Electronic Libraries and the Future: Implications for Academic Libraries with East Asian Collections

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[Abstract]

Academic libraries are stepping into uncharted territories with the advent of electronic books (ebooks) and electronic libraries. This article provides an overview of the current status of both electronic books and libraries, including a description of a beta test of a new service netLibrary(tm) at the University of Colorado at Boulder. Possible implications of new technology for various aspects of academic librarianship in the areas of acquisition, collection development, preservation, reference, circulation, interlibrary loan, and cataloging are discussed. Particular reference is given to East Asian collections. Benefits as well as liabilities are discussed. The authors raise issues regarding the potential of the new technology, and speculate on possible trends and areas for future research for academic librarians.

Background

Our age of information is often compared to the time of Gutenberg in the mid-15th century when the rapid development of technology drove drastic changes to take place in all walks of life in the Western world and ultimately led to the creation of printed books. Information technology today has set off similar surges of change, including the development of electronic books (ebooks). Such developments are reshaping the way people read and access information across the world and have rendered libraries in a constant mode of
change.

With the electronic book and library coming of age, the opportunities and challenges to our profession are fundamental. Where will libraries be in the age of electronic books? Are future academic libraries going to be totally electronic? Will the dream of a global library soon come true? Are future librarians going to be mostly computer specialists? What should library schools do to keep up with the changing demand from the library field? These questions have provoked many curious minds and generated numerous studies. This paper attempts to tackle some of these questions by speaking from our experience in the field. As librarians participating in the first electronic library in the world designed to serve all the functions of an academic library, we will share an overview of the current situation and some concerns.

Electronic Books

Ebooks belong to the third wave of electronic publishing. First, indexes from secondary publishers became searchable databases via online providers such as Dialog in the 70’s and later on CD-ROMs in the 80’s. When the World Wide Web became popular in the 90’s, primary journals began converting to PDF (Portable Document Format) or SGML (Standard Generalized Markup Language) format that enables users to “hot-link” to other references.

The concept of ebooks has been around for decades, yet for a long time ebooks only existed in science fiction. When Project Gutenberg (http://sailor.gutenberg.org/) was born in the Materials Research Lab at the University of Illinois in 1971, the concept of ebooks took physical form. In 1977, Kay and Goldberg of Xerox’s Palo Alto Research Center (PARC) published an article that was recognized as a landmark in the history of electronic books ①. Finally in 1998, the right technology became available at the right price for ebooks to reach the consumer market.

An ebook consists of digitized text that can be manipulated by the reader through devices that carry the information. There are many ebook publishers in the United States, among whom some also produce ebook viewers in addition to the digitized texts, such as SoftBook Press of Menlo Park, Calif. (www.softbook.com), NuvoMedia, Inc. in Palo Alto, Calif. (www.nuvomedia.com), Rocketbook (www.rocketbook.com), Everybook, Inc. of Middletown, Pennsylvania, (www.everybk.com), and Librius, Inc. of Bellevue, Washington, (www.librius.com). An ebook viewer typically (or at this writing) is formatted to look and feel like a printed book and may hold as few as ten books or as many as 1000. They are battery-driven and weigh between one and three pounds. They normally allow notes and annotations to be written directly on the screen and to be attached to the page until they are erased.

Compatibility is a key issue. Although an ebook can be read on a computer, different computers may require different formats. To avoid compatibility problems for ebooks, a group called the “Open E-Book Standards Group” which includes major computer companies and ebook publishers such as Microsoft, NuvoMedia, Softbook, EveryBook, Hitachi, Bertelsman, and Harper Collins has been formed. Electronic Book ’98 (Oct. 8-9) hosted by National Institute of Standard Technology in Gaithersburg, Maryland, met to discuss issues regarding hardware, software, content, and marketing for the emerging
industry. They agreed to the establishment of standards similar to those that supported the introduction of CDs and DVDs, and also discussed issues of format and transmission standards that enable users to download a book to read on any manufacturer’s device.

As of right now XML (Extensible Markup Language) is the recognized standard that promises to soon replace HTML as the basic Web markup language. XML is an encoding standard designed to support metadata creation, which will aid in aggregating and searching content. The XML encoding syntax, together with the Resource Description Framework, suits the Dublin Core standards and the various TEI (Text Encoding Initiative) schemes. It also can be used to manage copyright issues at an extensive level.

