Research on the Construction of the Service Platform for Commercializing Scientific and Technological Outcomes of Universities in the Guangdong-Hong Kong-Macao Greater Bay Area Based on SaaS Mode

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Abstract: As colleges and universities frequently participate in social and economic activities, they are increasingly closely connected with scientific research and industrial development, which enables them to be the main platform for implementing technology transfer and commercializing achievements. By analyzing the current situation of scientific and technological achievements transformation in colleges and universities in Guangdong-Hong Kong-Macao Greater Bay Area and giving suggestions, this paper tries to construct a service platform for scientific and technological achievements transformation in colleges and universities in Guangdong-Hong Kong-Macao Greater Bay Area based on SaaS mode. Eight core function modules and four auxiliary function modules are designed to strengthen the intermediary service function of scientific and technological achievements transformation, which effectively helps the construction of the Guangdong-Hong Kong-Macao Greater Bay Area and builds an international first-class science and technology innovation hub.

1 INTRODUCTION

As an important force in the national science and technology innovation system, colleges and universities have gathered high-end innovation elements in talent reserve, scientific research resources, cutting-edge achievements, and other aspects. They are the backbone of promoting the originality of emerging technologies and breaking through key technologies, providing an important carrier for China to optimize the collaborative innovation environment and significantly enhance the ability to commercialize scientific and technological achievements. Despite the accelerating pace of technological innovation in universities in the Guangdong-Hong Kong-Macao Greater Bay Area, due to the lack of specific policies, a unified information exchange platform, and a perfect intermediary service system, a large number of scientific and technological achievements are still difficult to be transformed into the driving force of the economic development of the Greater Bay Area. How to construct the service platform for the transformation of scientific and technological achievements in colleges and universities, improve the transformation rate of scientific and technological achievements, and provide powerful support for promoting the high-quality development of the Guangdong-Hong Kong-Macao Greater Bay Area is the core mission and central task for colleges and universities to transform scientific and technological achievements.

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2 CURRENT SITUATION AND SUGGESTIONS ON THE TRANSFORMATION OF SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN UNIVERSITIES OF THE GUANGDONG-HONG KONG-MACAO GREATER BAY AREA

2.1 Cross-Border Cooperation Mechanism Needs to Be Improved

Guangdong colleges and universities, scientific research institutions and enterprises, and scientific and technological personnel are still restricted to apply for multiple business visas to Hong Kong and Macao and there is no financial research project remittance subject in the foreign remittance category of the state foreign exchange management measures. The transit tax on scientific research funds of enterprises and scientific research institutions in Guangdong is still relatively high, which hinders the enthusiasm of institutions in the three regions to carry out cooperation. This needs to be coordinated and solved at the national level: optimize the examination and approval system for scientific research personnel to go to Hong Kong and Macao on business, facilitate scientific research personnel to travel to and from Hong Kong and Macao in the form of business endorsement to carry out scientific research cooperation and exchanges, actively appeal to the state to improve the fund transit appropriation procedures, and give preferential tax treatment to Guangdong scientific research institutions and enterprises for scientific research funds transit through Hong Kong and Macao.

2.2 The Construction of a Service System among Guangdong, Hong Kong, and Macao Must be Strengthened

Due to the different patent management systems and transfer systems of scientific and technological achievements among the three places, as well as the high flow cost of innovative elements such as information and talents, few technology transfer activities are conducted between Hong Kong, Macao, and nine cities in the Pearl River Delta, and the scale of transactions does not match the volume of technology transactions in the Guangdong-Hong Kong-Macao Greater Bay Area. For example, in 2020, Hong Kong exported 28 technologies to Guangdong, with a turnover of 240 million yuan and Macao exported 3 technologies to Guangdong, with a turnover of 4 million yuan. In turn, Hong Kong and Macao absorbed 503 technologies from Guangdong, with a turnover of 5.289 billion yuan. The Guangdong-Hong Kong-Macao Greater Bay Area exported 38,611 technologies, with a turnover of 326.194 billion yuan, and absorbed 26,224 technologies, with a turnover of 240.51 billion yuan. This means cooperation should be strengthened among the three places, and a strong service system must be built for the transformation of scientific and technological achievements, to make the service system more open and international for the transformation of scientific and technological achievements in the Guangdong-Hong Kong-Macao Greater Bay Area (Liu 2021).

