Constituent Elements and Enhancement Pathways of Competitiveness for Patent Information Services in University Libraries: Postprint

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Abstract

[Purpose/Significance] Developing patent information services constitutes one of the key directions for business transformation and development in contemporary university libraries. During this critical period when numerous university libraries have successively proposed prioritizing the development of patent information services, there exists an urgent need for empirical reference and theoretical guidance. [Method/Process] Employing methods including web-based investigation, literature review, and expert interviews, this study examines the primary practices and models adopted by domestic university libraries to enhance the competitiveness of their patent information services, encompassing: establishing specialized service departments, collaborating with external institutional resources, expanding service portfolios, etc. [Results/Conclusion] This paper proposes five constituent elements of competitiveness for university library patent information services: management competitiveness, information resource competitiveness, human resource competitiveness, service competitiveness, and brand competitiveness, validated through questionnaire surveys. Finally, it recommends that university libraries adopt a "step-by-step" strategic approach aligned with these competitiveness elements to systematically plan the enhancement of patent information service competitiveness.

Full Text

Preamble

Elements and Upgrade Path for the Competitiveness of Academic Library Patent Information Services

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Abstract

[**Purpose/Significance**] Conducting patent information services represents a key direction for business transformation and development in academic libraries. During this critical period when numerous academic libraries have proposed focusing on patent information services, there is an urgent need for empirical reference and theoretical guidance. [**Method/Process**] Using network surveys, literature reviews, and expert interviews, this paper investigates the primary practices and models adopted by domestic academic libraries to enhance their patent information service competitiveness, including establishing specialized service departments, cooperating with external institutional resources, and expanding service businesses. [**Result/Conclusion**] The paper proposes five major components of patent information service competitiveness for academic libraries: management competitiveness, information resources competitiveness, human resources competitiveness, service competitiveness, and brand competitiveness, validated through questionnaire surveys. Finally, it suggests that academic libraries should adopt a "step-by-step" path strategy aligned with these competitiveness elements to systematically plan and enhance their patent information service competitiveness.

Keywords: Academic Library; Patent Information Service; Competitiveness; Path
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Patent information services permeate nearly the entire process of scientific and technological innovation activities and play a vital role in enhancing innovation efficiency and industrial competitiveness. Currently, as China builds itself into an intellectual property powerhouse and vigorously implements an innovation-driven development strategy, economic structural transformation and upgrading have entered a critical phase. Chinese innovation entities and market players increasingly require patent service institutions to provide more personalized, professional, systematic, strategic, and large-scale patent information value-added services [1].

As an important component of China's patent information service institutions, academic libraries possess advantages in literature resources, human resources, and information services. Under the dual impetus of internal transformation needs and national policy guidance, domestic academic libraries have actively expanded patent information services in recent years, achieving certain social benefits. However, overall, patent information services in Chinese academic libraries remain in the initial and exploratory stages, primarily characterized by: single content, lack of standardization and systematization, significant limitations, and weak competitiveness [2-3]; insufficient practical efforts in applying patents to promote scientific and technological innovation, and inadequate actual effects in transforming patent information resources into real productive forces [4]. Encouragingly, patent information services in academic libraries

have shown promising development momentum, with the state introducing a series of supportive policies and an increasing number of academic libraries actively launching and expanding patent information services [5-6]. Under current circumstances, strengthening the innovation and development of patent information services has become an important indicator for evaluating the core competitiveness of academic libraries [7].

Combining network surveys, literature reviews, and expert interviews, this paper excavates and analyzes the primary practices and advanced experiences of domestic academic libraries in enhancing their patent information service competitiveness, conducting targeted research on competitiveness components and upgrade paths. The aim is to provide theoretical reference and practical guidance for domestic academic libraries to systematically strengthen their patent information service capacity building and competitiveness enhancement.

2. Enhancing Patent Information Service Competitiveness in Academic Libraries

To understand the various measures adopted by academic libraries to enhance patent information service competitiveness, from August to October 2017, the authors conducted investigations through website information and literature reviews, supplemented by individual expert interviews, focusing on over 60 academic libraries with experience and certain competitiveness in patent information services. The survey revealed that, in addition to strong comprehensive universities, more than 10 industry-characteristic universities also performed prominently, possessing unique advantages in serving industrial development. Service scopes varied according to university type and region. Universities in Guangdong and Jiangsu, due to pilot implementations of university intellectual property standardization, saw nearly 10 academic libraries launch intellectual property standardization services. Eight universities, having long-standing cooperation with the State Intellectual Property Office, developed certain advantages in resources and services after years of development. Most academic libraries have recently expanded this new business and are actively taking measures to develop patent information service capabilities: beyond conventional mechanisms, resource procurement, and talent recruitment, they have established specialized service departments, cooperated with external institutional resources, expanded service targets, broadened service scopes, secured talent and institutional qualifications, conducted academic research, and organized various academic activities. These measures have not only rapidly enhanced the patent information service competitiveness of some academic libraries but also provided valuable experience and important support for exploring competitiveness components.

