Characteristics and Implications of Intellectual Property Information Services in Japanese Universities: Postprint

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Abstract

[Purpose/Significance] With the in-depth implementation of the national intellectual property strategy, Chinese universities have actively engaged in intellectual property information services. Japan, as an early successful implementer of the intellectual property powerhouse strategy in Asia, has established a comprehensive intellectual property information service system within its universities, offering full-process intellectual property information services throughout the lifecycle of scientific research achievements. Analyzing the practical characteristics of intellectual property information services in Japanese universities holds significant practical implications for enhancing the service level of intellectual property information in Chinese universities.

[Method/Process] This study selects six Japanese Designated National Universities as research subjects and employs literature review and website analysis methods to examine the characteristics of their intellectual property information service systems, content, and models.

[Results/Conclusion] Drawing on the features of intellectual property information services in Japanese universities, it is recommended that Chinese university intellectual property information service centers implement full-process intellectual property information services, emphasize pre-filing patent value assessment, promote collaborative construction and sharing of intellectual property data and tools, innovate service models integrating industry, academia, and government, and develop high-caliber service talent teams through mutual exchange and secondment mechanisms.

Full Text

Characteristics and Enlightenment of Intellectual Property Information Services in Japanese Universities

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Abstract

[Purpose/Significance] With the further implementation of the national intellectual property strategy, colleges and universities in China have actively developed intellectual property information services. Japan is the first country in Asia to successfully implement an intellectual property power strategy, having established a comprehensive intellectual property information service system within its universities that provides full-process services centered on the lifecycle of scientific research achievements. Analyzing the practical characteristics of intellectual property information services in Japanese universities holds important practical significance for improving the level of these services in Chinese universities. [Method/Process] This study selected six Japanese Designated National Universities as research objects, analyzing their intellectual property information service systems, content, and models through literature review and website visits. [Result/Conclusion] Drawing on the characteristics of Japanese university intellectual property information services, this paper proposes that Chinese university intellectual property information service centers should implement full-process services, attach importance to pre-application patent value assessment, promote the collaborative construction and sharing of intellectual property data and tools, innovate industry-academia-government joint service models, and build high-level service talent teams through exchange and secondment programs.

Keywords: intellectual property; information service; patent; Japan; university

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Introduction

In March 2019 and July 2020, the China National Intellectual Property Administration and the Ministry of Education established 60 university-based national intellectual property information service centers in two batches, making intellectual property information services an important transformation direction for university library services in China. At present, Chinese university intellectual property information services primarily focus on patent information services, with patent novelty searches, intellectual property intelligence analysis, and intellectual property literacy education as their main content, effectively promoting the improvement of universities' scientific research achievement creation

and innovation capabilities. However, overall, there remain issues such as weak service capabilities, limited social service functions, and low talent proficiency.

Current domestic research on the theme of "university intellectual property information services" mainly focuses on service content, service models, system construction, platform development, development strategies, and domestic-international comparisons. Research subjects have concentrated on the practices and development trends of intellectual property information services in Chinese, European, and American universities, with relatively few studies on Japan—an early successful implementer of intellectual property power strategies in Asia. In-depth analysis of university intellectual property information services, which play an important supporting role in Japan's intellectual property information service system, remains to be supplemented.

Japan, as an intellectual property powerhouse in Asia, shares certain similarities with China in its intellectual property management system. As a key component of the national intellectual property strategic layout, Japanese universities have established specialized technology transfer intermediary organizations under policy guidance such as the "University Technology Transfer Promotion Law," built a comprehensive intellectual property information service system, and carried out full-process intellectual property information services around the lifecycle of scientific research achievements, effectively promoting the annual increase in patent transformation rates. Analyzing and studying the characteristics of intellectual property information services in Japanese universities, particularly patent information services oriented toward technological innovation and achievement transformation, holds important practical significance for improving the level of intellectual property information services in Chinese universities, enhancing patent quality, and strengthening national scientific and technological innovation capabilities.

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1. The Role of Universities in Japan's National Intellectual Property Information Service System

1.1 Japan's National Intellectual Property Information Service System

In the early 21st century, Japan's strategy of building a nation through scientific and technological innovation shifted to building a nation through intellectual property. To ensure and promote this strategy, the Japanese Cabinet established an Intellectual Property Strategy Headquarters and implemented policy guidelines such as the "Intellectual Property Strategy Outline" and the "Intellectual Property Strategy Promotion Plan," forming a public intellectual property information service system composed of four parts: government, intellectual property information service providers, enterprises, and university/research institution associations.

