

Current Status of University Patent Information Services and Path Design for Supporting Scientific Research Management: Postprint

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Abstract

[Purpose/Significance] The transformation of research paradigms and technological innovation necessitate patent information services, which in turn must support research management. Based on this premise, we review the current status of patent information services in domestic universities and explore pathways for their support of research management. [Method/Process] Employing questionnaire surveys, literature research, and content analysis, we examine the support provided by patent information services in domestic universities for research management. [Result/Conclusion] Currently, universities face issues including neglected patent data management, imperfect patent management systems, and a lack of platforms for promoting transfer and transformation through patent information. It is recommended to improve through the following pathways: leveraging the functions of relevant departments, establishing university-specific patent databases, improving patent management systems, and constructing transfer and transformation platforms.

Full Text

Current Status and Path Design of Patent Information Services Supporting Scientific Research Management in Universities

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Abstract: [Purpose/Significance] The transformation of research paradigms and the need for technological innovation require patent information services,

which in turn need to support scientific research management. Based on this premise, this study examines the current status of patent information services in domestic universities and explores pathways for supporting research management. [Method/Process] Using questionnaire surveys, literature research, and content analysis, this paper investigates the support provided by university patent information services for research management. [Result/Conclusion] Currently, universities face issues such as neglected patent data management, unsound patent management systems, and lack of platforms for promoting technology transfer through patent information. Improvements are recommended through the following pathways: leveraging the functional roles of relevant departments, creating university-specific patent databases, improving patent management systems, and building technology transfer platforms.

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Patent information encompasses technical, legal, and economic information, playing a pivotal role in technological innovation activities, market competition, and strategic decision-making [1]. Patent information services constitute a collection of corresponding methods, predictions, and solutions provided for each stage throughout the entire patent lifecycle. In an era of rapid technological development and continuous innovation breakthroughs, it is essential not only to create more and better patents bearing technological innovation achievements but also to support patent creation and technological innovation activities with patent information services. As the main force in technological innovation, universities are hubs for scientific research activities and home bases for researchers and their teams. Timely provision of patent information services facilitates scientific research and provides more robust support for research management.

2. Related Research Progress

Current research on university patent information services both domestically and internationally primarily focuses on two aspects:

2.1 Building Service Systems Centered on Demand

Patents are crucial sources of technical information and primary drivers of innovation, capable of predicting and promoting technological development [4]. Patent information represents the most important information asset for every innovation group [5], yet it is often underutilized. Many researchers suffer from insufficient or untimely access to patent information, leading to inadequate grasp of cutting-edge technologies, failure to prevent difficulties encountered in technological innovation, and lack of appropriate research management strategies, ultimately affecting the value of technological innovation outcomes. Therefore, universities should assess the situation and rely on their technology offices to

comprehensively manage patent-related work, leveraging libraries' unique resource advantages to enhance the patent information service capabilities of relevant personnel (such as librarians) [6], extending their roles to “patent experts” [7]. Based on evolving times, they should understand new user needs, such as those for innovation and entrepreneurship education [8], collaborative innovation [9], and different stages of industrial technology innovation [10], integrating big data technology to build comprehensive and robust service systems in terms of service content, processes, and effectiveness [11].

In December 2017, the State Intellectual Property Office and the Ministry of Education jointly issued the “Implementation Measures for the Construction of University National Intellectual Property Information Service Centers” (hereinafter referred to as the “Implementation Measures”). Article 9 explicitly states that “universities are the main entities for applying to establish university national intellectual property information service centers” [2]. The “2018 China Patent Survey Report” indicates that among different types of patent holders, universities rank first in purchasing patent information services at 21.4% [3]. Thus, universities should more actively adapt to national strategic needs, take their own demands as the benchmark, comprehensively carry out and optimize their patent information services, and focus on service quality and content settings to provide stronger support for research management.

2.2 Strategies for Improving Patent Information Services

Patent application requirements demand that decision-makers research all aspects of applications [12], which places higher demands on patent information services. Service providers should cover all aspects of the patent lifecycle as much as possible, formulate relevant management methods and measures according to their actual situations, and provide relevant services to researchers. As innovation entities, universities are the preferred institutions for carrying out patent information services. The technology office should take the lead, with the university library providing “embedded” services [13], fully utilizing their rich resources and high-quality talent to embed throughout the entire research process, providing patent information services for faculty and students, and supporting scientific research activities and technological innovation development.

Multi-angle investigations of some universities both domestically and internationally reveal that universities can achieve sustainable development goals in the context of new research paradigms by improving and perfecting patent information services in the following aspects: conducting patent information-related training, strengthening the development of patent literature information [14]; promoting the construction of information platforms for effective interaction between academic research and market operations [15]; increasing the promotion of patent information services to obtain first-hand materials related to scientific research in a timely manner [16]; enhancing in-depth cooperation with decision-making services [17]; establishing and cultivating relevant talent teams while further strengthening inter-institutional cooperation [18].

