

Research on the Development Problems and Countermeasures of Dongguan's Technology Market

Song Huimin

Faculty Member of Business School, Dongguan City University, Dongguan, Guangdong, China

Abstract: With the deepening construction of the Guangdong-Hong Kong-Macao Greater Bay Area and the continuous improvement of the regional innovation system, Dongguan, as a major manufacturing city, relies on the development of its technology market to drive local economic transformation and upgrading. Based on an analysis of the current state of Dongguan's technology market, this paper systematically identifies major problems in its policy system, service institutions, talent teams, and technology supply capacity, and proposes corresponding countermeasures and suggestions. The research shows that although Dongguan's technology market has initially established a policy system and transaction network, it still faces bottlenecks such as imperfect policies, weak institutional capacity, talent shortages, and insufficient supply. Therefore, efforts should be made to improve the policy system, strengthen regional coordination, advance institutional construction, cultivate intermediary forces, and build a pattern of "R&D + transformation" to promote the high-quality development of Dongguan's technology market.

Keywords: Dongguan; Technology Market; Technology Contract

1. Introduction

The technology market refers to a specialized market for the trading and transfer of scientific research achievements, innovative technologies, or patents [1]. It serves as an important platform for the transformation of scientific and technological achievements and a bridge connecting technological innovation with economic development [2]. The healthy development of the technology market is of great significance for accelerating the promotion and implementation of innovative achievements [3], enhancing the productivity of high-tech enterprises, and accelerating the circulation of

technology factors. For Dongguan, which is in a critical transition period from a "major manufacturing city" to an "innovative strong city," the technology market is not only a basic tool for allocating scientific and technological resources but also a core lever for solving the bottleneck of industrial transformation and upgrading and transforming its huge manufacturing demand into innovation momentum. Although Dongguan has achieved remarkable results in promoting technological innovation and industrial transformation in recent years, compared with advanced cities such as Guangzhou and Shenzhen, the development of its technology market still lags behind, with a particularly prominent structural contradiction between strong technology demand and insufficient supply capacity.

To deeply analyze this practical problem, this paper, based on the regional innovation background, systematically analyzes the main bottlenecks and deficiencies in the development of Dongguan's technology market and proposes targeted and operable countermeasures and suggestions, aiming to provide a reference for the construction of technology markets in Dongguan and similar manufacturing cities.

2. Current Development Status of Dongguan's Technology Market

The development level of the technology market depends both on the basic support of the regional innovation environment and on the scale and structure of technology contract transactions. The current overall situation of Dongguan's technology market is presented from two dimensions: basic environment and core indicators.

2.1 Basic Development Environment

In 2024, Dongguan's GDP reached 1,228.2 billion yuan, a year-on-year increase of 4.6%, ranking second in Guangdong Province. In 2022, R&D expenditure was 45.872 billion yuan, with R&D intensity rising from 1.5% in 2011 to 4.1%

in 2022, significantly higher than the national average (2.6%) and second only to Shenzhen among similar cities. By the end of 2023, there were 10,100 high-tech enterprises, which are important entities in technology transactions. In 2022, the number of patent grants was 95,581, with invention patents accounting for 10%-13%. The number of invention patents per 10,000 people increased 2.5 times compared with 2015. Dongguan has four national technology transfer institutions, ranking third in the province, but there is a significant gap compared with Guangzhou (12) and Shenzhen (11). There are only three secondary registration points for technology contracts, which is too few and affects the full registration of contracts.

