

Postprint of a Survey on the Current Status of Patent Holding and Management in Major Provincial Academies of Sciences

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Abstract

[Objective/Significance] Local provincial academies of sciences constitute an important component of the national academy system and regional innovation system. Promoting the transfer and transformation of intellectual property has become a significant task for these academies in recent years. However, the current status of patent holdings and management in China's local provincial academies has not yet been examined. This study aims to reveal the aforementioned status and provide countermeasures and suggestions for patent management in local provincial academies by incorporating advanced domestic experiences. [Method/Process] Through bibliometric analysis and comprehensive investigation, this study reveals and analyzes the patent resources and management status of major provincial academies, including Beijing Academy of Science and Technology, Shanghai Academy of Sciences, Guangdong Academy of Sciences, Shandong Academy of Sciences, and Heilongjiang Academy of Sciences. By integrating the advanced experience from the patent management system of the Chinese Academy of Sciences, it analyzes the existing problems and their root causes in patent management of major provincial academies, and proposes corresponding countermeasures and suggestions. [Results/Conclusion] The study concludes that specialization of talent teams and standardization of management systems are two key elements of patent management. Local provincial academies urgently need to establish a professional, standardized, and collaborative intellectual property management system.

Full Text

Preamble

The Investigation of Patent Holdings and Management Status in Major Provincial Academies of Sciences

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Abstract

[Purpose/Significance] Provincial academies of sciences constitute an important component of both the national academy system and regional innovation systems. Promoting the transfer and transformation of intellectual property has become a key priority for these institutions in recent years. However, the current status of patent holdings and management in China's provincial academies has not been systematically documented. This study aims to reveal this status quo and provide recommendations for patent management in provincial academies by drawing on domestic best practices.

[Method/Process] Through bibliometric analysis and comprehensive investigation, this paper examines the patent resources and management practices of major provincial academies, including the Beijing Academy of Science and Technology, Shanghai Academy of Sciences, Guangdong Academy of Sciences, Shandong Academy of Sciences, and Heilongjiang Academy of Sciences. By comparing these findings with the advanced patent management system of the Chinese Academy of Sciences (CAS), the study analyzes existing problems and their root causes, and proposes targeted recommendations.

[Result/Conclusion] The research concludes that a professional talent pool and standardized management systems are two critical elements for successful patent management. Provincial academies urgently need to establish professional, standardized, and collaborative intellectual property management systems.

Keywords: provincial academy of sciences, intellectual property, patents, local academy of sciences

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Introduction

In the early 21st century, China's local research institutes underwent significant reforms, including reductions in institutional funding, changes to grant systems, and the corporatization of certain academies. During this process, many local research institutes saw their capacity to serve regional science and technology development strategies gradually weaken, along with their contributions to regional economic growth. In recent years, as the scientific community has reflected upon and re-examined these reform experiences, the role of local

research institutes in promoting coordinated development of science and technology and the economy has been re-evaluated and repositioned [1].

Local research institutes are public welfare scientific institutions that address major regional needs in science, technology, and socioeconomic development, tackling key, difficult, and hot-button issues in regional development through public science and technology solutions. Their mission should differ from that of the “national team,” which serves national objectives; instead, they should focus on serving local needs, emphasizing applied research and technology services. These institutes should function as a bridge and link between industry and scientific research, organically connecting upstream basic research with downstream technological development in industry through the transfer and transformation of scientific and technological achievements, thereby actively promoting the application and commercialization of research results with industrialization potential and social benefits [2-3].

As the core and most economically valuable component of scientific and technological assets, patents represent an important indicator of an institution’s innovation level and capability. Patent implementation and industrialization also reflect a research institute’s ability to contribute to industrialization and economic growth. Against this backdrop of emphasizing enhanced contributions to economic development, many local research institutes have gradually strengthened patent creation and transformation metrics in their performance evaluation systems while de-emphasizing publication metrics. Patent creation, management, and industrialization capabilities have thus become central to the competitiveness of local research institutes.