Existing research shows that many universities have realized the importance and necessity of carrying out patent information services to support their research management and have actively responded to national calls to improve and enhance these services. However, the overall service implementation remains unsatisfactory. Scholars have proposed suggestions and reflections on building service systems from a demand perspective based on existing problems, and attempted to provide improvement strategies from the service itself. However, these approaches are relatively single-perspective, with applicable scenarios limited by specific angles, and the proposed directions mostly focus on the initial stages of the patent lifecycle, failing to fully consider all stages from a macro perspective, resulting in insufficiently in-depth recommendations.

Through questionnaire surveys, literature research, and content analysis, this study systematically examines the implementation of patent information services in domestic universities and comprehensively designs feasible pathways for these services to support research management throughout the entire patent lifecycle, aiming to fill gaps in existing research.

3. Questionnaire Survey on the Current Status of Patent Information Services in Universities

From April to November 2019, this study conducted a questionnaire survey of university technology management personnel and library management personnel, supplemented by literature research and content analysis methods, to understand the specific content and management of patent information services in domestic universities. A total of 449 questionnaires were distributed, with 415 valid questionnaires recovered, covering 93 undergraduate institutions nationwide. Among them, 82 institutions (88.17%) had established intellectual property information service centers, including the first batch of 23 university national intellectual property information service centers jointly recognized by the State Intellectual Property Office and the Ministry of Education.

3.1 Basic Situation

Patent information services are an important component of intellectual property information services. For universities, these services are mostly provided and managed by their intellectual property information service centers. The survey found that 79 centers (96.34%) are located in libraries, while only 3 (3.66%) are in other departments, indicating that libraries are the primary host institutions for intellectual property information service centers and play a pivotal role in providing corresponding services.

To make the service situation 梳理 d in this section more representative, this study extracted the 23 first-batch university national intellectual property information service centers (all affiliated with libraries) from the 82 surveyed centers. According to the specific work contents listed in Article 8 of the “Implementation Measures,” we 梳理 d their corresponding intellectual property information

service businesses and, after subdividing each business, displayed their service implementation status, with specific results shown in Table 1 .

Combined with the overall survey situation, the management and service positioning of university national intellectual property information service centers remain at a basic stage, specifically manifested in five aspects: 1) understanding development opportunities for library patent information services in the new era; 2) understanding the roles of various social patent information services; 3) building an information service framework supported by university libraries; 4) training professionals in the knowledge and skills required for service capabilities; and 5) obtaining effective support from relevant university departments and society.

Overall, all centers have gradually begun to provide services supporting internal research management and are actively building a four-layer content system comprising patent information literacy education, patent information retrieval and analysis services, embedded patent information services for research teams, and decision-support patent information services. However, they still lack clear and in-depth consideration of key and difficult areas such as high-value patent cultivation, intellectual property achievement transfer and transformation, university intellectual property asset management, and industrial technology innovation protection. The patent information services provided are relatively single and lack systematic approaches.

3.2 University Patent Data Management

Among the surveyed centers, most have neglected patent data management, lacking dedicated personnel to manage university patent data. Original and process data for patent applications, maintenance, and transformation are severely missing, making it difficult to provide services for university intellectual property management and support research management processes. Prominent contradictions include: 1) universities have large numbers of patent applications and granted patents but cannot screen high-quality, transferable patents in actual transformation; 2) they lack objective data or management process support based on the complexity of patents themselves; 3) no effective communication mechanism has been formed between inventors, managers, and transformation teams; and 4) awareness and capabilities for high-value patent cultivation among key researchers are weak.

Some schools have begun planning and strengthening related work for these weak links. For example, Harbin Institute of Technology has planned content related to patent applications and rights transfer; Peking University's Industrial Technology Research Institute and Technology Development Department have jointly implemented management for patent operations; Nankai University's Science and Technology Research and Development Department has clarified responsibilities for patent maintenance; and the University of Electronic Science and Technology's library has launched patent operation analysis services.

However, other universities mostly include patent protection and operation as part of information literacy education and lectures for faculty and students, without clarifying what specific work they will undertake. It is evident that most universities divide the patent lifecycle into fragments, failing to form a complete patent management system within their institutions, which increases the time cost for faculty and students to obtain patent-related information and reduces patent management efficiency.