In this system, the government serves as the service leader, primarily responsible for basic intellectual property information services including patent and trademark applications, examination, registration, and retrieval. Information service providers are service suppliers, offering multi-level commercial intellectual property information services to universities, enterprises, and industry associations. Universities, research institutions, industry associations, and enterprises are service supporters, providing professional resources, intelligence, and talent support for other members' intellectual property information services. Simultaneously, universities and enterprises are also service users, providing constructive feedback for the development of national intellectual property information services.

The various components of Japan's national intellectual property information service system have clear responsibilities and division of labor, with industry-academia-research-government mutually supporting and influencing each other (see Figure 1 [Figure 1: see original paper]). Under this system, non-profit basic information services and deep-level specialized commercial information services are carried out at different levels, enriching the content of intellectual property information services, improving service levels and quality, and promoting the healthy development of Japan's public intellectual property information services.

1.2 The Position and Functions of Universities in the System

Universities are a supporting component of Japan's national intellectual property information service system, possessing abundant scientific research resources and serving as an important driving force for national scientific and technological innovation. Since the implementation of the intellectual property-based nation strategy, the functionality of Japanese universities in the national intellectual property information service system has continuously strengthened, promoting the external utilization of innovation achievements.

According to the "Kyoto University Industry-Academia-Government Collaboration Policy," Japanese universities "serve as an important command tower function in the national intellectual property service system and the industry-academia-research collaborative innovation model" [22]. Relying on their own resources and talent advantages, universities provide effective support for the innovation activities of other members in the public service system. To better play this command tower role, various intellectual property-related departments within Japanese universities cooperate to jointly carry out intellectual property information services, undertaking the following functions: (1) formulating effective technological innovation support and development trend analysis for industry, government, and academia; (2) providing professional intellectual property strategic layout analysis and decision-making support for industry and government; and (3) promoting the transformation of university intellectual property through cooperation with external economic organizations.

2. Research on Intellectual Property Information Service Practices in Japanese Universities

This study initially selected 10 Japanese universities from the top 200 in the 2020 QS World University Rankings. By visiting their official and library websites, and considering their scientific research and innovation levels and intellectual property information service practices, six Japanese Designated National Universities designated by the Ministry of Education, Culture, Sports, Science and Technology were ultimately selected as the main research objects (see Table 1). Designated National Universities are members selected from national universities by the Japanese government to further improve their research and innovation capabilities, all ranking in the top 10 domestically in terms of research level, social cooperation, internationalization, and reputation.

Among the six surveyed universities, there are the Tokyo Institute of Technology specializing in engineering and natural sciences, as well as world-class research-oriented comprehensive universities such as the University of Tokyo, Kyoto University, and Nagoya University. This study primarily employed literature review and website visits to the portals and library webpages of these six universities to investigate the current status of intellectual property information services in Japanese universities. For cases where website information was insufficient, supplementary methods such as form consultation, email consultation, web search engines, and examination of patent office annual reports were used to complete the information. The investigation period was from December 2019 to October 2020. Through analyzing the practical characteristics of Japanese universities' intellectual property information services, this study aims to provide reference and guidance for the construction and development of these services in Chinese universities.

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3. Characteristics of Intellectual Property Information Services in Japanese Universities

3.1 A Comprehensive Intellectual Property Information Service System

A comprehensive intellectual property information service system is an important foundation and guarantee for universities to effectively carry out full-process intellectual property information services. All six universities surveyed have established standardized, multi-department collaborative intellectual property information service systems within their institutions. These systems generally consist of five components: the university's intellectual property department, research promotion department, library, industry-academia collaboration department, and Technology Licensing Organization (TLO), which jointly provide full-process information services for university research achievements from creation to operation. At the Tokyo Institute of Technology, this system also

collaborates with university management and legal departments to provide services such as intellectual property infringement litigation, offering corresponding policy and legal support for university intellectual property activities.

