

A Study on the Status and Strategies of Specialized Library Services for the Commercialization of Scientific and Technological Achievements in Research Institutes

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Abstract

Purpose/Significance: Centered on user needs and taking the form of scientific and technical information services in specialized libraries as the entry point, this study provides recommendations for specialized libraries to serve the transformation of scientific and technological achievements in research institutes, attempts to construct a scientific and technical information service model for specialized libraries, and aims to facilitate the transformation of scientific and technological achievements in research institutes. **Methods/Process:** Through methods such as literature research, interviews and questionnaires, and website and case investigations, this study conducts research focusing on the demand side of scientific and technical information services—research institutes, and the supply side—specialized libraries. Based on the phased characteristics of scientific and technological achievement transformation, it explores the needs of researchers and deficiencies in existing services, and proposes recommendations for improving scientific and technical information services in specialized libraries. **Results/Conclusion:** A systematic and hierarchical scientific and technical information service model for specialized libraries can provide direction and specific forms for service practice in specialized libraries. Specialized libraries continuously innovating their service forms oriented toward the transformation of scientific and technological achievements have positive significance for promoting the transformation of scientific and technological achievements in research institutes and enhancing the core competitiveness of specialized libraries.

Full Text

Research on the Current Status and Countermeasures of Special Library Services for the Transformation of Scientific and Technological Achievements in Research Institutes

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Abstract

[Objective/Significance] Centered on user needs and focusing on the forms of scientific and technical information services provided by special libraries, this paper offers recommendations for special library services supporting the transformation of scientific and technological achievements in research institutes. It attempts to construct a scientific and technical information service model for special libraries to facilitate this transformation. **[Method/Process]** Through literature research, interviews, questionnaires, website investigations, and case studies, this study examines both the demand side (research institutes) and supply side (special libraries) of scientific and technical information services. Based on the stage-specific characteristics of technology transfer, it identifies researcher needs and gaps in existing services, proposing improvements for special library information services. **[Result/Conclusion]** A systematic, hierarchical special library information service model can provide direction and specific forms for service practice. Continuous innovation in service forms by special libraries for technology transfer has positive significance for promoting the transformation of scientific and technological achievements in research institutes and enhancing the core competitiveness of special libraries.

Keywords: Transformation of scientific and technological achievements; Special libraries; Information services; Innovative services

Classification Number: G250; G251.5

International competition today is a contest of comprehensive national strength based on economic and scientific-technological capabilities. In recent years, China has increasingly emphasized technological innovation, ramping up R&D investment and witnessing rapid growth in scientific and technological output. Against this backdrop, the demand for transforming these achievements has become more urgent. As President Xi Jinping emphasized, “Only when scientific and technological achievements are integrated with national needs, people’s demands, and market requirements, completing the three-stage leap from scientific research to experimental development and then to application and promotion, can they truly realize their innovative value and drive innovation-led

development” [1]. Therefore, accelerating the marketization and industrialization of scientific and technological achievements and improving transformation efficiency is imperative.

In China, research institutes constitute a crucial supplier of scientific and technological achievements. However, they still face practical difficulties in technology transfer, such as information asymmetry between supply and demand and poor communication channels. More research is thus needed on information services for technology transfer in research institutes. In the field of scientific and technical information services, special libraries have always played a vital role. As specialized information service institutions, they are characterized by rich academic resources, concentrated professional talent, and strong technical capabilities. Exploring innovative models for special library services in technology transfer represents an inevitable trend, which will both promote the transformation of scientific and technological achievements in research institutes and facilitate the expansion and deepening of special library services while enhancing their core competitiveness.

