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Recommendations for the Development Strategy of Guangzhou' s Biomedical Technology Innovation Service Platform

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Abstract

Abstract The biomedical industry has become another important driving force for global economic and social development following the information industry, while various types of technology innovation platforms have become crucial supports for the development of the biomedical industry. Through in-depth investigation and analysis of various technology innovation platforms in Guangzhou' s biomedical field, this paper clarifies the basic situation of their construction, operation, and services; identifies problems existing in the services of Guangzhou' s biomedical technology innovation platforms by comparing relevant domestic and international development situations; and proposes targeted countermeasures and reference suggestions, such as promoting the construction of national laboratories in strategic emerging areas of biomedicine and taking the lead in building a Pearl River Delta biomedical sharing platform.

Full Text

Suggestions on the Development Strategy of Guangzhou' s Biomedical Science and Technology Innovation Service Platform –Investigation and Analysis of Science and Technology Innovation Service Platforms in Guangzhou' s Biomedical Field

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Abstract

The biomedical industry has become another important driving force for global economic and social development following the information industry, and various types of science and technology innovation platforms have become critical supports for this development. Through in-depth investigation and analysis of different types of science and technology innovation platforms in Guangzhou' s biomedical field, this paper clarifies the basic conditions of platform construction, operation, and service provision. By comparing domestic and international development situations, it identifies existing problems in Guangzhou' s biomedical science and technology innovation platform services and proposes targeted countermeasures and reference suggestions, such as promoting the construction of national laboratories in strategic emerging biomedical fields and leading the development of a Pearl River Delta biomedical resource sharing platform.

Keywords: Bio-medical field; Science and technology innovation service platform; Guangzhou

1. Introduction

Governments worldwide attach great importance to the development of the biomedical industry. Many countries regard the biotechnology industry as a strategic priority for the 21st century and a crucial means to enhance national competitiveness, formulating development plans and increasing policy support and financial investment through strengthened leadership and talent recruitment. For example, the United States treats the biomedical industry as a new economic growth point, implementing the "Biotechnology Industry Incentive Policy"and continuously increasing investment in biotechnology R&D and industrialization. Japan has formulated the "Biomedical Industry Nation-Building" strategy. The EU' s Sixth Framework Program allocates 45% of its R&D budget to biotechnology and related fields. Singapore has developed a plan to "join the top ranks of biotechnology within five years,"allocating S$3 billion over five years to support life sciences and biotechnology industries [1]. The bio-industry will gradually become another important driving force for future global economic and social development following the information industry. Relevant analysis suggests that the bio-industry' s formation phase was 1980-2000, its growth phase is 2000-2025, and its maturity phase will be after 2025, indicating that the global bio-industry is still in the initial stage of large-scale industrialization

[2]. It is predicted that starting from 2020, the bio-industry will truly become one of the world' s leading industries.

In China, over 80% of biomedical enterprises have been established for less than five years, with projects still in their infancy. Most were founded by university researchers or returned overseas scholars based on basic research accumulated in their original institutions, averaging no more than 30 employees and RMB 5 million in capital. These enterprises primarily focus on innovative product R&D [3]. Basically in the investment phase, they face bottlenecks in hardware conditions such as funding and R&D equipment, as well as in technical support and market channels, which greatly hinder their innovation capacity.

Biomedical public service platforms serve as carriers for various innovation elements within industrial clusters, providing equipment, information, technology, talent, capital, and other services to promote exchanges and cooperation between enterprises and research institutions within the cluster. These platforms can effectively address the aforementioned problems. Consequently, various biomedical industry clusters in China have established different forms of public service platforms to provide supporting advanced equipment, technical support, and other services for product R&D, pilot testing, and industrialization of biomedical innovation enterprises, helping such enterprises concentrate their limited resources on innovation. After years of operation and development, these platforms are gradually releasing their tremendous driving force in promoting industrial innovation capacity, expanding the scale of the biomedical industry, enhancing industrial competitiveness, and achieving sustainable industrial development [4].