The rapid development of technology can only make ebook formats more convenient to use and less expensive in the future. More dramatic display technology improvements are just a few years away.

**Electronic Libraries**

When electronic books become common, electronic libraries that “house” electronic books are born naturally. It is not a far reach from the concept of electronic books to that of electronic libraries. In fact, several electronic libraries are currently in existence. That is, libraries in the sense of being collections of electronic books, rather than physical buildings and physical collections. For example, the JSTOR collection of digitized journals is often referred to as a “library.” The Gutenberg Collection of classic books that are beyond copyright forms a library according to some definitions. Certain publishers are touting their collections of books available electronically as libraries. Most people now are aware of electronic bookstores, such as Amazon.com and BarnesNoble.com, which allow for purchase of current titles over the Web. There are also numerous international electronic book vendors for East Asian language materials, such as Chinesebooks.net for Chinese language materials and hanshan.com for Asian art.

It is not until recently, however, that an attempt has been made to put all these electronic possibilities together into a package designed to mimic traditional library functions, with the added benefits made possible by new technology. A company called netLibrary™ (www.netlibrary.com), founded in Boulder, Colorado in August 1998, has developed a dynamic prototype of a true online library. In its mission statement, the company says its goal is to “Become the premier provider of electronic books (ebooks) providing professional, reference, and scholarly works for the institutional and corporate libraries.”

In 1998, Timothy Schiewe, now the president of netLibrary™, began developing his concept of an online library. His prior experience with a company called Infomaster that provided online current banking information to the financial community gave him a solid base for development. Because of his electronic publishing experience, he already had contacts and insights into the information needs of the community. He sought and received venture capital funding of approximately five million dollars from a number of sources, and began developing the system. In May, 1999, the company received another influx of twenty-five million dollars to continue developing the product.

In designing the product, netLibrary™ com-
pleted market research, held focus groups and sought input from many librarians, library schools, consortia, professors, and publishers. Since April 1, 1999, a beta test of the system has been running at the University of Colorado at Boulder, one of the members of netLibrary™'s Charter Program. The other members of the charter group are OhioLink, PALINET, CARL, the University of Texas and the University of Phoenix.

The company itself has seen major growth in its staff, physical plant, and computer capabilities. At the launch of the company, netLibrary™ had approximately 2000 public domain titles and 1000 copyrighted books available on their system. At this point they are adding between thirty and fifty titles a day of copyrighted, current book publications (7). They have signed contracts with many book publishers, focusing on the science, technology, and medical fields. McGraw Hill Professional Books, ABC-CLIO, M.E. Sharpe, Libraries Unlimited, and Scarecrow are among the first publishers to sign contracts with netLibrary™. Contract talks are in the works with major university presses and other publishers. Although cautious in their approach, publishers in general have been interested in exploring the possibilities of adding new revenue streams from such a project.

The computer architecture behind netLibrary™ is a high-bandwidth, Internet based system that offers 24 hour a day, seven days a week access, through a high-capacity, and IP based fiber optic network designed to transmit up to two terabits of information per second. According to company information, the system is currently capable of handling a minimum of forty transactions per second and one million users per day, and the infrastructure is scalable to one million transactions per hour and ten million users per day. It incorporates load-balancing technology to manage traffic and distribute communications evenly. Company information also states that to download ebooks, libraries or patrons will need to install Knowledge Station, their proprietary software. The minimum system requirement at this writing for Knowledge Station is a Pentium PC with Windows 95 and Internet Explorer 4.0, 100 MHz processing speed, 32 MB RAM and 20 MB available disc space. Currently Knowledge Station does not support Macintosh users, but a new version is planned to address this. Such users may read materials on-line with a Web browser but may not download.

The beta test of netLibrary™ began on Mar 29, 1999. As a member of the CARL (Colorado Alliance of Research Libraries) consortia, the University of Colorado at Boulder is the first site to be brought up. Currently, CARL is working with netLibrary™ to decide on titles to be purchased in the first round of acquisitions. Some of the charter members may wait a bit longer to actually purchase materials, as the inventory of available titles is not as large as some would like. The beta test will go a long way towards answering some of the questions raised in this paper, and interested readers will need to stay informed on the progress of the system.