2.1 Establishing Specialized Service Departments

To concentrate library resources and better expand patent information services, some academic libraries have established specialized departments or created

dedicated positions. As one of Jiangsu Province's academic library bases for patent information dissemination and utilization, Nanjing Tech University Library specifically established an "Innovation Support Center" responsible for base construction and various intellectual property information services both on and off campus. Jiangsu University Library established "Zhenjiang Yibaite Science and Technology Information Service Company" in December 2009; in 2013, it integrated resources from this company and the university's technology transfer center to establish Jiangsu Huizhi Intellectual Property Service Co., Ltd., providing intellectual property and patent information services, enterprise information customization, patent cultivation and operation services for universities and enterprises. At the end of 2017, Tongji University Library restructured its organization into four centers, with its Intelligence Services and Research Support Center specifically housing a Department of Discipline and Intellectual Property Services. Peking University Library actively provides patent services for faculty and graduate students as an important service supporting research, with dedicated patent and intellectual property service specialists responsible for overall planning and service implementation [8-9].

2.2 Cooperating with External Institutional Resources

As academic library patent information services remain in the initial stage overall, cooperation with other institutions for literature resource sharing and complementary resource formation is needed to accelerate capability enhancement. Some industry-characteristic academic libraries, rich in resources within specific domestic industrial fields, have cooperated with the State Intellectual Property Office to become national-level intellectual property information service departments. Jingdezhen Ceramic Institute Library and Northeast Forestry University Library were approved in 2006 and 2009 respectively by the State Intellectual Property Office as the China Ceramic Intellectual Property Information Center and China Forestry Intellectual Property Information Center, receiving relevant resource support from the State Intellectual Property Office. Some qualified universities have also become national intellectual property training bases or remote education branch stations. Nanjing Tech University Library hosts the National Intellectual Property Training (Jiangsu) Base Patent Data Center and Patent Information Service Center; Northeast Forestry University Library houses the National Intellectual Property Training (Heilongjiang) Base and the "China Intellectual Property Remote Education Harbin Institute of Technology Branch Station," where faculty and students can freely utilize the State Intellectual Property Office's teaching platform—the China Intellectual Property Remote Education Platform. Additionally, some academic libraries actively cooperate with local intellectual property departments and patent service agencies. Shanghai Maritime University Library cooperated with the Pudong New Area Intellectual Property Office to establish the "Pudong New Area Intellectual Property Office Shanghai Maritime University Workstation," sharing resources to jointly serve universities and industrial development in the Lingang area. In May 2017, Xinjiang Shihezi University Library signed a technical cooperation

agreement with Beijing Hexiang Huizhi Technology Co., Ltd. on "Patent Early Warning Analysis" to further enhance library business capabilities. In October 2017, Chongqing University Library discussed with the Chongqing Intellectual Property Office plans for establishing a Chongqing Intellectual Property Office University Patent Information Service Sub-center.

2.3 Expanding Service Targets

Beyond serving their own universities, libraries should further open to society, serving local industrial development and economic construction [10]. In recent years, as academic libraries' patent information service capabilities have improved, service targets have gradually expanded to government decision-making departments and industrial/enterprise users. Sichuan University Library's patent industry technology analysis services help university and government researchers conduct forward-looking thinking [11]; Tianjin University Library closely integrates market demands to provide enterprises with specialized docking services including novelty searches, patent legal status retrieval, intellectual property guidance and consultation, and thematic intellectual property training [3]; South China Agricultural University Library focuses on developing agricultural characteristics and advantages, conducting patent early warning report analysis for the bio-pesticide industry [12]; Nanjing Tech University Library conducts patent retrieval and analysis, patent strategy formulation for enterprises in a high-tech industrial park, and jointly developed an OLED patent information navigation database with the Advanced Materials Research Institute to promote university teaching, research, and industrial innovation [13]; Tongji University Library actively conducts product and industry market analysis, providing patent analysis services for enterprises to help them understand major competitors and technology layouts and clarify their own technological competitive position [14].