In recent years, under government leadership, localities have collaborated with universities, enterprises, and research institutions to build various forms of public service platforms, showing a trend of diversified development. Based on the R&D process in the biomedical field, science and technology innovation service platforms can be divided into three main types: basic condition service platforms, public and professional technology service platforms, and achievement transformation service and industrialization cluster platforms. The establishing body, institutional nature, functional positioning, and business model of these public service platforms directly affect their operational efficiency and determine their motivation, service level, and service effectiveness in serving biomedical enterprises. Through analysis of three representative platforms in Beijing' s Zhongguancun, Shanghai' s Zhangjiang, and Guangzhou, we can identify the following main characteristics [5]: diversified platform investment entities; platform construction based on the entire biomedical industry chain; platforms prioritizing the revitalization of various innovation resources; and platforms adopting a combination of public welfare and market-oriented operational strategies. Meanwhile, existing platforms' advantages mainly manifest in: emerging agglomeration effects; enhanced industry-wide innovation capacity; and strengthened international cooperation.

2. Current Status and Problems of Guangzhou' s Biomedical Science and Technology Innovation Service Platform Construction

In 2007, Guangzhou became a national bio-industry base city and a national pharmaceutical export base city. It is one of China' s most concentrated and advantageous cities in the medical and health industry, with abundant medical resources, a strong pharmaceutical culture, and a solid industrial foundation. As of 2014, statistics show that Guangzhou' s biomedical industry' s main business revenue reached approximately RMB 150 billion, with added value of about RMB 45 billion, demonstrating increasingly prominent advantages in industrial scale and efficiency [6]. At the "Global Biomedical and Health Industry Development Roundtable Conference" hosted by the Guangzhou Municipal Government in 2015, Chen Rugui, then Executive Vice Mayor of Guangzhou, proposed that by 2025, the biomedical and health industry would become Guangzhou' s number one pillar industry in terms of output value, with scale expected to reach RMB 1 trillion [7].

The Guangzhou Municipal Party Committee and Government have attached great importance to the development of the biomedical and health industry, successively issuing a series of policy measures including the "Opinions on Promoting the Accelerated Development of the Bio-industry," the "Guangzhou Bio-industry Innovation Development Action Plan (2010-2012),"and the "Guangzhou Bio-industry 12th Five-Year Development Plan" to accelerate the cultivation of the biomedical and health industry from multiple aspects including industrial development strategy, talent, funding, and taxation [8]. Relying on the Guangzhou National Bio-industry Base plan and combining it with the development plan of the Sino-Singapore Knowledge City and the industrial foundation of various districts (county-level cities), Guangzhou has coordinated the construction of core bio-technology R&D areas such as Guangzhou Science City, Guangzhou International Health Industry City, and Guangzhou International Bio-Health Island, gradually forming a "three centers, multiple regions" industrial layout that highlights agglomeration effects [9].

In recent years, Guangzhou has invested over RMB 500 million in fiscal funds in the biomedical and health industry, focusing on supporting new drug varieties, biological diagnostics, medical devices, and other fields, ranking first among the three major industrial sectors supported by municipal science and technology plan projects. The city has successively built a number of major pharmaceutical production and innovation platforms, including the Guangzhou Institutes of Biomedicine and Health, Chinese Academy of Sciences, and the South China New Drug Innovation Center, and has planned and launched the Guangzhou International Health Industry City and Guangzhou International Biotechnology Center. Relevant statistics show that Guangzhou has established 11 national engineering centers and laboratories, 13 professional incubators, 133 scientific research and development institutions, 153 key laboratories at various levels, 128 engineering technology research and development centers at various levels, and

51 enterprise technology centers at various levels [8]. The city has vigorously supported leading biomedical enterprises, continuously enhancing their demonstration and driving effects, and has cultivated a group of biomedical enterprises with leading positions in China, producing a large number of internationally advanced scientific and technological achievements. In 2014, Guangzhou' s biomedical industry filed 1,905 invention patent applications and was granted 1,231 patents, with 35 PCT patent applications [8], further highlighting its innovation capacity.