Impact on Academic Libraries

The complexities of providing electronic books to academic libraries are apparent. While the beta test has not progressed to a point that allows for any extensive conclusions, the product has been developed enough to allow some speculation about the impact such a library system may
have on traditional academic library operations. This study focuses on the areas of acquisitions, collection development, circulation, preservation, reference, bibliographic instruction, and cataloging with particular reference to East Asian collections.

**Acquisition and Collection Development**

One of the first things that a library must do is to acquire materials. The electronic environment has already provided for ordering materials online from vendors, greatly enhancing efficiency. In the electronic library model, many titles would be received in electronic format. They would not need physical handling in the sense that print titles do, eliminating some unpacking, mailing, marking, binding and other physical tasks associated with traditional book acquisition. The speed at which acquiring material would be possible will also make major changes in acquisition operation. A patron could conceivably have in hand or on the computer an electronic version of a book moments after requesting the purchase of the title.

The potential of the sort of electronic library described here will benefit international acquisition and help the collection development process of East Asian collections in North America. East Asian collections in the United States have been battling the difficult situation of acquiring most of their books abroad for many decades. There has been a publishing explosion in East Asia in the past decade. China alone publishes about 100,000 titles every year. The largest East Asian collection in North America today can purchase less than 10% of what is published in China. Facing the publication explosion in East Asia, East Asian librarians in the U.S. have called for the construction of a global collection for East Asian Studies. With the skyrocketing prices for East Asian language publications, it is getting increasingly more difficult for libraries to keep up with publications in Asia. In addition to the high book prices, shipping is another huge expense libraries have to bear. Postage for East Asian materials is often as high as the cost of the books. For new publications, it often happens that by the time orders reach the book vendors, the titles needed have been sold out or gone out of print.

With the emergence of electronic books and electronic libraries, materialization of the concept of a global library is within reach, with some questions yet to be resolved. An especially attractive feature for university presses and the academic library community is the possibility of the online library to keep the more esoteric titles in print constantly. Electronic books may not have any shipping charges. These will give libraries a great advantage in acquiring foreign titles. The process of constructing an international electronic library, however, still will take significant efforts to accomplish. Digitization of Asian language materials involves participation and agreement from many different countries where materials are published. Copyright issues and ownership issues must all be resolved based on international cooperation.

Collection development in the electronic environment has already seen many innovations and changes. Librarians are already used to making decisions on the format of material they purchase. Should the material be in paper, microform, film, tape or all of them? Hardbound or paper covered? CD’s or web access? In some ways, considering electronic books is as simple as
considering another format. It will have its advantages and disadvantages, just as other formats do. Certainly an electronic and easily updated format holds great potential for reference and current awareness sources. Because of the electronic nature of the material, small press runs of more expensive or esoteric titles may no longer cause material to go out of print before some libraries make their decision or have the money to make the purchase.

**Circulation**

As Lynn Silipigni Connaway, Director of the Library and Information Services program at the University of Denver points out, one of the services most obviously changed by an electronic library will be circulation services. Patrons will check the electronic catalog as usual, find the electronic book desired, check it out electronically, use it electronically and return it electronically. A significant potential exists to lessen the need for staff in all those areas, and conjointly lessen the possibility for human error in all those functions. While this may decrease the amount of overdue fines collected, libraries prefer to have their materials available rather than collect overdue fines on them. Users may be allowed much more flexible loan periods, material will be available around the clock, and the traditional time needed to shelve and reshelve material will no longer be an issue. Another significant change would be in the amount of shelf space dedicated for new acquisitions. Shelf space that formerly held print materials may be shifted to space for terminals and electronic equipment including computers and printers.

A more difficult issue to address concerning circulation is that of privacy of records and user authentication. Company information, provided by netLibrary™ states that all records identifying patrons names and records are confidential and that they will follow ALA guidelines concerning information requested or received and materials accessed in any way. This is done through a system of layered security devices that not only protects the privacy of information in transit on the Internet but also an encryption of records to prevent interpretation if they are accessed inappropriately. At this point, early in the beta test, it is impossible to judge how well the company system works but it is encouraging to see the level of attention given to the question.

