시스템 사서(Systems Librarian)의 역할 분석을 통한 미국의 도서관 정보기술 동향 연구
- 2006년부터 2010년까지의 채용공고 분석을 중심으로 -

Evolving Roles and Requirements of Systems Librarianship in U.S.A.: Analyzing Trends in Job ads from 2006 to 2010

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【초 록】

1997년 Lavagnino가 도서관 발전에 기여한 정보 기술 동향을 4단계로 구분하면서 의문으로 남겨두었던 마지막 다섯 번째 단계는 웹에 관련된 기술, 오픈소스 어플리케이션, 정보기술을 이용한 도서관 협력 네트워크, 디지털 도서관, 무선통신과 소셜 미디어 등이 주가 되는 단계로서, 최근의 도서관 경향을 잘 대변해 준다. 이에 필자는 최근 미국의 도서관 정보기술 동향을 고찰하기 위해 2006년부터 현재까지 발표된 시스템 사서와 이와 관련된 직무에 대한 채용공고를 분석하였는데, 그 결과 다음의 세 가지를 도출하였다. 첫째, 'Systems Librarian'은 더 이상 도서관 자동화 시스템 관리 능력만을 의미하는 것이 아니라 각 도서관에서 필요한 다양한 정보기술의 적용과 수행능력을 요구한다. 둘째, 의외로 'network management skills'은 그다지 많이 요구되지 않는다. 마지막으로, 희귀소장자료를 다루는 부서에서 시스템 사서의 필요성이 높아지고 있다. 이러한 결과는 시스템 사서의 주요업무인 도서관 자동화 시스템을 넘어서는 정보기술들로 인해 새로운 직무들과 직책들이 생성되었음을 의미하는 것으로, 특히 최근에 가장 요구되는 정보 기술은 바로 웹과 관련된 기술들임을 확인할 수 있을 뿐 아니라 팀제 환경에 적합한 인재를 더욱 선호하는 경향이 있음을 확인할 수 있다.

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【Abstract】

In 1997, Lavagnino defined four stages of technology trends in libraries; but, he left a question about the fifth stage. Based on literature review, the following; Web technology, open source application, library consortia, digitization, wireless, and social media are the main trends in the fifth stage. Analyzing the job advertisements (ads) dating from 2006 to 2010 in systems librarianship, the analysis showed that there are three patterns. The first pattern is that the title of 'system librarian' is no longer specific to managing only the ILS at many libraries. The second pattern - network management skills - is not highly required in the job ads. And the last pattern - especially academic institutions which have archive or special collection departments - was looking for a systems librarian. In addition, Web technology has evolved as the most required skill according to the advertisements, as well as inter-personal skills in a team environment.

【Keywords】
Systems Librarian, Library Job Description, Library Automation, Library Technology Trend

1. Introduction

Emerging information technology has significantly influenced both service methods and working environ-

ments in libraries. In addition, these changes have sped up to involve not only libraries as information providers but also work flow systems inside libraries. It is apparent that the roles and responsibilities of librarians were significantly affected by these trends over decades. Systems librarianship also has grown and changed over decades since computing technology, especially in library automation, was tested in academic libraries. There has been a correlation between information technology and systems librarianship since its inception. By looking into the past, we can expect that developments in information technology will cause more changes in libraries and information service institutions.

Since IBM introduced the 360 series, a large mainframe computer, in 1964, Canada, Germany, Sweden, UK, USA, and USSR independently tested the library automation for certain processes such as acquisitions, serials control, circulation, catalogues, and indexing (McCallum 2003). This testing of library automation progressed until around 1975. These were generally adopted as experiments as a part of research activities in academic institutions (Naylor 2007). The idea of library automation was initiated and developed in the 1960s and 1970s and was focused in the United States and Britain.

The emergence of Systems librarianship has naturally related to the advent of library automation. In the 1960s, there were several reasons for the need of library automation. Evolving computing and communication technology was able to test and build up a system and it was also a time of growth in higher education with increased investing in funding of library collections and facilities. To process large library collections, libraries required effective work flow systems. One of the big steps was obtaining catalog records for their copies from one central institution such as OCLC (Ohio College Library Center, now Online Computer Library Center, Inc). MARC (Machine-Readable Cataloging) had a critical role in developing a shared cataloging system because it was one of the first cataloging formats to share the computer readable forms

(Borgman 1997). It was the most significant shift in the development of library automation because hand written cards had started to vanish and some of the hand written library work flow began to transfer to the reading machines.