In terms of talent development, Guangzhou focuses on cultivating and introducing four types of team talents: entrepreneurial leading teams, innovative leading talents, early-stage entrepreneurial talents, and young innovative talents. Through relevant policies and supporting implementation plans, the city has comprehensively improved the environment for talent cultivation, introduction, and utilization, striving to build a "talent highland." By the end of 2013, Guangzhou had 15 universities and colleges and over 40 research institutes related to biomedicine [10]. According to surveys, the number of scientific and technological talents in universities in biomedical-related fields reached 26,560, accounting for 60.30% of scientific and technological personnel in science, engineering, and medical universities [10]. To support scientific and technological talents under 35 years old in conducting independent innovative research activities, Guangzhou established the Pearl River Science and Technology New Star Program in 2011. By the end of 2013, 300 Pearl River Science and Technology New Stars had been selected, with more than half in the biomedical field [8]. In terms of high-end talents, Guangzhou' s biomedical industry leads all industries in the number of academicians of the Chinese Academy of Sciences and Chinese Academy of Engineering (13, accounting for 32.5% of the total in Guangzhou) and "Thousand Talents Plan" experts (39, accounting for 39% of the total in Guangzhou).

2.2 Distribution Status and Questionnaire Survey of Guangzhou' s Biomedical Science and Technology Innovation Service Platform Construction

In the biomedical field, Guangzhou has accumulated over the years a group of excellent and fruitful science and technology platforms, including national engineering (technology) research centers, national key laboratories, provincial and ministerial key laboratories, and municipal and departmental key laboratories. This paper conducted documentary research and compilation of these platforms accumulated over the years in Guangzhou and created a distribution map of Guangzhou' s main national, provincial, and municipal biomedical science and technology platforms, as shown in [Figure 1: see original paper].

We designed a questionnaire to survey Guangzhou' s biomedical innovation service platforms[2], focusing on investigating the external science and technology innovation service resources and service conditions of Guangzhou' s biomedical field, as well as the platforms' large scientific instruments, equipment, soft-

ware, and related scientific and technological databases, biological germplasm resources, human genetics, reference materials, experimental materials, and other natural scientific and technological resources with an original value of over RMB 500,000 that can provide external services. A total of 77 institutions with external service capabilities completed the survey, reporting 140 innovation service platforms. Based on the professional fields of the reported platforms, the 140 platforms concentrated on drug R&D, biotechnology, medical research, experimental animals, instruments and software, agriculture, and other areas. On this basis, we conducted further investigation into the two key areas of biotechnology and pharmaceutical R&D, and the following analysis will focus on these two fields. Among the platforms surveyed, 42 were biotechnology service platforms and 35 were pharmaceutical R&D service platforms. The general status of platform service resources is described in -3:

Statistics on Resource Overview of Biotechnology Platforms and Pharmaceutical R&D Platforms (Technical Personnel Composition, Basic Data Resources, Total, Average, Quantity, Value)
Note: Natural scientific and technological resources include human genetics, reference materials, experimental materials, etc.

Statistics on Distribution of Biotechnology Platforms and Pharmaceutical R&D Platforms (Supporting Units/Number, Professional Function Distribution/Number, Universities, Research/Medical Institutions, Enterprises, Basic Research, Enterprise Drug Design, Pilot Testing and Production)

Statistics on Intellectual Property Rights and Qualifications of Biotechnology Platforms and Pharmaceutical R&D Platforms (Intellectual Property Composition, Biotechnology 12, Pharmaceutical R&D 15, Quantity, Proportion, Quantity, Proportion)

The survey found that in the bio-pharmaceutical R&D field, Guangzhou' s science and technology innovation service platforms have three establishment models: First, some platforms actually relying on universities have separately established project companies, nominally in corporate form but actually operating as internal university research institutions; second, platforms relying on enterprises are basically self-built platforms operating in enterprise mode; third, platforms relying on universities and research institutions are basically established with government investment and led by the supporting institutions, with little participation from private capital, and are managed basically as internal laboratories with a focus on internal laboratory management rather than platform external service operations. Overall, the innovation service platform system in this field has not yet established an organizational and operational architecture with multi-party participation, diversified investment, enterprise management, and market-oriented operation.

