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Construction and Practice of a Subject Information Service Model for Professional Libraries Based on the SECI Model: A Case Study of the National Science Library, Chinese Academy of Sciences (Postprint)

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Abstract

[Purpose/Significance] This study investigates the application and innovative practice of the SECI model from knowledge management theory in professional library subject information services, aiming to improve knowledge management within subject information services, effectively enhance service quality, consolidate and strengthen the competitiveness of professional library subject information services, and provide reference for the effective application of the SECI model in subject information services. [Method/Process] A professional library subject information service model based on the SECI model is constructed, upon which empirical analysis is conducted to summarize the innovative service practices implemented by the National Science Library, Chinese Academy of Sciences based on this model. [Results/Conclusion] The transformation between tacit knowledge and explicit knowledge is embedded in multiple aspects of subject information services. Introducing the SECI model into professional library subject information services can address certain deficiencies in the knowledge management process of subject information services, provide conceptual and methodological guidance for professional libraries to conduct innovative practices in subject information services, and effectively promote the enhancement of core competitiveness and overall service level of subject information services.

Full Text

Preamble

Construction and Practice of Subject Information Service Mode of Professional Library Based on the SECI Model——Taking the Na-

tional Science Library as an Example

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Abstract

[Purpose/Significance] This study investigates the application and innovative practice of the SECI model from knowledge management theory in professional library subject information services. It aims to improve knowledge management in subject information services, effectively enhance service levels, consolidate and strengthen the competitiveness of professional library subject information services, and provide a reference for the effective application of the SECI model in this domain.

[Method/Process] We construct a professional library subject information service model based on the SECI model and conduct empirical analysis by summarizing the innovative service practices of the National Science Library, Chinese Academy of Sciences, guided by this model.

[Result/Conclusion] The transformation between tacit and explicit knowledge is embedded in multiple aspects of subject information services. Introducing the SECI model into professional library subject information services can address certain deficiencies in knowledge management processes, provide conceptual and methodological guidance for professional libraries to carry out innovative practices in subject information services, and effectively promote the core competitiveness and overall service level of subject information services.

Keywords: SECI; professional library; subject information service; knowledge management; model construction; practice

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Introduction

China is currently implementing an innovation-driven development strategy that encourages individuals and organizations to pursue innovative practices. In the era of the knowledge economy, any individual or organization that cannot effectively manage and apply knowledge will fail to innovate and is destined

to be eliminated by the times. Professional libraries should provide users with dynamic, proactive, and value-added knowledge services, and therefore must maintain a forward-looking approach to knowledge management to ensure high-level utilization of knowledge in subject information services, thereby achieving innovation and sustainable development in these services while continuously enhancing the core competitiveness of professional libraries.

To understand existing domestic research on library knowledge management, we conducted a search in the CNKI database using the professional search formula: TI=(“SECI”+“knowledge management”+“tacit knowledge”+“explicit knowledge”)* (“library”+“library and information science”+“information service”+“knowledge service”+“intelligence research”+“subject information”+“subject service”). This yielded 2,380 results, indicating a substantial body of literature that peaked around 2007, suggesting high research interest in library knowledge management at that time. After 2011, the number of published papers declined significantly, with research content becoming repetitive. Overall, studies have primarily focused on theoretical research, model development, strategy formulation, evaluation frameworks, and application prospects of library knowledge management.

Domestic research on library knowledge management covers a wide range of topics, but most articles on the application of the SECI model in libraries remain at the theoretical discussion stage, lacking systematic summarization of models and introduction of practical applications and successful cases, with research objects predominantly focusing on university libraries. Foreign research in library knowledge management has concentrated on information behavior and retrieval, information and communication technologies, emphasizing technical exploration and practical application, but these remain largely experimental studies. This paper introduces the SECI model into professional library subject information services, analyzing its specific application pathways and methods, constructing a professional library subject information service model based on the SECI model, and summarizing the innovative service practices conducted by the National Science Library, Chinese Academy of Sciences based on this model.