2.2 Overview of Technology Contract Development

The technology contract is a core indicator for measuring the activity of the technology market. The transaction value of technology contracts increased from 145 million yuan in 2012 to 9.24 billion yuan in 2023, reaching a historical peak of 22.207 billion yuan in 2019. The average transaction value per contract increased from 955,000 yuan to 22.319 million yuan, significantly higher than the provincial average (8.947 million yuan). In terms of the composition of technology contracts, technology development contracts occupy a core position, accounting for an average of 85% of the number of contracts and about 75% of the transaction value. The transaction value of technology transfer contracts fluctuates sharply, with an average value per contract reaching 91.05 million yuan, demonstrating high-value characteristics. Technology service contracts account for only 0.3% of the transaction value, while technology consulting contracts have long been marginalized, with zero transaction value for many years. In terms of technology output and absorption, Dongguan is a typical technology-demand-oriented city. In 2021, the transaction value of absorbed technology contracts (50.22 billion yuan) was 38 times that of output (1.31 billion yuan), the highest ratio among cities in the Guangdong-Hong Kong-Macao Greater Bay Area. In terms of technology absorption, about 66% came from other provinces, 32% from within the province, and 2% from overseas and the Hong Kong-Macao-Taiwan region. In terms of field characteristics, the transaction value of

technology contracts in the electronic information field accounted for 64.14% of the city's total, while advanced manufacturing accounted for 32.40%, with the two fields together accounting for 96%, showing a high degree of concentration. Regarding major technology contracts, the transaction value of major technology contracts worth over 10 million yuan accounted for more than 92% of the city's total for two consecutive years, with large-value, high-quality transactions dominating the market.

3. Problems in the Development of Dongguan's Technology Market

3.1 The Supporting Policies for the Technology Market Need Improvement

1. Lack of Municipal-Level Regulations on Technology Market Management

From the perspective of China's overall legal and policy framework for technology market management, it is currently not fully developed. For Dongguan, the direct legal basis at the national level is the "Progress in Science and Technology Law," and relevant legal provisions are scattered in the "Civil Code of the People's Republic of China," the "Measures for the Registration and Management of Technology Contract Recognition," the "Rules for Technology Contract Recognition," and other institutional norms. At the provincial level, the main institutional norm for technology market management in Guangdong Province is the "Guangdong Province Technology Market Management Regulations." Guangzhou has formulated and issued the "Guangzhou Technology Market Management Regulations," and Shenzhen has issued the "Shenzhen Special Economic Zone Technology Transfer Regulations." Compared with Guangzhou and Shenzhen, where the technology market is more developed, Dongguan has obvious deficiencies in technology market management regulations and has not yet formulated corresponding technology market management regulations. This situation restricts the healthy development of Dongguan's technology market, making it difficult for national and provincial laws and regulations to meet the actual needs of technology transaction activities in Dongguan.

2. The Incentive Policy for Technology Contract Registration and Recognition Is Outdated

Although Songshan Lake has issued the

"Dongguan Songshan Lake Measures for Promoting the Transformation of Scientific and Technological Achievements," which provides incentives for enterprises, platforms, industry-university-research cooperation, and technology managers, these policies are only applicable to the Songshan Lake area. Other areas of Dongguan still implement the incentive policy from 2000, which only provides a subsidy of 200 yuan per technology contract completed by a registration point, with an annual cap of 40,000 yuan. This seriously affects the work enthusiasm of technology contract registration points outside Songshan Lake and impacts the transformation efficiency of technology transfer participants such as enterprises, platforms, and technology managers.

3.2 The Service Capacity of Technology Market Institutions Needs Improvement

1. Few National Technology Transfer Institutions and Low Capacity

In 2024, Dongguan has four national technology transfer institutions, accounting for only 12.9% of the province's total (31 institutions), with a significant gap compared with Guangzhou (12) and Shenzhen (11). In 2020, the Torch Center announced the assessment results of national technology transfer institutions. In the province, there were no excellent institutions, seven good, 15 qualified, and three unqualified. Among them, Dongguan had no excellent or good institutions, three qualified, and one unqualified.

2. Lack of a Comprehensive Technology Transfer Platform

In recent years, various technology trading platforms have been built in Guangdong, such as Huazhuanwang, Doctor Technology, Foshan Zhongkelian, and Zhongshan Kewang. However, Dongguan has not yet established a technology trading platform serving regional development. The full-chain ecosystem for the transformation of scientific and technological achievements-"technology demand-achievement supply-technology trading-support services-incubation and cultivation"-needs to be established and improved, which to some extent affects the development of Dongguan's technology market.