2.4 Expanding Service Scope

Surveys by Shen Chunhua [5], Liu Hongguang [15], Liu Yang [16] and others indicate that academic library patent information services have traditionally concentrated on patent novelty searches, reader training, and patent retrieval. However, statistics from Yangzhou University Library in May 2017 on 115 academic libraries offering patent information services show that service content has expanded to patent information analysis, intellectual property strategy, intellectual property standardization, patent early warning, patent value assessment, and patent rights protection [6]. Yangzhou University Library planned and formulated patent service processes based on different needs and characteristics of patent services at different stages of the research process, providing multiple patent service projects including patent novelty searches and patent assessments for the research process [17]; Jingdezhen Ceramic Institute Library provides patent information analysis and early warning, patent navigation, thematic patent database construction, enterprise and industry intellectual prop-

erty strategy research, and enterprise intellectual property management standardization consultation services for the national ceramic industry and various industries in Jiangxi Province; Nanjing Tech University Library adopts an embedded patent information service model, providing researchers with patent early warning and macro/micro patent technology analysis [18].

Furthermore, promoting patent navigation for industrial development and the intellectual property review system for major economic activities are important measures for implementing the national intellectual property powerhouse strategy with broad development prospects [19]. The state has established the first national patent navigation project (university) research and promotion center to promote the establishment of university patent navigation science and technology innovation decision-making mechanisms and cultivate university patent navigation service workstations [20]. Libraries at South China University of Technology, Fuzhou University, Hunan University, and East China University of Science and Technology have successively launched industry patent navigation and intellectual property review services. Academic library patent information services have gradually moved beyond traditional single-service models toward personalized, in-depth business services.

2.5 Securing Institutional and Personnel Qualifications

Traditional advantages for market-oriented patent information services have concentrated in scientific and technological intelligence institutions and social patent information service agencies. For academic libraries to enter the market and serve enterprises, they must obtain certain qualification certifications based on their own strengths to establish institutional service images. Jingdezhen Ceramic Institute's China Ceramic Intellectual Property Information Center was approved by the State Intellectual Property Office as early as 2006, subsequently becoming one of the first batch of "Intellectual Property Service Brand Institutions" nationwide and a "National SME Public Service Demonstration Platform" certified by the Ministry of Industry and Information Technology; Northeast Forestry University Library is the China Forestry Intellectual Property Information Center, National Intellectual Property Training (Heilongjiang) Base, and China Intellectual Property Remote Education Northeast Forestry University Branch Station. To strengthen basic public service capabilities for the public and innovation entities, including patent literature support, patent information consultation, and public education, the State Intellectual Property Office designated 120 units as national patent literature service outlets, with academic libraries accounting for approximately one-third [21]; some academic libraries actively joined provincial and municipal special construction projects, such as Guangdong Provincial Intellectual Property Office's "Academic Library Patent Information Service Capacity Enhancement Plan" project and Jiangsu Province's academic library patent information dissemination and utilization base construction project, rapidly enriching their patent information data resources and tools, strengthening patent information services, and enhancing

talent cultivation under government and relevant authorities' support. Table 1 lists some institutional qualifications and selected academic libraries.

Table 1 Partial List of Patent Information Service Institutional Qualifications and Selected Academic Libraries

Qualification Name	Selected Academic Libraries (Partial)
National Patent Literature Service Outlets	Nearly 40 universities including Peking University, Shanghai Jiao Tong University, Shanghai Maritime University, Zhejiang University, South China University of Technology, Sun Yat-sen University, China University of Mining and Technology, Yangzhou University, Tianjin University, Harbin Institute of Technology, Jingdezhen Ceramic Institute, University of Science and Technology of China, Fuzhou University, Zhengzhou University, Henan University, Huazhong University of Science and Technology, Central South University, Guangxi University, University of Electronic Science and Technology, Xinjiang University, etc.
2017 Jiangsu Province Academic Library Patent Information Dissemination and Utilization Base	12 universities including Southeast University, China University of Mining and Technology, China Pharmaceutical University, Nanjing University, Nanjing University of Science and Technology, Soochow University, Nanjing Tech University, Jiangsu University, Nanjing University of Aeronautics and Astronautics, Hohai University, Changzhou University, Nanjing Agricultural University, etc.
Guangdong Province Academic Library Patent Information Service Capacity Enhancement Plan Project	7 universities including Sun Yat-sen University, Jinan University, South China University of Technology, Guangdong University of Technology, South China Agricultural University, Guangdong Pharmaceutical University, Guangdong Polytechnic Normal University, etc.