Through comprehensive survey and analysis of Guangzhou' s biomedical innovation platforms, we found common problems: the biomedical innovation service chain has basically taken shape, but platforms at both ends of the service chain

are still missing, advantages of middle-stage technology platforms are not prominent, and soft platforms are seriously insufficient; technology service platforms are small in scale and highly dispersed, with internal operational mechanisms, management systems, and service marketization needing improvement; platform operation lacks targeted policy and institutional guarantees, and systemic obstacles to sharing and service urgently need resolution; effective matching between service demand and supply is insufficient, and supporting services for scientific and technological innovation are incomplete.

2.3 Analysis of Guangzhou' s Biomedical Science and Technology Innovation Service Platform Types

This paper defines Guangzhou' s biomedical science and technology innovation service platforms as those that rely on scientific research institutions, universities, key industry enterprises, and science and technology intermediary agencies with rich and high-quality scientific and technological infrastructure and strong advantages in scientific research, development, and service. These platforms optimize and integrate various scientific and technological resources to provide public scientific and technological services related to the biomedical field to society, including research and development, achievement transformation, and technical services.

Based on the scientific and technological R&D process in the biomedical field and corresponding to the three main R&D categories and processes of basic research, applied research, and experimental development, this paper divides Guangzhou' s biomedical science and technology innovation service platforms into three main types: basic condition service platforms, public and professional technology service platforms, and achievement transformation service and industrialization cluster platforms. We selected some representative cases from these three types of platforms in Guangzhou for introduction and analysis to understand the overall status of Guangzhou' s external science and technology innovation service chain in the biomedical field, as well as its service mechanisms. Additionally, in actual investigation, we found that some platforms' service functions include not just one type but two or three types of services. Therefore, many actual operating platforms may have overlapping functions in terms of type. Thus, when classifying platforms in this paper, we primarily categorize them based on their main functions and service features. For example, platforms mainly providing public technology or R&D services are classified as public and professional technology service platforms, while those mainly providing basic resource services are classified as basic condition service platforms.

2.3.1 Basic Condition Service Platforms Basic condition service platforms are important components of regional science and technology innovation systems, integrating shared platforms or service platforms for research and experimental bases, large-scale scientific instruments and equipment, natural scientific and technological resources, scientific data, scientific and technological

literature, public services for scientific and technological achievement transformation, and network scientific and technological environments.

Guangzhou' s biomedical basic condition service platforms mainly include five types: scientific literature sharing platforms, scientific data sharing platforms, instrument and equipment sharing platforms, experimental animal public service platforms, and natural resource sharing platforms. These platforms primarily aim to integrate and share basic resources of the biomedical industry, responsible for collecting scientific and technological literature, scientific data, and information on high-end large-scale instruments and equipment, experimental animal resources, and natural resources within biomedical industry bases. After classifying and processing the information, they establish resource databases and publish resource status through network service platforms for sharing by biomedical enterprises in the region [11]. The survey results are shown in [Figure 2: see original paper].

Analysis from the survey reveals: (1) From the common characteristics of such platform construction, basic condition service platforms require large and continuous funding investment and need to integrate a large amount of advantageous and characteristic resources. (2) The construction of basic condition service platforms is achieved by integrating resources from member units or sub-platforms; the more scientific and technological resources the platform agglomerates, the broader its service scope. However, the phenomenon of emphasizing construction over management remains obvious. (3) Some platforms are currently in continuous construction phases, having agglomerated advantageous resources and relying on better management mechanisms to achieve good operational results, such as the Guangdong Scientific and Technological Resources Sharing Network, Guangzhou Scientific and Technological Resources Public Service Platform, Guangdong Large-Scale Scientific Instrument and Equipment Sharing Service Platform, and Guangzhou Life Science Large-Scale Instrument Regional Center of the Chinese Academy of Sciences.

