In Search of a New Model: Library Resource Sharing in China - A Comparative Study

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Abstract

This paper reviews the framework of library resource sharing (LRS) in China and examines, from a comparative perspective, cases of recent development, particularly in the 1990s and early 2000s. Highlights include: (1) historical review of LRS in the U.S. and China, particularly in the areas of print union catalogs and union lists, online bibliographic utilities, and interlibrary loan; (2) literature review of Chinese publications, and LRS issues and challenges in China; (3) Analysis of three LRS models to provide a contextual grasp of a paradigm shift taking place in China; and (4) comparative analysis of LRS objectives, structure, and governance, etc., in the U.S. and China.

The study also underscores the imperative for building a national digital library system in China to gain a competitive edge in resource sharing and to support the country's rapid social and economic growth. At this stage of development, the success of China Academic Library & Information System provides a convincing argument for a national digital library system with its methods of governing, financing, and development.

Introduction

This study presents an argument that LRS has grown in importance because of the upheaval of information technology and the escalating economic growth of China in a global environment. Significant changes took place during the past twenty years in China. Unique models of LRS have begun to take shape, as a result of intensive study of successful LRS models in developed countries, particularly the U.S. These emerging Chinese models of LRS offer valuable case studies in sustainable long-term growth for how they address issues such as paradigm shifts,

strategies, leverage of financial, technological, and human resources, and adaptation of new approaches in governing and leadership. The study is based on extensive research of the relevant publications on LRS and review of selected websites.

Historical Review

LRS is a term becoming popular in the U.S. during the computer network and Internet Age, although the initial efforts made towards LRS long preceded the introduction of computer technology. As we look back in history, LRS was, has been, and continues to be a dream of librarians in both U.S. and China. The Farmington Plan (1942-1972), frequently cited by Chinese librarians as an inspirational prototype for collaborative acquisitions, embodied one of the earliest attempts to build a comprehensive world collection in the U.S. The plan called for each cooperating library to assume the responsibility of acquiring one copy of every book published anywhere in the world on a given subject area which could conceivably be of interest to researchers in America. The plan ended in 1972, but the dream of LRS has been carried on in various forms. Now, thirty years later, Chinese librarians resume the dream with a new plan for library cooperation to acquire access to most foreign digital journal publications through a few nationwide groups of collaborating libraries.

1. LRS in the U.S.

In the U.S., LRS came into vogue as early as the 1970s when a new technology was deployed by the OCLC (then Ohio College Library Center) to automate the production of catalog cards with machine-readable formats.[1] OCLC used the new technology to provide bibliographic records online which immediately facilitated the development of library databases and enabled sharing of cataloging procedures. The direct result of this automatic provision of bibliographic records was the birth of copy cataloging; a move that significantly reduced the need for libraries to do original cataloging locally. The next major impact on resource sharing was the development of low-cost minicomputers. The ability of these machines to handle multiple tasks simultaneously and accommodate rapid access and large capacity of storage devices to support online activities was integral to the advancement of resource sharing. Enabled by the technological development and the continued growth of library automation, a few important regional library alliances emerged. One of the earliest alliances was Illinois Library and Information Network (ILLINET), which was formed to support "an information network for interlibrary loan and reference services."[2] In the late 1980s, OhioLINK became another successful cooperative venture of academic libraries in the U.S. The original purpose of OhioLINK was to build a statewide online cataloging system. Today OhioLINK serves 600,000 students, faculty and staff members at eighty-five member institutions. Its union catalog consists of 45.3 million items; of which 9.8 million are unique items supporting a non-mediated online inter-campus borrowing and delivery service.

1.1 Print Union Catalogs and Union Lists

One important objective of LRS during the pre-automation era was to construct a union catalog through which libraries published their holdings and collections to the general public. In the U.S., the earliest effort to create a union list of serials began in 1901, when a *Union List of*

Serials in Chicago was published. By the 1930s, it became very common to find references to union list projects carried out in most of the major cities in the U.S. At the national level, the Library of Congress published the *Union List of Serials* in 1927, containing 75,000 titles and representing the holdings of 225 libraries. In the mid-1950s, the first monthly, quarterly, annual and five-year cumulative printed editions of the *National Union Catalog* were published in book form. The first volumes of the *National Union Catalog, pre-1956 Imprints* appeared in 1968, and the project continued for more than a decade. During this time period, libraries became increasingly reliant on computers for bibliographic and locational information.

1.2 Online Bibliographic Utilities

Along with the development of automation systems and interactively linked local and regional networks was the evolution of the "bibliographic utilities"--widely used jargon among U.S. librarians to mean "cooperatively based online systems whose origins were in the sharing of cataloging data."[3] Examples of such bibliographic utilities in the U.S. are abundant. The Online Computer Library Center (OCLC), the Research Library Information Network (RLIN) and Washington Library Network (WLN) all began in the early 1970s. While they were different in many respects, these three major bibliographic utilities primarily entered into a networking environment as a shared cataloging system; however, each of them moved beyond the sharing of cataloging data and extended their capabilities. The relationship of participating members with the three utilities varied. Dennis Reynolds points out that some libraries "are direct participants, with terminals located on their premises; others are indirect participants through processing centers or special arrangements; still others have no formal status as users of any of the systems but still gain access to one or more of the databases and rely on their information."[4] The three online systems have played a monumental role in providing automated support for producing, processing, and disseminating bibliographic information required by libraries. In 1999 and 2006, WLN and RLG respectively merged with OCLC. With these changes, OCLC became the only national bibliographic utility in the U.S.