Electronic libraries by nature will promote cultural exchange and understanding through library collection and services. When it becomes more convenient for U.S. libraries to acquire and access Asian language materials, it will become equally easy for libraries in Asian countries to access collections and publications in the U.S. The concept of globalization is embodied in such an integrated international library.

Worries have been expressed on the stability of the electronic format and what would happen if the company goes out of business and/or the technology becomes obsolete. Any provider will need to address these concerns and netLibrary™ says it has a plan in place to respond, which includes a promise to make the books purchased available on CD should the company go out of business.

**Preservation**

Physical deterioration of print materials has posed a serious threat to older library collections all over the world. Libraries have taken emergency measures to rescue many fast diminishing
collections. Take China and Japan for example. A decade ago, the Japanese National Diet Library's microfilm project put on microfilm the fast deteriorating books and journals, which were almost all printed on acid paper as a result of the large influx of western paper and papermaking technologies during the Meiji Era (1868-1912). Microfilming has saved the materials from deterioration, but only helps a little with access to these materials. For example, in the entire United States, only one library owns a copy of the complete collection of the Meiji microfilm and three other libraries own some part of it. Access to the materials is expensive and impossible for many users.

In the Chinese case, there are numerous historical documents being lost to physical deterioration everyday. Last year, one of the authors of this article visited the library of Central Ethnic University in Beijing, and was shocked to see the poor conditions in which some of the world's only copy of research materials on Chinese ethnic minorities are kept. The library owns a rich collection of original research materials on various ethnic groups in China. These materials are housed in buildings that do not have temperature or humidity control. Tightly packed bookshelves are covered with dust. During the summer, the poor air circulation in the stacks makes it difficult even for people to walk through them. Because of the poor physical conditions of these collections, they are virtually closed to the public. Collections such as this are commonplace in China. Libraries and national archives in China have made efforts to compile and reprint many rare book collections, however, normally only limited collections get reproduced and limited copies are printed; therefore only a few libraries can afford them. Access to these materials for most users in China or abroad is still very hard.

In the past few years, many initiatives have been taken to digitize materials of Chinese classics. Many major collections of Chinese classics are now available on CD ROMs, such as the Ershiwu Shi (Twenty-five Histories), the Siku Quanshu (Complete Documents of the Four Treasuries), and Zhongguo Difangzhi (Chinese Local Gazetteers) among numerous others. With electronic books and electronic libraries emerging on the horizon of the library world, digitization presents an immediate solution not only to urgent preservation problems but also to issues regarding access. Preservation for access is replacing the old model of preservation for preservation's sake. Preservation and access will go hand in hand to enhance library services for these materials.

A library can digitize a unique collection that is part of their holdings for users at a remote location to view the materials online without having to make a trip to the owning library. Materials that are too valuable, too fragile, or too heavily used to send through standard interlibrary loan can also be digitized and made available electronically. Potentially, the possibilities for electronic borrowing of "special collections" may become much greater. While electronic scanning is now quite expensive and labor intensive, it still has enormous potential to share valuable, rare, fragile and unique materials in a way that libraries have not been able to do up to now.

Details regarding how to make such resources available internationally, however, still need to be worked out among different owning libraries across the world. The ownership issue
needs to be addressed, especially in regard to digitization of historical collections. Some Chinese libraries own valuable collections that are not available elsewhere in the world, and they are concerned that once these materials are digitized they would lose the ownership over them. For that reason, authorities of these libraries may be reluctant to digitize their rare book collections, while at the same time ignoring the risk of losing these materials permanently to deterioration. Money is another key matter in digitizing such collections. Financial constraints make it impossible for owning libraries, such as the library of the Chinese Central Ethnic University, to engage in any digitization projects. The international community should pay attention to such situations and take the initiative in rescuing such valuable materials, because they are part of a cultural heritage belonging to all human kind.

Reference and Bibliographic Instruction

Significant changes and possibilities are already apparent in the advent of an electronic library in terms of reference service and bibliographic instruction. Providing twenty-four hour access to collections and to primary reference sources, which netLibrary™ is currently doing, adds dramatically to a library’s capability to provide service. Reference sources may be updated in a timely manner. Patrons will access these sources electronically, use them for the short period required to check a fact or get a statistic, and then the reference sources can be returned and reshelved instantly. There will be no problems of a patron taking a book to another area of the library for study or copying, thus rendering the book unavailable for as much as a day before its return to the shelf.