1. Theoretical Foundation

1.1 Knowledge Management and the SECI Model

Horton proposed the concept of knowledge management from the perspective of resource management evolution in his 1979 work. Since then, various definitions of knowledge management have emerged. In 1995, Japanese scholars Ikujiro Nonaka and Hirotaka Takeuchi published *The Knowledge-Creating Company*, introducing the classic knowledge management theory—the SECI model. The model comprises four stages of conversion between tacit and explicit knowledge: Socialization, Externalization, Combination, and Internalization, elucidating the relationships and interactions among individuals, groups, and or-

ganizations in the knowledge creation process. Socialization involves the conversion from tacit to tacit knowledge, primarily through experience sharing to create new tacit knowledge. Externalization converts tacit knowledge to explicit knowledge and represents the key to knowledge creation, as tacit knowledge is expressed through clear concepts and language to facilitate knowledge sharing. Combination transforms explicit knowledge into more complex and systematic sets of explicit knowledge, making it more concrete, understandable, and usable. Internalization converts explicit knowledge back into tacit knowledge, where explicit knowledge is shared within an organization and transformed into individual internal tacit knowledge, typically achieved through “learning by doing” and “learning from practice.” This internalization enables continuous knowledge accumulation for individuals and organizations, promoting the next round of knowledge transformation and allowing the “knowledge spiral” to ascend continuously [Figure 1: see original paper]. Subsequently, Nonaka and other scholars further refined the theory by introducing concepts such as “Ba” (shared context), knowledge leadership, knowledge assets, and knowledge vision, which form the theoretical foundation for this study.

1.2 Professional Library Subject Information Service

A professional library is defined as a library with specialized collections, serving professional communities, whose staff have received specialized training in particular disciplines and provide specialized services to readers. Subject information service involves in-depth analysis and knowledge representation of information content and its internal relationships according to users’ specific needs. Essentially, it is a process of knowledge flow involving the generation, collection, organization, dissemination, and utilization of various tacit and explicit knowledge. Grounded in specific disciplines or topics, it centers on subject service teams, is oriented toward subject user needs, and employs certain technologies and methods to satisfy those needs. As the external environment changes and user demands continuously upgrade, subject information services must not be satisfied with existing service content and forms but must actively respond to environmental changes to achieve knowledge innovation and service innovation.

2. Subject Information Service Model Based on the SECI Model

Current knowledge management in professional library subject information services generally suffers from inadequate knowledge exchange and sharing mechanisms, imperfect knowledge organization and management methods, insufficient innovation and systematization of knowledge content, and low economic utility of knowledge utilization. Introducing the SECI model into professional library subject information services can leverage the knowledge management concepts and methods of different transformation stages to propose targeted measures. Constructing a subject information service model based on the SECI model [Figure 2: see original paper] can facilitate the application of the SECI model in

subject information services, help improve service levels, and inspire innovative practices.

2.1 Using SECI Socialization to Promote Knowledge Exchange and Sharing

Applying the socialization theory of the SECI model can facilitate tacit knowledge exchange and sharing between subject librarians and researchers, as well as among subject librarians themselves. First, when providing subject information services, subject librarians must clarify researchers' service needs and complete requirement analysis, which presupposes sufficient tacit knowledge exchange between librarians and researchers. Subject librarians should actively integrate into researchers' working environments, understand their real needs based on familiarity with their specific research work, and provide services by "integrating into the front line." During service delivery, both parties must maintain close contact and timely communication regarding needs and questions to ensure that the librarian's service is "embedded" throughout the entire research process. After delivering subject information service products, librarians should also actively seek feedback opportunities to understand researchers' satisfaction, suggestions, and opinions regarding the service process and products. This exchange promotes the formation of shared mental models and thinking patterns, provides references for future services, and facilitates trust-building and long-term cooperative relationships—essential in today's highly competitive knowledge service industry.

Second, tacit knowledge exchange and sharing among subject librarians constitute another important aspect of the socialization stage. Internal tacit knowledge exchange within subject information service teams is key to promoting overall service level improvement. In the SECI model's socialization stage, the "apprenticeship" model is considered good practice for tacit knowledge exchange. In subject information services, this can be implemented through "senior librarians" mentoring "junior librarians" to form "service teams" that collaborate on service delivery. Professional libraries can regularly hold subject librarian exchange meetings with different themes, encouraging open discussions such as brainstorming sessions to foster an open sharing team atmosphere and promote internal tacit knowledge transformation.