2.1 Literature Review on Library Services for Technology Transfer

Information gaps between research institutes and markets hinder transformation efficiency, creating an urgent need for specialized information services oriented toward technology transfer [2][3][4]. Libraries, both domestic and international, constitute an important component of specialized information service institutions, and research and practice in this area have emerged. For example, the University of Toledo Libraries provides information support for local inventors and entrepreneurs through database services and diverse information products, playing multiple roles such as expert consultant and collaborative partner to promote local economic development [5]. The University of Arizona Libraries collaborates with campus commercialization departments to conduct commercialization services that facilitate early-stage invention commercialization [6]. Charles E. Bosomworth et al. surveyed 26 Fortune 500 companies to investigate how their central research operates and how laboratory technologies are transferred to commercial applications [7]. The results showed that a crucial factor common to these companies’ technology transfer efforts was library involvement, which provided a primary source of ideas and information.

In China, research on library services for technology transfer has roughly evolved through stages examining service necessity/feasibility, strategies, practices, and models. Li Hua noted that “library and information science, as an integral part of the social structure of scientific research,” should serve the transformation of scientific and technological achievements into productive forces [8]. Studies have explored the conditions and approaches for library services in technology transfer [9][10][11][12]. For instance, Yuan Yi proposed that university libraries could support technology transfer by conducting intelligence research for project initiation and promoting research achievements [13]. Subsequently, researchers gradually developed strategy studies, including helping researchers find markets

[14], establishing technology transfer platforms in university libraries [15], building library websites for research achievement promotion [16], and constructing service platforms for specific disciplines [17]. With theoretical development, relevant practices have emerged, such as Deng Fei et al.'s introduction of technology competitive intelligence application in technology transfer at Chinese Academy of Sciences institutes [18]; Liu Yanli et al.'s description of information resource push services and thematic report service models based on subject librarian practices [19]; and Lu Ying et al.'s discussion of embedding subject services in the technology transfer process [20]. Overall, domestic research has gradually deepened, but service forms remain fragmented and lack systematic coverage of the entire innovation chain. Therefore, exploring the construction of a systematic service model for research institutes based on the strong service capabilities of special libraries holds both theoretical value and practical significance.

2.2 Main Stages of Technology Transfer in Research Institutes

Numerous studies indicate that technology transfer has distinct stage-specific characteristics. Shi Shanchong argues that technology transfer includes three components: technology sources, transfer objectives, and transfer activities [21]. Chen Zuxin et al. propose that it comprises research, development (including pilot testing), and production-commercialization stages [22]. Lü Mingxin suggests that the broad process includes basic theoretical research, applied theoretical research, development research, pilot-scale amplification, and industrial production [23]. Zhen Honglun divides the process into research and development, transfer and application, and production-operation stages [24]. Based on conceptual understanding and relevant literature, technology transfer activities in research institutes primarily include five stages: project selection and initiation, technology and achievement R&D, pilot-scale incubation, achievement promotion, and marketization/industrialization. Special libraries should provide scientific and technical information services covering this complete innovation chain.

3 Current Status of Supply and Demand for Library Services in Research Institute Technology Transfer

Demand influences the realization of supply, while supply can determine and create demand [25]. User demand-driven, user-centered service that actively creates and uncovers demand represents an important principle for library services supporting technology transfer in research institutes. Therefore, to construct a comprehensive and systematic service model, thorough investigation of both the supply side (libraries) and demand side (researchers) is necessary to clarify the current status. The authors conducted interviews and questionnaires with researchers on the demand side and analyzed existing service forms of special libraries. Through comparison of supply and demand, gaps in current services and improvement recommendations were identified.

3.1 Interviews and Questionnaires—Demand Side (Researchers)

(1) Interview Survey and Analysis

Chinese Academy of Sciences (CAS) research output ranks among the world's top [26], with researchers demonstrating high awareness of technology transfer and research achievements in strategic emerging industries showing strong transfer potential. Therefore, interview subjects were selected from CAS researchers in strategic emerging industries. shows the basic information of interviewed researchers (names replaced with letters for privacy protection). Semi-structured face-to-face or telephone interviews were conducted.