Another enhanced service available with digitized materials is improved search capabilities, including full text searching of the electronic material. According to company information from netLibrary™, every word in every book will be indexed and searchable. Patrons will be able to search using keywords and natural language. Along with full text searching, the system offers a unique opportunity to take notes electronically as the book is used. The notes may be saved to a personal file, downloaded and shared with classmates, instructors, or students, if needed. The notes taken will become the property of the user. Personal bookshelves where a user purchases a title, according to the company, may be built with the downloading techniques programmed into the system. Researchers will immediately see the potential for such full text searching, referencing and note-taking options.

Traditional types of personal reference interviews and interactions may diminish, as many patrons will feel that they can get what they need with little or no help from professional librarians. If patrons are effective and efficient online searchers, the various powerful search mechanisms of the system will provide them with extraordinary access to information; however, experience from the library reference desk shows that skilled online searchers are few and far between. It is very possible for a new or untrained user to be overwhelmed with endless information possibilities. Traditional ways to deliver reference services will change; yet the demand for new reference services relating to the use of electronic systems, advice on the most efficient searching strategies, and trouble shooting will definitely increase.
This new type of library also raises new challenges for bibliographic instruction. Teaching information gathering skills will need to focus increasingly on the availability and the access to electronic information. Critical thinking and skills in searching and making appropriate choices of materials relevant to certain subjects will be vastly more important to library users in the new electronic environment. While many young students today have no problems using computers and using them fearlessly, they may not understand, without instruction, how to discern what information is valuable, accurate and appropriate for their needs. The role of the bibliographic instruction librarian will become increasingly critical in guiding users through the overwhelming maze of information and providing effective ways to access information.

The need for change in bibliographic instruction becomes even more critical in terms of East Asian studies. Take Chinese studies for example. Because of the existence of the enormous wealth of scholarly materials, an independent academic field has long been established in research on how to use scholarly sources and how to find information in countless historical documents. Over thousands of years, many Chinese scholars have specialized and spent their lives creating indexes and concordances to help other researchers find what they need. Courses and academic degrees are offered at college and graduate levels and in library schools in the study and use of such indexes and concordances. Library instruction has also been designed around the use of these resources. The challenges and opportunities brought about by something like netLibrary™ for East Asian materials will be fundamental. There may be no need to learn all about these indexes and concordances since full text searching will become available. This assumption may be too sanguine and extreme about what technology can offer; however, advances in information technology have raised a question that East Asian librarians and scholars must answer. We must be proactive in bringing new technology into our still “traditional” bibliographical instruction classroom.

Interlibrary Loan

Another traditional function of academic libraries is that of interlibrary loan. It has been a longstanding obligation of libraries to share their materials with users other than their own patrons. Formal agreements between libraries allow the exchange of materials through photocopy, fax, email, and physical mailing of books. In a time of electronic books, standards and accepted processes for interlibrary loans may change dramatically. Clearly there will be a need for new guidelines, rules, and protocols to continue the highly desirable sharing of resources that now takes place. Will a borrowing library need to be “authenticated” as an owning library patron before it can borrow ebooks? If publishers can establish their own rules for the use of their materials by licensing how much of an ebook may be downloaded or copied, then those license agreements must be accepted and adhered to by the patron, no matter where the patron is located. At present, netLibrary™ does not include interlibrary loan capabilities. Since the profession feels strongly about the benefits of sharing resources, the question of electronic borrowing of electronic books will need to be addressed. Electronic possibilities will open up new challenges for librarians, perhaps decreasing paperwork and increasing special research services, such as fee
based information delivery for a broader patron group.

Options for charging for use of such materials to particular patrons may offer a method to pay to have the materials put online. Significant benefits could accrue from the use of electronic books to ease distribution problems and expand loanable materials. But details need to be worked out to address ownership, authentication, copyright, and technology issues.

Cataloging

Only a few years ago, many people did not believe it was a good idea to catalog Internet resources, because they thought there was nothing worth cataloging on the Internet. The traditional cataloging rules and MARC format developed to control print materials don't easily apply to electronic materials. Such mentality is quickly going out of date as electronic journals and books become popular. The emergence of electronic libraries has made organization of resources on the Internet for effective access an urgent issue.