1.3 Interlibrary Loan (ILL)

The need of every library to have an ILL function has been a major impetus for the collaboration of libraries. Although the concept of interlibrary lending was documented as early as in the 19th century,[5] its wide acceptance as a library service in the U.S. was not until 1917 when a committee of the American Library Association issued the first *Code for Interlibrary Loans*. The code was officially adopted in 1919 by the American Library Association (ALA) to regulate behaviors with respect to interlibrary loan activities. "The code does not override any consortial agreements and regional or state codes that may be more liberal or more prescriptive but the national code provides guidelines for exchanges between libraries where no other agreement applies."[6]

The steps that involve the greatest degree of cooperation to facilitate ILL are: (1) determining the location of needed items, (2) transacting ILL requests, and (3) delivering materials or documents from one library to another. During the pre-computer era, the interlibrary activities were rather limited due to a lack of effective locational tools. Before the three major automated online bibliographic utilities were developed, libraries relied on print union catalogs and union lists to locate sources to borrow. In the mid- and late 1930s, many regional bibliographic centers were formed to initiate union card catalogs. Until the late 1970s, the Bibliographical Center for

Research in Denver, for example, remained a more viable tool for determining regional locations for pre-1976 publications than OCLC or the National Union Catalog.[7] Most of the centers did not last very long because of the high cost of perpetual maintenance.

In the post-automation era, many state-based consortia were formed to facilitate ILL services. These regional consortia used OCLC or RLG bibliographic utilities but formed their own courier networks to ensure timely interlibrary delivery. Both RLG and OCLC have developed their own ILL management software (ILL Manager, Ariel, ILLiad, and Odyssey) to help member libraries handle local ILL office workflow and document delivery. The OCLC online union catalog and union lists have eventually become the most shared cataloging system in the world. From this resource, an interlibrary module was developed that enables libraries to search lending libraries' holdings, communicate requests, and track the process status. Today, more than 6,900 libraries in 96 countries and territories around the world use OCLC's World Cat. In order to foster an international LRS, OCLC has launched a Global Sharing Program to help these libraries borrow beyond state and national boundaries.[8]

2. LRS in China

China did not have many of these developments until the post-cultural revolution era. During the early 1980s, most academic libraries in China were still using card catalog systems. Developing a national union catalog and union list was a daunting task. Many libraries operated independently from each other and sharing resources and services was impractical.

2.1 Print Union Catalogs and Union Lists

China promoted a plan for LRS during a very brief period in the 1950s. The plan, known as the *National Library and Information Coordination Plan* (1957), was endorsed by the State Council to establish two mandates: (1) to set up library Coordination Committees at both national and provincial levels; (2) to compile a national union catalog and a national union list. As a result, two national central library committees were established in Beijing and Shanghai to explore means for interlibrary lending.[9] Some progress was made in the establishment of agreement for reciprocal use of other libraries' collections on site, but actual interlibrary lending was very limited due to a lack of automated management and control systems. The plan did not quite take off and was quickly interrupted by the Cultural Revolution (1966-1976). The effort was resumed in the 1980s based on the pre-Cultural Revolution plan, but librarians soon found themselves handicapped by a lack of accurate and complete bibliographic information. The need for national union catalogs and union lists were again put on the front burners. The task of developing national union catalogs and union lists was placed on the shoulders of the Beijing National Library (the forerunner of the National Library of China). The library began to disseminate cataloging records in cards, experiment with MARC tapes, and establish standards for cataloging and classification. However, it was not until the 1990s that intensive activities began to focus on standardization of bibliographic data format and collaborative cataloging via networks.

2.2 Online Bibliographic Utilities

As of today, there are two major bibliographic utilities in China. The National Library of China (NLC) began cataloging Chinese materials online in 1988 and distributing a machine-readable catalog in 1990.[10] As the largest public library in China, the NLC plays a paramount role in establishing cataloging standards and developing useful tools to support a national union catalog. In 1997, the National Acquisitions and Cataloging Center was established in the NLC to

coordinate acquisitions, organize cooperative cataloging activities, and provide support and services to public libraries nationwide. By the end of May 2005, the center already had 536 participating members and 944 institutional data users. During a 12-month period from June 2004 to May 2005, a total of 1 million bibliographic records were downloaded by its users.[11] By the end of 2006, the union catalog of NLC accumulated over 1.2 million bibliographic records. However, today the NLC faces some challenges to sustain its national utility status: (1) it lacks variety in the materials acquired; (2) it lacks diversity of services needed from its customers; and (3) it lacks international demand for its bibliographic products. Widely recognized in China as a pioneer in authority control, NLC's authority control standards have not been universally accepted outside China.[12]

Another national bibliographic utility for academic libraries emerged in 1999 when the China Academic Library and Information System (CALIS) was founded. CALIS is part of the 211 Initiative by the State Council to build a national information support system for all the higher educational institutions and is funded directly by the Ministry of Education. CALIS develops resources and provides services through four subject-specific national information centers in the areas of social science and humanities, engineering and technology, medicine, and agriculture, and eight regional information centers as gateways to the surrounding areas.