2.3.2 Public and Professional Technology Service Platforms [Figure 2: see original paper] Distribution Map of Basic Condition Service Platforms

Public and professional technology service platforms are systems established through government guidance and support, with participation from enterprises, universities, research institutes, and industry associations, relying on relevant key laboratories, engineering (enterprise) technology centers, and technology enterprise incubators to provide technical services mainly including common and key technology R&D, technology transfer, and technology resource sharing for industrial development [12]. Guangzhou' s biomedical public and professional technology service platforms include various sub-platforms such as professional R&D service platforms, biomedical testing service platforms, experimental animal public service platforms, information service platforms, human resource platforms, and investment and financing platforms. These sub-platforms mainly provide technical and information services on key common technologies, talent,

and markets for domestic and international biomedical industries; provide professional consulting services such as expert consultation and legal consultation; and implement external cooperation on research projects within biomedical industry bases [11]. The survey results are shown in [Figure 3: see original paper].

Analysis from the survey reveals: (1) Platform funding sources are diversified. Public and professional technology service platforms have three main funding sources: financial support from national, provincial, and municipal platform funds; R&D fees, testing, and inspection fees from commissioning units; and substantial funds obtained through integrating multiple platform resources. (2) Service levels and target objects are segmented. Guangzhou currently has a wide variety of public and professional technology service platforms in the biomedical field, with rich and diverse types. Corresponding service institutions can basically be found for different technical service levels and target objects. For example, in drug R&D, there are institutions such as the South China New Drug Innovation Center, Guangzhou Institutes of Biomedicine and Health of the Chinese Academy of Sciences, and Guangzhou Zhongda Drug Development Center. (3) Service subjects are diversified. Among platforms providing external public and professional technology services, service subjects are diversified, including national-level laboratories/bases/platforms, provincial and municipal platforms or institutions, and some listed and large and medium-sized enterprises.

2.3.3 Achievement Transformation Service and Industrialization Cluster Platforms [Figure 3: see original paper] Distribution Map of Public and Professional Technology Service Platforms

The main task of achievement transformation service and industrialization cluster platforms is to accelerate the development of technology transaction markets and promote the flow, diffusion, and transformation of scientific and technological achievements. According to the "Guangzhou Bio-industry Innovation Development Action Plan (2010-2012)" [9], Guangzhou' s biomedical industry park layout will be based on the existing Guangzhou National Bio-industry Base plan, combined with the development plan of the Sino-Singapore Knowledge City and the industrial foundation of various districts (county-level cities), through overall planning and optimized layout to form an industrial layout with "three core areas, six characteristic parks, and three incubation and service bases" that complement each other' s advantages and develop in coordination (the "363 layout"), jointly constituting the overall framework of Guangzhou National Bio-industry Base. Specific survey results are shown in [Figure 4: see original paper]:

[Figure 4: see original paper] Distribution Map of Achievement Transformation Service and Industrialization Cluster Platforms

Analysis from the survey reveals: (1) Representative achievement transformation service and industrialization cluster platforms in Guangzhou' s biomedical field are mainly concentrated in the vast and sparsely populated Guangzhou Economic and Technological Development Zone (including Guangzhou International

Bio-Island, Sino-Singapore Guangzhou Knowledge City, and Guangzhou Science City). These platforms develop in the form of science and technology industrial parks, and those with better development are characterized by broad planning and construction areas and agglomeration of high-tech scientific research and industrial institutions. (2) Since the bio-industry integrates knowledge innovation (applied basic research), technological innovation (applied development), achievement transformation, and scaled production, it is necessary to leverage the government' s organizational and coordination functions, establish mechanisms and policy environments to promote rapid bio-industry development, give full play to enterprises' role as the main body of bio-industry development, and accelerate the development and rapid industrialization of biotechnology. (3) It is necessary to emphasize the construction of achievement transformation services such as incubators and accelerators within science and technology park platforms, and to guide industrial agglomeration as a principle, forming industrial chains among institutions within the parks, which are advantageous manifestations of achievement transformation service and industrialization cluster platform development.