2.3 Higher Vocational Colleges and Private Universities Need to Follow Up

According to the statistical data of the Guangdong Province Department of Education, in 2020, colleges and universities in Guangdong Province signed 691 technology transfer contracts with a contract value of 1758.192 million yuan, and an actual income of the year is 312.311 million yuan（see Table 1）. Among them, the number of technology transfers in colleges and universities such as higher vocational colleges and private undergraduate courses is pitifully few. Therefore, it is necessary to focus on personnel training, cultivate high-level technology transfer talents, and promote the construction of specialized technology transfer institutions to carry out professional management and operation of post-scientific and technological achievements.

Table 1. Amount of technology transfer of universities in Guangdong Province from 2018 to 2020

Unit	Contract amount of Technology transfer (ten thousand yuan)			Actual income from technology transfer (ten thousand yuan)		
	2020Y	2019Y	2018Y	2020Y	2019Y	2018Y
Public undergraduate	29993.4	62152	25077.5	22062.3	17277.1	19321.1
Non-governmental undergraduate	326.8	268.3	249.3	145.4	149.3	135.9
Public higher vocational college	205	140.8	215.2	176.6	141.8	208.2
Non-governmental higher vocational college	0.2	2	1	0.2	2	0.5
Affiliated hospital	145293.8	1822.4	99.1	8846.6	192.4	32.1
Total	175819.2	64385.5	25642.1	31231.1	17762.6	19697.8

3 CONSTRUCTION PRINCIPLES OF THE SERVICE PLATFORM FOR TRANSFORMING SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN THE GUANGDONG-HONG KONG-MACAO GREATER BAY AREA

3.1 Government-Led Principle to Strengthen School-Enterprise Cooperation

The platform is invested in and constructed by the government to build a bridge between technological innovation and transfer and transformation, carry out wide-field and multi-level scientific and technological exchange and cooperation under the unified planning, guidance, and supervision of the government, encourage the establishment of efficient school-enterprise cooperation mechanism, carry out cooperation and exchange activities including data sharing, cooperative research, achievement transformation, talent cultivation, and other forms, and implement market-oriented management operation mode. This helps to meet the increasing technological innovation demand of enterprises (Xu 2010).

3.2 Integrated and Open Principle to Optimize the Configuration

It is important to integrate the innovation service resources and strength of colleges and universities in the Guangdong-Hong Kong-Macao Greater Bay Area, effectively link up various technology markets and achievement transformation service platforms, innovate mechanism, perfect environment, and open service, so as to facilitate the development of various scientific and technological innovation service institutions, and build the Guangdong-Hong Kong-Macao Greater Bay Area into a scientific and technological achievements transformation base with international competitiveness.

3.3 Combination of Public Welfare and Market-Oriented Services

The real-name membership system is implemented for all users in the platform, with the principle of voluntary participation, co-construction and sharing, honest services, and common development. The platform aims to provide public welfare services for the technological innovation of the vast number of science and technology enterprises, support the development of specialized value-added services that meet the market demand, promote the development of science and technology intermediary services, and form a socialized service pattern in which public welfare and market-oriented services rely on and promote each other, as well as a network-based, specialized and socialized whole-process supporting service system.

4 FUNCTION REALIZATION OF THE SERVICE PLATFORM FOR TRANSFORMING SCIENTIFIC AND TECHNOLOGICAL ACHIEVEMENTS IN UNIVERSITIES OF THE GUANGDONG-HONG KONG-MACAO GREATER BAY AREA

4.1 Basic Development and Design

The service platform for commercializing scientific and technological achievements of colleges and universities of the Guangdong-Hong Kong-Macao Greater Bay Area employs the component-oriented SaaS enterprise application architecture for development, which can avoid the problems of poor universality, inability to cross platforms, low flexibility, and low development efficiency. Compared with scattered development tools, the bottom framework of the platform adopts the component-oriented SaaS enterprise application architecture, mainly driven by the database, and unifies the security management and performance management of the data transmission layer, data storage, transaction processing, and network structure at the framework level. It flexibly integrates third-party applications including CRM, CMS, SRM, OA, MES, and BI, integrating with various existing front-end technologies and development modes so as to be well compatible with historical resources. According to the needs of technology trading business of scientific and technological achievements transformation in colleges and universities, the platform functions include twelve subsystems, such as supply and demand release center, trading center, promotion center, information center, science and technology incubation, training center, data center, comprehensive service, teacher's workshop, science and technology consultation, service forum, recruitment and job hunting（see Figure 1）

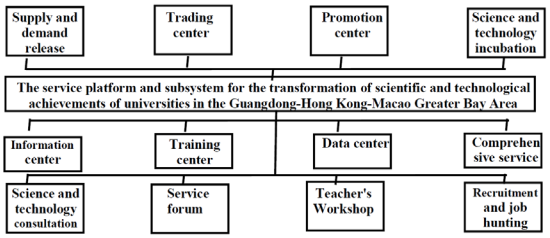

Figure 1. The service platform and subsystem for the transformation of scientific and technological achievements of universities in the Guangdong-Hong Kong-Macao Greater Bay Area