As one of the core services, CALIS wanted to build a national union catalog to facilitate resource sharing among academic libraries. The project was approved in 1997, and the CALIS Cooperative Online Cataloging Center was launched in March 2000. Since then, CALIS has speeded up the construction of a union catalog and the number of records has been increasing rapidly. For example, within two months from Nov. 1 to Dec 31, 2006, 46,355 bibliographic records were added to the database. By the end of 2006, the union catalog database accumulated over 2 million bibliographic records of various types of materials in several languages. On average, over 1,000 titles were added to the database each day, and over 200,000 records were downloaded per month by member libraries. In addition to the rapidly growing union catalog, CALIS began to offer training and workshops through its regional centers to promote its cataloging standards. In 2001, CALIS approved the *CALIS Guide for Cooperative online Cataloging*, a monumental 2-volume work that has been regarded as catalogers' bible by CALIS members. As of the end of 2006, a total of 604 institutions participated in the CALIS cooperative cataloging program. According to Yi Lu, the CALIS Cooperative Online Cataloging Center has developed the largest and best online cataloging system in China with a reputation of thoroughness, inclusiveness, and accuracy of its products.[13]

2.3 Interlibrary Loan

In China, full-scale ILL did not exist until the 1990s when networked computer systems were introduced. Not only did this gap in connectedness set ILL service back in China, but until recently, it has also been handicapped by the lack of several key elements that a preferred interlibrary sharing environment requires. First, a functioning online national union catalog in the capacity of OCLC or RLIN did not exist. Second, collaboration among libraries was only at a conceptual level, and many libraries wanted to wait to avoid risks since there had not been any successful models to follow. Third, many librarians still hold on to the "our collections" vs. "your collections" mentality. Until the late 1980s, both public and academic libraries had closed stacks. To remove materials from the premise was considered a risk for potential loss and

damage to the materials. Some libraries are only willing to lend materials with more than one copy.

Because of the reasons given above, the most common ILL method in China today is on-site reciprocal borrowing. A library user must first obtain a generic ILL card from their home library before visiting a reciprocal library. Each consortium has different ILL policies. Therefore, a user must know which library he/she wants to go to in order to obtain the right ILL card from the home library. Some consortia have specific restrictions about what a non-affiliated patron can borrow. A user can also avoid a trip to the reciprocal library by entrusting the home library to obtain the requested item. In that case, a certain processing fee is assessed depending on the type and location of the lending library. Certain large national universities also offer international ILL service, but the fees are prohibitively high and the process long. Because of the extra steps and fees involved, ILL in China has not been as popular as in the U.S., and the demand for the service is generally low. An article published in 2002 shows that, of 702 academic libraries, 397 participated in some sort of ILL service, and only 24 libraries had exceeded an annual total of 1,000 ILL transactions.[14] The ILL transaction data at Suzhou University cited in another article published the same year reinforces the assumption that there is a very low demand for ILL service. For a six-year period from 1996 to 2001, the total annual ILL transactions were respectively 94 (1996), 368 (1997), 324 (1998), 629 (1999), 584 (2000) and 550 (2001).[15]

ILL in China is a fee-based document delivery service. This type of service-for-payment tests a user's ability to pay. For many students, use of ILL services may be their last resort, if not something to be avoided altogether. The pay-per-use document delivery system does encourage people to use the service responsibly, and some major universities do offer to share part of the service cost to encourage the use of the service. Generally, locating resources and obtaining access to them have been two major challenges. Libraries in China have been slow in adopting document delivery technology available in the market. Very few consortia have their own courier service to ensure fast turnaround. Until the formation of CALIS in 1998, photocopied articles were sent in the mail, and scanned documents were forwarded via fax or e-mail attachment. As more and more libraries are connected via an information network, purchasing and obtaining access to full-text databases apparently become a better strategy for libraries to make information available for users. Indeed, it has become a top priority for LRS in the networked environment.

2.4 Resource Sharing in a Networked Environment

The surge in LRS initiatives coincides with a period when the Chinese government began to invest heavily in a national information highway infrastructure. The first high-speed network, National Computing & Networking Facilities of China (NCFC), funded by the State Planning Commission and a World Bank loan, was installed in 1989 on the campus of the Chinese Academy of Sciences (CAS). The original intention was to use this network to connect three campus networks: The Chinese Academy of Sciences, Beijing University, and Qinghua University. The backbone of NCFC was completed in 1993. One year later, it became fully connected to the Internet via a Sprint international router, providing Internet connection to the three campuses. At about the same time, the State Education Commission launched The China Education and Research Network (CERNET) from Qinghua University campus. The CERNET connected 10 major research universities throughout the country through NCFC. By 1995, telephone lines had increased by 10 million, and DDN, a nationwide digital data transmission

network, had expanded to all the major provincial capitals and was quickly expanding into other middle cities.[16] With this structure in place, the following major events were able to happen:

1993	APTLIN (Academia Sinica, Peking University, and Tsinghua University) was rolled out as the first shared library and information network. The project was funded by the National Natural Science Foundation of China.
1997	A National Acquisitions and Cataloging Center was established in NLC in Beijing to promote and coordinate online collaborative cataloging for public libraries in China.
1998	The proposal for CALIS was approved by the National Development and Reform Commission, setting a goal of completing phase one of CALIS by 2000.
1999	A Conference was hosted by NLC in Beijing to promote resource sharing; 124 libraries signed the *Proposal for Nationwide Library and Information Resource Sharing*. Consequently, 122 libraries also signed a *National Interlibrary Loan Code* in the same year.
2000	The first plan for China Digital Library Project (2000-2005) was launched.
2000	*China-US Million Book Digital Library Project* was launched in Zhejiang University. The project intended to digitize in collaboration with America libraries about one million books of which 50,000 are Chinese titles and 50,000 are English titles; plus theses and dissertations from the collections of participating libraries of both sides.
2002	The Digital Library Consortium of Academic Libraries in China was formed.[17]
2004	China Academic Social Science and Humanities Library (CASHL) was officially launched at Beijing University.
2006	National Science Library of Chinese Academy of Sciences (formerly China Science Digital Library) was formed from the integration of the Library of Chinese Academy of Sciences in Beijing with three other branch libraries at Lanzhou, Chengdu, and Wuhan.

Literature Review

1. Publications on LRS in China

Chinese publications on LRS between 1994 and 2004 show that interest in LRS had gained steam during this 10-year period. A total of 397 articles appeared in various types of journals. In addition to the articles, a few books on the subject of LRS were also published during the period. Most of these articles focus on literature reviews and are introductory in nature. Of the 397 articles, 312 (78.6%) discussed the resource sharing environment in general. Sixty-nine (17.4%) focused on the issues and development of academic libraries. The rest of them were about public

and special libraries. Publications on LRS intensified after 1997. The shift of focus was from general review and introduction to in-depth study and analysis. Topics of these studies include the following:[18]

- Analysis of trends and patterns
- Barriers and challenges for further development
- Connectivity and sharing between libraries and archives on a university campus
- Copyright and licensing
- Ways to share access online full-text articles (especially foreign journal articles)
- How to develop collections and resources in various disciplines

2. Issues and Challenges in China

Many articles on resource sharing have mentioned divides between public, academic, and special library systems as major barriers to true resource sharing. Each type of library has its own administrative system supported by the network of its own governing organization, and thus follows its own protocol. The public library network, led by the NLC and the Shanghai Public Library system, is governed by the Minister of Culture. CALIS is under the oversight of Minister of Education. NSTL is under the Minister of Science and Technology. The National Science Library system is managed by the Chinese Academy of Sciences (CAS). Other special libraries or school libraries are under either a government agency or a regional municipal administration. As a result, a library is mainly responsible to the mission and objectives of its parent organization that provides funding and budget. Based on the level of funding a library receives, many libraries continue with the self-sufficient paradigm in order to acquire materials or develop integrated library systems and networks. Small libraries that are at the bottom of this administrative hierarchy and do not have much to share are often left out of any of the major consortial networks. Increasingly, those who can benefit the most from sharing are the small public libraries in the rural areas and libraries of small community colleges and vocational schools.

Many publications express concern about the inaction of certain libraries in developing regions. By far, all the powerful information network and resource sharing consortia are established in the large metropolitan areas with booming economies; therefore, many barriers still exist in developing or under-developed regions, hampering desirable initiatives and progress. Sun Wei and Zhao Fang[19] summarized the following as common barriers:

- Traditional perception of libraries as closed, self-sufficient collections that usually do not invite creative ideas for collaboration and sharing

- Traditional organizational blocks featured with inflexible bureaucratic layers that hamper cross-block coordination of financial and human resources

- Lack of policies and rules governing behaviors and activities of LRS

- The disparity among libraries in the deployment of integrated library systems and in the application of standards and protocols, resulting in the lack of open and compatible network platforms

- Lack of commonly accepted definitions of the changing paradigm in a networked environment

Models

Regardless of the existing barriers and unbalanced development, remarkable progress in LRS has been made in a short period of past twenty years. Our review of activities in the past twenty years reveals some patterns of LRS, based on which the following three models are analyzed in order to present a macro-perspective of LRS in China. The three applicable models (centralized model, consortium model, and gateway model), often intertwined without distinctive parameters, are presented here to offer an understanding of the paradigm change on a theoretical level. All the terms used to describe the three models may be defined in different contexts. The writers used them with a narrow application to the organizational structures rather than network communication context.

