will also reach the highest standards.

In the implementation plan of China Unicom's Industrial Internet "Wo Cloud +" cloud ecological alliance covering six major product segments of connectivity, platform, identification, collection, application, and security, Unicom focused on showing its result in four areas of 5G assistance, cloud-network integration, big data and platform empowerment and etc. Dongguan Unicom has signed strategic cooperation agreements with many industry leading enterprises including Huawei, ZTE, H3C, Emerson, Microsoft, SymLink, Robustel, and Advantech. According to the agreement, Dongguan Unicom will strengthen cooperation with relevant enterprises, integrate resources, technologies and platforms in the field of industrial IoT, build a "shared, win-win, and wonderful" "Internet +" Advanced Manufacturing Industry ecosystem, and jointly serve Dongguan manufacturing transformation and upgrading.

4.2 Major cities implement industrial internet strategy

4.2.1 Shenzhen builds industrial internet based on 5G technology
The development of Advanced Manufacturing Industry is the "hard core" of Shenzhen's industrial development and the "hard core" of the Greater Bay Area competition. Shenzhen will build the core of world-class Advanced Manufacturing Industry clusters such as electronic information with global influence and competitiveness. Shenzhen strongly supports the industrial Internet demonstration application. 2 projects were selected by the Ministry of Industry and Information Technology of PRC for the 2018 Industrial Internet Pilot Demonstration Project. 4 projects were selected by the Ministry of Industry and Information Technology of PRC for the 2018 pilot demonstration project of integrated development of manufacturing and Internet electronic manufacturing. Industries in machinery
equipment, precision machining, medicine manufacture, gold jewelry, garment processing and other industries have produced a number of typical application cases. As the only city in China with an industrial added value of more than 900 billion yuan, it took the lead in developing the 5G industry, and the Advanced Manufacturing Industry is transitioning towards the integration of intelligence, digitalization and integration. Ordinary industrial Internet companies and 5G industry leaders such as Huawei, ZTE, and Foxconn, will continue to lead Shenzhen manufacturing in new display, next-generation communication technologies, 5G and mobile Internet. In key areas such as robots and their key parts, high-speed high-precision processing equipment and intelligent complete equipment, vigorously develop intelligent manufacturing and equipment integration, and radiate to biomedicine, high-end medical diagnostic and treatment equipment, genetic testing, modern Chinese medicine, intelligent robots, 3D Printing, BeiDou Navigation Satellite System applications and other key areas.

4.2.2 Guangzhou builds China's leading industrial internet ecological hub
Guangzhou formulated the "Guangzhou Action Plan for Deepening the" Internet + Advanced Manufacturing Industry "to develop the Industrial Internet", and promoted the "log in the cloud and the platform" platform through the platform system cultivation action, industry support enhancement action, and application innovation pilot demonstration cultivation action, forming a number of demonstration parks featuring industrial Internet innovation, services, and applications.

In addition, the industrial ecological integration development action will promote the development of large, middle and small enterprises, promote leading enterprises to open their capabilities and share resources to upstream and downstream enterprises in the industrial chain through the industrial Internet, and improve the information and digitalization of SMEs.

At the same time, through the establishment of an innovative service ecology, establish a provincial industrial Internet industry alliance Guangzhou Branch with Guangzhou characteristics, and build a "Guangzhou Industrial Internet Enterprise Hospital" that integrates corporate medical examinations, demonstration production lines, empowerment ecology, and ability training.

We plan to build national and provincial industrial innovation centers, technological innovation centers, manufacturing innovation centers, and achievement transformation centers in the major Advanced Manufacturing Industry cluster areas. Promote the accelerated development of "manufacturing + 5G" and support the deep integration of 5G and manufacturing. Support the development of 5G + intelligent manufacturing, 5G + VR / AR, 5G + ultra-high-definition video, 5G + unmanned driving and other customized network construction, and promote the development of 5G systems and terminal equipment industries through typical applications[6].