Numerous scholars have conducted theoretical and practical research on patent management in research institutes, covering macro-level policies [4], management mechanisms and models [5-7], talent team development [8], and industrialization pathways [9]. While these studies are relatively comprehensive, closer analysis reveals that empirical research on patent management in research institutes has typically focused on specific provinces, cities, or individual institutes. Few scholars have directed attention to provincial academies of sciences at the national level.

Provincial academies of sciences serve as the vanguard of local research institutes and important members of regional innovation systems. However, the fields in which these academies have deployed their intellectual property achievements and the status of their intellectual property management have not been systematically documented. This paper investigates the patent management practices and holdings of major provincial academies to provide a useful reference for management departments in various provincial academies.

2.1 Research Data and Methods

This study utilizes patent data from the Chinese Academy of Sciences Patent Online Analysis System, which sources its data from the State Intellectual Prop-

erty Office, ensuring reliability and authority. Based on urban competitiveness and comparative strength among provincial academies in the National Academy of Sciences Alliance, this research selects the Beijing Academy of Science and Technology, Shanghai Academy of Sciences, Guangdong Academy of Sciences, Heilongjiang Academy of Sciences, and Shandong Academy of Sciences as representative cases. The primary data are summarized in .

shows the organizational structure and patent holdings of the major research subjects. The Beijing Academy of Science and Technology comprises 30 directly affiliated units, including 8 applied technology development institutes, 10 public welfare research institutes, 3 science popularization venues, and 9 science and technology service institutions. The Shanghai Academy of Sciences includes 14 directly affiliated units, 8 municipal units, and 19 central government-affiliated units. The Guangdong Academy of Sciences has 23 independent legal entities, including 22 key research institutes. The Heilongjiang Academy of Sciences operates 12 innovation-oriented research institutions. The Shandong Academy of Sciences consists of 12 innovation-oriented research institutions, 1 provincial economic and information technology development research institute, and 2 prefecture-level units.

2.2.1 Comparison of Annual Trends in Invention Patent Applications

Analysis of annual trends in invention patent applications reveals similar growth patterns among the Guangdong, Shandong, Shanghai, and Heilongjiang Academies of Sciences. In contrast, the Beijing Academy of Science and Technology appears to lack momentum in patent applications. These trends are illustrated in [Figure 1: see original paper].

2.2.2 Comparison of Patent Holding Structures

The patent holding structures of the Beijing Academy of Science and Technology and Shanghai Academy of Sciences are relatively similar. This similarity stems from the Beijing Academy's relatively low proportion of natural science research and development institutions, while the Shanghai Academy operates under a loose organizational model that includes some municipal institutions and central enterprise R&D institutions located in Shanghai. In contrast, the Heilongjiang, Shandong, and Guangdong Academies of Sciences are dominated by traditional research institutes, resulting in more similar patent holding structures among them. The detailed comparison is presented in .

2.2.3 Comparison of Major Patent Holders

Examination of major patent holders across the provincial academies shows that patent ownership is relatively concentrated, with the top three patent holders in each academy accounting for over 50% of total patent holdings. Notably,

although the Shanghai Academy of Sciences is among the larger patent holders, most of its patents actually originate from central government units located in Shanghai, while its directly affiliated and municipal units demonstrate relatively weaker research capabilities. The detailed comparison is provided in .

2.2.4 Comparison of Main IPC Classifications

Comparing the top 10 IPC classifications across the provincial academies (see), G01N (investigating or analyzing materials by determining their chemical or physical properties) and C12N (microorganisms or enzymes; compositions thereof; propagating, preserving, or maintaining microorganisms; mutation or genetic engineering; culture media) appear with high frequency. At the individual academy level, G01N does not appear in the top 10 for Heilongjiang Academy of Sciences, as it lacks specialized analytical testing research institutions. The Beijing Academy of Science and Technology and Shandong Academy of Sciences have developed relatively strong analytical testing technologies compared to other categories. Both the Guangdong Academy of Sciences and Shanghai Academy of Sciences have achieved substantial research results in both G01N and C12N categories.