1. Centralized Model

Until today, the commanding political and economic system in China has been a centralized, top-down, hierarchic model. A library or a library system fits into an administrative "block" of the rigidly structured system within which each library strives to be self-sufficient with its own full processes of acquisitions and cataloging. The same is true of any sub-system at a provincial level. A typical example of this model is found in the NLC and other public library systems. Beijing, Shanghai, Guangdong, Fujian, and Hubei are trendsetters in LRS in the public libraries; the prevalent LRS structure evolves around the "central + sub libraries" concept.[20] This centralized model of LRS is characterized by: (1) one central library providing its resources and services to the sub-libraries of a system; (2) information resources acquired and processed centrally or cooperatively; and (3) interlibrary loan service provided to other libraries in one-way direction. Although there is a certain degree of sharing, this model does not focus on equal sharing among the members of a system because the contribution is overwhelmingly unbalanced between a central library and branch libraries. The information resources are maintained and controlled mostly by the central library.

One of the benefits of being a central library is that it always gets the largest piece of government funds. Thus, it enjoys a very commanding position in influencing group decisions, as well as in leading important projects which often come with updated facilities and technological enhancement in human resources. On the other hand, disadvantages exist in unbalanced sharing. Central libraries have more resources, creating a need to share more with others; however, an imbalance exists because they pay a great deal, but gain very little. Other libraries are not, in a true sense, partners, but end users. Priorities and missions vary depending on the size and level of a central library and must be very carefully outlined in a LRS agreement so that a fine balance can be maintained between what a library is able to share and how it can make up for the cost associated with sharing.

Putting aside the issues of unbalanced sharing and organizational inflexibility, a strong central library can make significant contributions. In the case of the NLC, its *National Acquisitions and Cataloging Center* leads the cooperative cataloging of many public libraries and distributes MARC records of the *National Bibliography* to other libraries in a variety of forms, such as disks, CD/DVDs, electronic files for downloading and ftp transferring. NLC's Document Delivery Service Center provides international ILL services through mail and email to over 500 libraries in 63 countries.[21]

As a central library, NLC is facing greater challenges in retaining the level of on-site usage of its print collections. Based on comparative statistics from 2003, the total circulation transactions dropped by 12.71% from the previous year, gate count dropped by 9.86%, library card applications dropped by 17.85%, and the total number of viewers of NLC web page was down by 14.48%.[22]

To resolve the difficulties, the NLC has been moving forward to be more flexible and participative in LRS activities. The NLC has acted as a coordinator for the Consortium of National Information Resource Sharing,[23] to facilitate resource sharing among public libraries nationwide; it has also recently participated in the National Cultural Information Resource Sharing Project,[24] and contributed in building a national network to create, preserve, and disseminate digital content of Chinese cultural information resources to the general public in China.

2. Consortium Model

The term *consortium* is derived from the U.S. library lexicon to generally refer to any form of cooperation and collaboration among participating libraries. In the U.S., three important elements define a library consortium: (1) it is a loosely defined partnership based on each institution's own interests and needs; (2) it is formed by contract that delineates the rights and obligations of each member; (3) its members retain their separate legal status, and the consortium's control over each participant is generally limited to activities involving the joint endeavor.

Library consortia in China exist in a variety of forms. The term "consortium" is often used interchangeably with "alliance," "network," "association" or a "group" of libraries sharing resources and services within the same administrative block. This is due to the fact that all libraries in China are government funded and all historically fit into certain "blocks." A consortium in China often carries the inherited bureaucratic structure, especially among libraries, in the same "block" and is funded totally by the same legislative body. Generally, it is easy to form a sharing group among libraries within the "block," rather than across "blocks." In addition, libraries in a "block" share the same information network which is essential for creating a shared virtual environment. It is thus natural for libraries to form a consortium based on specific types of libraries such as academic, public, and special libraries.

In China, several distinctive types of consortia have emerged, and more libraries began to join cross-block consortia to shake loose the hierarchical blocks in exchange for more flexibility. The majority of consortia, like those in the U.S., are single-type consortia following the division of academic, public and special libraries. Academic libraries, often funded more generously than public libraries, do not have much need to share with public libraries. For public libraries, it is just the opposite: there is an increasing call for multi-type consortia with local academic and special libraries.

Academic library consortia first became prevalent in China in the 1990s, fueled largely by the fast-growing national information network. For academic libraries, LRS started up among some universities that are nationally reputable and located in developed areas. Academic libraries have many advantages in building information networks and in leading the trends. First, their collections are more comprehensive than those of public libraries. Second, they have far superior collective intelligence on their campus that creates scholarly information to share. Third, they

have far better funding and financial resources than public libraries. Fourth, they are comparative and self-sufficient enough to allow them to share on a more equal footing. Examples of academic library consortia include the Network Library of Colleges and Universities of Shanghai,[25] the Net Library of Beijing Area Higher Educational Institutions,[26] Tianjin Academic Library Information System,[27] Hebei Academic Digital Library,[28] and Hubei Academic Library Committee.[29] Each of these consortia has a uniform web platform through which members share the union catalog, digital databases, and interlibrary loan services. These consortia support cooperative acquisitions and cataloging, train and certify library staff in processing materials based on established standards, and coordinate the development of digital projects and virtual reference service.

Public library consortia in China are usually formed around a central library of a city or a metropolitan area. Examples include Shenzhen Acquisitions and Cataloging Center, Guangdong Province Public Library Automation Network,[30] and Hubei Public Library Consortium.[31] Cross-region consortia have come into play since 2000. One example is the China Regional Libraries Network[32] co-founded by six key public libraries. It currently has 71 members located in various regions. A major purpose of these public library consortia is still cooperative cataloging and acquisitions because of the lack of a nationwide comprehensive union catalog.