Since then systems librarianship has significantly changed because of revolutionary technologies. A good approach to evaluate the trends of systems librarianship, its skills, and to gain an overview of the technological impact on systems librarianship is to study job ads. Recently, the systems librarianship position has received attention in South Korea because the need for professional librarians requiring more expertise in special areas including the ever evolving technological skills is in greater demand (Hoang et al. 2008).

The purpose of this study is to examine job ads dating from 2006 through 2010 and discover the presence of trends in systems librarianship. In addition, this article will describe how systems librarianship has developed over the decades and what kind of technological impacts have influenced systems librarianship since the profession was created in the 1970s.

2. Literature Review

This literature review will appear to lack currency, but that is because the most recent research conducted on the topic appears to have ended around 2003.

The term, "system" has several meanings, but some of the meanings will explain how systems librarianship came by this title. In the Merriam-Webster Dictionary, there are several meanings of the word system: 1. *A regularly interacting or interdependent group of items forming a unified whole*. Since the library is a growing organism and each sub-department (Reference, Catalog, Acquisition, Circulation, Serial, and Inter-library loan) are interacting and interdependent, all the modules in an ILS are also sharing its responsibility with the same data set. 2. *A group of devices or artificial objects or an organization form-*

ing a network especially for distributing something or serving a common purpose. Each institution has its own mission and purpose. Under the mission, they have their own organizational structures formed by network and work flow set up by the systems and 3. *Harmonious arrangement or pattern* (Merriam-Webster 2010). All the elements in the workflow, organization chart or modules in the systems are required to inter-act well.

Although it is unclear who or which institution used the title first, it has been used in Australian libraries since the mid-1960s (Jilovsky 2003). The appearance of systems librarians began with actual development of the library automation systems in the mid-1970s. From the mid-1960s to 1970s, systems librarians were a rarity and many libraries hired computing engineers who did not have a library educational background because the systems involved in the position mostly required someone who had high computing knowledge or programming skills for their development and maintenance. Thus, systems librarians at this time mostly dealt with technical issues such as setting ter-minals, running indexing jobs and managing and in-teracting with technical staff and programmers and sometimes in operating the systems and training staff (Lavagnino 1997).

Unlike traditional librarian positions, such as in ref-erence, cataloging, acquisitions, etc., the detailed roles and functions of systems librarians vary. Many articles about systems librarianship express how broad its roles and requirements are which means that one definition does not exist because each institution and its systems needs are different. Here are some of the many defi-nitions from various authors:

"I consider myself to be a librarian first and a computer user second. My professional goal is to discover new ways to use computers to improve li-brary and knowledge services. Therein lies the es-sence of systems librarianship. Systems librarianship is the art and science of combining the principles of librarianship with the abilities of computing technol-

ogy" (Morgan 1996).

"Systems librarians should be librarians who have learned information technologies or computer ex-perts who have learned about libraries" (Martin 1988, 61).

"A systems librarian is commonly viewed as someone who is a primarily a librarian but oversees the running of a number of systems for a library" (Jilovsky 2003, 302).

"A systems librarian is a librarian who is respon-sible for managing the information technology used in a library" (Jordan 2003, 273-274).

The definition of systems librarian is somewhat diffi-cult to compare with other library job titles because its requirements and functions are fully related to the size and organizational structure, and the needs of the in-stitutions (Jilovsky 2003). It simply and broadly de-scribes that someone takes responsibility for information technology at libraries. Here is a surveyed list of titles under the systems librarianship (Gordon 2003, 7-12):

• Network Services Librarian
• Systems Coordinator
• Technology Coordinator
• Systems manager
• Principal Librarian for Automation and Technical Service
• Electronic Information Systems Librarian
• Information Technology Librarian
• Automation Librarian
• Support Team Leader
• Computer Systems Manager

As mentioned earlier, the emerging role of systems librarianship has its roots in developing library auto-mation systems from the middle of the 1970s. In the 1960s, it was the beginning of the commercial com-puter era. Computer technicians who were able to de-sign and program batch systems were needed to con-

duct pilot projects in the libraries as research process.

With regard to library automation and information technology, Borgman and Lavagnino have examined the trends of technology affecting libraries in each stage by 1997. This work began to show how technology affected libraries and began to analyze systems librarian's roles at each stage.

