Information service of special libraries in China: Current status and prospect

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Abstract  The article firstly summarizes the structure and development of special libraries in China. Then, the best practices of the documentation, information and consulting services of the Chinese special libraries in the digital and networking environment are provided. It finally explores the approaches for the special libraries to offer new professional services in order to meet the needs for knowledge-based services.

Keywords  Special library, Digital library service, Service mode, Information service

1 Introduction

The libraries in China fall into four major categories: national library, public library, university library, and special library. Of these categories, the special library is the most complicated one. The special libraries are generally affiliated to a host organization and provide service for the research activities of the host organization[1]. According to the ISO definition, special library refers to the service-oriented academic institution which focuses on collection, organization and preservation of the documentation and information of a particular institution or specific fields, and provides quick services in documentation and information[1]. Therefore, these special libraries have relatively fixed readerships, who are engaged in the research on particular fields. Driven by the needs of these readers, the special libraries have formed their own features in information collections and their own ideas in service. With respect to the collection development, these special libraries organize the literature necessary for research, which cover various media and types. With respect to the service contents, they highlight the proactive service to provide intelligence research and advice to the decision-makers. In terms of the service organization, they are engaged in customized and knowledge-based services and adopt advanced technologies to improve the efficiency.

According to preliminary statistics, there are nearly 6000 special libraries in China, including the libraries in the research institutions, government agencies, government-sponsored institutions, non-government organizations (NGOs), and enterprises[2]. Some of the largest special libraries in China are those of Chinese Academy of Sciences (CAS), Chinese Academy of Agricultural Sciences (CAAS),

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Chinese Academy of Medical Sciences (CAMS), Institute of Scientific and Technological Information of China (ISTIC) (also there are many provincial and municipal information institutes), China National Chemical Information Center (CNCIC), China Machinery Industry Information & Publication (CMIP), China Metallurgical Information and Standardization Research Institute (CMISRI), Information Center of China National Institute of Standardization (CNIS), and Library of National Institute of Metrology (NIM). These libraries are the leading special institutions in their specific fields at the national level and can provide information services across China. In addition, there are various special libraries under the government agencies at other levels, as well as a large number of libraries run by the enterprises.

2 Basic structure of the special libraries in China

The special libraries in China are complex. Their users come from various areas, including scientific research, social and economic development, medical and health, national defense, religion and humanity\[3\]. Different types of special libraries vary greatly in scales and levels. The smallest special library could have only one librarian, while the large library could house several hundred librarians. For instance, National Science Library of CAS, including the branches, has five hundred librarians and ten millions of books are provided for tens of thousands of researchers. However, the smallest library under the institutes of CAS is only staffed with one or two librarians, with few ten thousand of books provided for dozens of readers. Science & Technology (S&T) libraries dominate the special libraries in China, representing the future growth of the special libraries. The paper focuses on the S&T libraries development and services to present the modes, features and trends of S&T special libraries in China.

2.1 Evolution and structure

The systematic development of S&T special libraries in China can be traced back to 1950. After Chinese Academy of Sciences was established, the Library of Chinese Academy of Sciences and some regional libraries were also set up to organize some libraries of the institutes under CAS in books and literature collection, processing, and service. In 1956, CAS established Scientific and Technological Information Institute in accordance with the 12-Year Long Term Planning of Science and Technology in China (Shier Nian Kexue Jishu Fazhan Yuanjing Guihu de Yaoqiu), and special libraries in medical and agriculture sciences were also founded. In 1958, in line with the request of the Scheme on Developing Scientific and Technological Intelligence (Guanyu Kaizhan Keji Qingbao Gongzuo de Fang’an), Scientific and Technological Information Institute of CAS was separated from CAS as an independent institute. More than 50 scientific and technological institutes were then organized in the industrial sectors and local areas, such as the former Ministry of Machinery, the former Ministry of Ordnance Industry, and in Shanghai and Beijing municipalities. The founding of these institutes signified that China had set up a
relatively sound S&T information service system in the planned economy and provided a series of intelligence and consulting services for the S&T development of various industries and the regional economic development.

In 1978, China launched a market-based economic reform to restructure the management of its economic resources. Many S&T information service institutions faced great challenges amid the reform process. The local and industrial institutions were gradually transformed to specialize in market information development, technical transfer and consulting services. Guided by the market-oriented concept, many special libraries affiliated to these institutions were confronted with some major problems such as funding shortage, librarian and user losses. Most libraries did not have financial resources to increase the collections for many years, and the special database systems were terminated due to lack of new data. That has stagnated the development of special libraries in China.