2.2.5 Overall Trends in Patent Transfer and Transformation

Overall patent transfer and licensing activities across the provincial academies indicate that these institutions still prefer self-implementation of patented technologies, with transfer and licensing ratios remaining relatively low. However, since 2009, growth trends in patent transfers and licensing have become evident across all provincial academies. In 2015, the total number of patent transfers reached a historical peak of 153 cases, as shown in [Figure 2: see original paper].

2.3 Summary

In terms of organizational structure, all provincial academies can be functionally divided into innovation sectors such as biology and health, materials and chemicals, resources and environment, equipment and manufacturing, electronics and information, and think tanks and services, though the proportions of each sector vary significantly. For example, the Heilongjiang Academy of Sciences operates 12 innovation-oriented research institutions, including only one science and technology service institution and no specialized analytical testing research institution. The Beijing Academy of Science and Technology has 30 legal entities, including as many as 4 think tank institutions and 9 science and technology service institutions. The Shanghai Academy of Sciences comprises 31 institutions, with over 20 involved in equipment and manufacturing. The Guangdong Academy of Sciences has up to 5 institutions related to biology and ecology. These structural differences result in distinct characteristics in each academy's intellectual property portfolio. The Heilongjiang Academy of Sciences produces minimal output in G01N analytical testing technologies, with

patent achievements concentrated primarily in chemistry. The Beijing Academy of Science and Technology, with its high proportion of think tanks and services and low proportion of natural science research institutions, shows insufficient momentum in patent applications. The Guangdong Academy of Sciences has concentrated many of its patent achievements in microbiology research.

These observations demonstrate that organizational structure is closely related to intellectual property creation. Each provincial academy should adjust and optimize its organizational structure according to its own goals and positioning.

3 Patent Management Models of Major Provincial Academies of Sciences

The transformation of scientific and technological achievements is a systematic endeavor that requires supportive policy environments and effective intellectual property management mechanisms. Therefore, this study investigates the patent management models of major provincial academies from both policy and institutional perspectives. The investigation employed three methods: (1) web-based research, accessing each provincial academy's website to download policies and regulations related to scientific achievement management; (2) literature research, focusing on journal articles studying the Beijing, Shanghai, Heilongjiang, and Shandong Academies of Sciences; and (3) telephone interviews with relevant personnel in research management departments of selected academies to understand their distinctive policies and implementation.

3.1 Characteristics and Shortcomings of Patent-Related Policies in Major Provincial Academies

Based on the investigation, current patent-related policies in provincial academies primarily address the following aspects:

3.1.1 Subsidies for Patent Application and Maintenance Fees

Most provincial academies have established subsidy policies for patent application fees. For example, the Heilongjiang Academy of Sciences formulated the "Heilongjiang Academy of Sciences Patent Subsidy Fund Management Measures" and the "Heilongjiang Academy of Sciences Reward and Management Measures for Patent Applications Abroad," providing subsidies of 1,000 RMB for design patents, 1,500 RMB for utility model patents, 3,000 RMB for invention patents, and 10,000 RMB for international patent applications. The Beijing Academy of Science and Technology's innovation team management measures encourage and support innovation teams in obtaining high-level scientific achievements and awards, and provide financial support for patent and other intellectual property applications, with most local academies stipulating that patent maintenance costs be covered by project funds.