Additionally, some universities have begun exploring the construction of their own patent databases to improve patent information service quality through high-quality intellectual property data management and platform construction, including Zhejiang University, East China University of Science and Technology, and South China Agricultural University. Most of these adopt patent databases for universities built by enterprises providing patent information services, such as Guangzhou Ourchem Information Consulting Co., Ltd. (hereinafter referred to as “Ourchem”). Such enterprises can establish service teams together with university intellectual property information service centers, ensure timely patent data updates based on their big data centers, implement basic management and indexing of university patent data, improve patent data quality, and combine high-quality customizable classification systems to generate intelligent analysis reports with automatic push capabilities according to service purposes, or provide targeted services for research groups, or serve important processes such as patent management and transfer and transformation, and even provide social technology output services.

3.3 Patent Management System

The patent management system should fully consider the four components of creation, utilization, protection, and management, optimizing full-process management throughout the entire lifecycle from creation to application, maintenance, and transformation, and integrating patent information services into every aspect of these four components. However, the survey found that the patent management systems of various centers are unsound, with five main problems: 1) Work in the creation and application stages is relatively concentrated, mainly providing patent information services including patent knowledge popularization education, retrieval, novelty search, early warning, and pre-application preparation (specific processes, objective basis), while subsequent work is weakened; 2) Work in the patent maintenance stage is generally valued but lacks corresponding patent information services or the services provided are insufficient to support this stage, typically manifested by the low proportion of effective patents to total applications, short patent maintenance periods, and large numbers of patents being abandoned after grant due to lack of effective evaluation and management; 3) The proportion of patents or high-value patents in technology transfer is extremely low; 4) Patent management is only integrated into research management using research management systems, lacking professionalism and operability with poor general application; and 5) There

is insufficient in-depth cooperation with decision-making services.

3.4 Patent Information Promotion of Transfer and Transformation

Patent transfer and transformation play a pivotal role in promoting deep integration of industry, academia, and research, and advancing the technological innovation system. However, current platform construction in universities is unsatisfactory, with serious deficiencies in platforms for promoting transfer and transformation through patent information. According to the survey, Zhejiang University has established a Technology Transfer Center that adheres to a scientific cooperation strategy suitable for its own development, aiming to optimize the layout of industry-academia-research cooperation and provide information support for promoting technology transfer and transformation, with relatively mature development. The university's website also features a "Technology Transfer" column, though its specific content is empty. Peking University has established technology transfer funds, allowing faculty and students to apply for financial support for technology transfer by completing required forms based on actual conditions, but provides no other services. Lanzhou University's website also has a "Patent Funding" column, and Article 10(3) of the "Lanzhou University Patent Management Measures" explicitly states that "to promote rapid patent technology transfer, invention patent maintenance fees within three years after grant shall be shared proportionally by the university, the inventor's department, and the inventor" [19], but no relevant transfer platform has been established. Tongji University has built a Science and Technology Achievement Transfer and Transformation Center with detailed workflows for faculty and students, but the content under the "Transformation Base" column is empty.

Based on the above and the overall survey situation, most universities have measures to promote industry-academia-research integration and technological innovation according to actual conditions, but the degree of specific work implementation is shallow, mostly in initial stages and immature. There is a general lack of construction of complete and professional transfer and transformation platforms or centers.

4. Pathways for University Patent Information Services to Support Research Management

By analyzing the current status and existing problems of patent information services in domestic universities, the authors believe that universities should start from the creation end, provide services to support transfer and transformation, and ultimately support their research management in all aspects. They should combine their own characteristics and advantages to explore sustainable development service models, focus on key points and attack difficulties, leverage the functional roles of relevant departments, integrate services throughout the entire patent lifecycle, cover the full scope of research-management-transformation-

industry, and actively explore and put into practice. According to actual research, Ourchem's integrated service model can provide good support for universities. This model essentially takes high-quality data management as the core, focuses on serving high-quality creation, emphasizes assisting in cultivating high-value patents as the key, and bases itself on service promotion and win-win development. It unites intellectual property management departments, transfer and transformation departments, faculty innovation departments, and intellectual property college education and training departments for information exchange and mutual support, establishing a patent information service system useful for supporting current university research management. The specific pathways are shown in Figure 1 [Figure 1: see original paper].

4.1 Leveraging the Positive Role of University Intellectual Property Information Service Centers

Most university intellectual property information service centers are established within libraries. In addition to rich patent and non-patent literature resources, libraries have excellent information service teams and are important platforms for universities to carry out patent information services. They should fully leverage the advantages of information centers, starting from project novelty searches to discover researchers' deep-level needs for patent information, providing full-process tracking services, improving patent application quality, assisting in high-value patent cultivation, and helping university technology offices improve data management details and flow directions. They should assist university asset management offices with objective bases for intangible asset evaluation of intellectual property, support the rapid industrialization of implementable patents, and effectively cooperate in talent training, intellectual property information literacy education for researchers, and "double first-class" discipline construction, forming a full-process service system from university innovation to achievement protection.