3.3 Shortage of Supporting Talents for the Technology Market

1. The Scale of the Technology Manager Team Is Not Large

Although Dongguan has successfully established a National Technology Transfer Talent Training Base (Guangdong), its construction is still in its early stages. To ensure training quality, the base adopts a small-class teaching model, strictly controlling the number of trainees for each session of primary technology manager training to within 120. As of 2023, the base has trained 1,298 primary technology managers, 330 intermediate, and 31 advanced, and has awarded 214 RTTP international registered technology manager certifications. However, this training scale is still far from meeting the urgent demand for technology manager training in Guangdong Province.

Moreover, the hierarchical training system from theory to practice has not yet been perfected. Most technology managers have only received short-term training, lacking systematic learning and practice, and there is still a significant gap from becoming versatile and compound technology managers. Therefore, the base needs to continue its efforts in building the training system and improving training quality to meet the growing demand for technology transfer talents.

2. Small Number of Technology Contract Registration Personnel

As of the end of 2020, the province had more than 150 national technology contract registration personnel, with only three in Dongguan; there were 91 provincial technology contract registration personnel, with only three in Dongguan. Moreover, there is high staff turnover at registration points, and the team is unstable. The scale of talent in Dongguan's technology market needs further expansion.

3.4 Weak Service Capacity of Technology Contract Suppliers

1. Low Capacity of New R&D Institutions

After nearly a decade of construction, new R&D institutions have provided technical support to Dongguan enterprises by introducing R&D teams, enhancing the technological level of enterprises, and promoting industrial upgrading. The technology transactions of new R&D institutions have reached a certain scale. For example, the Peking University Dongguan Institute of Optoelectronics has achieved technology transactions of more than 30 million yuan since its establishment through technology development, transfer, consulting, and services. According to statistics from the Dongguan

Science and Technology Bureau for the first half of 2020, 30 new R&D institutions signed a total of 1,544 contracts, with a total value of 189 million yuan.

However, some institutions have low transaction volumes and weak viability. According to relevant data, among the technology transactions of new R&D institutions in the first half of 2020, only nine had a ratio of contract value to R&D expenditure exceeding 1, indicating that at most nine institutions might survive through technology contracts. In terms of the ratio of contract value to total income, only five had a ratio exceeding 1, indicating that the contract value was much higher than total income and that the actual amount received was relatively slow. In 18 institutions, the contract value was much lower than total income, indicating a low degree of marketization. Overall, more than half of the institutions have insufficient technology transaction volumes, low transaction values, and weak service capacity [4].

2. Obvious Shortcomings in Basic Research

Compared with the marketization level of other production factors, the marketization degree of technology factors in Dongguan is not high, and the allocation efficiency is relatively low. For example, there is a lack of major original achievements. The proportion of basic research and applied research in total R&D investment was only 3.7% in 2020, lower than the provincial average (5.87%) and the national average (6.01%).

4. Path Choices for Promoting the Development of Dongguan's Technology Market

4.1 Improve the Policy System of Dongguan's Technology Market

Drawing on the practice of technology transfer system construction at home and abroad, the government plays an indispensable role in the top-level design of the technology transfer system [4] and is a very important driving force. Improving the technology market system must first focus on building a relevant policy support system.

1. Policies to Regulate Technology Transaction Behavior

To ensure the healthy, orderly, and rapid development of Dongguan's technology market, efforts should be accelerated to formulate policies, regulations, and relevant supporting

implementation rules to regulate technology transaction behavior and protect the rights and interests of transactors in Dongguan's technology market. Drawing on the practices of other cities such as Guangzhou and Shenzhen, the "Dongguan Technology Market Management Regulations" should be formulated and issued.

2. Promote Technology Transfer Incentive Policies

Although Songshan Lake has issued a series of policy measures to promote technology transfer, such as the "Dongguan Songshan Lake Measures for Promoting the Transformation of Scientific and Technological Achievements," the implementation scope of these policies is limited to the Songshan Lake area and has not yet been extended to the whole city of Dongguan, so their incentive effect is relatively limited. To further enhance policy effectiveness, it is recommended to accelerate the preparation of local supporting documents for Dongguan that align with the national factor market allocation reform, based on the existing policy framework and closely combined with the uniqueness and existing problems of Dongguan's technology market. At the same time, special plans for the development of Dongguan's technology market during the "14th Five-Year Plan" period should be intensively studied and formulated, as well as a comprehensively upgraded version of the "Dongguan Measures for Promoting the Transformation of Scientific and Technological Achievements," to clarify the direction and path for the high-quality development of Dongguan's technology market during the "14th Five-Year Plan" period.

