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## Postprint: Capacity Building for Intellectual Property Information Services with User Participation in University Libraries

**Authors:** Zhang Shanjie, Yan Xiang, Liu Xiaoqin, Lu Yikai, Chen Weijiong

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### Abstract

[Purpose/Significance] This study explores the capacity building of intellectual property information services in university libraries through user participation, aiming to provide ideas and reference for libraries to obtain multi-party user resource support and better develop their service capacity. [Method/Process] Based on the multi-role community characteristics of users, the concept of user participatory design is introduced, positioning various user types—including government, industry alliances/associations, universities, enterprises, and research institutes—as creators and innovators of intellectual property information services. A capacity building framework for university library intellectual property information services is constructed, and the resource endowments of different user categories are analyzed. [Results/Conclusion] Taking the capacity building initiative for intellectual property information services at Shanghai Maritime University Library as a case study, this paper verifies that user participation and support provision serves as an effective approach to compensating for resource deficiencies in university libraries and facilitates the development of intellectual property information service capacity. The study concludes with expectations for diverse user groups to demonstrate concern for and support capacity building efforts for intellectual property information services in university libraries.

### Full Text

#### Preamble

#### User Participation in the Construction of Intellectual Property Information Service Capabilities of University Libraries

*Zhang Shanjie, Yan Xiang, Liu Xiaoqin, Lu Yikai, Chen Weijiong*  
Shanghai Maritime University Library, Shanghai 201306

**Abstract:**

[Purpose/Significance] This paper discusses the construction of intellectual property information service (IPIS) capabilities in university libraries through user participation, aiming to provide ideas and references for university libraries to obtain multi-user resource support and better develop their IPIS capabilities. [Method/Process] Based on the multi-role community characteristics of users, the participatory design (PD) concept is introduced. Various users—including government, industry alliances/associations, universities, enterprises, and research institutes—are positioned as creative designers and changers of IPIS. A framework for constructing university library IPIS capabilities is built, and the resource situations of different user types are analyzed. [Result/Conclusion] Taking the IPIS capability construction of Shanghai Maritime University Library as an example, this study verifies that user participation and support is an effective way to compensate for resource shortages in university libraries and contributes to the construction of IPIS capabilities. The paper concludes with expectations for various users to care about and support the IPIS capability construction of university libraries.

**Keywords:** university library; intellectual property information service; user participation; capability construction

**Classification:** G251

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Intellectual property information services 贯穿 the entire process of scientific and technological innovation activities and play a crucial role in enhancing innovation benefits and industrial competitiveness [1]. Against the backdrop of the impending global new round of scientific and technological revolution and industrial transformation, with innovation increasingly driving development, China attaches great importance to constructing a public intellectual property information service system. As important information service institutions, university libraries possess abundant database resources and professional talent, giving them advantageous conditions for conducting patent information services [2]. The government has also incorporated support for universities to develop intellectual property information services into multiple national plans and standards, including the “13th Five-Year Plan for National Intellectual Property Protection and Utilization” and the “13th Five-Year Plan for National Education Development.” Although these centers are affiliated with university libraries, domestic university libraries have insufficient practical efforts in applying patent information to promote scientific and technological innovation, and their actual effectiveness in converting patent information resources into productive forces remains limited [4]. How to better enhance the IPIS capabilities of university libraries and leverage their role has become a concern for multiple stakeholders. Based on the participatory design (PD) concept and from the perspective of user participation in providing resource support, this paper proposes that university libraries can leverage user resources to develop targeted IPIS capability construction, offering positive guidance and reference for the current construction of university intellectual property information service centers.

The “Higher Education Institution Intellectual Property Management Standards” (GB/T 33251-2016) and the “Implementation Measures for the Construction of University Intellectual Property Information Service Centers” have been specially issued to support this development. Additionally, based on the need for their own transformation, an increasing number of university libraries are developing IPIS as an important business to further enhance their value and role [3]. It can be said that university libraries have welcomed a favorable development opportunity for conducting IPIS.