Based on this comprehensive information service system, every stage of the intellectual property achievement lifecycle—from creation to transformation—has corresponding departments providing intellectual property information support services. For example, prior-art investigations and key discipline technology tracking services are provided before major research project initiation; patent examination consultation and agency application, as well as intellectual property information resource management services, are offered during the patent application and maintenance phase; and in-depth services such as patent information analysis, patent competitive intelligence, and intellectual property asset management are provided during the patent transformation and operation stage. Additionally, the intellectual property department and library provide guidance and basic support services throughout the entire lifecycle of research achievements, such as formulating intellectual property development strategies, conducting professional training and public intellectual property literacy education, and providing free intellectual property information resource recommendations and access to both internal and external users by introducing various intellectual property resource databases and linking relevant external platforms.

3.2 Diversified Intellectual Property Information Service Content

Based on differences in technical content and service targets, full-process intellectual property information services in Japanese universities can be divided into four categories: (1) Basic intellectual property information services, such as patent consultation, patent information promotion, and training education provided by the intellectual property department, and services like public reading rooms, patent retrieval, and patent information and tool resources offered by the library. (2) Technical intellectual property information services, including technology novelty searches and research project initiation services conducted by the research promotion department, patent agency services provided by the intellectual property department, and services such as patent competitive intelligence, patent value assessment, and patent transfer and transformation carried out by technology transfer organizations and industry-academia collaboration departments. (3) Customized intellectual property services, such as intellectual property commercialization services, strategy formulation, and decision-making support under the industry-academia-government collaboration model. (4) Education and training services, including public intellectual property information literacy education and professional talent training programs.

3.3 A Characteristic "Integrated" Operation Mechanism

The diversified intellectual property information services in Japanese universities, particularly patent information services supporting scientific research achievement application and transformation, mainly benefit from their char-

acteristic integrated operation mechanism for scientific research achievement application and transformation. First, universities have established specialized TLOs with legal person status within their institutions. TLOs combine the functions of Chinese university intellectual property information service centers and patent agencies, responsible for promoting the transformation of basic research into industrial application research. To enable TLOs to better function within the service system, an integrated operation mechanism between TLOs and relevant functional departments has been established (see Figure 2 [Figure 2: see original paper]), organically connecting services carried out by different departments.

TLOs work with intellectual property departments to conduct major research project design, patent agency application, technology value and market demand assessment, achievement transfer, and intellectual property asset management. Simultaneously, TLOs share the function of promoting industry-academia collaboration with industry-academia collaboration departments, establishing an intellectual property information channel between universities and enterprises that connects the university's original technological achievements with enterprises' independent marketization needs, forming a virtuous cycle of technology achievement transformation into economic benefits.

In this integrated operation process, the pre-application value assessment conducted by TLOs during patent application and research project initiation is particularly noteworthy. TLOs submit invention/project initiation applications to external institutions and venture companies for assessment of their technical value, application scenarios, and market demand, with assessment results fed back to intellectual property departments and inventors in the form of opinion letters. Based on these results, inventions with technological application value are patented by TLOs, which then follow up on patent licensing marketing and implementation, while inventions with lower value are abandoned. Pre-application value assessment can filter out large numbers of low-quality, low-practicality patent applications during the initial invention stage, not only reducing the economic and human costs of applying for and maintaining low-quality patents but also helping to improve the quality and licensing rate of university patent applications. The increase in high-quality patents will also enhance the quantity and efficiency of achievement transformation implementation, preventing university research achievements from "sleeping."

Through integrated operation, the innovation needs of universities and enterprises are effectively and precisely matched. From 2018 to 2020, the University of Tokyo held nine joint innovation technology seminars with enterprises/industries, producing 1,428 joint research proposal topics covering multiple disciplinary fields including medicine, aviation, information, and culture, providing numerous research projects and innovative technologies to industry and society and effectively promoting regional innovation and socio-economic development.

3.4 An Industry-Academia-Government Bilateral Collaboration Service Model

Attaching great importance to the needs of external users such as enterprises and government and providing customized intellectual property information services constitute important content of current Japanese university intellectual property information services. All six surveyed Japanese Designated National Universities have established industry-academia joint intellectual property service models and established Industry-Academia Collaboration Promotion Departments (see Table 2). In October 2015, the University of Tokyo established its Industry-Academia Collaboration Promotion Department, which oversees the Innovation Promotion Department and Intellectual Property Department and is responsible for the development, application, registration, management, and external utilization of scientific research achievements within the university.

