Investigation into Patent Information Service Models and Content in German Universities and Their Implications: Postprint

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Abstract

[Purpose/Significance] Through investigation and analysis of the patent information service models and content in German universities, this study explores methods and content suitable for the development of patent information services in university libraries in China.

[Method/Process] Using web-based research and literature review methods, this study examines the German patent information service system, focusing on regional patent information centers established in German universities and European PATLIB centers. It systematically investigates their service models and content, and summarizes their service advantages, characteristics, and effectiveness.

[Results/Conclusion] By drawing on the practical service experience of various patent information centers in German universities, such as their comprehensive service systems, professional service capabilities, and diversified advanced service projects, this paper proposes insights for reference on developing patent information services in domestic university libraries.

Full Text

Research and Enlightenment on the Mode and Content of Patent Information Services in German Universities

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Abstract: *[Purpose/Significance]* Through investigation and analysis of the modes and contents of patent information services in German universities, this study explores methods and contents suitable for the development of patent information services in Chinese university libraries. *[Method/Process]* Using network research and literature review methods, this paper examines the German patent information service system, focusing on regional patent information centers (PIZ) and European PATLIB centers established in German universities. It systematically investigates their service models and contents, and summarizes their advantages, characteristics, and effectiveness. *[Result/Conclusion]* By drawing on the practical experience of German university patent information centers—including their well-developed service systems, professional service capabilities, and diversified advanced service projects—this paper proposes enlightenment for domestic university libraries to develop patent information services.

Keywords: patent information service; university library; PIZ; PATLIB

Since the promulgation of the National Intellectual Property Strategy Outline in 2008, Chinese universities have actively implemented the Standards for Intellectual Property Management in Higher Education Institutions under policy promotion, continuously improving their intellectual property service systems and playing an important role in enhancing researchers' innovation capabilities and scientific research levels. In December 2017, the General Office of the Ministry of Education and the Office of the State Intellectual Property Office jointly issued the *Implementation Measures for the Construction of University Intellectual Property Information Service Centers*, which clearly defines university intellectual property information service centers as providing full-process services for the creation, utilization, protection, and management of university intellectual property, supporting collaborative innovation and advantageous discipline construction, and promoting the transformation of scientific and technological achievements [1]. Consequently, many universities have established intellectual property information service centers affiliated with their libraries [2]. In March 2019 and June 2020, two batches totaling 60 university national intellectual property information service centers were selected to effectively play a leading and exemplary role in intellectual property information services [3-4]. In February 2020, the Ministry of Education, the State Intellectual Property Office, and the Ministry of Science and Technology jointly issued the *Several Opinions on Improving Patent Quality in Higher Education Institutions and Promoting Transformation and Application* [5], which also emphasizes that university intellectual property information services should play their role in promoting the transformation of scientific and technological achievements and enhancing universities' "Double First-Class" construction capabilities.

As the birthplace of the patent system, Europe has established a relatively mature public patent information service system through long-term development, and its service models and experience are worthy of study and application by

domestic university library staff in developing patent information services. In existing domestic research on foreign patent information services, including European countries, Feng Jun [6] analyzed the operation and service practices of the U.S. Patent and Trademark Resource Centers (PTRC); Liu Yanping [7] and Jiang Lifu [8] introduced the development, establishment, and collection status of early U.S. Patent and Trademark Depository Libraries (PTDL); Tao Rongxiang [9] studied the evolution of U.S. patent information services from PDL to PTRC; Shen Jinhua [10], Zhang Shanjie [11], Feng Yang [12], and Tian Yajuan [13] provided general descriptions of the working models of PTRC and the European Patent Information Center Network (PATLIB centers); Yan Zhe [14] detailed the European PATLIB center project and its enlightenment for university library patent information services in China; Wu Xiaoxia [15] introduced the working characteristics of the European PATLIB center project; Xu Jiayi [16] introduced the consulting services of the European Patent Office; and Zhang Jing [17] and Tan Bo [18] studied intellectual property information services in British libraries.