Special library consortia comprise special types of libraries and have played important roles in coordinating LRS activities in specific subject areas. Examples are the Medical Library Association of Chinese Universities and Colleges,[33] which comprises about 151 academic medical libraries, and the National Science and Technology Library (NSTL)[34]. As one of the major national LRS systems, NSTL consists of eight major national science and technology research institutions, and covers the fields of science and technology, engineering, agriculture, and medicine. It aims to collect, organize and preserve cooperatively and comprehensively the science and technology information resources in Chinese and foreign languages, and extend the access to these resources through a unified portal. Collectively it has the largest print science and technology journal collection in China, among which about 29% are in Chinese and 71% are in foreign languages.

Multi-type consortia consist of various types of libraries. One typical example is the Shanghai Information Resources Network (SIRN)[35]. SIRN is a cross-block regional consortium with the purpose of providing a single, cross-block searching and sharing platform in the Shanghai area. It currently has 31 members, including public, academic, and special libraries. Zhejiang Province Digital Resource Network[36] is another example, which consists of public, academic and special libraries in Zhejiang Province.

3. Gateway Model

LRS development in China today is greatly enhanced by the formation of a national information infrastructure which was spurred by the emerging information technology. The infrastructure reflects the political and social system and structure of the country, which is a top-down structure from the central government to the regional government and to the local, municipal government. The design of gateway model resembles the top-down structure which typically has three tiers consisting of national centers, regional centers, and local centers and libraries as end-users. This model is in a certain way comparable to the aviation control model where an information center

serves as a hub "to which passengers are transported from different locations within the country, and then transported as a group to a foreign destination."[37] Two examples of such a model are presented below:

3.1 China Academic Library & Information System (CALIS) [38]

As a management center, CALIS was established in 1998 when it began to plan, design and implement a nationwide academic library system. CALIS aims at promoting and improving resource sharing among academic libraries, optimizing the methods of assembling, accessing, and delivering resources and information through the national platform. It also eyes helping participating libraries achieve cost-effectiveness, as well as offering the information and research support to advance the high education in China. As of the end of 2006, it developed 604 members distributed in twenty-seven provinces, cities, and autonomous regions in China. Its long-term goal is to build the largest academic digital library in China, and to construct, organize, and distribute digital resources to over 1,500 universities and colleges in China.[39]

CALIS has a unique financial support structure as it is designed to become financially self-sufficient. Support comes from three sources. The primary source is a grant from the central government that makes the foundation of the system possible. The money has been used in purchasing software and hardware for CALIS centers and commercial databases, developing software and databases, and training staff members. Another source is contributions from local governments: a province or city that wants to host a regional service center of CALIS on one of its university campuses must pay toward the construction of the local center. The third source is from the fees paid by member libraries, such as host site fee, membership fees, and service usage fees. In order to sustain its viability, CALIS will continue to seek funds from external sources as well as internal membership contribution. The system will be financially operated in the same way as the OCLC model in the future.[40]

The organizational structure of CALIS is characterized by a combination of both centralized and localized management. Basically, the management of CALIS is centralized and highly integrated. Its national administrative center is responsible for the central administration and infrastructure of the system. Services are provided to members through a three-tier information support structure. At the top of the structure, are four subject-specific national information centers (first-tier); in the middle, there are twenty eight regional / provincial information centers (second-tier) to provide secondary support for all the other member libraries (third-tier) as end-users. Within this three-tier structure, the national centers provide information at a national level, while regional/provincial centers coordinate regional LRS activities with the national centers and other regional/provincial centers. Each center functions as a gateway through which core services are negotiated, customized, and delivered.

Since its inception, CALIS has established several major projects to support its long-terms goals. Services currently in production mode include the largest union catalog in China, online collaborative acquisitions and cataloging, an array of Chinese and foreign databases which are still growing, and a web-based document delivery service for which 46 of its members are certified as service providers. Continuing efforts include the construction of more than 50 digital databases and the coordination of group purchasing of foreign electronic databases.

In November 2003, CALIS launched the Research Center of Academic Digital Library in China to investigate and develop critical technology and application systems employed in digital library systems. A standardized digital library model was designed to be customized and applied by members. The standardized model comprises a unified search platform, a processing system, an interlibrary loan and document delivery system, a virtual reference system, a digital copyright management system, etc. So far, about 22 digital library test sites are under construction and will be published in the near future. Each test site utilizes its own local strength and resources to perform the following tasks:

- Research and develop key digital library technologies and their applications
- Serve as a testing and pilot site for technological applications
- Explore new models of services
- Mobilize and integrate institutional and regional resources with CALIS

2. China Academic Social Science and Humanities Library (CASHL)[41]

Launched in March 2003, the mission of CASHL is to cooperatively collect and preserve foreign and Chinese periodical resources in the social science and humanities and to provide a unified online search portal for users to retrieve and access these resources. CASHL is affiliated with CALIS, which provides data processing standards and technical support to CASHL.