The National Intellectual Property Administration and the Ministry of Education jointly issued the “Implementation Measures for the Construction of University Intellectual Property Information Service Centers” in December 2017. To date, nearly 100 universities have issued documents establishing intellectual property information service centers affiliated with their libraries. However, domestic university libraries still show insufficient practical efforts in applying patent information to promote scientific and technological innovation, and their actual effectiveness in converting patent information resources into productive forces is inadequate [4]. How to better enhance the IPIS capabilities of university libraries and leverage their role has become a concern for multiple stakeholders. Based on the participatory design (PD) concept and from the perspective of user participation in providing resource support, this paper proposes that university libraries can leverage user resources to develop targeted IPIS capability construction, offering positive guidance and reference for the current construction of university intellectual property information service centers.

## 1. Connotation of Intellectual Property Information Services in University Libraries

### 1.1 Connotation Analysis

The “Higher Education Institution Intellectual Property Management Standards” and the “Implementation Measures for the Construction of University Intellectual Property Information Service Centers” clearly define the positioning and main tasks of university libraries or IPIS centers [5-6]. The U.S. Patent and Trademark Resource Centers (PTRC) and the World Intellectual Property Organization’s Technology and Innovation Support Centers (TISC) also specify requirements for how libraries should conduct IPIS [7-8]. Based on a survey of business practices at 23 first-batch university national IPIS centers in China, the primary purpose of university library IPIS is to serve university scientific and technological innovation and local economic and industrial development. Specific business content mainly includes intellectual property information retrieval, knowledge training and consultation, database construction, patent early warning, patent novelty search, industry technology analysis, scholar/institution patent competitiveness analysis, intellectual property analysis and review, and technology transfer and transformation support services, covering the entire process of industrial decision-making, research project initia-

tion, R&D, and achievement transformation. However, since university library IPIS is still in its infancy, current domestic services are mostly limited to patent information services, with only a few universities involving trademark and copyright information services. As university library IPIS capabilities rapidly improve, the service connotation may be further enriched in the future.

## 1.2 Current Status Review

Around the implementation of China's Patent Law in the 1980s, university libraries began exploring the utilization of patent literature and tools. After approximately 30 years of exploration, the establishment of the "University Library Patent Information Service Promotion Group" in June 2015 marked IPIS as a business development direction for university libraries. China has recently issued multiple supporting policies: at the end of 2017, the National Intellectual Property Administration and the Ministry of Education jointly issued the "Implementation Measures for the Construction of University Intellectual Property Information Service Centers," calling for qualified universities nationwide to establish IPIS centers affiliated with libraries; in 2018, the WIPO TISC program in China was introduced to support active university applications. The "Several Opinions on Accelerating the Construction of Intellectual Property Information Public Service Systems Under New Circumstances" explicitly proposes that by 2022, there should be 100 university national IPIS centers and TISCs. As of September 2019, 23 universities have been recognized as first-batch "University National Intellectual Property Information Service Centers," and nearly 10 universities have become TISC host institutions or candidates, demonstrating rapid development momentum.

In recent years, university library patent information services have become a hot research topic in the library field. The research and development process can be roughly divided into three parts: First, the transition from experience discussion to specific business practice. Feng Jun [9] and Tao Rongxiang [10] investigated IPIS practices at U.S. PTRC university libraries, proposing referential experiences from strengthening patent information supply capacity building and conducting diverse patent information promotion activities. Li Feng [11], Wang Ling et al. [12], and Feng Jun et al. [13] respectively discussed patent information literacy education, patent information retrieval, and patent technology trend analysis services provided by Peking University, Tianjin University, and Nanjing University of Technology libraries for researchers. Second, service objects have expanded from within universities to social users. Zhang Likun et al. [14] and Su Qiuxia et al. [15] proposed embedded patent information service content and models based on different needs and characteristics at various stages of the research process. Li Sujuan [16], Liu Hongguang et al. [17], Ji Pengfei et al. [18], and Zhang Shanjie et al. [19] explored how university libraries can provide patent information services for enterprise users and proposed countermeasures such as strengthening service awareness and establishing cooperation mechanisms. Third, service content is gradually diversifying. Wu Ru et al. [2]