From existing research, domestic scholars have focused on general introductions to patent information service work in the United States and Europe (including the UK), or overall service model studies. However, there is almost no research on the German university patent information service system, despite Germany being an important EU member with unique and mature models and systems in patent information services. Therefore, this paper uses network research and literature review methods to conduct a comprehensive and systematic investigation and in-depth analysis of German patent information service models and contents, aiming to provide reference for Chinese university libraries to develop patent information services.

2. German Patent Information Service System

2.1 Service System Cooperation Network

The German Patent and Trademark Office (DPMA) is the central authority for intellectual property protection in Germany and the largest national patent and trademark office in Europe, with three offices in Munich, Jena, and Berlin [19]. Germany's patent information service system has formed a well-structured, regionally rational patent information service cooperation network centered on the DPMA and jointly established with various service institutions nationwide, as shown in Figure 1 [Figure 1: see original paper].

At the international level, the DPMA assists the World Intellectual Property Organization (WIPO) in receiving and examining PCT (Patent Cooperation Treaty) applications at the international stage and uploading various documents to WIPO. At the European level, it represents the interests of Germany as a member state, the Federal Ministry of Justice, and the Ministry of Consumer Protection in the European Patent Office (EPO) and the European Union Intellectual Property Office (EUIPO), maintaining close cooperation with them [20].

The DPMA also maintains cooperative relationships with intellectual property offices (patent offices) in other countries worldwide. For example, its cooperation with the China National Intellectual Property Administration (CNIPA) began in 1982, with the DPMA providing numerous patent training measures and assistance in building the patent system, such as drafting patent laws, training patent examiners, and establishing relevant information technology. Current cooperation projects between the two offices include the Patent Prosecution Highway (PPH) program.

At the domestic level, the DPMA cooperates with the Patent Attorney Association and the Federal Patent Court, which are extremely important for its work, and collaborates with various client committees such as the Association of Intellectual Property Experts, the Patent Information Users Group, and the Trademark/Documentation Working Group to adjust and develop its work to meet users' individual needs.

The 21 PIZ regional patent information centers (PIZ regional centers) within Germany are officially recognized partner institutions and regional contacts of the DPMA. They collaborate to protect innovation achievements and provide advice and assistance to regional users in scientific application, monitoring and managing patents, and preventing infringement. The EPO has established European Patent Information Centers (PATLIB centers) in European member states to promote patent information communication, exchange, and collaborative utilization. Cooperating with the EPO, the DPMA has established 23 PATLIB centers in Germany (21 of which are also PIZ regional centers) to jointly promote patent information service work.

2.2 Patent Information Center Service Models

Due to their broad service scope, standardized service models, and ability to independently add service content according to user characteristics and needs, PIZ regional centers and PATLIB centers have become the main force for patent information services in various regions of Germany. The user types they serve, service methods, and cooperation models and contents with official partners are shown in Figure 2 [Figure 2: see original paper].

(1) PIZ Regional Center Service Model. The PIZ Association was established in 1992 to develop patent information centers in various German states to promote the dissemination of intellectual property-related information to the public, with a non-profit orientation. Currently, there are 21 PIZ regional centers in Germany [21], all of which are also European PATLIB centers, with 12 PIZ regional centers established in universities or university libraries. Each PIZ regional center provides corresponding patent information services according to the cooperation agreement *Standards for Cooperation between DPMA and Regional Partners* [22], based on which each center can determine its own patent information service projects according to its service objects and scale.

(2) PATLIB Center Service Model. The European PATLIB center project

is a patent information service project cooperated by the EPO with national patent offices of member states and supported by the EPO. The project currently involves 364 PATLIB centers in 37 European member countries [23], which work through mutual communication and collaboration. Each PATLIB center is familiar with the local industrial, economic, and business environment and provides valuable patent information services to university teachers and students, entrepreneurs, small and medium-sized enterprises (SMEs), inventors, scientific researchers, patent attorneys, or other members of the public. The EPO also points out that cooperation between PATLIB centers and the EPO must be coordinated by the national patent office where the center is located, and cannot cooperate directly with the EPO [24].