After its access to World Trade Organization (WTO) at the turn of the 21 century, China stopped all the “illegal” channels of books trading under the framework of WTO, which brought about great difficulties to the development of special libraries. To address this issue, the State strengthened the S&T infrastructure, and established the National Science and Technology Library (NSTL) to enhance the procurement of the foreign S&T journals and the sharing service system. NSTL is a virtual center, consisting of National Science Library of CAS, Library of CASS, Library of CAMS, ISTIC, CMIP, CNCIC, CMISRI, Information Center of CNIS, and Library of National Institute of Metrology. They work closely to collect the printed copies of foreign journals and proceedings and to digitize and deliver the abstract of paper, and deliver the full texts on demand for all the researchers across China.

So far, a new structure has been established for the S&T libraries in China. It combines the real and virtual libraries for resources and service sharing. Institutions in various industries are used as the nodes to establish a service chain on special libraries that cover all over China. The central nodes provide literature and intelligence services in their respective industries and regions to establish a resource sharing system. For example, NSL of CAS, a core member of NSTL, is responsible for organizing the sub-branches of NSL of CAS and the libraries of the institutes under CAS to develop the S&T information service system. Library of CAAS, also a member of NSTL, takes the lead in organizing the libraries of CAAS at various levels to develop their information sharing and service system. Similarly, Library of CAMS has coordinated and organized the libraries of its subsidiary institutes in developing an information sharing network on medical sciences. As a result, the S&T information service system has been developed in the framework of special libraries by integrating the resources from various sectors in China.

2.2 Network–based development of special libraries in China

In April, 1993, sponsored by National Natural Science Foundation of China (NSFC), the former Library of CAS worked with Library of Peking University and Library of Tsinghua University to develop key technologies on APTLIN (Academy of Sciences, Peking University and Tsinghua University Library & Information
Network) in Beijing, and make explorations on network-based libraries, which initiated the digitization and networking process of libraries in China. This finding was showcased at the IFLA’96 Beijing Conference and greatly acclaimed by the domestic and international experts.

In 1996, Ministry of Education, the former State Planning Commission, and Ministry of Culture provided support to the projects of digital libraries, which paved the way for the large-scaled development of these libraries in China. In 1997, the Shanghai Library launched its digital library project; it is followed by National Library of China which organized key technology research on digital library in 1998; the China Academic Library & Information System (CALIS) was initiated under the support of Ministry of Education in 1999; and the Project of National Science and Technology Library (NSTL) was launched in 2000; later in October, 2001, CAS commenced its China Science Digital Library (CSDL) Project. Thus, the basic framework of digital libraries has been formed in China (see Fig. 1[4]). Driven by these projects, many special libraries also carried out their own digital library programs. These programs include the organization of digitized resources, development of digital and networking information service systems, and digital literature delivery and information services. For example, Library of Chinese Academy of Social Sciences (CASS) established the digital library on social sciences, while Library of Central Compilation and Translation Bureau developed the digital library on Max-Leninism, and Library of the People’s Daily developed the database of the newspaper. The libraries of the institutes under CAS, guided by National Science Library of CAS, were also engaged in the development of digital library, such as building the catalogue database, full text resources, the library service website, the full text delivery system and reference consulting system.

**Fig. 1 The main frame of Chinese digital library.**

Notes: CASHL, China Academic Humanities and Social Sciences Library; NDLC, National Digital Library of China.
The National Science and Technology Library (NSTL) is a virtual service system sponsored by Ministry of Science and Technology (MOST), together with CAS, Ministry of Finance (MOF), and Ministry of Education (MOE). It organizes its members to collect, preserve, and develop the S&T literature and information in the areas of agricultural, industrial, phys-chemical and medical sciences according to the principles of “unified procurement, standardized processing, integrated releasing and resources sharing”, to serve the researchers across the country. The member agencies, with the help of NSTL, have completely collected the major foreign S&T journals, formulated the standards and criteria on data processing, and developed databases on S&T literature. In 2002, NSTL established a 1000Mbps fiber network in Beijing by upgrading its service system, enabling the connection via 100Mbps fiber between among National Library of China, China Education and Research Network (CERNET), China Science & Technology Network (CSTNET) and Intelligence Institute of PLA General Armament Department (GAD).