**** Basic Information of Interviewed Researchers

The interviews covered researchers' attention to and understanding of technology transfer, their needs for scientific and technical information services during transfer, and suggestions for current services. Responses were recorded and then extracted and summarized according to technology transfer stages. presents the main scientific and technical information service needs of researchers at different stages.

Overall, researchers expressed service needs concentrated in the early stages of technology transfer, with needs for mid-to-late stage services present but poorly understood and inaccurately articulated. This indicates that libraries need more proactive promotion and deployment of later-stage transfer services. Additionally, three main suggestions emerged from researchers' comments: (1) **Service professionalism**: hoping information service personnel possess professional disciplinary competence and service capabilities; requiring accurate and reliable resources; demanding in-depth content; and expecting targeted, personalized services. (2) **Service proactivity**: hoping information service personnel provide services proactively and strengthen service promotion. (3) **Service breadth and depth**: requesting more market-related information or services, such as market demand information, and expanding resource channels.

**** Researchers' Scientific and Technical Information Service Needs at Different Technology Transfer Stages

(2) Questionnaire Survey and Analysis

Based on literature and interview findings, a questionnaire was designed comprising three parts: "Basic Information," "Service Needs," and "Service Influencing Factors," including single-choice, multiple-choice, rating scale, and open-ended questions. Distributed online to researchers, 339 complete responses were received, with 302 valid questionnaires (89.09% valid response rate). Among valid respondents, 82 were research professors or equivalent (27.2%), 102 associate research professors or equivalent (33.8%), 98 assistant research professors or equivalent (32.4%), and 20 others (6.6%). This distribution well reflects the overall researcher population. Regarding research project types, 47.0% were applied research, 36.1% basic research, and 13.6% comprehensive research. The most represented disciplines were engineering and materials science, chemical science,

mathematics and physics, and life sciences. The questionnaire identified specific information service needs, summarized in as main needs at different stages. In open-ended responses, researchers also expressed suggestions for technology transfer information services, focusing on four aspects: strengthening service promotion, improving personnel professionalism and service quality, expanding service content, and enhancing technology application and follow-up evaluation feedback. These suggestions warrant serious attention from special libraries.

**** Main Service Needs at Different Technology Transfer Stages

3.2 Website and Case Investigation—Supply Side (Special Libraries)

(1) Domestic and International Special Library Website Investigation

Based on directories from library associations, multiple domestic and international special libraries/information institutions were selected for website investigation. and show the basic service offerings of five domestic and five international libraries respectively (the “Stage” column uses “ , , , , ” to correspond to the five technology transfer stages).

Findings indicate that for project initiation and technology R&D stages, most domestic special libraries can provide corresponding scientific and technical information services, including literature retrieval and provision, scientific and technical information tracking, thematic information products, subject consultation, subject intelligence, and technology novelty search. For achievement matching and promotion, institutions like the Institute of Medical Information of Chinese Academy of Medical Sciences, Library of Academy of Military Sciences, and China Geological Library promote achievements through scientific journals. However, for pilot-scale incubation and marketization stages, most special libraries have service gaps. International special libraries also provide online thematic resources, information consultation, scientific data services, and information tracking to support project initiation and R&D. None offer targeted services for the pilot-scale stage. For promotion, Japan’ s National Institute of Informatics and Canada’ s Canada Institute for Scientific and Technical Information (CISTI) use scientific journal publishing to facilitate information dissemination; Korea’ s Korea Institute of Science and Technology Information operates a specialized platform publishing scientific journals and updates with links to many countries. For marketization, CISTI provides intellectual property and industrialization services, offering market and business intelligence to assist in technology transfer planning and financing, accelerating technology marketization and industrialization. Thus, both domestic and international special libraries have significant service gaps, particularly in pilot-scale incubation and marketization stages.