Germany currently has 23 PATLIB centers, with 12 also established in universities or university libraries. The EPO assists each PATLIB center in better carrying out patent information services within its region by providing various support. The support projects and their contents provided by the EPO are shown in Table 1 .

3. Service Content and Advantages of German University Patent Information Centers

More than half of Germany' s PIZ regional centers and PATLIB centers are established in universities or university libraries, with the rest in chambers of commerce, companies, or enterprises. Intellectual property, including patent information services, is highly valued in universities, and the service content is relatively comprehensive. Therefore, this paper selects the 12 PIZ regional centers and PATLIB centers established in German universities or university libraries as the research objects for German university patent information service content.

3.1 Service Content of University PIZ Regional Patent Information Centers

As official partner institutions of the DPMA, university PIZ regional centers provide patent resources including those provided by the EPO, other free online resources, and commercial patent databases purchased by the centers, such as PatBase, PATSelect, QPAT/Orbit.com (Questel), Thomson Innovation, and TotalPatent (LexisNexis) [26].

The service content of each PIZ regional center is roughly divided into four aspects: research services, application services, competition and analysis services, and patent strategy services [27]. Unlike Chinese patents, which include invention, utility model, and design patents, German "patents" do not include utility models and designs, which are separate branches of intellectual property. The service content of each university PIZ regional center is not limited to patents (including utility models and designs) but can also include copyright, trademark, and other intellectual property information services. The patent in-

formation service content involved is shown in Table 2 (the complete names and URLs of each PIZ regional center can be found on the PIZnet webpage [28], so only the corresponding university or university library names are listed in Table 2).

Overall, Chemnitz University of Technology, Darmstadt University of Technology, Ilmenau University of Technology, and University of Kassel provide relatively more patent information services. In terms of service types, research services are widely carried out by all universities, with six universities designated as priority receiving points for patent documents. In competition analysis services, all universities provide patent monitoring services, but design monitoring and patent statistics and analysis services are only provided by some universities. Only five universities—Chemnitz University of Technology, Darmstadt University of Technology, Ilmenau University of Technology, University of Jena, and University of Kassel—are involved in more patent strategy services.

The specific work content of each type of patent information service is as follows:

(1) Research Services. Centers provide reading rooms or research rooms for users to access with advice, guidance, and support from center staff. Simple searches are used for preliminary searches of certain research and evaluation of result relevance. Literature research assists users in obtaining patent document resources containing a large amount of original technical information to provide sufficient professional information for users' research. Prior art assessment and novelty studies search existing technology to evaluate the patentability of patent applications under consideration of saving technology development costs. Infringement research searches existing patents to prevent infringement or uses retrieved documents to prove the invalidity of existing patent rights. Applicant research is used to understand competitors' patents or trademarks. Family patent research aims to determine the countries where a patent is filed. Research consultation includes helping solve problems encountered by users in patent searching, developing research strategies, and preliminary evaluation of results.

(2) Application Services. PIZ regional centers cooperate with the German Patent Attorney Association to provide free preliminary advice to inventors at least once a month, including basic patent issues, specific legal matters, application procedures and requirements, and patent licensing. In addition, German federal law designates six centers as priority receiving points for patent applications, where inventors can submit application documents through various methods.

(3) Competition and Analysis Services. Patent (including design) monitoring monitors regular information on relevant patent publications according to user needs and continuously sends monitoring results to users at specified intervals. Legal status monitoring monitors the latest dynamic changes in relevant patent ownership, such as regularly visiting official websites every month so that users can respond to authorized patents in a timely manner and/or file

objections (in Germany, the time limit for filing objections against authorized patents is within three months after authorization). Patent statistics and analysis analyze and evaluate innovation activities, market intentions, competition conditions, and R&D trends in specific technical fields, as well as patent layout directions.