CASHL also has a three-tier structure comprised of national information centers, regional information centers, and individual member libraries. Currently there are over 80 member libraries, including academic libraries and libraries in the CAS System. CASHL coordinates the acquisitions among members to avoid duplication. So far there are over 2,800 foreign and Chinese periodicals presented on its website. It adopts centralized document delivery service mode: once a user retrieves a document, he/she can request the document directly through the CASHL system. CASHL will then find the document from digital databases, its own collection, or from member libraries, and deliver the electronic file (the paper will be scanned as an electronic file) to the user by email.

The ILL services of CALIS and CASHL are not free. Although users can have free access to certain information such as bibliographic information and certain electronic resources, they have to pay to have ILL service and access to most electronic databases (they may be given some discount according to the electronic database subscription status of their libraries). Once a user fills in the request form and pays the fee online, requested information or items will be sent to the user by email or mail.

Analysis and Discussion

1. Objectives and Goals of LRS

Several differences in the objectives and priorities of LRS are evident between the U.S. and China. The objectives of LRS in the U.S. have changed through the phases of their development. During the pre-computer phase, LRS activities focused on sharing and improving local print resources. A study of library collaboration by James Kopp during the period between 1931 and

1971 listed 24 activities of collaboration. The four objectives at the top of the list were: (1) to facilitate reciprocal borrowing privileges; (2) to expand interlibrary loan service; (3) to compile union catalog or lists; and (4) to offer photocopying services. Thirty-six years later, on-site reciprocal borrowing is no longer a preferred way of ILL service, and union catalogs are easily available at national (OCLC) and regional (state or regional consortia) level.

LRS in the U.S. today focuses on how to provide services in a digital and networked environment. Current objectives generally include: (1) creating a virtual catalog that includes the total holdings of the consortium; (2) establishing a statewide borrowing and delivery network as a cost-effective alternative to ILL service; (3) beginning group purchasing of e-databases, e-journals, and e-books; and (4) offering training and workshop in new practices and technology. Many of the state consortia have become prototypes of digital libraries in their respective regions. GALILEO in Georgia and I-Share in Illinois are two ready examples. At the national level, OCLC provides overall support and solutions to all its member libraries in the areas of cataloging and metadata, digitization and preservation, resource sharing, collection development, and e-content management. In recent years, it rolled out a free service, WorldCat.org, which is poised to become the new model of a national virtual library. It allows anyone to search for an item and to identify the nearest holding library, where the users can borrow the item based on the library's loan policies. Useful links to publishers and book dealers are also provided if a user is interested in purchasing an item.

LRS in China jump started during the 1990s and was largely enabled by the newly built national communication networks. However, much catch-up work needs to be done in order to foster a true LRS environment. The first priority was, and still is, to build a national union catalog without which cooperative cataloging and ILL would not be feasible. A second priority was to purchase and acquire access to all major foreign e-journals, focusing on science and technology, medicine and agricultural publications, which are extremely expensive but indispensable in supporting the nation's education and researches. In the past, NLC, CAS, and a few major national universities all strived independently to maintain print collections with NLC as the designated central site for the most comprehensive collections of foreign journals. In the current environment, the exponential increase of journal prices and the shift toward digital format has compelled these institutions to reevaluate their acquisition policies. None of these institutions could possibly remain self-sufficient in building foreign journal collections. NLC, as big as it seems to be in China, is no longer considered a successful model in meeting acquisitions needs. Emerging national alliances such as CALIS and CASHL have set as their goals gaining access to digital format of foreign journal publications through collective bargaining, and achieving cost-effectiveness by adapting a need-based, just-in-time access and delivery model for foreign journal publications. Traditional ILL service is still among the top priorities for all the resource sharing initiatives, but only at the preliminary stage. Demands for ILL services are rising but at a slow pace.

2. Type, Size, and Structure of LRS

LRS in the U.S. started from grass-root movements and took the form of library consortia. From a national point of view, the activities are very decentralized. Most library consortia in the U.S. are formed according to the types of the libraries and the geographic proximity. There is no national center to manage and control the efforts and activities. Basically, every state has at least one statewide consortium, and the majority of consortia comprise academic libraries statewide or

cross-state, although the number of public library consortia is on the rise. These consortia are formed to solve common problems. Some consortia dissolve as common goals fade away. The fact that there are very few multi-type consortia in the U.S. indicates that the goals of public libraries are so different from academic libraries that it would benefit neither of them to form an alliance.

In the U.S., joining a consortium is a library's choice, and it is not uncommon that a library is involved in several consortia based on its own priority and objectives. To ensure that users have access to most resources available, many large research libraries tend to allocate a considerable amount of the annual budget on consortia and utilities expenses, and the funds allocated to these areas are sometimes used to measure a library's capacity and strength. For example, the University of Pennsylvania is a member of the Pennsylvania Academic Libraries Consortium, Inc., and participates in its statewide E-Zborrow interlibrary loan program. It also holds a membership in the cross-state consortium called Borrow Direct, comprised exclusively of prestigious Ivy League universities such as Yale, Columbia, Princeton, etc. Of the seven members of the Borrow Direct consortium, five are also members of the RAPID interlibrary consortium that features fast interlibrary document delivery service among members.