3. Policy Formulation Methods

Government governance emphasizes the extensive participatory management of the government, market, social organizations, and the public. Therefore, in the process of formulating policies, regulations, and rules to promote the development of Dongguan's technology market, the opinions and suggestions of all parties in the technology market should be widely sought. A "Dongguan Technology Market Management Joint Meeting" mechanism, led by the science and technology administrative department and with the participation of representatives from various technology market entities, should be established to strengthen communication and collaboration between the technology market competent authorities and relevant members of the technology market. Its

purpose is to "communicate situations, study problems, and solve problems," strengthen the close connection between the technology market management department and other technology market entities, and promote the sustained and healthy development of Dongguan's technology market.

4.2 Strengthen the Coordinated Development of the Greater Bay Area Technology Market

The geographical, technological, and organizational proximity of Guangzhou, Shenzhen, and Dongguan provides unique conditions for the coordinated development of the technology market in the Guangdong-Hong Kong-Macao Greater Bay Area.

1. Strengthen Regional Cooperation and Policy Coordination

Guangzhou, Shenzhen, and Dongguan can explore the establishment of a joint meeting system for the coordinated development of the technology market, holding regular meetings to conduct in-depth discussions and consultations on issues such as technology transfer, achievement transformation, and policy coordination. According to the development needs of Dongguan's pillar industries, the establishment of a Guangdong-Hong Kong-Macao Greater Bay Area electronic information technology professional technology market with Dongguan at its core should be explored. A Guangdong-Hong Kong-Macao Greater Bay Area electronic information technology professional platform should be established within the "Dongguan Intellectual Property Transaction Service Platform" to form a multi-level and specialized technology trading network platform. Local governments in the Greater Bay Area should jointly establish a special fund for the coordinated development of the regional technology market and jointly introduce relevant policies to encourage technology cooperation and achievement transformation among enterprises, universities, and research institutions. Incentive and reward policies should be given for the transfer of scientific and technological achievements within the Greater Bay Area to encourage and support regional scientific and technological innovation cooperation and promote the free flow and optimal allocation of factors such as technology, talent, and capital.

2. Promote In-depth Integration of Industry, Academia, and Research in the Greater Bay

Area

Guangzhou, Shenzhen, and Dongguan each have their own advantages in scientific and technological innovation. They can achieve complementary advantages and resource sharing by strengthening regional cooperation. For example, Guangzhou and Shenzhen can leverage their advantages in scientific research institutions and high-end talent to provide technical support for Dongguan's industrial upgrading, while Dongguan can rely on its manufacturing base to provide broad application scenarios and market space for the scientific and technological achievements of Guangzhou and Shenzhen.

4.3 Promote the Construction of Technology Market Service Institutions

1. Establish a Complete Technology Contract Registration and Recognition Work System

There is still room to increase the number of technology contract registration sites in Dongguan. A comprehensive survey of universities, research institutes, design institutes, and large and medium-sized enterprises in Dongguan should be conducted, especially strengthening liaison with the "horizontal offices" and "industry offices" of universities and research institutions. The number of registration points and registration staff should be expanded, and efforts should be made to bring all "large institutes, large universities, and large enterprises" in Dongguan into the technology contract registration service system to form a complete Dongguan technology contract registration and recognition network system.

2. Strengthen the Construction of a Professional Team of Technology Contract Registration Personnel

National and provincial technology contract registration and recognition training should be held to continuously cultivate a group of professional technology contract registration practitioners, expand the scale of the professional team, and improve the service level.