(4) Patent Strategy Services. Patent data management assists users in structuring application data and monitoring data for quick access and research. Patent evaluation selects appropriate evaluation methods to assess the value and quality of one' s own patents or competitors' patents according to patent development dynamics. Patent portfolio analysis is an important step in supporting users' overall patent strategy and can identify patents that can be sold or licensed. Strategic patent management manages the strategic use of patent rights, optimizes property portfolios to obtain active positions and competitive advantages in international markets, and protects rights while avoiding unnecessary costs. Anti-piracy and enforcement refer to investigating infringement and taking legal measures when necessary. Patent development refers to assisting users in obtaining benefits through sales or licensing. Invention examination is a standardized evaluation procedure that helps inventors develop patents.

3.2 Service Content of University PATLIB Centers

The 12 German university PATLIB centers are also PIZ regional centers. Therefore, in addition to carrying out patent information service work according to the cooperation agreement between PIZ and DPMA, these 12 university centers also receive various support services from the EPO for PATLIB center members and carry out corresponding service work according to the EPO' s requirements for member states, such as selectively carrying out seven types of intellectual property services and 12 types of service content according to each center' s own characteristics.

The intellectual property types and service development of German university PATLIB centers are shown in Table 3 (similar to Table 2, the complete names and URLs can be found on the EPO webpage [23], so only the university or university library names are listed in Table 3).

Overall, in terms of intellectual property types involved, only Dresden University of Technology covers all seven types of intellectual property services. Most other universities only involve trademarks and patents (including utility models and designs), while the library of Magdeburg University also involves copyright services. In terms of service content provided, the University of Bremen only provides basic services and intellectual property commercialization among advanced service items, the library of Dortmund University of Technology has no advanced service content, while Dresden University of Technology, Ilmenau University of Technology, and University of Kassel provide all four types of advanced services.

(1) Basic Services. German university PATLIB centers provide patent con-

sultation and expert advice, and can provide auxiliary materials. They provide reading rooms for users to access various databases with the support of center professional staff. They provide bibliographic data, abstracts, or main claims from European, German, U.S., and international patent data and classification systems for patent searching. Users can request help from the consultation desk at any time regarding patent searching, database access, information on national and international application fees, and some preliminary invention issues.

(2) Advanced Services. Monitoring services can help users monitor technology field development trends, competitor market layout and development activities, and legal status in real time, providing monitoring results to facilitate early identification and enable users to make corresponding countermeasures. Patent data statistical analysis services can provide decision-making basis for users and help them seek new technology application fields and partners. User training and lecturer services mainly carry out teaching research, seminars, and lecture training according to user needs, with content that can involve intellectual property strategies, advice for inventors, introduction to patent research, employee invention law, sources of legal status information, analysis of search results, patent management models, intellectual property protection systems in various countries, patent evaluation methods, tools, and indicators, etc.

(3) High-Level Services. Invention economic potential evaluation and commercialization use qualitative or quantitative patent evaluation methods to assess the value and development potential of an applicant' s patents. Based on evaluation results or their own patent strategies, they consider implementing the transfer and transformation of patent technology achievements, such as realizing the market value of patents through sales, transfer, or licensing. Patent clinic services involve center staff cooperating with patent attorneys and consultants to provide users with comprehensive evaluation and corresponding advice on patents free of charge.

3.3 Advantages and Characteristics of the German University Patent Information Service System

German university PIZ regional centers and PATLIB centers cooperate with the DPMA and carry out patent information services with the help and support of the EPO, promoting the utilization and dissemination of patent information. This service model and content have the following advantages and characteristics:

(1) Well-Developed Service System with Reasonable Center Layout. Germany' s patent information service system integrates forces from all parties, centered on the DPMA, cooperating with the EPO and EUIPO, and jointly establishing PIZ regional centers and PATLIB centers in a balanced manner according to location and scale, with more than half of the centers established in universities or university libraries to meet the research needs of university teachers, students, and surrounding enterprises and inventors, and promote the

dissemination and utilization of patent information.