**** Scientific and Technical Information Service Content—Domestic Special Libraries

**** Scientific and Technical Information Service Content—International Special Libraries

(2) Case Study—National Science Library, Chinese Academy of Sciences

The National Science Library, Chinese Academy of Sciences (NSL) is a representative special library with strong capabilities in resources, talent, and technology. It has undertaken innovative practices serving technology transfer in research institutes, providing valuable references for service model construction. Through consultation with subject librarians, literature review, and news reports, the authors summarized NSL's technology transfer services in . Compared with traditional information services, NSL has made many innovative attempts, providing more market-oriented and specialized scientific and technical information services through industry analysis reports, science park information service stations, market and industry environment analysis, and intellectual property operations.

**** Service Practice Cases of the National Science Library, Chinese Academy of Sciences

(3) Current Status of Scientific and Technical Information Services

Based on comparative analysis of interviews, questionnaires, website investigations, and case studies, special libraries currently offer relatively mature services for project initiation and technology R&D stages, basically meeting researcher needs. However, in mid-to-late transfer stages—including pilot-scale incubation, marketization, and industrialization—most special libraries have service gaps. Achievement promotion is limited to traditional forms such as journal publishing, urgently requiring more diverse service forms to meet researcher needs. Specifically: at the project initiation stage, resource databases and retrieval services are provided but market-related resources are lacking; technology novelty search services exist but lack analysis of market demand, R&D prospects, and risks. At the technology R&D stage, subject intelligence services are well-developed (e.g., thematic services, research reports) but market and industry reports are lacking; support for technology achievement value assessment is insufficient. At the pilot-scale incubation stage, virtually no libraries offer relevant services. At the achievement promotion stage, some libraries publish technical achievements in journals, but promotion forms are limited and ineffective. At the marketization stage, follow-up services for achievements entering the market are lacking, with service content and forms needing improvement. In summary, based on supply-demand gaps and relevant practices, this paper attempts to construct a systematic special library scientific and technical information service model driven by demand, providing countermeasures and suggestions for special libraries serving research institute technology transfer.

4.1 Demand-Driven Systematic Hierarchical Service Model

Existing special library scientific and technical information services suffer from limited stage coverage (biased toward early stages), fragmented services, and insufficient tracking of service effectiveness. Therefore, creating a demand-driven, systematic service model is strongly necessary. The model should center on re-

searcher needs, linking library scientific and technical information services with technology transfer stages. The basic framework is illustrated in [Figure 1: see original paper]: technology transfer stages (Process, set P) generate researcher demands for scientific and technical information services (Demand, set D); special libraries meet these demands through specialized information service support (Support, set S2, including Resource set R, Librarian set L, and Technology set T) and diverse service programs (Service, set S1), ultimately promoting the transformation and application of scientific and technological achievements in the market (Market, set M) and subsequent market feedback.

[Figure 1: see original paper] Basic Framework of the Service Model

Based on clarifying these relationships, a demand-driven systematic hierarchical service model is constructed as shown in [Figure 2: see original paper]. The model comprises a support layer, service layer, demand layer, and transformation layer, with the service layer divided into basic and innovative scientific and technical information service forms. Supported by resources, personnel, and technology, special library service programs map to researcher needs, facilitating the realization of each technology transfer stage.

[Figure 2: see original paper] Stage-Based, Hierarchical Scientific and Technical Information Service Model for Special Libraries