In the design of security, stability, and data consistency of the platform, multi-level security control methods (operating system level, database level, application system level, and data operation level) and multi-level password technology are adopted, which can define the module use authority, function authority, operation authority (add, delete, modify, check, review) registration authority of operators. The platform possesses the function of monitoring operation logs, monitoring real-time registered users, ensuring the safety of stored data, encrypting key data, supporting system security recovery, backup data, and verifying built-in data (Li 2019). The development process is divided into five phases: database design and modeling (design the database and data ER model of the service platform for transforming scientific and technological achievements in universities of the Guangdong-Hong Kong-Macao Greater Bay Area), business logic design and development (definition of business function logic), interface UI development (UI design of service platform for transforming scientific and technological achievements in universities of the Guangdong-Hong Kong-Macao Greater Bay Area), application component arrangement and extraction service interface (arrangement and extraction of SaaS cloud resource of service interface required by the service platform for transforming scientific and technological achievements in universities of the Guangdong-Hong Kong-Macao Greater Bay Area for construction and assembly), component assembly stage, integrated deployment online stage (online release deployment of SaaS cloud platform and the deployment mode of export deployment package on third-party server). The platform development flow chart is shown in Figure 2.

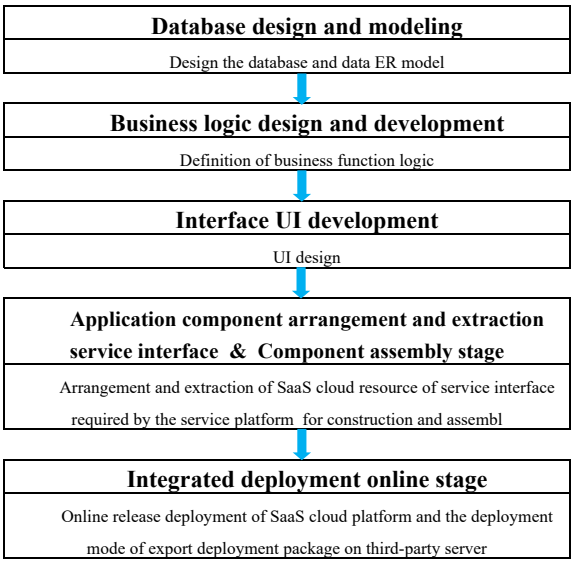

Figure 2. Flowchart of development of service platform for transforming scientific and technological achievements of universities in the Guangdong-Hong Kong-Macao Greater Bay Area

4.2 Diversification of Core Functions

The service platform for transforming scientific and technological achievements in universities of the Guangdong-Hong Kong-Macao Greater Bay Area aims to serve the active exploration of the deep integration of schools and enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area, the integration of scientific research and teaching, and the cultivation of scientific and technological innovation and entrepreneurship talents. Therefore, based on this goal, eight modules are mainly set for the functional design of the platform. (1) Supply and demand release center. It includes the function of project supply, high-quality project, patent supply, trademark, copyright, new agricultural varieties, technology demand, trademark demand, copyright demand, new varieties demand, investment information, and financing information. (2) Trading center. It provides public bidding transaction services for patents and other intellectual property objects by using auction, bidding, and online bidding. It includes the network bidding system, patent retrieval, and evaluation system, state-owned scientific and technological achievements listing system, scientific and technological achievements trading information publicity system, etc. (3) Promotion center. It includes enterprise roadshows, project roadshows, investment and financing roadshows, university roadshows, activity roadshows, network exhibitions, and other functions. (4) Information Centre. It enjoys the functions of news information, science and technology policy, cutting-edge trends, and international cooperation. (5) Science and technology incubation. It sets up the functions of entrepreneurial activities, entrepreneurship counseling, entrepreneurial team, and incubation projects. (6) Training center. It possesses the functions of training information, online courses, instructor style, and a database. (7) Datacenter. It provides an innovation resources map, public database, capability data, instruments, and equipment of universities in the Guangdong-Hong Kong-Macao Greater Bay Area. (8) Comprehensive services. It includes evaluation, legal affairs, retrieval, early warning, agency, audit, and other functions. The diversified functions are more advanced and safer, with better expandability, stronger adaptability and scalability, and faster business realization capability, which can effectively improve the development speed of scientific and technological achievements trading platform, reduce costs, shorten the time, reduce manpower investment, and comprehensively promote the achievement transformation service of universities and enterprises in the Guangdong-Hong Kong-Macao Greater Bay Area (Jiang 2015).