(2) Macro Guidance from the State with Regional Freedom. German patent information services are DPMA-led. Each PIZ regional center works according to the cooperation agreement standards signed with the DPMA. Even when joining the EPO' s European PATLIB centers and receiving resource, technical, and training support from the EPO, they must be recognized by the DPMA as official partners, and each center cannot cooperate directly with the EPO. The DPMA is responsible for the overall layout of each center' s patent information service work, proposing service requirements and content, but each center can also carry out personalized patent information services according to the development characteristics of its region and the different needs of its service objects, giving each center considerable room for development.

(3) Professional and Comprehensive Resources with High-Quality Personnel. The EPO provides a large part of search resources, tool resources, learning resources, and training resources, but universities also purchase various patent information resources according to their disciplinary development needs for users to use in research rooms or reading rooms for various research purposes. In addition to attending the EPO' s rich annual conferences and group seminars and exhibitions each year, service personnel at each university center also receive regular guidance from the DPMA. Center staff can also consult EPO and DPMA experts simultaneously to solve problems encountered in their work.

(4) Thorough Basic Services and Strong Advanced Services. Based on the service content of German university patent information centers, some basic service work is carried out comprehensively, thoroughly, and meticulously, such as patent resource acquisition, patent searching, research services, and training lectures. However, these service contents usually involve various difficulties and pain points inventors face during patent application. The advanced service projects carried out by German university centers, such as patent monitoring, patent clinics, patent evaluation, patent commercialization, and patent strategy, are more challenging and require service personnel to have broader, more solid and profound professional knowledge and more service experience and skills.

3.4 Effectiveness of German University Patent Information Services

Based on the above service models, contents, advantages, and characteristics, the effectiveness achieved by German university patent information service centers is specifically manifested in the following aspects:

(1) Cooperation Accelerates Patent Information Dissemination and Utilization. As PIZ regional centers, German university patent information service centers carry out patent information services under the guidance of cooperation agreement standards with the DPMA, especially serving university teachers and students and surrounding SMEs. As PATLIB centers, they serve the public with support from the EPO in technology, human resources, and other aspects, forming a huge cooperative service network to achieve the goal

of disseminating and utilizing patent information.

(2) Expanding Service Influence. The professional, comprehensive, and standardized services of each center have led to continuous increases in center numbers and scale. Staff training, user training, customized training, and national activities are carried out, such as the annual PIZnet Action Week aimed at providing intellectual property strategies and directional advice for SMEs, which publicizes patent information service work while expanding its influence, thereby attracting more users to participate.

(3) Formation of Stable User Groups. Each center has clear service objectives, understands user needs, has standardized business practices, rich experience, and mature development. They provide personalized patent information services for different target user groups within their respective regions, provide and screen valuable information, and give advice on patent strategy, evaluation, and operation, forming stable user groups and thus enabling regional patent information service work to enter a virtuous cycle of development.

(4) Promotion of Patent Technology Transfer and Transformation. German patent information service work attaches great importance to patent operation, especially encouraging SMEs to carry out scientific and technological innovation and commercialization. Therefore, under policy guidance and service promotion, some centers also cooperate with university technology transfer centers or other external institutions or organizations to jointly promote the transfer and transformation of patent technology achievements. For example, the library of RWTH Aachen University cooperates with the university' s technology transfer center and the Association for the Promotion of Innovation and Technology Transfer (AGIT) to support technology transfer and enhance innovation capabilities; the Patent Information Center of Chemnitz University of Technology is itself located in the university' s Knowledge and Technology Transfer Center; the PIZ center of Dresden University of Technology is part of the university' s technology transfer office and cooperates with the patent transfer and licensing group to promote patent technology transformation; and the Patent Information Center of the University of Kassel cooperates with GINo (GmbH Innovation Nordhessen) to commercialize patents in a market-oriented manner.