4.2 Basic Scientific and Technical Information Services

Some basic service forms are relatively mature, meeting partial researcher needs in technology transfer. Special libraries should further explore entry points for serving technology transfer based on these existing forms. These mainly include: (1) **Selective Dissemination of Information (SDI)**: For project initiation and technology R&D stages, conducting professional searches on entrusted research topics and providing results as indexes, abstracts, or full texts. Future efforts should expand search scope to include market research reports and scientific and technical news. (2) **Technology Novelty Search**: Helping researchers evaluate the novelty and advancement of topics, serving as an important basis for project initiation. (3) **Information Dynamic Tracking**: Real-time tracking of research and technical information as well as market and industry dynamics can promptly correct possible deviations in R&D and allow project adjustments. (4) **Research Data Management**: Large volumes of research data generated during studies can cause duplication, confusion, loss, and security breaches if not effectively managed, severely impacting research efficiency and data security. Increasingly, libraries provide research data management services, assisting with data organization, classification, and archiving, and building knowledge management platforms or data warehouses, saving researchers time and promoting publication and dissemination of their achievements. (5) **News and Journal Promotion**: Primarily used for achievement promotion. News media offers fast, segmented dissemination; publishing latest achievements through libraries' WeChat, Weibo, and other channels as well as

external science and technology media enables broader dissemination. Some special libraries publish scientific journals with technology transfer columns to publicize various achievements, achieving promotional effects.

4.3 Innovative Scientific and Technical Information Services

Survey results indicate that basic services cannot fully meet all researcher needs in technology transfer. Therefore, leveraging advantages in technology, talent, and resources, special libraries should proactively provide more innovative information services, with specific practices as follows.

(1) Market Demand Analysis

Technology transfer is an economic activity, and market supply-demand relationships are important influencing factors. Currently, Chinese researchers still follow a “project initiation—appraisal—award application” orientation, easily leading to achievements disconnected from market needs with poor practical applicability. Special librarians should leverage professional information retrieval advantages to analyze international and domestic market demands related to research topics, helping researchers identify real market needs. Analysis content may include market environment, technology application prospects, and R&D risks, providing a more comprehensive and long-term perspective for project initiation. This requires librarians to have high sensitivity to market environment analysis and adequate professional background knowledge.

(2) Industry Database Construction

Currently, most libraries primarily purchase external commercial literature databases, mainly including academic journals, e-books, and patent documents, with few databases for market or industry data. Based on researcher needs identified in this study, researchers have clear demands for market information, industry data, and financial policy information during technology transfer. Therefore, special libraries should actively conduct needs surveys among researchers and build specialized industry databases with library characteristics as needed. For smaller libraries or those not yet equipped for independent database construction, resource systems can be improved through co-construction and sharing with external institutions, helping researchers quickly obtain market and financial data to provide industry data support and decision-making references for research projects.

(3) Technology Achievement Evaluation

Technology achievement evaluation provides scientific judgment of value, traditionally dominated by government agencies. In May 2021, the 19th meeting of the Central Committee for Comprehensively Deepening Reform reviewed and approved the “Guiding Opinions on Improving the Evaluation Mechanism for Scientific and Technological Achievements” [27], emphasizing the need to accelerate a diversified evaluation system with government, social organizations, and other participants and develop market-oriented evaluation. As specialized information service institutions, libraries can participate in evaluation services from

multiple angles. First, special libraries can assist evaluation by providing technology novelty search reports and market research reports. Second, librarians with disciplinary backgrounds and intellectual property knowledge can provide specialized consulting services related to technology achievement evaluation. Finally, they can serve as bridges, screening professional third-party evaluation institutions for researchers. Through continuous accumulation of expert resources and service experience, special libraries can gradually develop their own evaluation models.

(4) Intellectual Property Training and Operations

User training is an important library service form. In technology transfer-oriented scientific and technical information services, special libraries should further improve training content by adding more intellectual property-related topics, enabling researchers to master basic knowledge of patents and trademarks and enhance intellectual property protection awareness. A comprehensive intellectual property training system should be gradually established to improve researchers' overall understanding of intellectual property in scientific and technological achievements.

Intellectual property operations employ business models to optimize the allocation of intellectual property rights between rights holders and relevant market entities. According to relevant literature and actual investigations, researchers have preliminary awareness of intellectual property importance but struggle to complete specific transfer processes and operation models independently, requiring assistance from research management departments. Special libraries possess rich experience in information services and patent knowledge services and can form specialized teams to optimize resource allocation for scientific and technological achievements, conducting intellectual property licensing, transfer, financing, or patent pooling to improve technology transfer efficiency. This form also facilitates intellectual property portfolio operations, thereby more fully realizing the value of scientific and technological achievements.