3. Development Strategies and Policy Recommendations for Guangzhou' s Biomedical Science and Technology Innovation Service Platforms

Through literature research, questionnaire surveys, field investigations, and consultations with government management personnel and relevant biomedical industry experts, this paper has preliminarily completed an investigation of Guangzhou' s overall status, current service conditions, and service mechanisms of the external science and technology innovation service chain in the biomedical field.

The construction of science and technology innovation service platforms is a fundamental supporting force for scientific and technological innovation and the fundamental guarantee for sustainable scientific and technological development. It can provide services in scientific research instruments, scientific and technological information, achievement incubation, achievement transformation, and technical services. Guangzhou' s biomedical science and technology innovation service platforms should take revitalizing various discrete innovation resources within Guangzhou' s biomedical field as their main task, fully utilizing existing equipment or scientific research resources and professional talents from universities, research institutes, enterprises, incubators, and service agencies to establish and open various forms of resource sharing systems and service systems. Aiming at the needs of innovative enterprise development, they should establish an efficient, convenient, and open scientific resource service system to address common needs in the biomedical field, reduce costs, and provide services, which is of great significance for optimizing the allocation of scientific and technological resources, promoting the open sharing of scientific and technological resources, building a regional innovation system, and constructing an innovative society.

In terms of specific approaches, Guangzhou can explore models for constructing large innovation platforms and institutional mechanisms, including:

(1) Promoting the Construction of National Laboratories in Strategic Emerging Biomedical Fields

National laboratories have clear missions to serve national strategic objectives, engage in original innovation core work, undertake cutting-edge basic research, and conduct high-tech transfer [13]. Developed countries such as the United States and Germany have numerous world-renowned national laboratories that have generated large amounts of original innovation [14]. The Chinese government implemented the National Key Laboratory Construction Plan in 1984, and the "National Medium- and Long-Term Science and Technology Development Plan Outline (2006-2020)" proposed that "according to major national strategic needs, in emerging frontier interdisciplinary fields and fields with Chinese characteristics and advantages, relying mainly on national scientific research institutes and research-oriented universities, build several national laboratories with strong teams, high levels, and comprehensive interdisciplinary integration." The 2008 "Government Work Report" also pointed out the need to "promote the construction of the national innovation system, focusing on building a number of national laboratories" [15]. Within Guangdong Province and even Guangzhou City, promoting national laboratory construction is of extraordinary significance. Therefore, Guangzhou should select directions closely related to strategic emerging industries or major scientific research fields in the biomedical domain, such as stem cell and regenerative medicine, integrate high-quality R&D institutions and platform resources within its jurisdiction, and strive for national laboratory construction, which will greatly promote the leapfrog development of Guangzhou' s and even Guangdong Province' s biomedical industry.

(2) Leading the Construction of the Pearl River Delta Biomedical Sharing Platform

The Pearl River Delta region is one of China' s three major areas with the largest population concentration, strongest innovation capacity, and most comprehensive overall strength. As it gathers Guangdong Province' s important scientific and technological resources, it is China' s largest high-tech industry belt and an important high-tech industry production base domestically and internationally. When Guangzhou leads the construction of the "Pearl River Delta Biomedical Science and Technology Resource Sharing Platform," it needs to pay attention to improving collaborative innovation policies and regulations to guarantee resource sharing, establishing a reasonable collaborative innovation benefit distribution mechanism, enhancing its own innovation capacity, and improving regional cooperation effects.

(3) Establishing a Multi-level Linked Platform Mechanism at National, Provincial, Municipal, and District Levels

Regarding platform layout in the biomedical field, Guangzhou can establish a set of construction demand selection mechanisms recommended by regions

and jointly discussed by provinces and cities, based on the needs of industrial development and enterprise innovation in various urban areas and the overall platform layout. This would form a multi-channel investment pattern dominated by national-provincial-municipal and even national-provincial-municipal-district multi-level fiscal funds, encouraging and guiding social capital to participate in platform construction in the biomedical field. Based on performance evaluation and management, a linked service reward and subsidy mechanism at national-provincial-municipal-district levels should be established to promote platform service effectiveness.