Information source: Compiled from State Intellectual Property Office, Jiangsu Provincial Patent Information Service Center, and Guangdong Provincial Intellectual Property Office website information

Regarding personnel qualifications, the State Intellectual Property Office conducted multiple nationwide batches of national patent information leading talent and teaching talent certifications from 2012-2015, recognizing a total of 105 leading talents and 296 teaching talents; in 2016-2017, 941 individuals were certified as national patent information practical talents, with dozens from academic

libraries. Currently, a few strong libraries already possess leading talents, teaching talents, and practical talents simultaneously (see Table 2). Some academic libraries also actively support librarians in learning patent and legal knowledge and encourage them to pass the national patent agent qualification examination. Additionally, to support the cultivation of patent information service talents at provincial and municipal levels, Jiangsu Province has conducted annual selection and certification of provincial intellectual property leading and backbone talents for many years, providing strong support for academic libraries to secure personnel qualifications.

Table 2 Partial List of Patent Information Service Personnel Qualifications and Selected Individuals (Academic Libraries)

Qualification Name	Selected Individuals (Academic Libraries)
National Patent Information Leading Talent	3 individuals including Yan Chungen (Jingdezhen Ceramic Institute Library), Zhang Jianhua (Shihezi University Library), Li Haiying (Northeast Forestry University)
National Patent Information Teaching Talent	6 individuals including Luo Xiaoning (Jingdezhen Ceramic Institute Library), Bao Zhi! (Nanjing Tech University Library), Zheng Yuanyuan (Shihezi University Library), Zheng Meiyu (Fujian Agriculture and Forestry University Library), Liu Changwei (South China Agricultural University Library), Song Tianhua (Harbin Institute of Technology Library)
National Patent Information Practical Talent	Over 30 individuals including Liu Minrong, Huang Rikun, Guo Yanqiu, Wu Yaping, Yu Haidong, Liu Yanqiu, Rui Xue, Dai Xuedong, Fu Xinjin, Gao Jian, Mutelip Mamut, Shao Yuan, Turgun Niyaz Tursun, Yu Jing, Zayida Musa, Chen Qianli, Zhang Yu, Chen Yaxue, Lai Yi, Wang Qian, Chen Weili, Luo Chunrong, Wang Xiuhong, Yan Hui, Sun Zhumei, Huang Jidong, Wang Xingwang, Lu Yikai, Shi Liang, Zhang Shanjie, Yang Mei, Zhang Yang, Wang Ling, Yu Minjie, etc., from over 20 units including Xinjiang University Library (6 individuals), Shanghai Maritime University Library (3 individuals), Jingdezhen Ceramic Institute Library (2 individuals)

Information source: Compiled from State Intellectual Property Office website information

2.6 Conducting Academic Research

Conducting academic research and promoting team research capabilities through project-based research is also an effective way to enhance patent information service capacity and quality. Academic libraries also actively encourage and support service librarians to apply for various research projects, with some libraries already obtaining national, provincial, and municipal-level projects, using project research as a lever to promote team building (see Table 3). Securing high-level research projects in the field of patent information utilization or services indicates that these academic libraries have accumulated certain foundational capabilities.

Table 3 Partial List of Research Projects on Patent Information Utilization/Services Undertaken by Academic Libraries

Library	Project Title	Project Number	Funding Agency
Tianjin University Library	Citation Analysis Between Chinese Patent Literature and World Scientific Papers	11BTQ022	National Planning Office of Philosophy and Social Science
Tongji University Library	Research on Demand and Capability-Oriented University Library Patent Intelligence Service Mechanism	15BTQ027	National Planning Office of Philosophy and Social Science
Shandong University of Technology Library	Research on Deep Embedding of University Libraries in Patent Operation	16BTQ029	National Planning Office of Philosophy and Social Science
Shanghai Maritime University Library	Research on the Construction of Academic Library Patent Service System for Full-Process Industrial Technology Innovation	17BTQ058	National Planning Office of Philosophy and Social Science

Library	Project Title	Project Number	Funding Agency
Nanjing Tech University Library	Research on Multi-Dimensional and Multi-Level Patent Text Mining Supporting Innovative Design in the Big Data Era	17BTQ059	National Planning Office of Philosophy and Social Science
Northeast Forestry University Library	Biomass Energy Patent Strategy Promotion Engineering Project	PS2011-008	State Intellectual Property Office
Tianjin University Library	Environmental Protection Equipment Patent Analysis and Early Warning	TJTQ11-020	Tianjin Social Science Planning Office
Zhejiang University of Technology Library	Research on Patent Operation Models in Higher Education Institutions	GDIP2015-G11	Guangdong Provincial Intellectual Property Office
South China Agricultural University Library	Research on University Library Patent Intelligence Service Mechanisms and Paths	2013-IP-07	Guangdong Provincial Intellectual Property Office
South China University of Technology Library	Research on Patent Information Services for Provincial Collaborative Innovation Centers	Ztx2013A-11	Zhejiang Library Society