Organizing the resources on the Internet for better access has been and still is a difficult task for information specialists and librarians. Although there are many Internet search engines, all of which are becoming increasingly powerful, effective retrieval of the fast growing body of information on the Internet is far from satisfactory. For example, it is still very difficult to get a comprehensive and relevant search on a particular subject. No technology yet can replace the contributions catalogers make in organizing information for access.

Bibliographical control and organization of information according to established cataloging rules and practices will provide basic access and infrastructure for the resources on the Internet. One proof-of-concept example for Internet cataloging is the Scout Report Signpost project (http://scout.cs.wisc.edu/index.html), where Internet resources are cataloged, classified, and arranged using established cataloging rules and practices, such as the Library of Congress Classification scheme and Library of Congress subject headings, together with the metadata standard.

It is obvious that cataloging will continue to play an important role in organizing Internet resources. As more libraries go electronic and receive books in electronic format, cataloging ebooks and integrating the bibliographic records into local online catalogs become a critical part of librarianship. Cataloging itself, however, must change to meet the new demands of electronic resources. MARC format should be flexible enough to reflect the characteristics of electronic resources and issues brought up by such formats must be addressed. For example, it is hard to keep descriptions stored in static cataloging records when the work itself is dynamic and interactive. Therefore, it is essential to provide some form of permanent URLs in the cataloging records for Internet resources. Efforts made in that direction include proposals of Uniform Resource Names (URNs) and Persistent URLs (PURLs).

Internet cataloging also opens more opportunities for catalogers to provide useful points of access that they were unable to provide before. For example, in the traditional print materials catalog, it would be a luxury to have access to chapter headings or table of contents of a monograph. Libraries now only provide such access on special occasions, such as for anthologies, when they deem it necessary. When cataloging elec-
Eltronic books, catalogers can easily provide access to a table of contents, since the whole book is digitized already. Of course, such new services will involve variations of current cataloging rules and MARC format. Another new service may be to add abstracting and summary information to the cataloging record for electronic books. Such information is now mostly available through the book publishers and vendors. This service can also be extended to include reviews via “hot links.”

The Dublin Core Metadata initiative is a major effort to improve the efficiency of cataloging electronic resources on the Internet. Originally conceived for author-generated descriptions of Web resources, it has attracted the attention of formal resource description communities such as museums, libraries, government agencies, and commercial organizations. As a result, the Dublin Core, a metadata element set for simple content description of electronic resources, has been developed to facilitate retrieval. The Dublin Core is intended to be usable by non-catalogers as well as resource description specialists. Most of the elements have the same commonly understood semantics as that of a library catalog card.

Web-based OPAC technology has made access to the Internet resource just a click away. For netLibrary™, cataloging records of ebooks will be imbedded in a library’s online catalog, so a patron may search for electronic books just as they would for print books. netLibrary™ is working on a way to provide USMARC records for ebooks through OCLC for the titles that a library wishes to purchase and add to its collection. The records may have “hotlinks” through URLs to titles in the netLibrary™ catalog. This will allow users to search the online catalog and retrieve materials both print and online through the standard catalog search process, or using the netLibrary™ search engine, opt for searching only ebooks. As many libraries have done with electronic journals, some indication of the electronic status of the material will need to be added to the cataloging record, so patrons are aware that they are retrieving online materials. Cataloging of Asian language materials involves another set of technical issues, such as the Wade-Giles-pinyin conversion issues and parallel fields for vernacular information in authority records, just to name a few.

The potential to add vastly more information to a cataloging record of an ebook opens up opportunities to provide greater access. Initiatives like the Dublin Core Project allow most of the cataloging work to be done upstream where books are originally published. These will create major shifts of priority for cataloging. To make sure cataloging continues to provide bibliographic control for effective access, cataloging librarians must adhere to and further develop nationally accepted standards for description of electronic resources.