3. Actively Promote the Construction of an Online Technology Market

The online technology market has developed on the basis of the traditional technology market, making up for the problems of incomplete information, asymmetry, and high transaction costs in the traditional technology market. The online technology market has wide coverage,

long trading hours, and a large amount of information, which not only improves the efficiency of technology transactions but also effectively reduces transaction costs, optimizes the allocation of scientific and technological resources, and promotes the transformation of scientific and technological achievements. At present, although Dongguan has launched the "Dongguan Intellectual Property Transaction Service Platform," the website is updated slowly, and the intellectual property transaction module has only been updated to 2015. The website's visibility and social recognition are low. Therefore, it is necessary to actively promote the construction and development of Dongguan's online technology market, enrich and improve the functions of the "Dongguan Intellectual Property Transaction Service Platform," accelerate the update speed, actively promote it to society, and make the functions of the online technology trading market substantial. Efforts should be made to vigorously develop online technology bidding, technology property rights auctions, technology promotion, and other technology trading services, establish a quality assurance system for technology value assessment, legal consulting, expert services, etc., hold virtual and actual combined scientific and technological achievement promotion meetings, and build a regional technology trading platform.

4.4 Support the Development of Technology Market Intermediaries

Dongguan has a large number of small and medium-sized enterprises with urgent technological needs but relatively weak technological supply, requiring the transformation and application of a large number of scientific and technological achievements in Dongguan. Relying solely on the government to achieve the transformation of scientific and technological achievements is far from sufficient. There is an urgent need to improve the market mechanism for the transformation of scientific and technological achievements. Professional technology intermediary institutions and managers are familiar with investment policies and understand the country's taxation, industry and commerce, and legal systems, and can help scientific and technical personnel find funds and markets.

Vigorously Cultivate and Develop Technology Intermediary Institutions

The functions of Dongguan's technology

intermediary institutions urgently need to be expanded, and their service levels urgently need to be improved. Managers of Dongguan's technology market should actively guide technology intermediary institutions to develop in the direction of service specialization, organizational scaling, and institutional standardization. Relevant government departments should liberalize technology intermediary institutions, encourage diverse and society-oriented technology intermediary institutions, and cut off the dependence of technology intermediary institutions on the government. At the same time, private capital should be encouraged to establish or participate in technology market intermediary institutions, operate flexibly, and become stronger and better to realize their intermediary function of serving the development of the technology market.

2. Strengthen the Training of High-Quality Technology Manager Teams

To promote the prosperous development of Dongguan's technology market, Dongguan should take proactive action and actively build a complete vocational technology manager training system.

(1) Establish the "Dongguan Technology Manager Association." The association aims to bring together industry elites and build a professional platform. The association will regularly hold various exchange activities to provide a broad stage for information sharing and experience exchange among technology managers, thereby strengthening information communication and resource integration among them, effectively improving the efficiency of scientific and technological achievement transformation, and injecting new vitality and momentum into the coordinated development of the technology economy in Dongguan and the entire Guangdong-Hong Kong-Macao Greater Bay Area.

(2) Encourage high-tech enterprises to actively participate in technology manager training. It is actively advocated and encouraged that high-tech enterprises deeply participate in technology manager training programs. Such initiatives not only provide valuable reserve talent resources for the professional manager team but also, through the training process, promote close cooperation between enterprises and technology managers, helping enterprises more quickly and efficiently locate and obtain urgently needed technology supply or demand,

thereby accelerating the commercialization process of scientific and technological achievements and enhancing the innovation capacity and market competitiveness of enterprises.

(3) Build and optimize the technology manager training system. Select universities and social training institutions with superior conditions and solid foundations to jointly build technology transfer talent training bases. On this basis, carry out pilot projects for a diversified, multi-level technology transfer talent training system covering academic education, continuing education, and vocational education, aiming to comprehensively improve the professional quality and comprehensive ability of technology managers.

(4) Carry out professional skills training for technology transfer specialists. The technology transfer specialist mentioned here is different from a general technology manager. Technology transfer specialists generally already have relatively stable jobs. The emphasis of professional technology transfer specialist skills training is on improving the job skills of in-service personnel and giving full play to the positive role of in-service personnel in technology transfer. At the same time, a training system and filing system for technology transfer specialists should be established, promoting the establishment of technology transfer specialist positions in universities, research institutes, and enterprises, and building a cooperation network for technology transfer specialists.