Library	Project Title	Project Number	Funding Agency
Harbin Institute of Technology Library	Construction of Market Competition Environment University Library Patent Information Service Models	2015-B-041	Heilongjiang Provincial University Library Work Committee

Information source: Compiled from National Planning Office of Philosophy and Social Science, CNKI, and selected academic library websites

2.7 Organizing Various Academic Activities

Organizing academic seminars or training courses symbolizes academic libraries' ability to integrate internal and external resources and mobilize multi-party resources, representing an important measure to expand social influence. Academic libraries also regard this as a way to enhance and demonstrate their own capabilities and serve industry development. Tongji University Library hosted the "First National Academic Library Patent Information Analysis and Service Seminar," Jingdezhen Ceramic Institute Library has hosted the "National Ceramic Industry Intellectual Property Practice Training Course" and "National University Patent Information Analysis Practice Seminar" for consecutive years and hosted the "University Patent Information Service Work Seminar," Nanjing Tech University Library co-hosted the "Jiangsu Province Academic Library Patent Information Dissemination and Utilization Work Seminar," Shanghai Maritime University Library hosted the "Lingang Area Intellectual Property Service Publicity Week Series" and hosted the "Pudong New Area Intellectual Property Review Talent Advanced Training Course," and Tsinghua University Library, Peking University Library, Jinan University Library, Jilin University Library, and Guangxi University Library have respectively cooperated with Guangzhou Aokai Information Consulting Co., Ltd. to hold patent information retrieval and analysis training courses for academic libraries.

3. Components of Academic Library Patent Information Service Competitiveness

3.1 Theoretical Basis and Concept

The core competitiveness theory was proposed in 1990 by American management professor C.K. Prahalad and British strategic management professor Hamel Garg in the *Harvard Business Review* as a theory regarding enterprise competitive, survival, and development capabilities. Subsequently, Chinese scholars

rapidly conducted research on library core competitiveness from different perspectives, gradually achieving localization of core competitiveness in the library field [22]. Industry research on library core competitiveness mainly includes three perspectives: resource view, service view, and management view [23]. Currently, library development models are transitioning from resource-driven to service-dominated [24], making the service view more prominent, namely knowledge services and information services.

Academic library core competitiveness has dynamic migratory characteristics. The core competitiveness of an academic library must adapt to the organization's environment. When the environment undergoes significant changes, academic libraries must update their original knowledge and technology and reintegrate to form new core competitiveness [22]. Previously, academic libraries' knowledge service capabilities were mainly reflected in subject librarians' disciplinary service capabilities. Today, as patent information services are becoming an important expanded business for academic libraries, patent information service capability will become a new component of academic libraries' core competitiveness.

Combining analysis of academic library patent information service business and status, and integrating concepts related to library core competitiveness [25], the authors propose that academic library patent information service competitiveness refers to the capability that academic libraries strive to cultivate and develop, enabling them to maintain unique advantages in the patent information service field, discover, acquire, integrate, and utilize various patent information and technological resources to maximally satisfy users' patent information service needs.

3.2 Component Design

Based on the aforementioned investigation, drawing on existing research results regarding library core competitiveness [26], and combining with Shanghai Maritime University Library's patent information service construction focus in recent years, the authors propose that academic library patent information service competitiveness components include management competitiveness, information resources competitiveness, human resources competitiveness, service competitiveness, and brand competitiveness, as shown in Table 4 .