Each university uses its Industry-Academia Collaboration Promotion Department as the leading unit and important hub for industry-academia-government cooperation, organically connecting internal intellectual property departments, research promotion departments, technology achievement transfer departments with government, enterprises, and external institutions, forming an industry-academia-research collaborative innovation intellectual property public information service system (see Figure 3 [Figure 3: see original paper]).

Under this industry-academia-government joint service model, the intellectual property activities of universities and enterprises are bilaterally connected, with multi-party cooperation in intellectual property information services. Specifically: (1) Enterprises commission or jointly conduct major scientific research and innovation projects with universities, with universities providing research venues and intellectual property theory/technical resource support, and enterprises providing research funding. In 2019-2020, 92.41% of Japanese university research funding came from joint or commissioned research project revenues under the industry-academia-government collaboration model (see Figure 4 [Figure 4: see original paper]), forming a virtuous cycle of technology and economy. (2) Enterprises and external institutions provide technical talent and industrial resource support for university innovation projects, helping to smoothly transform university research achievements. Under this service model, the University of Tokyo has implemented an average of 1,600 joint research projects annually in recent years, generating over 200 venture companies such as the University of Tokyo Edge Capital (UTEC) and UTokyo Innovation Platform (UTokyoIPC) around the university, gradually forming a university-enterprise intellectual property ecosystem based on academia and oriented toward achievement transformation through measures such as promoting intellectual property management and reforming operation mechanisms.

The industry-academia-government collaborative innovation intellectual property information service model plays an important role in strengthening the social functions of university intellectual property information services. In this

model, government and enterprises are no longer merely users of intellectual property information services but also leaders and builders of these services, providing demand feedback and various resource support for university intellectual property information services. This user participation in university intellectual property information services ensures that service development is based on actual user needs, making service operations "well-targeted," ultimately promoting continuous improvement in service capabilities and creating more new technologies and products with social value by making intellectual property the core of industry-academia collaboration.

3.5 Data-Driven Intellectual Property Information Platforms

3.5.1 Integrating Database Resources to Fulfill Educational Functions of Intellectual Property Information Dissemination and Utilization Among the database resources of the six surveyed university libraries, all include some Japanese or other countries' intellectual property information databases that are freely accessible to the public. In the database resource list of the University of Tokyo's affiliated library, there are 12 databases covering intellectual property information resources, among which six databases including USPTO (United States Patent and Trademark Office Full-Text Database), J-PlatPat (Japan Intellectual Property Information Database), and Espacenet: Patent search are freely open to off-campus public users, while five international intellectual property information databases such as Derwent Innovations Index can be accessed by off-campus users after registration.

Furthermore, to solve problems encountered by the public in accessing and utilizing intellectual property information, Tohoku University, Kyoto University, and the University of Tokyo have established intellectual property knowledge columns on the homepages of their intellectual property departments or industry-academia promotion departments, integrating information resources such as internal patent achievements, innovation projects, and intellectual property policies. For example, Tohoku University's industry-academia collaboration department page has established "Intellectual Property Handbook" and "Intellectual Property" columns, integrating basic intellectual property knowledge in the form of electronic handbooks; Kyoto University's Intellectual Property Department homepage provides information consultation on common intellectual property issues in the form of "FAQ," including intellectual property knowledge, patent application procedures, and transformation and utilization examples; and the University of Tokyo's intellectual property department has opened an "Intellectual Property Basics" column, disseminating intellectual property-related information from four aspects: patents, trademarks, copyrights, and joint research.

3.5.2 Leveraging External Data Platforms to Form Intellectual Property Information Resource Sharing Networks By utilizing some open-access knowledge sharing platforms, Japanese universities have established intel-

lectual property information sharing networks. For example, on the JPCOAR knowledge platform, university libraries and the National Institute of Informatics in Japan have established cooperative relationships, enabling member university libraries and research institutions to share various types of research data including intellectual property information resources. As of October 13, 2020, 656 university libraries and research institutions, including the six Designated National Universities studied in this paper, have joined the JPCOAR knowledge sharing network [24]. Based on data sharing, universities no longer provide intellectual property information services singly or for fixed users but instead form an information service network with other members including research institutions, with advantageous resources in different fields, disciplines, and attributes being openly accessible within the network. Relying on such research data sharing platforms not only expands the fields and targets of university intellectual property information services but also helps achieve collaborative construction and sharing of innovative technologies and research achievements among universities.