(4) Exploring Mechanisms for Other Types of Platform Construction

Additionally, in the mechanism of constructing science and technology service innovation platforms in the biomedical industry, Guangzhou can explore other types of platform construction, such as development models for university science park platforms at the municipal level; platforms for provincial-municipal or academy-municipal co-built research institutions; and industry-university-research technology innovation platforms established based on leading enterprises.

On the other hand, Guangzhou also needs to optimize existing platform construction, with specific measures including:

(1) Improving Planning and Guarantee Measures

Construct an R&D service chain suitable for industrial development needs through overall design. Learning from the ideas of the United States and EU' s "Critical Path Opportunities List" and "Innovative Medicines Initiative," organize high-level professional consultation to analyze Guangzhou' s priorities, advantages, and R&D service needs in developing the biomedical industry, and construct a suitable pharmaceutical R&D innovation service chain for Guangzhou.

Strengthen chain advantages and characteristic links through key support. With limited resources, Guangzhou should adopt a differentiated development approach, focusing on supporting advantageous and characteristic links in the innovation service chain.

Fill gaps in the chain through targeted supplementation. For weak and missing links in the innovation service chain, carry out demand-oriented "chain-supplementing" actions, with government authorities commissioning relevant institutions to conduct service demand surveys.

Regulate service supply and demand through policy guidance. The government needs to support service platform operations and encourage enterprises to utilize innovation service platforms through systems and policies to cultivate the demand market. For example, support platform operations through service rewards, reduce user costs through subsidies for platform service usage to encourage service demand, and support platform operational development by increasing demand.

Promote resource open services through policy environment innovation. Strengthen the institutional construction of scientific and technological resource sharing, clarify the public goods nature of scientific and technological infrastructure platforms formed by national investment and their obligation to provide social services through corresponding regulations or administrative measures, providing legal basis for sharing services. Implement flexible and diverse sharing models according to the characteristics of different types of scientific and technological infrastructure resources [16].

(2) Improving Construction and Operation Models

Adopt a multi-participation construction model. Under the existing university-locality collaborative innovation alliance framework in Guangzhou, introduce special measures to encourage multi-party cooperation in building innovation service platforms in the biomedical field, and introduce innovative models in platform ownership, management rights, and operation rights.

Establish a scientific assessment and evaluation system. For R&D and innovation service technology platforms currently invested in and built by the government as the main body in state-owned scientific research institutes and universities, comprehensive evaluation should be conducted across four dimensions: service capability, management level, output performance, and basic conditions, to comprehensively and systematically evaluate the platforms' capabilities and effectiveness in resource organization, management, and sharing services [17].

In terms of overall management and coordination mechanisms for the service system, establish innovative evaluation mechanisms that focus on actual evaluation and supervision effects. In terms of accreditation methods, learn from Shanghai' s model to implement unified accreditation and listing management for innovation service platforms in professional fields. Additionally, introduce a socialized evaluation mechanism in evaluation and supervision, accept social supervision, and entrust third-party intermediary agencies to evaluate platform operations. By combining evaluation results with rolling support and other reward and punishment measures, form an evaluation model where internal self-discipline and social supervision promote each other [17].

(3) Establishing Unified Information Promotion and Intermediary Service Systems

Establish a unified information portal for industry innovation service platforms. Build a resource service information sharing platform for user aggregation, sharing, services, and exchanges, providing technical service supply and demand information release, intelligent retrieval and matching for supply-demand docking, and online docking between supply and demand parties, to achieve interactive communication between platforms, between platforms and clients, and between platforms and management agencies.

Leverage the third-party service functions of science and technology intermediaries. Establish innovation service stations to gather professional intermediary

agencies in technology agency, information intelligence, R&D design, intellectual property rights, application consultation, certification guidance, technical training, industrial docking, technology finance, and project incubation, providing auxiliary supporting support for the development of professional technology platforms to ensure smooth operation of the service chain.

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