Table 4 Components of Academic Library Patent Information Service Competitiveness

Component	Secondary Indicators
Management Competitiveness	Development goals, strategic positioning; Resource guarantee mechanism, talent cultivation mechanism, performance evaluation mechanism, incentive mechanism; Specialized department, specialized position

Component	Secondary Indicators
Information Resources Competitiveness	Literature information resources; Commercial databases, self-built thematic patent databases; Free analysis tools, commercial analysis tools; Government departments, library and information institutions, commercial intellectual property service institutions
Human Resources Competitiveness	Business expertise capability; Patent retrieval and analysis capability, legal knowledge, professional disciplinary knowledge, academic research capability; Learning capability, innovation capability, coordination capability, communication capability; Team composition and scale; Number of personnel, educational background, professional background, title hierarchy
Service Competitiveness	Service philosophy; Proactive service, personalized customized service; Service target scope; Government, universities, enterprises, research institutes; Service business scope; Patent retrieval, patent novelty search, patent training, patent early warning, patent strategy, patent evaluation, patent navigation, patent transfer and transformation, intellectual property analysis and review; Service time cycle; Regular (annual, monthly, etc.), irregular (urgent); Service technology and means; Online, offline; Quality control process, user satisfaction
Brand Competitiveness	Institutional qualifications and honors; National, provincial, other; Personnel qualifications and honors; National, provincial, other

(1) Management Competitiveness. Management competitiveness is reflected in academic libraries' ability to leverage various resources to achieve patent information service goals based on their strategic positioning and service mission. It serves as the action guide and institutional guarantee for enhancing patent information service competitiveness and constitutes an important element for evaluating management levels. Academic libraries should construct comprehensive incentive mechanisms, performance evaluation mechanisms, resource guarantee mechanisms, and talent cultivation mechanisms based on their positioning and service mission, attach importance to patent information service development, establish specialized patent information service departments, mobilize librarians' enthusiasm, stimulate creativity, and optimize operational mechanisms to effectively guarantee business innovation and sustainable devel-

opment of patent information services.

(2) Information Resources Competitiveness. Academic libraries' patent information resources competitiveness refers to possessing competitive patent literature information resources and data analysis tools. With patent literature analyses often involving thousands or even tens of thousands of documents, possessing professional patent analysis tools for efficient analysis becomes particularly important and constitutes a basic condition for academic libraries to conduct in-depth patent information services [27]. Simultaneously, cooperating with government departments, library and information institutions, and commercial patent information service institutions to develop resources through joint construction and sharing also reflects academic libraries' patent information resources competitiveness.

(3) Human Resources Competitiveness. Human resources are the most "dynamic" resources in academic libraries and key factors in forming library core competitiveness [26]. Beyond necessary business comprehensive capabilities, librarians engaged in patent information services must master legal knowledge related to patents, corresponding industry field background knowledge, patent database retrieval methods, patent analysis tool usage methods, and high-level research and analysis capabilities. The capabilities of patent information service librarians directly affect service quality, while service team scale and reasonable hierarchy will determine the institution's long-term development and scale effects.

(4) Service Competitiveness. Service is key to whether libraries' core values can be enhanced, with the ultimate goal of satisfying user needs. Academic libraries' patent information service competitiveness depends on whether service philosophy is advanced, service targets are clear, service technologies and means are scientific and advanced, and whether service scope, time cycles, and service quality meet user needs. Whether academic libraries possess sufficient service competitiveness to respond to market demand changes will directly affect the development of patent information services.

(5) Brand Competitiveness. Brand competitiveness encompasses academic libraries' comprehensive advantages in information resources, human resources, services, and management in the patent information service field. It forms the driving force source for achieving sustainable development of academic library patent information services and helps promote patent information services into a virtuous cycle development stage, specifically reflected in qualifications and honors obtained from the State Intellectual Property Office, Ministry of Education, provincial and municipal intellectual property offices, and industry organizations, as well as personnel qualifications and honors. The formation of brand competitiveness directly relates to whether academic libraries can secure more external resources, expand service targets, and increase social influence.

3.3 Theoretical Validation

To verify the scientificity and rationality of the academic library patent information service competitiveness components, questionnaire surveys were distributed to academic library personnel for validation. Questionnaire design was based on relevant literature research, extensive preliminary investigation, and expert recommendations to form measurement items. Distribution targeted primarily academic library leaders and staff, using direct WeChat push to individuals and invitations within professional WeChat groups to maximize survey data quality and credibility. This survey was conducted from June 7-13, with 178 questionnaires returned, excluding 19 from non-academic library personnel, resulting in 159 valid questionnaires. Among valid respondents, participants came from 25 provinces and municipalities, with higher participation from Shanghai (50), Jiangsu (20), and Beijing (10). Approximately 60% of respondents were from 985 universities, 211 universities, and Double First-Class university libraries. In terms of position distribution: 15 library leaders, 59 department heads, and 85 business backbone/frontline service personnel. In terms of title distribution: 22 senior titles, 56 associate senior titles, 64 intermediate titles, and 17 junior titles, with senior title personnel accounting for 49.1%. This indicates broad respondent distribution with extensive library work experience, ensuring questionnaire quality. Additionally, SPSS 23.0 software was used for reliability analysis of the 159 questionnaire variables, yielding a Cronbach's α value of 0.951, confirming good questionnaire reliability.