Borgman and Lavagnino studied the technological trends in libraries in evidence as of 1997. Lavagnino formed four stages with question about stage five. With a literature review, I would like to propose several technological skills to define stage five technology trends in libraries. Some technologies were previously initiated in the early stages, but matured and became widely used in stage five. The listed trends are characterized as mutually interacting with each other.

WEB TECHNOLOGY: Internet technology is starting to dominate. Colleges and universities have begun to focus more on the internet as an educational medium and a communication tool. Distance education classes were developed via online, and learning management systems were adopted in many institutions (Cookson 2000). Needless to say, library services were also changed in order to provide information through different means online, beyond just basic retrieval services. Digital libraries were fully developed to support teaching, learning, and research to cope with these changes in education.

OPEN SOURCE: Since the GNU[1] project, which is a "Unix-like" free operating system, was launched in

〈Table 1〉 The stage of the technology trends in libraries (Borgman 1997 and Lavagnino 1997)

Stages	Borgman	Lavaginino
One	(mid 1960s - 1970s) • Automation improved work tasks, work flow, and relationship between technical processing functions • Sharing cataloging data with developing standard protocols - MARC, OCLC, and library cooperation network started	• Adding Machines
Two	(1970s - 1980s) • Libraries were able to operate all processing factions online • Emerging market for automated library systems by vendors • Online Catalog became available on local area network • Initiated to convert old records to computer-readable form	• Mainframe and Minicomputer technology • Function-specific separate automated library systems • Emphasis on automating technical tasks • Offline batch-processing systems • Online time-sharing systems added late in stages
Three	(1980s - 1990s) • Utilizing communication technology to access the collections of other libraries • Union catalog initiated and developed Inter -library loan service • Data exchanged online through develop standard and protocol • Online Catalog, databases on public access systems can be viewed on World Wide Web	• Integrated online library systems available from vendors • The Online public access catalog is born • Microcomputer appears and begin proliferating
Four	(1990s - 1997) • Z39.50 standard implemented for online catalog and other bibliographic retrieval systems • Advanced searching and data exchanged with less complex record structures and content through WWW • Digital Libraries initiated • Interoperability key factor in this stage of server/client environment	• Local, National, and International networking develops • TCP/IP and VT100 terminals become de facto standards • National and international standard allow increased collaboration • Server technologies replace mainframes and minicomputers • The central computing environment becomes a distributed, client-server environment
Five	?	?

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1) GNU Operating System Homepage. 〈http://www.gnu.org/〉.

1984, open source software received more attention and has been applied to certain library projects because of budgets, security, and similarity of the philosophy of librarianship. Due to the advantages of open source, libraries have developed to apply various software and applications in server/client environment. Some of the library Web portals and ILS were initiated to follow the trend (Gordon 2003, 36-40). Koha[2], the first open-source ILS was introduced in New Zealand, and Evergreen[3], an open source ILS was also developed by the Georgia Public Library Service which was released in 2006.

LIBRARY CONSORTIA: Library cooperation was not the traditional scheme for a long time. Through technology, libraries at the state level in the United States have purchased and developed shared online resources, ILSs, and online public catalogs (OPAC) to centrally manage their buying power for better price. This was a trend for systems librarians or managers to help them lessen their burden of managing ILS systems and to focus more on other technological developments. One example is the PINES (Public Information Network for Electronic Services) system which was launched in 2006 through the Evergreen Project which is the library consortium of Georgia[4], and now many other states have their own collaborative group.

DIGITIZATION: Library standards and protocols have developed from the beginning of library automation. 2001 was an important year for archives. Open Archives Initiative Protocol for metadata harvesting (OAI-PMH) was initiated in 1990 and, in January 2001, it was introduced to the public. Following this, several electronic repository applications based on server/client architecture were developed to enhance the digital libraries projects (Carpenter 2003).

WIRELESS: In 2004, 99.6% of all public libraries had installed LAN and 98.9% offer public access computing for library patrons (Breeding 2005a). Many patrons owned laptops and wireless technologies adapted to provide service with developing security issues and policies in libraries. Wireless networks gave more freedom to access real time information without the constraint of place.