3.1.2 Policy Framework for Patent Transfer and Transformation

In 2012, the “Opinions of the CPC Central Committee and the State Council on Deepening the Reform of the Science and Technology System and Accelerating the Construction of the National Innovation System” proposed giving full play to the leading role of local governments in regional innovation, establishing platforms for the transfer and transformation of scientific and technological achievements, and effectively promoting the integration of science and technology with industrial development. This provided clear direction for local provincial academies. Consequently, incentive policies for patent transfer and transformation have gradually increased. While most previous policies were framework-oriented with weak operability, some provincial academies have recently made bold attempts to introduce specific, detailed, and operational guidelines. For instance, in December 2015, the Shandong Academy of Sciences issued the “Shandong Academy of Sciences Implementation Measures for Promoting the Transformation of Scientific and Technological Achievements (Trial),” which meticulously defines the composition of scientific achievement benefits, identifies eligible personnel and teams for benefit distribution, and provides detailed provisions on profit sharing for two categories: “scientific achievement transfer, licensing implementation, and horizontal project income” and “scientific achievement valuation as equity investment.” The document also specifies detailed procedures for implementing benefit distribution, ensuring fairness and justice through collective decision-making by leadership on major issues and staff congress systems.

3.1.3 Positive and Negative Incentives for Patents

Positive incentives for patent creation and transformation are typically implemented through patent awards, such as the “Shandong Academy of Sciences Patent Award.” Negative incentives link patents to individual, team, and institute evaluation and assessment. For example, the Shandong Academy of Sciences proposes making invention patents and high-level papers important criteria for unit performance evaluation and researcher promotion. The Guangdong Academy of Sciences incorporates both the quantity and quality of patents into the evaluation system for application-oriented research institutes, assigning them substantial weight to draw attention to achievement transfer and transformation.

3.1.4 Electronic Patent Archives Management and Patent Competition Tracking

According to the investigation, only the Heilongjiang Academy of Sciences has shown attention to computerized patent management information systems and patent competition tracking, while other provincial academies have demonstrated insufficient emphasis in this area.

Overall, major provincial academies have shown considerable attention to patent

transfer and transformation. Compared with previous transfer and licensing situations, policy levers have begun to take effect. However, the current policy system still lacks measures to curb low-value patents, which will continue to consume resources for a considerable period. Additionally, the lack of attention to macro-level patent trends reflects that provincial academies still view patents merely as scientific achievements, showing insufficient market sensitivity and requiring broader perspectives.

3.2 Characteristics and Shortcomings of Patent Management Systems in Provincial Academies

Generally, all provincial academies adopt a two-level distributed management model, with the academy-level research management department (science and technology department) responsible for overall scientific achievement and patent management, and institute-level science and technology departments having designated positions to interface with the academy level. Academy-level patent management functions primarily include formulating and implementing management systems and detailed rules for scientific achievement awards, planning and managing academy-level patent work, and organizing intellectual property protection training and publicity. In essence, the academy-level research department provides only macro-level guidance, while specific patent applications, implementation, and industrialization are completed independently by each institute.

At both academy and institute levels, although dedicated personnel are assigned to intellectual property management, they are not necessarily professionals. In fact, except for some patent achievement registration and administrative work, patent application, protection, and valuation are essentially outsourced. Some academies centralize outsourcing at the academy level. For example, the Beijing Academy of Science and Technology has signed a strategic cooperation agreement with Beijing Luhao Patent Agency Co., Ltd., with the company handling the vast majority of patent applications and training within the academy. Others allow individual institutes or even patent holders to independently select outsourcing partners.

4 Advanced Experience in Two-Level Patent Management Systems in the Chinese Academy of Sciences System

The Chinese Academy of Sciences (CAS) is a major force in China's independent innovation and a member of the inter-ministerial joint meeting on national intellectual property strategy implementation. CAS attaches great importance to intellectual property work and has issued a series of policies and regulations, such as the "Guiding Opinions of the Chinese Academy of Sciences on Further Strengthening Intellectual Property Work." Its innovative measures in two-level intellectual property management primarily include:

4.1 Establishment and Expansion of the “Intellectual Property Specialist” System for Major Academy Projects and Key Research Directions

The CAS Intellectual Property Office conducts training and certification for intellectual property specialists and establishes corresponding information databases and credibility systems. This measure has significantly enhanced the professionalism of relevant positions. Some institutes have even expanded the intellectual property specialist system. For example, the Dalian Institute of Chemical Physics not only has 12 CAS-level intellectual property specialists but has also established institute-level intellectual property specialists in research groups, demonstrating the effectiveness of this system [10].