4.3 Construction of Dongguan's Industrial Internet Industry Ecological Supply Resource Pool
In order to accelerate the development of the Industrial Internet and provide strong support for the digitalization, networking, intelligence, and service-oriented transformation and upgrading of the manufacturing industry, Dongguan organized the application and selection of the "Industrial Internet Industry Ecological Supply Resource Pool".

4.3.1 Build an Industrial Internet Platform
An industrial Internet platform has been established, with cloud infrastructure, which can provide virtualized computing, storage, and network resources, and has the capabilities of a basic framework, storage framework, and computing framework. The service functions of the industrial Internet platform include industrial big data analysis, industrial application software provision, technology resource sharing, industry collaborative services, industrial resource allocation, and supporting services.

At present, industrial Internet platform companies include Huawei, China Unicom, China Telecom, China Mobile, Guangdong Intelligent Robotics Institute, Guangdong Xinhang Intelligent Technology, Dongguan Gugao Automation Technology, Dongguan Monda Group, and Dongguan Unite Furniture Association, Dongguan Prophet Big Data, GOPOINT and etc., totally more than 20 companies.
4.3.2 Build an Industrial Internet Solution Provider
Create solution providers with data acquisition, industrial software, industry solutions and system integration functions. At present, the solution providers include Huawei, China Unicom, China Telecom, Guangzhou POI-TECH Intelligent Information Technology, Guangdong Yixun Technology, Kingdee Software, Dongguan Zhenkun Software, Dongguan Green Energy Environmental Protection Energy Saving Technology, Dongguan See-kon Automation Equipment, DongGuan ZhongChuang Intelligent Manufacturing System Co., Ltd and etc., totally more than 20 companies.

4.3.3 Improve Industrial Internet Service Support Capabilities
Develop a group of service institutions with professional service capabilities, public service capabilities, financial service capabilities and service guarantee capabilities. At present, the service agencies include China Unicom, China Telecom, Guangdong Huashang Intelligent Manufacturing Technology Service, DGCIQ, Dongguan Dongli Rice Growth Smart Manufacturing Partnership (L.P.), Cloud Computing Industry Chinese Academy of Sciences, Dongguan City 2 Integration of Information Technology and etc.

4.4 Foshan promotes industrial information integration
Foshan promotes infrastructure construction around the Industrial Internet and builds a multi-level platform system. At the same time, it supports enterprises or business alliances to cultivate a number of vertical industry platforms around the cultivation of equipment manufacturing, home appliances, textiles, clothing, and automobiles. Construct a low-latency, high-reliability, and wide-coverage industrial Internet network infrastructure to form a number of mature and innovative application solutions and products in advantageous industries. At the same time, it will cultivate two domestically leading industrial Internet platforms with strong strengths, and 10 industrial Internet service providers with leading technologies and models; Promote more than 1,000 industrial enterprises to implement digital, networked, and intelligent upgrades using new industrial Internet technologies and new models, and drive 20,000 enterprises to "log in the cloud and the platform". Six projects were selected into the Guangdong Industrial Internet Industry Ecological Supply Resource Pool, and Midea's 5G + Industrial Internet Application Demonstration Park was selected as the first batch of Industrial Internet Application Demonstration Parks in Guangdong Province. National Instruments and Spirent Communications Announce Collaborative Development of 5G New Air Interface Device Test System, Allowing 5G Chip and Device Manufacturers to Validate 5G NR Smartphone and IoT Device Performance in the Lab without access to complex and expensive gNodeB. The new 5G performance test solution will support sub-6 GHz and millimeter wave bands and will seamlessly integrate into Spirent's existing network simulation platform[7].

5. Conclusions
Guangdong is the first provincial government to issue a proactive industrial Internet policy, and has created a very good industrial Internet ecology. By vigorously promoting the deep integration of the Internet, big data, artificial intelligence and the real economy, focusing on the digital transformation of the real economy, in China, we took the lead in promulgating local policies to support the development of the Industrial Internet, and actively explored the cultivation and introduction of Industrial Internet platforms, the promotion of application demonstrations, and the construction of logo analysis nodes, forming a relatively complete industrial ecosystem.

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