3.6 Interchange and Secondment of Intellectual Property Information Service Personnel

Since 2002, the Japan Patent Office has launched a series of intellectual property advisor dispatch programs for universities, such as the "Intellectual Property Producer Dispatch Program," "Intellectual Property Strategic Designer Dispatch Program," and "Industry-Academia Collaboration Intellectual Property Expert Dispatch Program," dispatching intellectual property expert advisors to universities and research institutions to help establish specialized intellectual property information service talent systems, design intellectual property development strategies for universities, guide the construction of university intellectual property information management systems, deeply explore excellent scientific research achievements in universities, and enhance university scientific and technological innovation levels.

Simultaneously, to ensure the professional level and enhance the business capabilities of university intellectual property information services, universities such as the University of Tokyo, Kyoto University, and Tohoku University require applicants for intellectual property information service positions to have practical experience in universities, government, enterprises, and patent service agencies. According to statistics, Japanese universities established 177 industry-academia collaboration promotion departments in 2019-2020, with only 41% of staff in these departments previously employed by universities, while the majority came from external organizations such as public research institutions, enterprises, and government departments [23] (see Figure 5 [Figure 5: see original paper]).

In addition to introducing high-level talents with practical experience, Japanese universities also adopt talent secondment methods, establishing enterprise technology managers to provide technical management and guidance throughout the entire lifecycle of research achievements and assist in providing intellectual

property information consultation and other support services to achieve technological complementarity and high-quality achievement transfer. Relying on specialized and compound intellectual property information service talent teams ensures that various service contents throughout the entire process are undertaken by dedicated personnel. For example, the Tokyo Institute of Technology has established patent managers and technology transfer managers within its TLO to specialize in patent agency, operation, and practical application of intellectual property information services.

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4. Implications and Recommendations

Since the promulgation of the "Implementation Measures for the Construction of University Intellectual Property Information Service Centers" in December 2017, intellectual property information services have become an important driving force for promoting scientific and technological innovation and achievement transformation in Chinese universities. Learning from Japanese universities' advanced experience in providing full-process intellectual property information services around the lifecycle of research achievements can provide practically significant reference and guidance for the development of these services in Chinese universities.

4.1 Improving the Service System: Multi-Party Collaboration for Full-Process Intellectual Property Information Services

Currently, most Chinese university intellectual property information service centers rely on libraries, collaborating with research institutes, university technology transfer centers, and patent agencies to provide basic intellectual property information services, with some universities leveraging their advantageous resources to provide deep services such as patent layout and patent navigation [2]. However, overall, due to the interwoven business and scattered information resources among various intellectual property-related departments within universities, full-process intellectual property information services centered on the lifecycle of research achievements have not yet been realized.

Drawing on Japanese experience, Chinese university national intellectual property information service centers should build a comprehensive intellectual property information service system within their institutions, fully leveraging the central and hub role of the information service center in the system, establishing collaborative working mechanisms, and clearly defining the functional division of labor among various nodes in the system to ensure that each stage of the research achievement lifecycle has corresponding departments providing intellectual property information support services. For example, the intellectual property information service center could collaborate with technology transfer centers and patent agencies to provide customized information services for patent transformation and operation; rely on libraries to provide basic informa-

tion services such as patent consultation and patent information dissemination and utilization, as well as technical information services such as patent novelty searches and patent competitive intelligence; cooperate with research institutes to provide services such as research project initiation, prior-art investigations, and key discipline technology tracking; and collaborate with management and legal departments to provide corresponding policy and legal support for full-process intellectual property information services.

4.2 Expanding Service Content: Emphasizing Pre-Application Patent Value Assessment

In 2019, Chinese universities authorized a total of 184,934 patents, with 6,115 transferred through contracts, resulting in a university technology patent transformation rate of only 3.31% [25], while Japan's university patent achievement implementation transformation rate reached 31.35% in the same year [23]. The current situation of large quantities of university patent achievements with uneven quality and low transformation rates urgently needs improvement.