2.2 Using SECI Externalization to Improve Knowledge Management Methods

Applying the externalization theory of the SECI model provides direction for knowledge organization tools and management technology applications, helping improve knowledge management methods in professional library subject information services. After clarifying researchers' needs, subject librarians can discuss and determine service plans, including specific working methods, platforms, and estimated completion times. Summarizing and inducting these contents into planning documents represents one form of converting tacit knowledge into

explicit knowledge. To make externalized knowledge more concrete and understandable, cognitive maps based on past experience can be combined with knowledge maps featuring navigation and dynamic linking functions to visually present tacit knowledge clearly, enhancing understanding for both researchers and librarians. In addition to knowledge tools, applying advanced technologies and concepts such as cloud computing, automatic classification, and machine learning also helps improve knowledge management methods in subject information services.

Furthermore, building a knowledge management system to preserve service experience is crucial. Subject librarians' working methods, inspirational ideas, and successes or failures can be transformed into viewable and learnable explicit knowledge through instant messaging, librarian forums, and other forms. Operationally, knowledge conceptualization and naming can be used to externalize experiences or methods, creating more vivid and easily understandable explicit knowledge. To enable subject librarians to upload work reflections and experiential methods anytime and anywhere, a corresponding knowledge management system should be provided. This explicit form of a "tacit knowledge treasure trove" will become an important indicator distinguishing professional library subject information services from other institutions and a valuable asset for building core competitiveness.

2.3 Using SECI Combination to Construct Knowledge Service Systems

Applying the SECI model's combination stage makes explicit knowledge concrete and systematic, helping expand the depth and breadth of knowledge content in subject information services and form systematic knowledge content and service systems. Subject information service content innovation and knowledge service system construction should be based on platforms such as subject information service platforms, knowledge product R&D and management service platforms, and subject information knowledge bases. Subject information services generate numerous explicit knowledge products like subject analysis reports and strategic intelligence planning reports. Only by further organizing, classifying, and deeply processing this knowledge can content innovation be achieved, comprehensive management of intelligence products be strengthened, and knowledge retention and systematization be facilitated, contributing to the establishment and transmission of the professional library's subject information service brand.

Additionally, strengthening standardized management of service knowledge is essential. The effectiveness of subject information services also depends on the team's internal workflow standards and content norms for subject reports. Subject information services include basic intelligence research, strategic intelligence research, and science and technology policy intelligence research, among other types, with multiple themes depending on researchers' disciplines and project content. To improve service efficiency and quality, a service standard system

should be developed covering documentation norms, content requirements, and analytical methods. Knowledge should be decomposed and refined to summarize conceptual and operational knowledge for future use. These norms should be tailored for different types and themes to achieve a combination of standardization and personalization, with timely updates to maintain dynamic content refreshment.

2.4 Using SECI Internalization to Enhance Knowledge Utilization Value

Applying the SECI model's internalization helps excavate the deep value of subject information services, expand their knowledge depth, and enhance the economic utility of knowledge utilization. First, knowledge stock should be catalyzed into knowledge increments. Service teams should regularly conduct training programs, leveraging exemplary cases and individuals to encourage team members to extend excellent working methods, service processes, and spiritual qualities into their own work, internalizing personal and organizational explicit knowledge into individually applicable tacit knowledge. This accumulates knowledge experience for better future subject information services and transforms personal and organizational knowledge stock into increments.

Second, service proactivity should be strengthened to extend the service chain. Throughout the entire subject information service process, subject librarians must maintain proactive initiative, actively summarizing problems from practice. Based on continuously innovative knowledge increments, the service chain should be extended to actively explore researchers' complete service needs, providing guarantees for scientific achievement creation, evaluation, incubation, application, and diffusion, enabling efficient operation and continuous innovation in subject information services.