In 2001, under the support of the Knowledge Innovation Program of CAS, the Library of CAS (previous name of NSL of CAS) carried out the CSDL program. The program, based on CSTNET, developed the literature and intelligence system for CAS, including the full text database, abstract database, reference database and information retrieval service platform. The program explored a new service model for CAS to distribute the digital resources to the subordinate institutes and pushed the information services to the scientists. The program consorted the institutional libraries to strengthen the database holding and established the strongly collaborative digital resources system. In CSDL, the libraries could share some special subject database via IP authorization and embed the digital resources into the research activities and working environments to establish a smooth information service flow. At the same time, CSDL has developed effective retrieval system, full text delivery system, virtual reference system, and developed a mobile authentication system to meet the needs of researchers for data and information while staying off-line from CSTNET.

3 Exploring the special library service

The development of digital libraries in China is a process with the exploration and transformation of library service mode. Chinese special libraries have accumulated many best practices during this process, explored and established the literature and intelligence service modes of special libraries to meet the demands of users. After several years of practice, Chinese special libraries have expanded the joint development of digital resource, the development of digital literature service system, and customized service mechanism, as well as the special information service, and have initially established a service mode for digitalized literature and information with Chinese characteristics.

3.1 The development of S&T literature databases

The first step for developing digital libraries is to digitize the print literature and establish the databases. The Chinese special libraries also follow this approach. There
are two major ways to build the digital resources of special libraries. One is to purchase literature databases, firstly buying or joining consortia of databases according to the demand of users, then integrating all kinds of digital resources including self-built resources or databases, and offering unified retrieval platform. Consortium subscription is one of the features of Chinese special libraries in resource development. The other way is to build special databases. Chinese special libraries cover all the professional areas, with specific literature databases and facts databases built according to the demand of users and topics, and provide support to the specific services of special libraries with special databases.

For example, as of end 2007, National Science Library (NSL) of CAS has actively organized the institutes under CAS to set up the resource consortia and made more than 100 databases and 7,459 foreign-language full-text electronic journals available and accessible to their researchers. Through establishing the workstation and single IP authorization, NSL of CAS has provided 20 literature databases for 38 institutes under CAS on specific demands. In terms of specific database building, NSL of CAS organized and integrated Chinese scientific literature database, Chinese Union Catalogue Database of Periodicals in Western Languages, Chinese Science Citation Database to form a unique database — Science China. This product has become a good service brand among domestic literature service market, and has been successfully merged into the Web of Knowledge, an international service platform of Thomson Reuters, Inc[6].

Another example is Library of CAAS, which introduced more than 100 literature databases, such as CABI of International Agricultural and Biological Sciences Centre, AGRIS of Food and Agriculture Organization (FAO), and AGRICOLA of National Agricultural Library of USA. In addition, it has built through its own efforts more than 50 databases covering the topics on Chinese agricultural S&T literature, international agricultural scientific literature, Chinese agricultural library catalogues, agricultural, livestock and fisheries S&T achievements, global agricultural development dynamics, Chinese food and macro-agricultural development, and Chinese agro-economics, among others[7].

3.2 Integrated service system

The development of digital libraries has brought opportunities for the service integration of special libraries. On the basis of building digital literature resource system, each of the Chinese special libraries has developed independent literature information service system according to their own features. The integrated service system of Chinese special libraries has the following three characteristics:

- Integration of information service with the research process. With the informationization of the scientific research activity, researchers have become adapted to doing research in a digital networking environment with the need to integrate the literature information service into the working environment. In 2006, based on the extensive survey on the researchers’ information access behavior, NSL of CAS developed “a tool of individual desktop information
seeking”, with which the users can retrieve literature information at ease in their own work environment. The users can choose the topic, data or question by drawing the words at any time while browsing the websites, editing documents or contacting by e-mail. They will be automatically connected with the integrated service system of NSL of CAS and use relevant service functions according to the features of the users and the workflow.

- Cross-domain integration of scientific literature, information and data. In the scientific research activities, the user needs a lot of zero information and non-literature information, which are dispersed in various information sources, and not included in the traditional information services. To address this issue, NSL of CAS has developed the “cross-retrieval services system”, providing integrated retrieval service on non-literature resources such as scientific data, courseware, instruments and equipment, proceedings, research institutions, scientists, tools, instruments, and terminologies. The retrievable targets are the authoritative and open-accessed online sources in relevant areas, including 8 types of resources and 62 databases. When users enter the search keywords, the retrieval in various databases can be enabled and displayed in a unified form[6].