4.2 Creating University-Specific Patent Databases

Creating university-specific patent databases facilitates more centralized and effective management of university patents and enables faculty and students to timely grasp information about internal patent applications and grants (publicly available portions). This work can be undertaken by the intellectual property information service center (library), with basic responsibilities including: 1) Ensuring data comprehensiveness by integrating patent data from internal mergers, cooperative applications, collaborative innovation, and university-run institutions to form integrated thematic databases, collecting all patents historically applied for by the university (including all publicly available data from domestic and foreign applications and grants); 2) Data updating and processing. Universities can connect with relevant enterprise big data centers to ensure real-time data updates and rely on them for professional data processing to better support patent information retrieval and analysis and provide higher-quality

patent reports for users; 3) Patent indexing. Conduct effective indexing of university patents, gradually deepening processing from an information intelligence perspective to promote optimization of intellectual property achievements and improve transfer and transformation rates; 4) Data early warning and comparative analysis. Extract comparison objects from the established national university patent database to conduct comparative tracking between universities and between disciplines, providing users with more comprehensive early warning analysis. Libraries can develop corresponding templates and automatically generate patent analysis reports combined with manual interpretation.

4.3 Improving the Patent Management System

Promoted by the university technology office and other intellectual property authorities and assisted by the library, data interfaces should be established with various faculties, inventors, key disciplines, and key laboratories (internal data on university patent applications and examinations) and integrated with the full-process management system of the patent lifecycle to optimize unified data management mechanisms. The management system can be improved in seven aspects: 1) Integrated management. Establish an information system for full-process management of the university patent lifecycle, forming an integrated management mechanism for patent application-payment-maintenance-transformation; 2) Data quality and integration. Improve data quality throughout the entire patent lifecycle while emphasizing the integration of process data from patent applications, examination, and payments (also internal university data) to provide important content references for patent value judgment; 3) Patent classification and grading. Based on complete and perfect data, combined with existing universal system standards, build a personalized evaluation system and assessment mechanism suitable for the university's actual situation, ultimately forming a "patent classification and grading evaluation system" applicable to the university; 4) Information application. Use information technology to automatically realize patent value (quality) assessment and promote the university's intellectual property standard management through informatization; 5) Asset management. Connect with asset management through establishing patent accounts; 6) Patent indexing. Real-time follow-up of university intellectual property status, timely indexing of patents, promoting patent creation, and improving transfer and transformation rates; 7) Agency control. Implement unified management mechanisms for agencies, with the university conducting strict quality control to screen suitable agencies for faculty and students.

4.4 Building Transfer and Transformation Platforms

Patent transfer and transformation platforms can promote effective cultivation and mining of high-value patents, enable university patent data to serve university research management, improve the efficiency of intellectual property achievement transfer and transformation, and promote technological innovation development. The university technology office should provide necessary support

for transfer and transformation work, with the library assisting in establishing transfer and transformation centers and building platforms. First, strengthen publicity to raise awareness among faculty and students about the importance of patent transfer and transformation; second, facilitate convenient connection with relevant personnel when needed, and improve transfer and transformation efficiency through the platform. In building transfer and transformation platforms, universities should also pay special attention to patent transformation success rates. Therefore, patent transformation must be effectively combined with research projects (project teams, project achievements, etc.) to better promote transformation work. When building their transfer and transformation portal management systems, universities can adopt online effective display and offline advantage promotion methods to manage relevant patent information and implement necessary support.

Scientific research is entering a data-driven fourth paradigm. As one of the important strategic resources, patents play a role in promoting the improvement of national overall innovation levels and expanding influence. Timely mastery of patent information helps promote technological innovation activities. Universities gather a large number of technological innovation resources, have high-level technological innovation personnel, are the main venues for scientific research activities, and are important sources of research output. Universities should further emphasize effective patent applications and high-level patent information services, strengthen planning and design, leverage the roles of technology offices, libraries, and relevant enterprises, form a positive interaction between patent information services and research management, and better support research management and technological innovation. In this regard, some domestic university libraries have already carried out effective work, but overall there is still a long way to go and greater efforts are needed.

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Current Status and Design of Supporting Scientific Research Management Path Patent Information Service in Universities

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Abstract: [Purpose/significance] Scientific research paradigm shift and technological innovation require patent information service, and patent information

service needs to support scientific research management. Based on this, this paper sorts out the current situation of patent information service in domestic universities and explores its support path for scientific research management. [Method/process] By means of questionnaire survey, literature research and content analysis, this paper analyzes the support of patent information service for scientific research management in domestic universities. [Result/conclusion] At present, there are some problems in universities, such as the neglect of patent data management, the unsound patent management system and the lack of patent information to promote the transfer and transformation platform. The following paths are suggested for improvement: giving play to the functional role of relevant departments, creating the exclusive patent database of the university, improving the patent management system, and building the transfer and transformation platform.

Keywords: university; patent information; patent information service; research management

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

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