surveyed 115 university libraries and pointed out that patent information services have included patent novelty search, intellectual property training, patent retrieval, patent information analysis, intellectual property strategy, intellectual property standard implementation, patent early warning, and patent value assessment, showing a diversified development trend. However, multiple scholars have also pointed out that university library patent information services still face problems such as insufficient capacity, scattered service content, and lack of standardization and systematization [20-21], especially lacking initiative, insufficient promotion, and inadequate service capacity when serving enterprises [22]. To enhance university library patent information service capabilities, Shen Jinhua et al. [23], Zhang Shanjie et al. [24], and Zhang Chi [25] conducted research from perspectives such as improving librarian capabilities, enhancing institutional comprehensive competitiveness, and strengthening internal and external cooperation.

Thus, domestic scholars have conducted series of studies on university library patent information services, pointing out that insufficient service capacity is a major bottleneck restricting the expansion of in-depth patent information services. However, few studies have explored how to fully utilize user resources to compensate for resource shortages and enhance service capabilities from the perspective of participatory design.

## 2. User Participation Concept and User Function Positioning

University libraries are important service entities in China's intellectual property information public service system, belonging to non-profit service institutions. The purpose of conducting IPIS is to support scientific and technological innovation in universities and enterprises, promote economic development, and boost the implementation of the intellectual property powerhouse strategy. Based on this purpose, university libraries actively provide IPIS to various users including government, industry alliances/associations, universities, enterprises, and research institutes. To promote a virtuous cycle of university library IPIS, the participatory design concept is introduced, proposing that various users should actively participate in IPIS design and resource support while enjoying quality services, and undertake the obligation to support university library IPIS capability construction, achieving the unity of rights and obligations to promote rapid improvement of university library IPIS capabilities.

### 2.1 Participatory Design Concept

Traditional product/service design often emphasizes being “user-centered.” In recent years, a new design model applicable to technology, space, services, and resources in the workplace—participatory design theory—has quietly emerged in Europe and America [26]. The core of PD theory is that users are not only consumers of products/services but also creative designers and changers,

possessing initiative. In the design process, all stakeholders including users together define problems, explore needs, design solutions, and conduct testing and evaluation. In contrast, under the “user-centered design” concept, users exist as research objects, as parties whose needs are met and studied, basically not participating in the service or space design process, presenting a passive state [27].

[Figure 1: see original paper] IPIS Process of University Libraries from PD Perspective

The international library community has applied PD theory in rich practical activities. The U.S. Council on Library and Information Resources organized multiple university library participatory design seminars, exchanging methods, research results, and experiences in user participatory design [28]. Successful U.S. university library PD projects have also proven the feasibility and scientific nature of applying PD theory in library space and service design [29]. Currently, domestic library service design and space design mostly emphasize user needs as the center, neglecting users’ subjective initiative. With social development and increasingly diversified and personalized user demands that are difficult for libraries to grasp, fully stimulating user enthusiasm and initiative and enabling direct participation in the design process has gradually become the fundamental way to enhance user satisfaction. Participatory design is becoming a new trend in library service design, helping to promote strategic transformation of library spaces and service transformation and upgrading in the new era [30].

## 2.2 User Function Positioning

Introducing PD theory into university library IPIS work, the service process is shown in Figure 1. In this model, users exist as a multi-role community. Various users including government, industry alliances/associations, universities, enterprises, and research institutes are first service consumers, outputting service demands to university libraries, participating in service content design, and finally receiving IPIS output from university libraries to complete a single service cycle. Simultaneously, as creative designers and changers of services, users provide certain resource support to university libraries, such as policy resources, expert resources, and funding resources, focusing on cultivating the front-end of IPIS—service capabilities. This constructs a user-participation-supported university library IPIS capability enhancement mechanism, injecting new energy into the IPIS cycle and promoting capability improvement and business development.