3. Successful Practice of Subject Information Service Using the SECI Model

The subject information service model based on the SECI model has been effectively applied in research and innovative practice. The National Science Library, Chinese Academy of Sciences, has deeply understood the connotations of the SECI model and used the model shown in Figure 2 to guide its subject information services, carrying out innovative service practices in multiple knowledge management aspects:

3.1 Smoothing Knowledge Communication Channels and Strengthening Knowledge Exchange and Sharing (S)

In the knowledge socialization stage of subject information services, applying SECI socialization (S) smooths knowledge communication channels and strengthens exchange and sharing. The National Science Library has established alliances with provincial academies of sciences at various levels

through strategic cooperation agreements, forming joint service mechanisms and establishing service guarantee and collaborative service systems that promote resource sharing, circulation, collaborative exchange, and mutual benefits among alliance members. It has launched strategic cooperation with Shanghai Academy of Sciences, Jiangxi Academy of Sciences, Guizhou Academy of Sciences, Shandong Academy of Sciences, and others, establishing the National Academy Alliance Library and Information Branch on November 5, 2013.

Guided by the service philosophy of “user-oriented, demand-driven, integrated into research, and supporting innovation,” the subject librarian team integrates subject information services into the front line of research and embeds them into the research process. When providing subject information services for various institutes of the Chinese Academy of Sciences, professional responsible librarians are assigned to each institute to investigate their daily research service needs through “institute visits,” achieving smooth online and offline communication. For institute innovation plans such as “Innovation 2020” and the “13th Five-Year Plan,” subject librarians conduct on-site research and expert symposiums to timely understand new demands for subject information services and conduct forward-looking strategic planning and deployment.

Subject librarians distribute demand survey questionnaires to research users, visit key researchers, and integrate into research group meetings, forming a continuous and effective user demand research model that produces outputs such as the “Survey Report on the Current Status and Needs of Library and Information System Services Across the Academy,” thereby smoothing knowledge communication channels. Internally, subject librarians regularly hold training sessions to promote learning and exchange, enhancing overall service capabilities and cultivating excellent new subject librarians. New librarians must participate in knowledge training in major business departments including resource construction and subject services, covering basic knowledge, skills, and position-specific training. Through the “senior-junior” mentorship model in institute service practice, new librarians can truly participate in specific service delivery, completing a standardized three-step training process—basic training + thematic training + supervised practice—with the guidance and assistance of senior librarians, enabling smooth and efficient integration into formal subject service roles.

3.2 Improving Scientific Data Management and Developing New Think Tank Services (E)

In the knowledge externalization stage of subject information services, applying SECI externalization (E) enables effective management of scientific data and development of new think tank services. Scientific data and knowledge management have become increasingly important in complex data-knowledge environments. The National Science Library has clearly positioned itself in scientific data and knowledge management, conducting research on distributed

cloud storage, aggregation, distribution, and integrated fusion of scientific and literature big data to achieve knowledge-based management of big data. It also conducts knowledge analysis research and knowledge discovery to meet new demands for data-intensive scientific research innovation, studying big data-based topic extraction, automatic classification, hot spot revelation, and trend prediction, while 致力于 establishing data management service systems and developing a series of information monitoring service platforms and research data knowledge service platforms.

In recent years, the Party and state have attached great importance to the construction of new types of think tanks with Chinese characteristics, elevating it to a national strategy for governance. Libraries have very close relationships with think tanks and can play important roles in this construction. The National Science Library, in cooperation with the National Science and Technology Library (NSTL), has built the NSTL National Major Strategy Information Service Platform to conduct think tank research and services, establishing columns for dynamic tracking, information services, policy highlights, research results, and knowledge maps. Specific products include monitoring bulletins, thematic briefings, industrial intelligence, and research reports covering strategic decision-making support, industrial development support, and enterprise development support, with special research topics on the Silk Road Economic Belt, Maritime Silk Road, Yangtze River Economic Belt, and Beijing-Tianjin-Hebei collaborative development. The content is rich, services are in-depth, and they closely follow the requirements of the times and think tank construction.