SOCIAL NETWORKING AND WEB 2.0 TECHNOLOGY: Since the Weblog (blog) was introduced in 2002, Web 2.0 has been a center of interest in library service. RSS, wikis, social bookmarking, and tagging were started and used to create interactive communication with patrons (Stephens 2006). In the view of systems librarians, this is not coding and programming with configuration hardware set-up; rather it is content-oriented service for providing real-time information and getting attention or feedback anytime. Mostly these services are application oriented from commercial companies with free use and ease of customization.

In addition to problems in labeling the position and defining the position's duties, the literature also indicates that it is not always clear how systems librarians obtain their skills. Mostly they acquire qualification in two ways: 1) they had an IT background prior to starting their position, such as degrees from computer science or its related major or focusing on information technology from library school. Or, 2) they start as traditional librarian in reference, cataloging, or other type of librarian position. They later change to systems librarian and develop skills in information technology over time through either self-education or gaining knowledge through various educational media (Dorrian 1998, 17-21). Whether they are prepared to be a systems librarian in schools or they switched from a traditional librarian position, the most important thing is that a systems librarian must keep up with current trends of technology because their job requires evaluating new technologies in order to develop and implement them for their libraries.

2) Koha Library Software Community Web Homepage. 〈http://koha-community.org/about/history/〉.
3) Evergreen-ils blog page. 〈http://open-ils.org/blog/〉.
4) Evergreen Project Homepage. 〈http://www.open-ils.org/〉.

3. Method

The study used content analysis from the qualifications and duties of the descriptions on the library job ads. Although "systems librarian" is the most representative title in this librarianship, there were many alternative titles and new emerged titles that were found. In the job titles, several keywords were used such as: systems, technology, Web, digital, programmer, database, and IT. Even if the titles were similar in systems librarianship, the duties and roles had more critical elements in job descriptions to add into the data. If there were duplicated postings, the postings were only counted once. If a position was posted again with modification, the modified job advertisement was added. If a position had double duties such as systems librarianship and reference librarianship, the job advertisement was counted once.

The following process was to verify that the jobs main responsibilities were largely related to information technology and were selected as samples. Two hundred and three job ads were used for this study and about 70% of job ads in systems librarianships were from academic libraries with about 20% of job ads from public libraries. The sample was drawn from the three major library job posting media commonly used by systems librarians and were examined: *LIBJOBS from The International Federation of Library Associations and Institutions (IFLA), job postings on Library & Information Technology Association (LITA), and Systems Librarian listserv from The State University of New York University Buffalo.*

<Table2> The numbers of Job ads

Total	2006	2007	2008	2009	2010
n=203	n=40	n=65	n=47	n=17	n=34

In order to extract the desired information, two assistants were appointed to input the codes on the job ads. A librarian and an IT staff were selected to code two divided skill set groups: the librarian coded the librarian skills with general requirements: library type, posting year, ILS, digitization, education, experience, interpersonal skills and the IT staff coded the IT skill set: programming/scripting languages, Web, network, server/operating system, and hardware and software for satisfying the first premise that the jobs under the systems librarianship are mainly involving at least one in the seven information technology set. To secure reliability, the assistants required conducting the coding process twice and if the assistants did not know the terms, they needed to discover the meaning of terms and have them confirmed by the author to put under the given categories.

A detailed coding of phrases within categories was also conducted because this is not just a simple keyword matching process. In this process, the assistants were instructed to rely on their personal and professional judgment and estimate not only word by word, but also by phrases for an accurate determination from the ambiguous information. In the requirements in the job ads, if specific acronyms were used, they put the specific terms under the categories for example, "Perl" in under programming language category and if general phrases were used, it would simply be marked with an "x" in the box under the related categories for example, "Web authoring" in Web category. If a job description includes many specific skills, the coders put each skill under the categories without limitation. Twenty pilot job ads were selected to build an index based on the categories. The final index was reviewed by the author to agree with the study purpose.

To classify the variables from the job descriptions, an Excel spreadsheet was used to input all the date required to organize. Tables were created by identifying variables from each job descriptions for the necessary fields, and included the following: job title, institution name and type, year of job posting, required and preferred qualifications, and duties.

4. Results

There were several variations to classify in systems librarianship. However, the results illustrate elements in job descriptions that identify the trends in this profession from 2006 to 2010.