Survey results showed that 91.8% of respondents agreed that academic library patent information service competitiveness mainly consists of five components: management competitiveness, information resources competitiveness, human resources competitiveness, service competitiveness, and brand competitiveness. Recognition rates for secondary indicators under each of the five components were 92.5%, 91.2%, 93.1%, 92.5%, and 91.8% respectively. The five indicators of institutional mechanisms, analysis tools, business expertise capability, service technology and means, and institutional qualifications ranked first among secondary indicators under their respective components. Among the 22 respondents with senior titles, recognition of indicator content settings was higher than the overall situation, with only one respondent expressing disagreement with the five-component setting, and only 2, 1, 1, 1, and 1 respondents respectively expressing disagreement with secondary indicators under the five components. This demonstrates the rationality of the competitiveness component design.

4. Paths for Enhancing Academic Library Patent Information Service Competitiveness

The strength of academic library patent information service competitiveness will directly affect academic libraries' value and status. Although developing patent information services has become a national strategic demand and an important direction for library transformation, academic library patent informa-

tion services remain concentrated in traditional services such as patent novelty searches, reader training, and patent retrieval, with significant limitations and weak competitiveness. While obvious progress has been made in business expansion in recent years, covering patent information analysis, intellectual property strategy, intellectual property standardization, patent early warning, patent value assessment, and patent rights protection, investigations show that most academic libraries' practices for enhancing patent information service competitiveness lack systematic planning and theoretical grounding. Therefore, in the process of enhancing patent information service capacity and competitiveness, academic libraries should avoid blind imitation and cannot expect overnight success. They require systematic planning, benchmarking against competitiveness components, identifying entry points, making multi-faceted efforts, and adopting a "step-by-step" construction path, as shown in Figure 1 [Figure 1: see original paper].

Figure 1 Path for Enhancing Academic Library Patent Information Service Competitiveness

4.1 Planning and Preparation Phase (Phase I)

Before launching patent information services, academic libraries should first secure attention and support from university leadership and relevant authorities, 争取 ing conditions and removing obstacles for library patent information services. They should then comprehensively consider library resources, service status, future development goals, user characteristics, and user needs to determine desired outcomes, business scope, and target users for patent information services, thereby scientifically planning patent information services in a planned and targeted manner. Second, surrounding patent information service goals and positioning, they should establish a set of institutional mechanisms to guarantee effective business development, including quality assurance mechanisms, personnel training mechanisms, and incentive mechanisms. Finally, they should recommend reorganizing or optimizing existing business departments, or establishing specialized departments and dedicated positions to concentrate patent information service advantages. The newly released *Implementation Measures for the Construction of University Intellectual Property Information Service Centers* states that universities should establish intellectual property information service centers to conduct intellectual property information services and talent cultivation [24]. It is recommended that qualified universities actively strive to establish intellectual property information service centers and compile three-year or five-year development plans for university intellectual property information service centers, using policies and plans to guide the orderly construction and rapid development of academic library patent information services. The quality of planning and preparation work in Phase I, including goal positioning and institutional mechanisms, directly determines the construction of Phase II and how far and how high patent information services can reach.

4.2 Comprehensive Construction and Enhancement Phase (Phase II)

Phase II for enhancing patent information service competitiveness is the comprehensive construction and enhancement phase, including improvements in information resources, human resources, and service competitiveness, representing the critical link for achieving patent information service goals.

Information Resources Competitiveness Enhancement. The more patent literature information resources in the collection, the more advanced patent analysis tools possessed, and the more other shared resources accessible, the more important conditions are provided for conducting patent information services and the more conducive to gaining user trust. Academic libraries should purchase or obtain through resource sharing some patent databases and analysis software necessary for patent information services based on their own conditions.

Human Resources Competitiveness Enhancement. Academic libraries must emphasize both external recruitment and internal training to build service teams. They should enhance patent information service librarians' professional capabilities in patent retrieval and analysis, data analysis, legal knowledge, and professional disciplinary knowledge through training participation, encourage and support project applications and paper writing to improve learning innovation and academic research capabilities, and strengthen coordination and communication skills. Simultaneously, they should strive to form a service team of 8-10 or more members considering professional background, education level, age, and title factors. A service team with certain scale and outstanding professional capabilities is the most critical factor for providing more high-level services and products.