4.3 Practicality of Auxiliary Functions

To overcome the problems and shortcomings in the process of transformation of scientific and technological achievements in colleges and universities, the platform has extended the functions and services and designed four auxiliary function modules. (1) Teacher's Workshop. Teachers with excellent scientific research quality are sincerely invited to participate in the platform, set up personal web space, display personal information and scientific and technological achievements, and recruit and prepare a scientific research team with the help of the platform. (2) Scientific and technological consultation. It offers professional intellectual property training courses, technical brokers, and other vocational qualification examination guidance services to cultivate and improve college students' scientific and technological innovation thinking, awareness, and ability. (3) Service forum. It provides teachers and students with a platform for exchanges for science and technology entrepreneurship projects, regularly holding offline activities, and inviting well-known scholars, entrepreneurs, and student inventors to participate in academic lectures. (4) Recruitment and job hunting. It provides job-seeking intention release for students who are interested in studying the laws, characteristics, and social functions of science

and technology activities, as well as science and technology systems, science and technology management, science and technology strategy and policy, etc., for two-way choice between enterprises and students (Zhong 2016). The practical auxiliary functions of the platform can help colleges and universities tap the potential and advantages of the transformation of scientific and technological achievements and economic development. Colleges and universities actively can integrate school-enterprise cooperation, technological breakthrough, innovation and entrepreneurship, talent cultivation, and other aspects into the transformation of scientific and technological achievements, laying a solid foundation for improving the scientific and technological innovation system in the Guangdong-Hong Kong-Macao Greater Bay Area and the establishing the international science and technology innovation center (Xiao 2021).

5 SUMMARY

The development of the Guangdong-Hong Kong-Macao Greater Bay Area is a key deployment of China's major development strategy and an important measure to promote national innovation-driven development. By 2025, scientific and technological cooperation in this area will be deepened in an all-round way. Relying on key innovation platforms such as Guangzhou Science City, Guangzhou-Shenzhen-Hong Kong scientific and technological innovation corridor will be built and Guangzhou-Shenzhen-Hong Kong scientific and technological cooperation mechanism and mode will be innovated. Through the construction of key innovation platforms such as the Nansha Guangdong-Hong Kong-Macao comprehensive cooperation demonstration zone, the Guangzhou-Zhuhai-Macao science, and technology innovation corridor will be formed to deepen Guangdong-Macao science and technology cooperation and pool high-end innovation resources. At that time, Guangdong, Hong Kong, and Macao will initially build a scientific and technological, and industrial innovation highland with global influence and become the driving force for important national innovation. Therefore, in order to serve the development of the Guangdong-Hong Kong-Macao Greater Bay Area, colleges and universities should start by maximizing their innovation resources, take open innovation as the guiding principle, form a more perfect operating mechanism based on the development characteristics of Guangdong-Hong Kong-Macao Greater Bay Area, in an effort to maximize the innovation benefits of colleges and universities, promote the industrial transformation and upgrading of Guangdong-Hong Kong-Macao Greater Bay Area, and serve the economic development of the Aera (Ke 2021).

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REFERENCES

Jiang Hai, Zi Hongzhi. (2015) Exploration and Practice of Collaborative Innovation Model for Transformation of Scientific and Technological Achievements in Universities in Guangdong. Science and Technology Management Research, 35(16): 94-99.

Ke T. (2021) Exploration on the Path of New R & D Institutions in Colleges and Universities Serving the Construction of Guangdong-Hong Kong-Macao Greater Bay Area, [J]. China University of Science and Technology, (06):12-15

Li Z. Q. (2019) Research and Development of Rapid Construction of Scientific and Technological Achievements Trading Platform Based on SaaS Mode [J]. Modern information technology,3(20):88-92

Liu Q. Q. (2021) Current Situation and Development Countermeasures of Scientific and Technological Achievements Transformation in Guangdong-Hong Kong-Macao Greater Bay Area, [J]. Guangdong Science and Technology, 30(11):15-17

Xiao Y. (2021) Exploration of the Construction of Innovation and Entrepreneurship Platform for Higher Vocational College Students Based on the Transformation of Scientific and Technological Achievements [J]. Popular technology,23(09):170-172

Xu J. (2010) Construction and Operation Mechanism of Service Platform for Transformation of Scientific and Technological Achievements in Zhejiang Province [J]. Science and Technology Management Research,30(22):83-87

Zhong Jiatao. (2016) Adopting Information Technology Means to Enhance the Effective Use of Technical Resources in the Transformation of Scientific and Technological Achievements. Modern Industrial Economy and Informationization, 16: 95-97.