4.1 Job Titles

Identification of the job titles was the foundation of this study. Word analysis was required to have a comprehensible view of job titles in systems librarianship. The title systems librarian is the representative term for the positions in the librarianship which deal with information and/or computer technology, but there are many variations in job titles. To categorize the data, it was necessary to filter the words in job titles with the roles and duties in the job descriptions. Four words, including: system, Web, technology, and digital, are the most used words for defining the titles in the job ads.
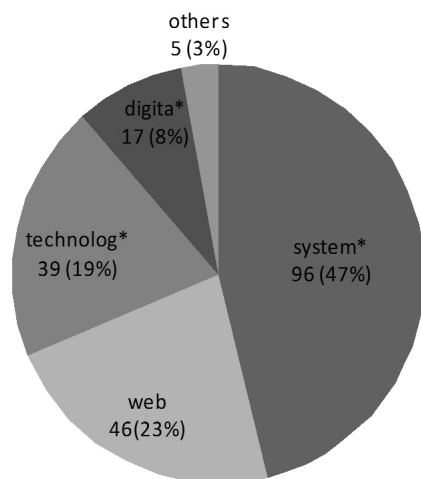
⟨Figure 1⟩ The most frequently used words in the job titles

The term, "systems", is still the most commonly used word in the positions ⟨Figure 1⟩. Since library automation was utilized in institutions, the systems librarian has the education and training to mainly manage ILSs. However, in job descriptions, the duties and roles may vary among the libraries. The meaning of systems is interpreted by the circumstance of institutions. It appears

to have two different meanings. One is ILS as an application which is in the narrow meaning, and the other is the work flow mechanism associating any technological support at large. In the big or special institutions which include large systems departments, the positions focus more on managing an ILS. In contrast, the positions in the libraries which do not have a system division or department need to deal with various duties including ILS management.

The term, technology was similarly used with wide meaning in the job description, but it seems to impose additional duties such as research in current trends, planning, coordinating, implementing, and managing information technology. Interestingly, three job descriptions under the title systems librarian did not address managing ILS, and the descriptions rather focused on Web authoring.

The term digital is a somewhat confusing word in systems librarianship. Open source archive standards and protocols have developed with various archive applications. Digital related duties are very similar to systems. It requires high technological skills in every aspect.

Overall, systems librarian was the most frequently used job title ⟨Table 3⟩. However, one hundred twenty seven individual titles were used among two hundred and three advertisements under the category of systems librarianship.

⟨Table 3⟩ Job titles in Systems Librarianship (used at least three or more).

n = 203	#	%
Systems Librarian	54	26.60
Web Services Librarian	15	7.39
Systems Analyst	8	3.94
Systems Manager	5	2.46
Systems Administer	6	2.96
Web Librarian	6	2.96
Emerging Technologies Librarian	4	1.97
Other job titles	105	51.72

Not like other traditional librarianship positions, systems librarianship focuses on supporting library oper-

ations through applying technologies, but the key issue is that technology is constantly changing. In the previous studies, defining job titles under systems librarianship was not an issue, but in this study there were many new titles under the category of systems librarianship such as: emerging technology librarian, library Web portal/systems librarian, and resource linking librarian. It was difficult to define roles and qualification by the titles alone. The meaning of systems librarianship is much broader than it used to be. The broad meaning is a librarian dealing with technology. The data shows that many similar duties and roles presented under different job titles. Even if the job ads were under the same title, systems librarian, there were dissimilarities in the job duties and requirements.
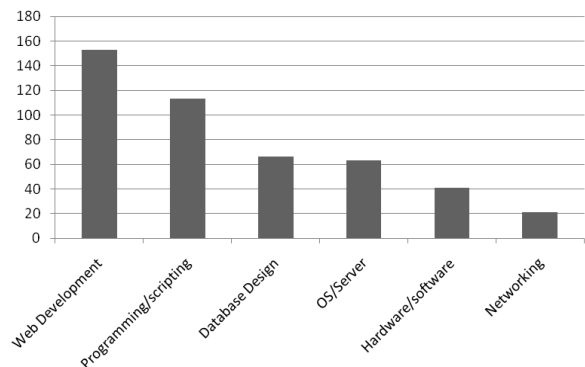
4.2 Information Technology Skills