- Seamless integration of all types of information services, and one-stop retrieval service. To cope with the problem of the failure of many distributed service systems to support multiple users for integrated use of multiple systems during the process of building digital library service systems in China, NSL of CAS developed integrated service system based on the Open URL standard, integrating seamlessly the original integrated literature retrieval system, literature downloading, delivery of full text, and consulting service, and enabling smooth and unified process from resource discovery, literature download, delivery service to reference. At the same time, the user scenarios sensitive mechanism has been embedded in the integrated retrieval system of the scientific journals.

### 3.3 Customized information service

Customized services are the major forms to realize the value of modern special libraries. In a non-digital environment, the customized services of special libraries are mainly reflected by the personalized use of library facilities, providing the users with personalized environment for reading, such as the subject reading room, personalized lending, and special consulting. In digitized networking environment, it enables users’ access to the literature anywhere and anytime through the decentralized service of online databases. The modern customized services of special libraries include: information customizing and pushing, special literature retrieval service, and information consulting, among others. The libraries offer literature information services according to the specific needs of researchers or projects. In the current period of special library development, the libraries are requested to strengthen active literature information services to the needs of the researchers, and build the system of subject-oriented librarians to conduct discipline-based information services. They are also required to organize the librarians to access the researchers’ work environment,
and provide the literature delivery service with an objective of improving the quality of the users in using the information.

In 2004, after completing the digital literature and information resource system, NSL of CAS set up the Task Force of Subject-oriented Librarians, which is aimed to promote the specialized literature information services directly for the researchers, and a system of subject librarian was made available for NSL of CAS. According to the strategy planning of CAS, NSL of CAS has set up subject reference librarians in energy, information technology, space technology, advanced materials and advanced manufacturing, micro- and nano-technology system, natural resources and ecological environment, population, agricultural science and technology, marine science to explore the road of subject reference in the literature service department and collection development department.

In 2006, NSL of CAS formally established the subject reference service department, with 40 subject librarian positions, and equipped each institute under CAS with professional subject librarians. The subject librarians visited the institutes to conduct users’ needs assessment and services, offer subject reference, training, and subject service, to understand and solve the problems. The library service and the cooperation among different departments were greatly improved, just during the course of the problem solution. Furthermore, the department worked closely with the librarians of the institutes by penetrating the research activities and projects, so as to ensure that the researchers can obtain the high-valued information service anywhere and anytime.

Information analysis service is the major approach for special libraries to provide high-quality services. The special libraries in China have undertaken many information analysis services in their respective areas. Information analysis services are mainly categorized as the two types: subject analysis and research projects; technology policy and strategic management. For the former, Library of CAMS has published various internal journals, such as *AIDS Research Update*, *Family Planning Research Update*, *Maternal and Child Health Research Update*, *Biomedical Research Update* and *Cardiovascular Research Update*, offering services to the medical research community across the country[8]. NSL of CAS has also published as many as 13 journals to update the progress in various fields. In terms of scientific policy and strategic management, ISTIC designed some portal websites on S&T policy, planning, and programs. Meanwhile, NSTL organized its member organizations to conduct research on specific topics, assess the progress in relevant disciplines, and prepare reports on policy consulting. NSL of CAS is actively involved in a number of activities, such as assessing China’s S&T competitiveness, evaluating China S&T developing level with bibliometrics method; selecting key development areas and topics to conduct intelligence analysis. Some reports have been published, such as *Chinese Science in World Science, Chinese Academy of Sciences in World Science, and Research on Competitiveness of each Component in National Innovation System*. 
3.4 Subject literature and information services

Subject literature and information service is one of the major service modes of Chinese special libraries, which has been widely applied in various types of special libraries. The major services include subject retrieval service and subject information navigation. Subject retrieval service is a type of service that according to the researchers’ requirements, libraries provide the customized information service by systematically and completely collect the S&T information in specific areas and make a professional analysis on the development. For example, with the help of NSTL, its member organizations have edited various types of subject abstracts, including *China Metallurgical Digest*, and chemical thematic literature. Library of Central Compilation and Translation Bureau is responsible for compiling the *Information on Foreign Publications* to update more than 100 kinds of key academic journals in philosophical and social sciences, and foreign new books in the United States, Britain, Germany, France, Russia, Japan and other countries, providing a window for the Chinese researchers to follow the advances of foreign theories. The Bureau has also compiled more than 20 types of subject bibliographies and indexes on Marxism and socialism. NSL of CAS, as a retrieval and service center at the national level, accepts more than 1000 commissions on the retrieval and analysis service annually. The subject areas of service cover the S&T and engineering, especially in the areas of physics, chemistry, geoscience, biology, environment science, material and information technology. The library can provide retrieval service to the research projects at national, provincial, ministerial, municipal, and local levels, from the project establishment, the achievement identification and the award application to the development of new products and declaration.