4. Enlightenment for Domestic University Libraries

Universities are the main bodies of scientific and technological innovation. University libraries should utilize their resource and personnel advantages, expand knowledge of patents and patent information mining, improve professional literacy, and thus provide services for university scientific and technological innovation. Based on the advantages and characteristics of German university and university library centers in patent information services, the following enlightenment is proposed for reference in the service work of domestic university libraries.

4.1 Accept Guidance from National and Local Bureaus to Improve Service Personnel Efficiency

German university patent information centers work under the guidance of the DPMA, and their staff participate in various trainings organized by the EPO every year to update field development trends and business knowledge. They can use the EPO network and consult EPO experts at any time. In China, the 60 university national intellectual property information service centers selected in two batches by the State Intellectual Property Office and the Ministry of Education have similar positioning and goals to German university patent information centers, namely disseminating patent information, strengthening patent information utilization, and serving university teachers, students, and surrounding enterprises. However, domestic university intellectual property information service centers are usually established independently, with service models and contents also determined independently. Although some university intellectual property information service centers have established alliances [29], the exchange and learning among alliance members mostly do not involve participation from national or local bureaus, and therefore cannot receive business guidance and support.

Shen Jinhua' s research points out that insufficient patent information service capability of librarians is an important factor restricting service level and effectiveness [30], and proposes a competency model for librarians including recognition of service value and proactive work attitude, as well as capabilities in patent retrieval, analysis, and intelligence research. On the one hand, many Chinese universities lack positive incentive mechanisms for librarians' efforts to improve patent information service capabilities, and librarians' own fear of difficulties and the university staff management system affect their enthusiasm and initiative. On the other hand, since domestic university patent information service work has not been carried out for long and is not yet mature, most service personnel are composed of scientific and technological novelty search personnel and subject service personnel. Based on school and library personnel allocation arrangements, many service personnel work part-time, with few full-time patent information service staff. Although these service personnel are familiar with school collection resources and possess patent document retrieval and patent novelty analysis skills, they mostly lack experience and capabilities in patent information services, resulting in insufficient capabilities in patent analysis and result interpretation.

Staff from national and local bureaus are senior intellectual property experts with strong professional knowledge and analysis and evaluation capabilities in patents, as well as sensitivity and practical abilities in patent management, infringement cases, and patent early warning. Therefore, if university librarians could also regularly receive guidance and training from national or local bureaus, and even strive for policy and financial support to encourage librarians to actively apply for or participate in patent special projects and research projects 面向全国有关单位, they could receive professional and systematic patent infor-

mation service skills training, thereby accumulating experience and expanding innovative services.

4.2 Strengthen Multi-Party Cooperation to Promote Common Development

Germany' s patent information service system is relatively well-developed and mature, forming a service network centered on the DPMA and jointly established with various forces, providing strong guarantees for patent information service work. Drawing on this experience, domestic university libraries can also adopt the following cooperation approaches to build service systems suitable for their own development:

(1) Cooperate with Alliance Members of University Intellectual Property Information Service Centers. As members of European PATLIB centers, German university PIZ regional centers maintain exchanges and contacts with other members (including European countries outside Germany) through the address directory provided by the EPO. Annual training is also an opportunity for service personnel of each member center to learn from each other, exchange ideas, and discuss service experience. Therefore, members of domestic university intellectual property information service center alliances can also strengthen cooperation, jointly introduce multi-source heterogeneous databases to ensure data accuracy, achieve sharing of patent information, resources, and training, exchange successful service case experiences, summarize existing problems, leverage each school' s advantages, and improve service efficiency.