4.5 Build a Pattern of "R&D in High-Tech Zones + Transformation in Towns and Streets"

Songshan Lake Science City has gathered a number of high-level research institutions and universities, built a number of national major scientific and technological infrastructure facilities, and is the pioneering start-up area of the Greater Bay Area Comprehensive National Science Center and the core innovation area of Dongguan. However, its ability to radiate and drive the development of surrounding areas is insufficient.

1. Enhance the Source Innovation Capacity of High-Tech Zones

Songshan Lake High-Tech Zone should rely on existing large scientific devices, major platforms, and new R&D institutions to continuously enhance its source innovation capacity.

Investment in basic and applied basic research should be increased, and scientific researchers should be encouraged to carry out high-level scientific research to provide a continuous stream of innovative achievements for technology transfer.

2. Promote Technology Transformation and Application in Towns and Streets

At the town and street level, a comprehensive technology transfer service system should be established, including technology transfer service institutions, technology contract registration institutions, etc., to provide all-round services for the transformation and application of scientific and technological achievements. Technology transfer service institutions should be encouraged to establish cooperative relationships with innovation carriers in Songshan Lake High-Tech Zone to jointly promote the transformation and application of scientific and technological achievements. Enterprises that successfully introduce and transform scientific and technological achievements from Songshan Lake should be given rewards and support to stimulate their enthusiasm for introducing Songshan Lake technology.

5. Conclusion

As an important manufacturing city in the Guangdong-Hong Kong-Macao Greater Bay Area, Dongguan is in a critical period of transformation from a "major manufacturing city" to an "innovative strong city." As a bridge connecting technological innovation and economic development, the technology market plays an irreplaceable role in promoting the transformation of scientific and technological achievements, optimizing the allocation of innovation resources, and promoting industrial upgrading. This paper systematically analyzes the development status, existing problems, and development paths of Dongguan's technology market and draws the following main conclusions:

First, Dongguan's technology market already has a good development foundation. The economy has continued to grow, R&D investment intensity ranks among the highest in the country, the number of high-tech enterprises has exceeded 10,000, the transaction value of technology contracts has increased from 145 million yuan in 2012 to 9.24 billion yuan in 2023, the policy system has been initially

established, the scale of technology transactions has continued to expand, and the sources of technology have shown a diversified pattern.

Second, Dongguan's technology market still faces multiple development bottlenecks. These are mainly manifested in: the lack of special regulations on technology market management at the municipal level and outdated incentive policies; the small number of national technology transfer institutions and their insufficient service capacity, and the lack of a comprehensive technology trading platform; the small scale of technology managers and contract registration personnel, and the incomplete talent training system; the weak technology supply capacity, insufficient investment in basic research, and the prominent structural contradiction between technology demand and supply.

Third, promoting the high-quality development of Dongguan's technology market requires multiple measures. Efforts should be accelerated to improve the technology market policy system, formulate the "Dongguan Technology Market Management Regulations" and promote citywide incentive policies; strengthen the coordinated development of the technology market in the Guangdong-Hong Kong-Macao Greater Bay Area and promote the in-depth integration of industry, academia, and research; improve the technology contract registration network and the construction of online trading platforms; vigorously cultivate technology intermediary institutions and professional technology manager teams; and build an innovation pattern of "R&D in Songshan Lake High-Tech Zone + transformation in towns and streets" to open up the "last mile" of scientific and technological achievement transformation.

The development of Dongguan's technology market faces both challenges and opportunities. In the future, Dongguan should base itself on its own industrial foundation, give full play to its

manufacturing cluster advantages, actively integrate into the Guangdong-Hong Kong-Macao Greater Bay Area innovation network, continuously optimize the technology market ecosystem, improve the efficiency of technology factor allocation, and provide strong support for promoting high-quality regional economic development. At the same time, Dongguan's practical experience can also provide a useful reference for the construction of technology markets in other manufacturing cities.

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