(5) Pilot-Scale Incubation Information Services

The pilot-scale incubation stage is a critical link in technology transfer, yet the vast majority of libraries have not yet developed relevant services. Under the background of deep integration of "industry-academia-research-application," developing relevant practices benefits library service innovation. Librarians can be stationed at science parks or pilot-scale incubation bases to establish information service stations, providing information resources, technical support, data management, consulting, and training services to assist in pilot testing of laboratory achievements. This is particularly feasible for libraries with science park service experience, as they can leverage existing infrastructure to quickly organize relevant resources and personnel.

(6) Website and Forum Promotion

In today's era of rapid internet development, libraries should fully utilize computer technology and network platforms to create more comprehensive online-offline integrated promotion models for scientific and technological achievements.

According to questionnaire results, researchers' most favored promotion form is specialized achievement information websites. Leveraging advantages in information organization and processing, special libraries can establish technology transfer information websites based on researcher needs, aggregating achievement supply-demand information, relevant institutional information, online and offline forum information, and various knowledge products, as shown in [Figure 3: see original paper]. Additionally, since offline promotion is highly targeted and interactive, libraries can organize achievement promotion meetings and technology development forums as hosts or co-organizers, promoting achievements by type and discipline to achieve better promotion effects and facilitate achievement transactions.

[Figure 3: see original paper] Special Library Technology Transfer Information Service Platform

(7) Market Competition Analysis and Effectiveness Feedback

External factors affecting technology transfer effectiveness include economic conditions, policy orientation, and technology development levels. Library scientific and technical information services should promptly provide monitoring reports on external market environments, analyzing technology achievement market entry strategies and competitors' advantages and strategies to provide references for researchers. To this end, special libraries should accelerate the building of relevant teams, encouraging librarians to benchmark against technology managers and improving service levels for mid-to-late stage technology transfer to effectively extend the information service chain.

Furthermore, serving the entire technology transfer process should include strengthened analysis of transfer effectiveness. The State Council's "Guiding Opinions on Improving the Evaluation Mechanism for Scientific and Technological Achievements" states that evaluation should grasp the gradual nature of research and stage-specific characteristics of achievements, strengthening medium- and long-term evaluation, post-evaluation, and achievement retrospection. Librarians should assist researchers in tracking the effects and application trends of achievements after market application. Combining market application status with earlier market prospect and risk analyses can further summarize the completion efficiency of technology transfer and the effectiveness of special library information services, facilitating subsequent improvement of technology transfer services and forming a virtuous cycle of information services.

Technology transfer promotes the integration of science and technology with the economy, driving the transformation of old and new growth drivers. In recent years, the state has issued a series of policies to stimulate researcher innovation vitality, continuously strengthening emphasis on technology transfer. As specialized information service institutions, providing information services needed for technology transfer has become an important business direction for special libraries. Through researcher questionnaires and interviews, as well as investigation of existing library services, this paper analyzes and summarizes researcher needs, current library service status, and supply-demand gaps, proposing tar-

geted recommendations and constructing a service model that provides basic and innovative service forms for library professionals' reference. Currently, as the state and research institutes attach increasing importance to technology transfer, the demand for special library service innovation and deepening becomes more urgent. Special libraries should seize this opportunity, pioneer new services, leverage their specialized capabilities, and enable researchers to obtain efficient and convenient scientific and technical information services. Future work should strengthen exploration and validation of service models and conduct more service practices in different disciplinary fields to further expand and deepen service content and consolidate the comprehensive competitiveness of special libraries.

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Wu Hao: Research concept development, study design, manuscript revision suggestions

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