To address these issues, first, relevant functional departments such as the Ministry of Education and the National Intellectual Property Administration should strengthen macro-level guidance, highlight transformation and application orientation, and establish and continuously improve various policies and measures conducive to enhancing patent quality and strengthening transformation and utilization. Universities should be encouraged to innovate in scientific research achievements, emphasizing the important role of patent quality in researcher funding, rewards, and evaluation assessments. Second, universities should establish pre-application patent value assessment systems, construct scientific patent value assessment indicators, and develop university research achievement value identification models based on these indicators. The intellectual property information service center, technology transfer center, or patent agencies should assess the technical value, application scenarios, and market demand of invention applications. Through pre-application value assessment, universities can effectively screen high-quality, transformable patents, helping to improve both the quantity and quality of university patent licensing.

4.3 Expanding Service Functions: Innovating Industry-Academia-Government Joint Intellectual Property Information Service Models

Meeting the intellectual property information service needs of external organizations such as government and enterprises helps university libraries expand their service functions and promote regional economic development and industrial innovation [26]. Currently, some Chinese universities have launched public-oriented intellectual property information services and achieved certain results, but overall, most universities still lack the capacity to serve enterprises and society, with numerous issues in service resources and models.

Drawing on Japan's "industry-academia-government collaborative innovation"

intellectual property information service model, Chinese university library intellectual property information service centers should assume the command tower function of promoting industry-academia-government collaboration. Through university intellectual property information service centers, universities, government, social enterprises, and external research institutions can be closely integrated to ultimately form a university-industry intellectual property ecosystem oriented toward achievement transformation. In this system, universities are responsible for providing innovation activity practice venues, professional technical guidance, and embedded intellectual property information services such as strategic management and operation to government, social enterprises, and external research institutions, while government, enterprises, and external research institutions provide corresponding technical resources, personnel resources, data resources, and funding support for universities. The four parties are closely integrated to form a collaborative innovation intellectual property public service system with resource exchange and complementary advantages, strengthening the social functions of university intellectual property information services and orienting the creation of internal research achievements toward industrialization, providing continuous momentum for regional technological and economic development.

4.4 Enhancing Resource Support: Building Intellectual Property Data, Information, and Analysis Tool Sharing Platforms

Regarding resource and tool configuration, Chinese universities' existing patent resources mainly consist of primary commercial databases and free resources, with relatively insufficient patent analysis tools [27]. To address this situation, universities can build and optimize intellectual property data resource and analysis tool sharing platforms from three aspects: (1) Strengthen exchanges and cooperation with local intellectual property institutions at all levels, actively introduce free public patent information service platforms and databases, and trial and purchase appropriate resources and tools based on university circumstances. (2) Build university-specific patent databases to integrate and manage full-lifecycle data of internal achievements, embedding intellectual property information services into research management processes to enhance service value. (3) Drawing on Japanese university experience, rely on some open-access knowledge sharing platforms to share various types of research data and analysis tools including intellectual property information resources, establishing intellectual property information resource sharing networks among universities and research institutions. By leveraging different advantages among universities, the fields and targets of intellectual property information services can be expanded, further deepening service levels and achieving interconnectivity of intellectual property information services.

4.5 Optimizing Personnel Training Through Interchange: Building Multi-Level, Compound Service Teams

Currently, Chinese university intellectual property information service centers have initially established highly educated, multi-disciplinary talent teams with relatively high professional proficiency. To continuously improve the professional quality of information service personnel, universities have conducted numerous professional training programs with diverse forms and rich content [28]. In addition to independently cultivating specialized talent teams, Japanese universities' approach of widely absorbing social talents also offers certain reference value.

Chinese university intellectual property information service centers should emphasize both theory and practice. In addition to conducting layered training for service personnel through courses and lectures on campus, they can also actively introduce government talent programs and employ professionals with rich practical experience from the National Intellectual Property Administration, patent agencies, and intellectual property information service enterprises. Relying on the industry-academia-government collaborative service model, talent complementarity can be achieved through methods such as establishing enterprise technology managers on campus to ensure high-quality service talent reserves, promote the continuous professional development of intellectual property service personnel, enhance the professional level and practical capabilities of university intellectual property information services, and provide strong talent support for full-process intellectual property information services.

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