(2) Cooperate with Scientific Researchers. On the one hand, during the construction of institutional repositories, cooperation with scientific researchers is needed to provide various data for patent applications, such as application volume, secondary units (the applicant or patentee column in patent publication or announcement texts cannot display secondary institutions), authorization volume, and current legal status information to ensure the completeness and accuracy of data in the institutional repository. On the other hand, university libraries carry out patent analysis, evaluation, and early warning services in relevant technical fields for scientific researchers, which requires continuous communication with researchers to adjust analysis directions and strategies, provide professional and reasonable analysis conclusions, and integrate embedded patent information services such as providing patent documents, guiding patent retrieval, and formulating patent development layout and strategies throughout the entire research process cycle of researchers, providing guarantees for researchers' innovation and entrepreneurship.

(3) Cooperate with University Research Management Departments. German university PIZ regional centers and PATLIB centers involve advanced service items for intellectual property commercialization, reflecting the importance attached to the implementation of scientific and technological achievement transformation. Many patent information service institutions are also estab-

lished in university technology transfer departments, and many centers maintain cooperation with external institutions that support innovative research and promote the transfer and transformation of patent achievements. In China, scientific researchers need to file with research management departments when applying for patents and implementing the transfer and transformation of scientific and technological achievements (including patents). Therefore, research management departments have relatively complete and accurate data. University libraries can assist research management departments in forming a coordinated mechanism that integrates scientific and technological innovation and intellectual property management with the transfer and transformation of scientific and technological achievements [5].

(4) Develop Suitable Strategic Partners. University libraries can choose to develop strategic partnerships with intellectual property service centers of scientific research institutions or commercial intellectual property information service centers in their province, city, or surrounding areas. Such centers usually have longer histories of patent information services and richer experience. Conducting extensive cooperation in intellectual property strategic planning research and information analysis consulting, scientific and technological strategy research and consulting, regional development planning and industrial competitive intelligence research, data platform development and construction, talent exchange and training, and project (topic) application and implementation at various levels can promote mutual development and build a new patent information service system.

(5) Cooperate with Patent Database Operators. Universities can purchase patent analysis software under permissible school policies and funding conditions. Software developers usually provide after-sales services such as retrieval and analysis consulting, regular training for librarians or teachers and students, participation in patent information analysis framework planning, or guidance on topic and analysis report writing. Therefore, university libraries can fully utilize the strong patent retrieval capabilities of database developers' technical personnel and their familiarity with various functions of databases to guide and help complete high-quality patent analysis reports and provide professional patent information services to users.

(6) Cooperate with Enterprises. To promote the dissemination of patent information in the public domain, SMEs constitute an important part of the service objects of German university PIZ regional centers and PATLIB centers, with many service projects mainly targeting surrounding enterprises. Domestic university libraries can apply their service content to the innovation and entrepreneurship development of surrounding enterprises, participate in various stages of project selection, R&D, and achievement management, and contribute to regional development, patent technology commercialization, and patent information dissemination.

4.3 Deepen Basic Services and Expand Advanced Services

A notable feature of German university PIZ regional centers and PATLIB centers is that they carry out many advanced service projects, such as patent monitoring, patent clinics, patent evaluation, patent commercialization, and patent strategy. This is inseparable from their mature service systems and high-quality service personnel. The service content of Chinese university library patent information service work mostly focuses on basic services, such as patent document acquisition, patent retrieval, patent novelty search, and patent lectures. These service tasks are strengths of library information literacy education and services, and the work is relatively mature. However, as the country attaches increasing importance to intellectual property service work, although university national intellectual property information service centers are continuously exploring new service directions and their service levels are constantly improving, and some university libraries are also trying some high-end patent information services, the service effects, levels, and quality are still somewhat lacking and cannot meet users' quantitative and qualitative demands for advanced patent information services.

Possible reasons for these problems include: first, insufficient patent service literacy of personnel, who cannot provide professional and in-depth patent analysis, technology layout, and market layout strategies, or solve users' practical problems and meet their substantive needs, resulting in unsatisfactory service effects. Second, inadequate communication and contact between service personnel and users. Since service personnel' s disciplinary backgrounds in most cases do not match users' patent technology directions, the resulting analysis reports, evaluation results, commercialization suggestions, or patent strategic plans have low relevance and fail to meet users' expected goals. Third, many Chinese university libraries' patent information service work lacks theoretical and systematic service standards to support and regulate service content and methods, and service personnel' s advanced patent information service work is highly autonomous and arbitrary, resulting in non-standard and unprofessional terminology, and superficial and incomplete analysis.