## 3. Framework Design for University Library IPIS Capability Construction

Guided by the PD concept and combining the demands and resource situations of various users including government, industry alliances/associations, universities, enterprises, and research institutes, a framework for university library

IPIS capability construction is proposed, as shown in Figure 2 [Figure 2: see original paper]. Under this framework, to obtain quality IPIS from university libraries, various users as creative designers and changers should provide multiple resource supports including policy resources, expert resources, project resources, and technical resources for university library IPIS capability construction. They should guide and help university libraries fully utilize these resources, design and adjust IPIS content and methods according to user needs, and ultimately promote continuous improvement and business development of university library IPIS capabilities.

The support for university libraries includes support for various IPIS institutions established or affiliated with university libraries, including: University Intellectual Property Information Service Centers, National Patent Documentation Service Outlets and National Intellectual Property Training Bases established by the National Intellectual Property Administration in universities, Science and Technology Novelty Search Workstations established by the Ministry of Education in universities, China Technology and Innovation Support Centers (TISC) jointly established by the National Intellectual Property Administration and WIPO in universities, and other relevant institutions established by relevant provincial and municipal departments.

### 3.1 National and Local Intellectual Property Authorities

National and local intellectual property authorities are business management and guidance departments for university library IPIS and also important service objects. They require IPIS from university libraries for major project IP review, national IP macro-policy formulation, and difficult problem research. In recent years, these authorities have incorporated university libraries as public service institutions into important nodes of the IP information public service network, issuing policy documents such as the “Implementation Measures for the Construction of University Intellectual Property Information Service Centers” and “Several Opinions on Strengthening IP Information Public Service System Construction Under New Circumstances.” They have recognized a batch of national patent documentation service outlets, IP service brand institutions, and training bases in university libraries. However, problems remain including insufficient service supply, unreasonable service outlet layout, inadequate public service capacity, and insufficient support for innovation and entrepreneurship. To better enhance university library IP public service capabilities, national and local IP authorities should review and evaluate existing support measures such as training for documentation service outlets, soft science and special research projects, and open patent database functions, and systematically plan and design from the top level regarding policy resources, data resources, expert resources, and project resources. They should play a leading role in policy and data support, guiding and supporting university libraries to undertake IP information public service projects and play important roles in the IP information public service system. For example, Guangdong Province’s multi-measure approach to sup-

porting university library IPIS capability construction is worth learning from and promoting. Since 2016, Guangdong has continuously funded the “University Library Patent Information Service Capability Enhancement Plan” project for three years, providing 300,000 RMB construction funds to over 10 university libraries. In 2019, a new “University Intellectual Property Information Service Center Construction Special Project” was established, selecting six university libraries including South China University of Technology and South China Agricultural University, again providing 400,000 RMB special construction funds to each. Additionally, the Guangdong Provincial Market Supervision Administration (Intellectual Property Office) has cooperated with South China Agricultural University and Jinan University to establish the “Guangdong Modern Agriculture Intellectual Property Research and Development Center” and the “Guangdong Strategic Emerging Industries Intellectual Property Research and Development Center.”