4.2 Establishment of Standardized Intellectual Property Management Mechanisms

CAS has established standardized management mechanisms, such as the “Interim Measures for Intellectual Property Management in CAS Research Institutions” and the “CAS Intellectual Property Work Guide,” which have clarified management functions and enhanced the systematic and standardized nature of intellectual property management.

Additionally, CAS is vigorously building specialized intellectual property transfer and transformation service departments. Unlike the intellectual property specialist system—which, while improving professionalism, still involves semi-professional, part-time personnel dispersed across various institutes—these specialized intellectual property transformation service departments are centralized, full-time organizations dedicated to promoting intellectual property transfer and transformation. The most typical case is the Shanghai Institutes for Biological Sciences (SIBS).

Established in 1999 through the integration of eight biology research institutions in Shanghai, SIBS comprises eight research institutes and four support units. Based on its mission and development goals, SIBS established guiding principles for intellectual property work, viewing it as both serving overall development goals and forming an important component of its innovation efforts. In April 2007, SIBS established the Intellectual Property and Technology Transfer Center, drawing on the professional management model of technology transfer offices in American research institutions. The center first hired an expert with extensive experience in U.S. intellectual property management and technology transfer as its director and began building a professional team. Second, it substantially increased the center’s budget and innovated its operational mechanisms: (1) granting full autonomy in personnel management; (2) providing considerable financial autonomy, including salary levels determined by the center director based on performance and market competition rather than following national public institution standards; and (3) allocating 10% of net income from technology licensing and transfer to center transformation personnel to

supplement operational funds and provide incentives. Following an internationally aligned professional operation model, the center strengthened whole-process management of patent evaluation, cultivation, and application, focusing on improving patent quality and commercial value as its core mission, and conducted professional marketing and commercial negotiations [11].

SIBS's Intellectual Property and Technology Transfer Center established a professional workflow comprising “invention → evaluation → value addition → patent → development → market → licensing/transfer → negotiation → contract” to improve patent quality and commercial value. By conducting professional marketing and commercial negotiations, the center achieved whole-process management from invention disclosure to final transformation, ensuring patent quality and effectively promoting the transformation of research achievements. In 2010, the center established Shanghai Shengzhihua Intellectual Property Service Co., Ltd. to extend its successful intellectual property management model to other CAS institutes, universities, and R&D enterprises.

5 Recommendations for Improving Patent Management Systems in Provincial Academies

Comparing CAS's successful experience in patent management and industrialization reveals that professional talent and standardized management systems are two key elements. Provincial academies can improve their patent management systems in the following areas:

5.1 Equipping with Professional Talent and Establishing Professional Intellectual Property Management

Currently, provincial academies essentially outsource intellectual property application, protection, and industrialization, lacking in-house talent capable of evaluating and reviewing the quality of outsourced services. This is a major factor contributing to low patent application quality and uncertain commercial value assessment. Provincial academies can gradually develop intellectual property management and service teams through a “introduction + internal cultivation” model. Furthermore, the tasks of the intellectual property management committee, intellectual property management and operation institutions, and intellectual property service support institutions are essentially an inseparable whole. While most provincial academies have long-established institutions providing intellectual property services—such as the Beijing Institute of Science and Technology Information under the Beijing Academy and the Guangdong Science and Technology Library under the Guangdong Academy—their subordinate institutes often look elsewhere for intellectual property services. This occurs because, on one hand, intellectual property service support is not given sufficient importance, and on the other hand, provincial academies have failed to establish information exchange and collaboration platforms among their subordinate institutions, preventing the organic integration of intellectual property

management, operation, and service support. Provincial academies urgently need to clarify the functions of intellectual property departments and strengthen collaboration.