Conclusion

Many issues, benefits, problems and concerns have been raised in this paper. The authors do not pretend either to have all the answers or to be able to predict the future of the electronic library. General predictions can be made with some assurance, however. Change, particularly technological change, will continue to happen at heart stopping speeds. Librarians and libraries must be ready to accept appropriate and useful changes and even, some would argue, to embrace
the change. As shown in the above discussion, many aspects of the changes reported on here are beneficial and, at the very least, have the potential to enhance library services and may solve some traditional library problems. It may be necessary, for libraries to set aside some of their budget to allow investigation into technological advances to determine if they will be useful for their institution. The goal is to take the best that the new technology has to offer and conversely to try to minimize the problems that such rapid change can bring.

In the electronic library environment, libraries will need to assign the use of their physical space differently. Clearly, the growth rates of stack space for printed materials will be declining. This will provide the opportunity for more innovative or creative use of the space not used for traditional materials. The authors have speculated, along with others, that reference rooms, help desk areas and the like will become grand reading rooms again, in the tradition of the British Museum, the Library of Congress and other large research libraries. The sole difference being that these reading rooms will house computer terminals, ports and other electronic hook ups, instead of print books.

Another major change will be in staffing patterns and job descriptions of professional librarians as well as paraprofessional staff. Currently, there are very few positions in the field of librarianship that do not demand some level of skill with and an understanding of computers. This will increase, and it seems clear that no information professional will be able to perform their jobs without a high degree of computer literacy. This has tremendous implications for library education, hiring practices and training within libraries today. The current rate of technological change has given rise to some "technophobes" who do not wish to deal with computers at all. The best case scenario that one can imagine for these people is that the technology progresses to the point of the ease and simplicity that we now enjoy with telephones and televisions, thus allowing the less computer literate to use the tools effectively, even without a deeper understanding of their operation. While the authors think this may happen in the distant future, we see a continual need to understand, learn and stay up to date on the latest innovations and technological changes if one is to provide professional service in the world of information access.

Because some processes that are now labor intensive will be simplified and automated, staffing patterns will also shift. Many have long predicted that computers will replace humans; however, in actuality while computers have taken on some tasks formerly done by humans, computers themselves and their upkeep and maintenance have spawned further human jobs. The authors feel that similar shifts are occurring in the library profession and will continue to occur. For example, with electronic books, there will be less need for people to shelve printed materials, and to handle the traditional circulation procedures. At the same time, however, more people will be needed to maintain machines, install and load software, and train on new systems. Binding and other preservation operations will change as well, with less need to handle the physical artifact of printed books and journals. Archiving electronic resources will become a critical need for most libraries, particularly the ones that choose to digitize their own unique collections in order to make them available to a broader patron base. So it
seems apparent that while such innovations as the ebook and electronic library will cause staff changes, no one who is willing to learn new skills and shift job responsibilities will lose out in the new environment.

While indulging in imagining the splendid future of electronic libraries, it must also be realized that there are still many issues facing the library profession. Technically, many questions such as system requirements for vernacular information and encoding standards still need to be resolved. It can’t be taken for granted that all regular Internet tools can normally handle the Chinese, Japanese, Korean, and other Asian language texts, because they are different from the English text in structure. Therefore, the appropriate system software must be installed and configured to work together with standard Internet navigating tools in order to view Asian characters in the electronic materials. Guidelines and standards must be established to handle such issues. Right now there are various encoding systems for East Asian language materials, making communication among the different languages still very difficult. Initiatives such as the Unicode (http://www.unicode.org/) have begun to address such technical issues. The Unicode, a 16-bit international character code for information processing, is being developed to provide one system to handle all the diverse languages and scripts in the world. This ambitious undertaking is yet to be perfected to satisfy the special needs of each individual language.

Calling for more research on the effects of the electronic library environment, the authors of this paper believe it is critical to the survival of our profession to look deeply into the implications of the paradigm shift that we are experiencing. This paper has raised a number of issues that demand further research. Some will be resolved by technological innovation; others will remain. Professional librarians must be the ones to answer the questions of how to best provide access to information, how to preserve that information for generations to come, and how to organize and distribute the flood of information that is now available. Decisions regarding the basic tenets of our profession must be based on informed and research driven results.

Notes


4. netLibrary™ company literature.


9. Zhou, Peter, “East Asian Collections in


(12) Erik Jul. “Now That We Know the Answer, What Are the Questions?” *Journal of Internet Cataloging* 1 no. 3 (1998): 11.