Service Competitiveness Enhancement. Academic libraries should establish a user demand-centered service philosophy, genuinely conducting patent information services from user perspectives and needs; clarify service user scope, expanding to social user groups if conditions permit, not only serving university decision-makers, researchers, and students but also expanding service scope and influence; adopt "Internet +" and new media technical means to shorten user waiting time, conduct patent information services efficiently, and enhance service satisfaction; furthermore, continuously expand businesses (such as patent analysis review, patent early warning, patent navigation, etc.) and strengthen quality control. Establishing WeChat communication groups involving users, service personnel, and consulting experts can enable users to promptly propose needs, service personnel to timely decompose and implement needs, and consulting experts to provide timely guidance, improving demand understanding accuracy and ensuring service quality and efficiency through timely and repeated communication.

4.3 Brand Formation Phase (Phase III)

Phase III is not only the effectiveness testing of Phase I and Phase II construction content and the business brand formation stage but also the starting point

for the entire patent information service competitiveness enhancement system's continuous cyclic construction. Through the planning and construction of the first two phases, academic libraries have formed systematic development plans in the patent information service field, accumulated certain practical experience, cultivated a group of patent information service talents, and generated certain influence. On this basis, they basically possess the conditions to secure qualifications and honors from the State Intellectual Property Office, Ministry of Education, relevant provincial and municipal authorities, and industry associations. Securing relevant qualifications and honors provides comprehensive testing of academic libraries' patent information service capabilities. Passing relevant selections or certifications indicates that academic libraries' patent information services have gained recognition and possess competitiveness at certain levels. Simultaneously, obtaining national or provincial-level qualifications or honors enables universities to secure more policies and resources, thereby promoting further business capability enhancement and driving patent information service competitiveness construction into the next cycle.

In 2018, the State Intellectual Property Office and Ministry of Education will conduct qualification certification for "National University Intellectual Property Information Service Centers" according to the jointly released *Implementation Measures for the Construction of University Intellectual Property Information Service Centers*. It is recommended that qualified universities actively prepare and apply. They should also closely monitor intellectual property talent expert selection and institutional qualification certification work in relevant provinces and municipalities, actively striving for opportunities such as applying for Shanghai Intellectual Property Talent Pool Expert titles.

Currently, the *Implementation Measures for the Construction of University Intellectual Property Information Service Centers* and the *National Education Development "13th Five-Year Plan"* and other policy documents clearly state that universities should be encouraged and supported to establish university intellectual property information centers, promote implementation of the national innovation-driven development strategy, improve the intellectual property information public service network, and enhance university innovation capabilities [28-29], providing good development opportunities for academic library patent information service work. Through in-depth investigation, this paper systematically constructs multiple practices for enhancing patent information service competitiveness, proposes components of academic library patent information service competitiveness and a "step-by-step" construction path, hoping to provide systematic thinking references for enhancing academic library patent information service competitiveness. However, due to differences in positioning, goals, and resource conditions among various libraries, in the process of enhancing patent information service competitiveness, academic libraries should adopt different approaches based on their own characteristics and needs, focusing on key points for enhancement and precisely addressing weaknesses for targeted capacity building and competitiveness enhancement, thereby maximizing academic libraries' value and enhancing their social influence.

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Author Contributions

Zhang Shanjie: Proposed research questions, designed research framework, and wrote the paper;
Lu Yikai: Participated in investigation and data compilation;
Li Hui: Participated in investigation and data compilation;
Chen Weijiong: Provided guidance on paper writing and suggestions for improvement.

The Elements and Upgrade Path for the Competitiveness of Academic Library Patent Information Services

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Abstract: [Purpose/significance] At present, carrying out patent information service is one of the key directions for the transformation and development of academic library business. In the critical period when more and more academic libraries have proposed to focus on the development of patent information services, there is an urgent need for certain experience and theoretical guidance. [Method/process] By means of network investigation, literature investigation and expert interviews, this paper investigates the main practices and modes adopted by domestic academic libraries to enhance the competitiveness of patent information services, including establishing special service departments, cooperating with external institutional resources, and expanding service business. [Result/conclusion] This paper puts forward five components of the competitiveness of patent information services in academic libraries: management competitiveness, information resources competitiveness, human resources competitiveness, service competitiveness and brand competitiveness, and verifies them by questionnaire survey. Finally, it is suggested that academic libraries should adopt a "step-by-step" path strategy according to the competitiveness elements to systematically plan and enhance the competitiveness of patent information services.

Keywords: academic library; patent information service; competitiveness; path

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