To solve these problems, Chinese university libraries can provide training, exchange opportunities, and a research project atmosphere to form service teams with certain scale and experience. They can embed themselves in research groups to systematically understand their existing patent technology layout, current research fields, and future plans, and build a knowledge system that matches the research group' s patent technology. They can introduce service standard specifications, such as the *Intellectual Property Analysis and Evaluation Service Specification* (Standard No. GB/T37286-2019) issued by the State Intellectual Property Office on October 1, 2019, to improve the existing patent service business system and guide service personnel in carrying out professional intellectual property information services.

Drawing on the advanced service projects and service effectiveness of German

university patent information service centers, domestic university libraries should continue to leverage their advantages in basic patent information services while actively exploring and practicing advanced patent information service content to provide professional and high-quality services for the cultivation and layout of researchers' high-value patents:

(1) Patent Monitoring Services. Regular patent monitoring can help users avoid infringement during the patent application process, identify technology field trends, legal status, and citation situations. It can also observe competitors' technology activities, monitor authorized patents in a timely manner, and file invalidation lawsuits.

(2) Patent Clinic Services. The patent clinic services of German university PIZ regional centers cooperate with field experts or patent agents to provide comprehensive evaluation and corresponding advice on users' patents. Chinese university library service personnel can also serve as "clinic doctors," providing inventors with reasonable application advice and determination of protection scope based on preliminary search results, saving inventors' time and capital costs.

(3) Patent Evaluation Services. Pre-application evaluation of patents can assess the patentability of proposed patent technology, technology development cycle, development potential, existing technology competition, and demand trends to decide whether to apply for a patent, thereby reducing the risk of patent invalidation and improving patent application quality.

(4) Patent Commercialization Services. Scientific and technological achievements in the form of patents can only demonstrate value when combined with demand and generate economic benefits when combined with the market. The ultimate purpose of intellectual property, including patent rights, in creation, utilization, protection, and management is to achieve technology transfer and transformation. The 2019 PATLIB annual conference held in May 2019 also emphasized the need to closely focus on technology transfer in the business environment in the intellectual property field [31]. The 2019 China Patent Survey Report shows that universities have a relatively high proportion of using authorized patents as technology reserves and using unimplemented patents to complete patent evaluation, assessment indicators, or obtain rewards [32]. Therefore, university libraries can assist scientific researchers and cooperate with research management institutions to conduct market information research on relevant patent technologies, thereby promoting information exchange with the market and improving the transformation rate of scientific research achievements.

(5) Patent Strategy Services. Formulating effective and reasonable patent strategies is a key step for universities, research institutions, and enterprises to develop and enhance competitiveness. University libraries can try to carry out this service to help users analyze and mine their own and competitors' patents, understand industry development trends and patent layout countries,

guide researchers' R&D directions through patent early warning, build competitive advantages, and make reasonable decisions.

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Wei Limin: Paper revision and finalization;
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Research and Enlightenment on the Mode and Content of Patent Information Services in German Universities

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Abstract: *[Purpose/Significance]* This study investigates and analyzes the modes and contents of patent information services in German universities to explore suitable methods and contents for developing patent information services in Chinese university libraries. *[Method/Process]* Through network research and literature review, the German patent information service system was studied, focusing on regional patent information centers and European PATLIB centers in German universities. Their service models and contents were systematically investigated, and their advantages, characteristics, and effectiveness were summarized. *[Result/Conclusion]* Drawing on the practical experience of German university patent information centers, including their well-developed service systems, professional capabilities, and diversified advanced services, this

paper offers enlightenment for domestic university libraries developing patent information services.

Keywords: patent information service; university library; PIZ; PATLIB

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