3.3 Building a Knowledge Service System and Developing Mobile Internet and Online Live Streaming (C)

In the knowledge combination stage of subject information services, applying SECI combination (C) promotes the construction of knowledge platforms and systems for professional libraries. In May 2017, the formal version of “China Science News” was released by the National Science Library. “China Science News” is a mobile internet-based knowledge service platform carefully built by the library, supplemented by multi-platform knowledge service functions such as WeChat public accounts and web versions. The China Science News APP features scholar homepages, research bibliographies, academic exchanges, integration of literature data resources, paper discovery and management, and personalized intelligence push, among other rich subject information service functions. It has partnered with Baidu Scholar, Microsoft Academic, and others to build researcher communication communities and mobile academic communication networks, promoting disciplinary exchanges. From resource supply, research services, to knowledge platforms, it constructs a new ecology of research knowledge services, providing multi-functional, multi-platform three-dimensional knowledge services for researchers.

Under the “Internet +” background, the emergence and development of mobile internet has further spawned new dissemination models for information and

knowledge, including mobile online live streaming. Mobile online live streaming, with its rich content, strong interactivity, and freedom from geographical and spatial constraints, has become increasingly popular among the public and researchers. “China Science News” has 顺应 this trend by hosting numerous online live broadcasts covering paper writing and publication, data management, project information, skills training, and achievement transformation, providing a mobile two-way interactive academic exchange platform for researchers. After a period of operational practice, it has been widely welcomed by researchers, with the number of online participants in single live broadcasts continuously increasing, bringing users a brand-new subject service experience.

3.4 Extending the Service Chain to Assist in Technology Transfer and Transformation (I)

In the knowledge internalization stage of subject information services, applying SECI internalization (I) can expand the depth of professional library knowledge services, extend the service chain, and assist in technology transfer and transformation. In the new era, the state continues to promote the innovation-driven development strategy. To support this, the Chinese Academy of Sciences comprehensively implements the “Pioneer Initiative” and continuously promotes the “Special Action for Promoting Technology Transfer and Transformation,” strengthening supply-side structural reform of scientific and technological achievements. Seizing this opportunity, the National Science Library has improved its knowledge transfer system, summarized past experiences and shortcomings, and embedded scientific and technological information services into specific links of technology transfer and transformation, providing market analysis, patent training, technology evaluation, achievement matchmaking, and technology promotion services for scientific research project selection, achievement formation, pilot incubation, enterprise production, technology diffusion, and large-scale production, thereby promoting technology transfer and transformation.

In 2017, the National Science Library formulated planning research reports for the development of green chemical industry in Shandong, providing suggestions for industrial development and participating in the “Chinese Academy of Sciences-Shandong Green Chemical Technology Innovation Symposium and Academician-Expert Science and Technology Tour.” More than 30 experts from institutes including the Dalian Institute of Chemical Physics, together with science and technology bureau officials from various parts of Shandong, leaders of the Shandong Center and its branches, and heads of key chemical enterprises (over 300 participants total), attended the meeting where experts delivered authoritative perspectives and organized relevant achievement matchmaking and enterprise research activities. In 2018, in cooperation with the Institute of Process Engineering, it released the “Development Report on the Membrane Skin Care Products Industry,” analyzing key core technologies, market conditions, and future development trends of the facial mask industry. The National Sci-

ence Library has now basically formed a full-chain subject information service system oriented toward researchers, government agencies, industrial enterprises, and makers, actively promoting the application of scientific and technological innovation from multiple levels and perspectives to prevent achievements from becoming “stale fruit,” ultimately serving scientific and technological innovation and socio-economic development [Figure 3: see original paper].

4. Conclusion

The SECI model of knowledge management has been effectively applied in academic research and innovative practice across numerous fields. This paper enriches research content in library knowledge management, addresses previous deficiencies in systematic research and case studies, and can inspire further application and promotion of the SECI model in professional library subject information services, providing references for more libraries to carry out innovative practices in subject information services. To form more systematic and systematic research, it is necessary to investigate more practice subjects and cases to better apply knowledge management theory to promote the overall level of subject information services and continuously enhance library service capabilities.

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

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