After developing the digital resource system, Chinese special libraries have designed and launched different forms of subject information navigation service websites and portals in vertical subjects. Relevant literature, institutional information, updating and news on the internet about the hot topics of science and technology at home and abroad, as well as the subject search engines are collected, selected, organized, described and revealed. They provide the users with navigation services and website linkages of major national and international science and technology institutions, helping the users understand the current status, resources features and the approach for accessing the information on the hot papers and research areas in science and technology. For example, with the support of NSTL, the member organizations have established a number of subject portals, e.g. Nano-science and Nano-technology Information Portal, Cognitive Science Information Portal, Water Resources Information Portal, Renewable Energy Information Portal, Food and Nutrition, Environmental Science and Technology, AIDS Prevention and Control, and Agriculture Three-dimensional Pollution Control[3]. With the help of CSDL of CAS, many subject and special literature information portals have also been developed. The subject portals cover a wide range of disciplines, such as physics and mathematics, chemistry, life science, resources and environmental science, library and information; while the special portals consist of those on microorganisms, the
Qinghai-Tibet Plateau, the Yangtze River ecology and the environment, natural products and natural medicine, Chinese seed plants, marine science, and patent information. With the support of Ministry of Agriculture (MOA) and MOST, Library of CAAS designed and launched China Agricultural Science and Technology Information Network, connected with the networks of the two ministries as one of the major sub-systems of Golden Agriculture program, which becomes a nationwide professional network, and enables information sharing worldwide.

4 The future trend

The special library is a specific organization providing literature and information service, which is mainly reflected by: 1) The service targets of special libraries are clearly defined, mainly to meet the information needs of their respective organizations. 2) The literature resource system of special libraries is focused on a specific domain, with a major objective to satisfy the literature need of the users. Therefore, the literature of the special libraries is of various types, from the zero, and primary, to the secondary, and tertiary literature, forming a sound literature system. 3) Each special library has built an integrated service system, offering a wide range of services such as literature reading, delivery, subject information service, intelligence research, unique information resource development, subject navigation portal, and subject reference service. 4) The special libraries mainly take a mode of active service, which integrates the literature information service with the research process according to the users’ information needs.

The expansion of digital libraries has rapidly promoted the development of special libraries, providing the enabling technical conditions for the special libraries to restructure and reform their literature and information service modes. In the emerging digitized and networked environment, the services of special libraries are expected to develop towards two main directions: the network-based literature and information-sharing, and the content analysis and knowledge-based services.

4.1 To develop comprehensive information resources and establish a network-based information sharing system

Chinese special libraries have explored the methods and modes of establishing digital literature support system via the consortium subscription and self-building of the databases, which laid the foundation for providing special literature and information services. With the further development of digital libraries, the resource development of large special libraries has been expanded from simply focusing on the scientific literatures to combining literature-data-information covering the data, courseware, and experimental conditions. NSL of CAS made a useful attempt in developing cross-domain integrated digital resource, for example, organizing the literature information processing on the basis of abstract and citation processing, and organizing the information processing of comprehensive scientific literature, scientific data, scientific research equipment and conditions. In addition, it also
developed cross-domain retrieval system, which enabled the integrated retrieval of non-literature information such as scientific data, courseware, equipment, academic conferences, research institutes, scientists, tools, and terminologies.

4.2 To organize the knowledge-based information service and provide consulting services for decision-making

Knowledge-based information service is a key area that attracts the attention of Chinese special libraries, as well as an important trend in the future. In the traditional library services, knowledge-based services exist in the form of subject investigations and consultation, in which Chinese special libraries have conducted a great deal of practices. In digital environment, however, the knowledge-based services of special libraries will be further promoted and expanded. Special libraries are responsible for organizing the information analysis on S&T literature, data, and the development, with up-to-date means and tools, to reveal the patterns and trends of S&T research activities. For example, NSL of CAS has developed the platform for intelligence analysis, to predict the technical trends with the help of S&T literature and patent literature. CNCIC has been following and studying the trends and progress of domestic and international chemical industry on a long term basis, and provides services such as the market research, forecasting analysis, and feasibility study according to various needs.

References