In China, LRS is more of a phenomenon of economic growth. In order to gain dominance and control in the market place, business enterprises have formed partnership and alliances. Education institutions began to merge and consolidate into large, comprehensive research universities in order to move up in national rank and to appeal to potential students by size and array of curriculum and courses. As a result, the libraries that used to belong to individual colleges need at least to be networked if not combined. Also at the regional level, university libraries began to discuss partnership and reciprocal agreement and to establish web presence among partners.

Resource sharing in the Consortia model tends to become decentralized as libraries want to gain freedom in forming partnership with peer institutions. On the other hand, most consortia are initiated and funded by local or regional governments to support regional education and economy development; therefore, library consortia must create a centralized system to control and direct the activities. Generally speaking, academic libraries enjoy more autonomy than public library consortia. As academic institutions have their own revenues, they have a greater say in their own budgeting. In terms of technical and human resources, academic libraries usually are more self-sufficient than public libraries. Thus, in terms of sharing, academic libraries contribute more equally than public libraries, which often rely heavily on the support of provincial and city libraries. As for the special library consortia, they have their own way of organization and funding. As they are funded by government agencies, they tend to fall into the centralized administrative blocks, and resource-sharing and cooperation is generally formed within the same systems.

3. Funding and Governance

LRS cooperation in the U.S. is usually governed by a Board of Directors, which generally consists of the directors of the member libraries. Some cooperative programs are mainly funded by the government. States that receive strongest government backing in LRS usually have excellent programs. For example, I-Share, OhioLINK, and GALILEO are all considered the best resource-sharing programs in the nation. Other programs are funded partly by the government to

cover the startup cost and partially from member contributions. Alternatively, self-governing organizations that operates in a business mode to obtain outside sources are increasingly popular.

LRS programs in China are funded primarily by the government. Collaboration among libraries is partitioned along the administrative division. A library or a library system is usually responsible to its oversight organization and the immediate constituency. The LRS programs in China are distinctive from those in the U.S. in the sense that they are not self-governing, nor are the member libraries partners. However, a few programs, like CALIS, start to move toward an independent and self-support model, emphasize expansion of services and customer base, and encourage other types of libraries to join their membership. By doing so, they have gained far more organizational leverage than other LRS programs.

Conclusion

Remarkable progress in LRS has been made in China during the last two decades, thanks largely to many key national initiatives sponsored by the Chinese government. Paradigm change has compelled libraries to form partnerships and alliances to meet various challenges. The centralized depository model has becomes obsolete. The locus of control over a library's collection has been moved outside an individual library as the proportion of distributed resources rapidly increases. As Marshall Keys observes, "When libraries lease or license a large proportion of their total resources, control of the collection becomes vested in other institutions and organizations."[42] This paradigm change demands libraries to work together through a large network to retain their control of access to resources.

Three LRS models have evolved from the new environment. NLC, as an example of the centralized model, has played a vital role in leading and reshaping China's public library system and has made substantial efforts in distributing bibliographic information as a way of promoting LRS. Resource sharing for NLC, however, is only one-way service to other public libraries at a huge cost. There is little reciprocity in its sharing with other libraries. The rigid and hierarchical centralized LRS model has been seriously challenged by the emergence of consortia and gateway resource sharing systems, which have more flexible and efficient ways of sharing.

The NSTL, an example of the consortia model and special library system, does not follow the 3-tier structure and is designed to be a virtual library to offer web access to its comprehensive collections regardless of their physical locations. It is the first national LRS system that has broken the boundary of disciplines and hierarchical blocks.

CALIS and CASHL, examples of the gateway model, lead in many creative ways the construction of a national information network for academic libraries. Based on the feasibility study and investigations of developed countries, they adopt a three-tier organizational structure through which collection development among members is coordinated and services are provided to users. A national academic library network has been formed to integrate, preserve and disseminate web-based resources that can be accessible by users at any place and any time. The success of the gateway model offers a good case study for other developing countries that are also in the process of building national library information support systems.

In terms of content development, these major nationwide LRS systems in China have built their own distinctive collections. Together they cover all the major research fields and include the

majority of libraries of various types in China. CALIS covers resources of academic libraries; CASHL covers periodical resources in social science and humanities from academic and research libraries; NSTL covers science and technology information resources of special libraries, and the National Cultural Information Resource Sharing Project covers cultural information resources developed by public libraries.

In terms of delivering services to members throughout the country, all major nationwide LRS systems emphasize building digital library systems. NSTL was born as a digital library. NLC has recently transformed its web site into a digital library, although the project is still ongoing. CALIS has been testing its own digital library model through 22 member libraries. These LRS systems have overcome the geographical barriers and weaved a nationwide network of knowledge to be utilized by the general public in the country.

The future will undoubtedly see the cooperation or even merger of these different systems in China, just like the merger of the WLN, RLG and other LRS systems with OCLC in the U.S., so that all different systems will be combined together, become a giant and unified gateway to co-coordinate all the LRS activities nationwide, and participate in international LRS endeavors.

Acknowledgement

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