Among the two hundred and three job ads, nineteen (9%) jobs ads did not describe the specific technological skills requirement, because the job ads were administration positions in the systems departments such as directors, heads, associate/assistant deans, or managers. These positions were mostly responsible for planning, developing, supervising, budgeting, and grant writing skills along with generalized knowledge in Information Technology. To identify specific information technology skills, these nineteen job ads were not included in determining the percentages in the calculation.
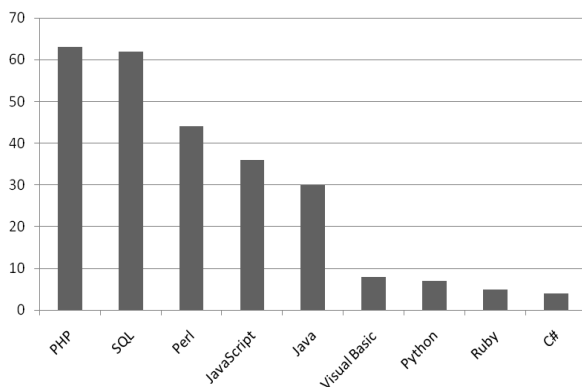
〈Figure 2〉 the popular programming languages

About 72% of the job ads included at least one or more programming language skills in the required or preferred area. As you see in Figure 2, the programming language has various requirements, but many job descriptions did not clearly address the purpose for the skills. However, the listed programming skills may have an organic relationship with ILS, Web, or relational database connectivity developed by the institutions based on the information of Figure 3. Above all, there is a great deal of technical need in the libraries that relates to making information available on the Web. Since the WWW has become part of library services, programming skills are highly essential to develop Web based library services. The intensified and detailed Web technology skills are based on programming skills which require the position to develop and create dynamic pages, and other Web-related tasks.

〈Figure 3〉 Information Technology skills required or preferred

Comparing to Wilson' categories of required skills under the systems librarianship, there is not much that has changed, such as developing and managing an ILS, network, server, software/hardware, database, programming/scripting (Wilson 1998). However, One hundred fifty three (83%) of the job ads addressed at least one or more Web-related skills such as designing, programming, scripting, and authoring, and were dominantly required by many libraries because the Web applications are some of the most desired tools for transferring information with retrieval, managing content, and interacting with patrons.

Researching more details, the most common required knowledge of Web authoring were HTML and CSS which were about 33% and 21% as listed in the job ads. These numbers were not included if the job ads simply listed general and vague definitions such as Web designing, authoring, and managing instead of specific skill, but fifteen job ads required the specific Web design software, Dreamweaver and fourteen jobs required the skills of graphic designing applications. In addition, eighteen jobs addressed the knowledge about the content management system because it is an important tool for decentralizing managing the contents and make it easy to update and delegate the tasks. Twenty Six job ads listed at least one or more requirements for Web 2.0 technology knowledge to follow the trend of social media.

Open source is a big trend in systems librarianship. Due to the nature of open source, it can be a methodology, source code, language, application, or software. In this study, it was not clear enough to put into code, but, a good number of programming and scripting languages, operating systems, server applications, content management systems, and ILSs are widely adopted in various ways.

4.3 Librarian Skills

Two of the key librarian skills in systems librarianship require significant information technology knowledge. In this study, ILS and digitization were two main librarian skills needed in systems librarianship. About seventy four (40%) were required to have skills in the ILSs management.

About forty one (20%) job ads demanded digitization knowledge about processing, standard protocols, and certain applications such as ContentDM, DigiToiol, and DSpace. Either to build a digital library or to involve digitization, these are required IT skills from server managing, graphic controlling, digital preservation standards, relational database, applications with various programming and scripting. This is why these skills appeared in the job ads.

4.4 Degree Required and Experience

Many library job ads in the United States require either the degrees of Master of Library Science (MLS) or Library and Information Science (MLIS), accredited by the American Library Association (ALA). One hundred fifty nine (78%) of job ads mention the MLIS or MLS as required, especially if the position included the term 'librarian.' This was more strictly applied if the position was from an academic institution (Table 4).

〈Table 4〉 Degree Required

n＝203	＃	％
MLIS or MLS	40	19.70
MLIS or MLS from ALA accredited	111	54.68
MLS or BS in computer related field	4	1.97
MLS from ALA or BS in computer related field	2	0.99
BS in Computer Science	29	14.29
MLS or BS in computer Science	2	0.99
Other Degree	12	5.91
No Degree specified	3	1.47

Library schools provide more competitiveness and vision in librarianship. Automated library systems, computing and networking technology, and management are key course requirements for systems librarianship (Xu and Chen 2001). If the MLIS, MLS or MSLS (Master of Science in Library Science) were not mentioned on the job descriptions, mostly the duties are very limited -- such as PC support specialist, computer technician, and programmer analyst -- and therefore do not require a library educational background.