The smooth coordination of two-level intellectual property work depends on symmetrical knowledge levels among relevant personnel. Therefore, it is necessary to establish a certification system to ensure that designated positions at both academy and institute levels possess equivalent patent management knowledge.

5.2 Adjusting Patent Incentive Models

Current incentive measures for patents remain primarily focused on specific monetary rewards for obtaining different types of patents. Using patent grants as the reward benchmark can only encourage the proliferation of low-value patents. To improve patent quality, specific incentive policies for patent transfer and transformation should be thoroughly researched and formulated, with clear standards and procedures for benefit distribution. Additionally, it must be emphasized that incentives for transformation personnel should not be overlooked.

5.3 Establishing Collaborative Mechanisms Among Intellectual Property Departments to Improve Efficiency

The text appears incomplete for this section. Based on the context, it would discuss establishing collaborative mechanisms among intellectual property departments to enhance overall efficiency and effectiveness of patent management systems in provincial academies.

References:

- [1] Zhang Haocheng. The Development Environment of Local Research Institutes Urgently Needs Improvement [EB/OL]. (2010-09-15) [2017-03-06]. <http://www.stdaily.com/sbhtmlnews/2010/9/236467.html?id=236467>.
- [2] Song Hui, Lü Huaqiao. Construction of Technology Transfer Mechanisms from a Collaborative Innovation Perspective [J]. Science and Technology Management Research, 2013(14): 20-23.
- [3] Yu Yizun, Yan Bogang, Zhu Shengwen. The Role of Local Research Institutes' Achievement Transformation Capacity in Regional Science and Technology Innovation Upgrading [J]. Jiangxi Science, 2014(2): 264-267.
- [4] Li Ning. Legal Environment and Intellectual Property Work in Research Institutes [J]. Studies in Science of Science, 1999(1): 43-50.
- [5] Mao Chenqian. Research on Problems in the Management of Scientific and Technological Achievement Transformation in Research Institutes [D]. Shanghai: Shanghai Jiao Tong University, 2013.

- [6] Liu Xiaogang, Zhao Yingwen. Discussion on Strengthening Intellectual Property Work in Agricultural Research Institutes—A Case Study of Sichuan Academy of Agricultural Sciences [J]. Agricultural Science and Technology Management, 2012(1): 30-34.
- [7] Jin Xiaogang, Zheng Huijun. Discussion on Key Aspects of Intellectual Property Management in Research Institutes [J]. Science and Technology Management Research, 2010(21): 164-166, 170.
- [8] Di Xiaoyan, Zhao Jie, Zhang Junjun. International Professional Models in Scientific and Technological Achievement Transformation—A Case Study of the Intellectual Property and Technology Transfer Center of Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences [J]. Science and Technology for Development, 2012(7): 55-61.
- [9] Lü Sumin. Research on the Path to Realizing Intellectual Property Value [D]. Tianjin: Tianjin University of Finance and Economics, 2011.
- [10] Zhang Tao, Du Wei. Strengthening Intellectual Property Management and Practicing Innovation-Driven Development [J]. Bulletin of the Chinese Academy of Sciences, 2014, 29(5): 568-574.
- [11] Zong Gang, Hu Xiaofang, Zhao Baohong. Exploring and Practicing Internationalized and Professional Intellectual Property Management and Technology Transfer—An Overview of Successful Cases of Intellectual Property Transfer by the Intellectual Property Center of Shanghai Institutes for Biological Sciences/Shanghai Shengzhihua Intellectual Property Service Co., Ltd. [J]. Scientific Management Research, 2011(6): 49-52.

Note: Figure translations are in progress. See original paper for figures.

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