### 3.2 Ministry of Education and Local Education Authorities

The Ministry of Education and local education authorities are also business management and guidance departments for university library IPIS. They require strong IPIS support for university discipline construction and performance evaluation, scientific and technological achievement transfer and transformation, and high-end talent academic review. The Ministry of Education has issued relevant documents to specifically support university library IPIS: the “Implementation Measures for the Construction of University Intellectual Property Information Service Centers” clearly states that the National Intellectual Property Administration and the Ministry of Education are responsible for guiding the construction and operation of university IPIS centers, with the Ministry of Education’s Department of Science and Technology and the Development Center for Science and Technology responsible for the selection, recognition, and support of national university IPIS centers. The Ministry of Education’s Development Center for Science and Technology also manages 102 university science and technology novelty search workstations in China, most of which are actively expanding IPIS. The “Notice on Publishing the List of First-Batch University National Intellectual Property Information Service Centers” issued by the General Office of the National Intellectual Property Administration and the General Office of the Ministry of Education also requires relevant provincial (regional, municipal) education authorities to strengthen guidance and support for university national IPIS centers in business development, information resource construction, talent cultivation, and service to local economic industries based on local conditions. The Jiangsu Provincial Department of Education issued the “Opinions on Further Strengthening Intellectual Property Work in Higher Education Institutions Under New Circumstances” in 2017, proposing that universities should emphasize IP information retrieval, analysis, and utilization, strengthen IP review, avoid R&D risks, and improve R&D efficiency. Although some provincial and municipal education authorities have attempted to support university library IPIS, overall, most provinces and cities still lack

sufficient attention and effective support policies. The Ministry of Education and local education authorities should pay further attention, making university library IPIS an important tool to promote university collaborative innovation and scientific and technological achievement transfer and transformation, formulating supportive policies for university library IPIS development, sharing expert resources, and organizing business training and exchange activities.

### **3.3 Science and Technology/Industry Authorities, Industry Alliances/Associations**

Promoting IPIS is a strategic task urgently needed to implement the national innovation-driven strategy and help build an IP powerhouse, playing a very important role in promoting scientific and technological progress, industrial upgrading, and economic development. Science and technology/industry authorities and industry alliances/associations shoulder important responsibilities for gathering industrial technology innovation resources, improving industrial technology innovation capabilities, and enhancing industrial core competitiveness. They require substantial IPIS in grasping global technology development trends, formulating science and technology development strategies, deploying R&D forces, and conducting enterprise investment surveys, some of which comes from university libraries. However, when facing growing deep-level and personalized IPIS demands, they cannot be timely and effectively satisfied. Therefore, science and technology/industry authorities and industry alliances/associations should cultivate university libraries as important forces in IPIS, providing industrial technology experts, enterprise resources, and industrial technology conference resources, actively participating in the design and construction of industrial IPIS platforms by university libraries, participating in service process formulation, timely feedback on industrial technology innovation needs to enhance service content relevance and quality, and encouraging and supporting capable university libraries to strive to improve IPIS capabilities, expand socialized IPIS, and embed themselves in industrial IP alliances, ultimately promoting industrial scientific and technological innovation and high-quality local economic development.

### **3.4 Enterprises and Research Institutes**

Enterprises hold the principal and leading position in China's technology innovation system, while research institutes play a backbone and leading role. In focusing on key links in the industrial and technology chains, and making breakthroughs in key generic technologies, frontier leading technologies, modern engineering technologies, and disruptive technologies for independent R&D and industrialization, enterprises and research institutes require substantial IPIS support, including: patent literature retrieval, patent novelty search, industrial technology analysis, IP analysis and review, and patent evaluation. University libraries have played an active supporting role in these areas [31]. Enterprises and research institutes can establish strategic cooperative relationships with

university libraries that have disciplinary advantages, provide necessary project funding, and timely provide technical support such as industry technology decomposition and patent technology scheme comparison during the process of university libraries embedding themselves in the entire R&D process, jointly determining service content and models, effectively ensuring the supply of quality IPIS.

### 3.5 Universities

Universities play a fundamental and vital role in the national technology innovation system. In the process of facing major national strategic needs, enhancing university innovation capabilities, conducting “double first-class” construction, and researching frontiers, universities urgently need personalized IPIS from university libraries, including: talent evaluation, discipline evaluation, technology trend analysis, patent application, IP literacy training, achievement transfer and transformation support, and project research support. As the direct construction unit of university IPIS centers, universities should actively respond to the call of the National Intellectual Property Administration and the Ministry of Education, deeply research and systematically plan the construction of university IPIS centers, establish and improve management mechanisms and service models, equip university libraries with professional service talent teams, and provide necessary construction funds, office space, and technical resource guarantees to fully support the construction of university library IPIS capabilities, so as to maximize the functions of university library IPIS, strongly support university technology innovation and advantageous discipline construction, and promote university scientific and technological achievement transformation.