About one hundred ninety three (95%) of job ads included work experience as a requirement (Table 5). Systems librarianship is associated with all areas in the library, and therefore the levels of library working experience reflect the importance of the candidate's background knowledge. More work experience contains critical decision making in various situations with human-networks and illustrates resources in the real world. Most notably, administrator positions with supervision duties required more experience.

⟨Table 5⟩ Experience required or preferred

n=203	#	%
No experience required	10	4.93
one - two	42	20.69
Three -four	50	24.63
five - six	15	7.39
seven - eight	6	2.96
nine - ten	1	0.49
Above 10	0	0.00
experience required	79	38.92

5. Conclusion

Systems librarians are specially trained library professionals that conduct a variety of tasks that focus on the ILSs of the library and its peripherals. Prior research verifies that systems librarianship continues to evolve. The definition of titles and duties of systems librarian are not and have not been clear (Chu 1990). Lavignino characterized the first four stages of systems librarianship in 1997. Identifying the fifth evolutionary stage in Lavagnino's research is the purpose of this study, as well as how the trends have affected systems librarianship.

This study analyzed two hundred and three job descriptions over the past five years. There were three general patterns drawn from the data. The first pattern, the title of 'system librarian' is no longer specific to managing only the ILS at many libraries. Many library ILS vendors have developed new modules and applications, because these have provided more controls and the ability to customize the environment in the libraries, but that does not mean it is simple or easy. It has resulted in a lot of planning, design, coordinating, and additional collaboration work with vendors and other departments in a library (Breeding 2005b). Due to constantly changing information technology, libraries tend to rely more and more on technology specialists. This trend produced or enlarged more refined systems departments and divided roles and duties of librarians or staffs. Large institutions, especially colleges and universities, tend to have more specified and detailed du-

ties, because many positions at large institutions were required to work in team environments. Today, accessing information heavily depends on the technology. Patrons want information quickly and easily at anytime and they will expect more. To meet patrons' expectations, libraries need abilities to research current trend, and to use wisely variously skilled persons, especially systems departments. All areas of library work are getting involved in technology. Maintaining and developing many of the services in libraries requires support from systems or IT staffs. To deal with this, several positions in a team environment are needed to provide efficient support in all aspects. This type of detailed and specified position can be seen in titles -- such as application developer, PC support specialist, Web designer, etc with administrator positions.

The second pattern unexpectedly found that network management skills were not highly required in the job ads because the network systems in academic institutions are normally controlled by university wide information systems offices, and the network systems in many public libraries are also controlled by the state level of Chief Information Office (CIO) or outsourcers.

And the last pattern, especially academic institutions which have archive or special collection departments were looking for a systems librarian, because digitization and building a digital library require almost identical IT skills found in regular systems departments and/ or many systems departments that provide combined support for the archive and special collection. Above all the IT skills, the positions require more knowledge of cataloging standards along with current trends in digitization.

The results indicate that titles and descriptions are still not easy to identify, because, although most systems librarians work with an ILS, other duties totally depend on the size and purpose of the libraries. In addition, evolving technologies produce new roles and duties with new job titles in this profession. Adopting new technology is an especially big issue in libraries. There were several positions such as Emerging Technology Librarian that emphasize applying new technology in

libraries. Specific technology skills beyond maintaining library automation systems were required such as network, hardware/software, programming, etc., but Web technology is the most required skill of the last five years, and will be more developed and used in the future.

Despite all the changes, one element has remained constant through the later stages of systems librarianship. That is the MLIS along with experience are the two main elements in the job requirements because many employers expect certain values above a level of technical skills in librarianship. In systems librarianship, adaptability and research abilities are very critical skills to cope with the ever changing work environment by technology.

The methodology used in this study was quantitative. The results allow for further investigation. For example, many colleges and universities have systems or similar departments. Examining the composition of the systems departments will provide a better perspective about systems librarianship. Also, conducting a longitudinal study may produce more commonalities such as comparing job descriptions of a specific position from past to present or each revision point in well known institutions that pioneered library automation. Another investigation comparing the transition of organizational charts in a library -- focused on systems personnel or the department with examining job descriptions -- will be interesting in finding some flow in systems librarianship.

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