## 4. Practical Case

Guided by PD theory, university libraries obtaining resource support and participation from government, industry/enterprises, universities, and other users helps solve deficiencies in policy resources, intellectual resources, funding resources, and other shortcomings, providing strong support for strengthening IPIS capability construction. Shanghai Maritime University Library (hereinafter referred to as “our library”) has, in the process of IPIS capability construction, first conducted extensive cooperation with government departments and enterprises by leveraging its resource advantages in the maritime field and winning user trust through service quality, and then further guided and coordinated user active participation and support, thereby obtaining substantial user resources for our library’s utilization and promoting the expansion of our library’s IPIS and rapid improvement of service capabilities.

#### 4.1 Participation of National and Local Intellectual Property Authorities

The National Intellectual Property Administration's Patent Documentation Department's national patent documentation service outlet training courses and series of special public lectures, the Shanghai Intellectual Property Administration's Shanghai patent talent training courses, and various IP training courses held by national IP training bases such as Jingdezhen Ceramic University and Northeast Forestry University have provided rich learning resources for our library's IPIS talent cultivation. The Pudong New Area Intellectual Property Administration Shanghai Maritime University Workstation is affiliated with our library. Since 2016, the Pudong New Area Intellectual Property Administration has provided annual operating funds for the workstation, jointly formulated annual work plans with our library, provided IP expert resources to guide enterprises and universities in the Lingang area, and conducted surveys by contacting relevant government departments when necessary. Furthermore, the opening of advanced account permissions for the National Intellectual Property Administration's PSS patent retrieval and analysis system has provided direct and effective support for our library's IPIS capability cultivation and enhancement.

#### 4.2 Participation of Ministry of Education and Local Education Authorities

After obtaining the Ministry of Education's fourth batch of science and technology novelty search workstation qualification in 2009, our library began exploring IPIS. However, due to lack of strong policy support, development was slow for many years. After the Ministry of Education canceled novelty search workstation recognition in 2015, it began investigating IPIS and jointly issued the "Implementation Measures for the Construction of University Intellectual Property Information Service Centers" with the National Intellectual Property Administration at the end of 2017, providing policy basis for our library to concentrate superior resources to vigorously expand IPIS. Simultaneously, the Ministry of Education's Development Center for Science and Technology provides annual special funding for novelty search workstations for business development and IPIS capability cultivation. In November 2016, the university signed a strategic cooperation agreement with the Pudong New Area Intellectual Property Administration to jointly establish the Pudong New Area Intellectual Property Administration Shanghai Maritime University Workstation, affiliated with the library, coordinating the participation of the Science and Technology Department and Technology Transfer Center and other functional departments. The university actively supports our library's IPIS team construction, ensuring dozens of person-times annually for external learning and training. Additionally, the university provides excellent hardware and software conditions in terms of office facilities and environment.

### 4.3 Participation of Science and Technology/Industry Authorities, Industry Alliances/Associations

Shanghai Lingang Marine High-tech Industrialization Base is China's first "National Marine Economy Innovation Development Demonstration City" and the main carrier for Shanghai (Pudong New Area) to create a "National Marine Economy Innovation Development Demonstration City," currently hosting over 100 marine technology enterprises. Since 2013, the base management party has signed a scientific and technological information strategic cooperation agreement with our library. In April 2019, the Shanghai Maritime University IPIS Center affiliated with our library established a workstation at the base. Based on the shared goal of providing quality marine field IPIS to base enterprises, the base management party has continuously participated in activity planning and organization during our library's "Intellectual Property Publicity Week" series in the Lingang area, providing venue resources and organizing enterprise representatives to participate in training and discussions. Simultaneously, during special project research, they actively contact representative enterprises in the base to provide full support for our library's project team research. The China Federation of Logistics and Purchasing also participates in service content design and provision, offering logistics technology case resources during our library's annual compilation of the "China Logistics Technology Development Report" to serve national logistics industry users.

### 4.4 Participation of Enterprises and Research Institutes

Shanghai Zhenhua Heavy Industries (Group) Co., Ltd. and Shanghai International Port (Group) Co., Ltd., renowned global enterprises in marine engineering and port shipping, are our library's main enterprise users. Cooperation with Shanghai Zhenhua Heavy Industries has lasted for 10 years. To better embed our services into the company's R&D and decision-making processes, the company's science and technology management department holds annual work exchange meetings with our library at the beginning of each year to discuss the company's latest business development priorities and negotiate scientific and technical information work points. They also irregularly organize our library service personnel to visit and conduct field research, providing necessary project funding and technical support such as industry technology decomposition and patent technology scheme comparison during the process of embedding our library in the entire R&D process, jointly determining service content and models, effectively ensuring the supply of quality IPIS.

### 4.5 Participation of Universities

Shanghai Maritime University has attached great importance to our library's IPIS capability construction for many years. Since applying for the Ministry of Education's novelty search workstation in 2008, the university has provided annual special funding for the novelty search workstation for business development and IPIS capability cultivation. In November 2016, the university signed

a strategic cooperation agreement with the Pudong New Area Intellectual Property Administration to jointly establish the Pudong New Area Intellectual Property Administration Shanghai Maritime University Workstation, affiliated with the library, coordinating the participation of the Science and Technology Department and Technology Transfer Center and other functional departments. The university actively supports our library's IPIS team construction, ensuring dozens of person-times annually for external learning and training. Additionally, the university provides excellent hardware and software conditions in terms of office facilities and environment.

User participation and support has injected new energy into our library's IPIS capability construction, enabling our library to continuously accumulate experience, expand business, and achieve a win-win goal of significantly improving both our library's comprehensive IPIS capabilities and the degree to which user IPIS demands are satisfied. Currently, our library is a national patent documentation service outlet unit, a council member of the first session of the National University IPIS Center Alliance, has three librarians selected as first-batch national patent information practical talents, and was among the earlier domestic universities to establish a university-level IPIS center. The IP research reports our library provides for government departments have received high recognition and instructions from leaders. The industrial technology competition situation research reports provided for globally renowned enterprises have been recognized and adopted by corporate presidents. The IPIS products provided for university discipline construction and scientific research have also played important reference roles.

In recent years, university library IPIS has achieved remarkable results. However, due to various constraints, current service capabilities are still insufficient to meet the high-level, personalized, and in-depth demands for patent information services from government, university, and social users. Insufficient available resources is one bottleneck facing university library IPIS capability construction. To expand in-depth IPIS, university libraries must first strengthen service capability construction, which cannot be achieved through limited resource support from the university alone but must obtain broad support from external forces. Based on the participatory design concept, positioning various users including government, industry alliances/associations, universities, enterprises, and research institutes as creative designers and changers of university library IPIS who actively participate in and provide technical resources, expert resources, funding resources, and other support, and participate in service content design and production, is an effective way to compensate for resource shortages in university library IPIS capability construction. Although government and university departments have already provided certain policy and funding support, there remains a large gap compared to the development needs of university library IPIS. It is hoped that various users will pay more attention to and provide more resource support for university library IPIS capability construction during their utilization of these services, providing a favorable development environment and condition guarantees, thereby promoting university libraries to

better support scientific and technological innovation in universities and enterprises, facilitate economic development, and boost the implementation of the intellectual property powerhouse strategy.

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## Author Contribution Statement

Zhang Shanjie: Proposed the research question, theoretical research and framework design, wrote the paper; Yan Xiang: Participated in literature research and data compilation; Liu Xiaoqin: Participated in literature research and data compilation; Lu Yikai: Participated in literature research and data compilation; Chen Weijiong: Provided guidance on paper writing and suggestions for improvement.

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

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