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Abstract

This paper compares current responsibilities of systems librarians supporting the traditional ILS with anticipated responsibilities associated with supporting the next-generation ILS and examines how the roles of systems librarians will change in migrating to the next generation ILS from the traditional ILS. The method used for this study is content analysis. The content sources are online job banks for keeping an archive of past listings over the past five years. The analysis results demonstrate a shift is happening where the primary roles and responsibilities of systems librarians supporting the next-generation ILS are becoming more human/organizations related, while those positions supporting the traditional ILS show that top roles are concentrated on information technology. Overall, this suggests that systems librarians are expected to manage much less in terms of tasks directly related to information technology. Consequently, systems librarians should re-engineer themselves accordingly so that they will be able to support more critical issues in the library.

Systems librarians play a critical role in academic libraries (Iglesias, 2010). They are the experts who not only understand libraries and information technologies, but also enable these two fields to work seamlessly together as a whole (Iglesias, 2010). The evolution of the Integrated Library System (ILS) has dramatically changed not only the responsibilities and duties of the positions, but also the basic knowledge, skills and abilities expected by employers.

The origin of the ILS in libraries dates back to the late 1960s and early 1970s, when computer technology was used to automate the processing of print materials and as an electronic version of the card catalog (Epstein, 1983). In the 1970s and 1980s, due to the innovation of computer technology and telecommunications, the first generation ILS was invented as a character-based mainframe application, which included staff modules for cataloging, acquisitions, circulation, serials, administration, and the character-based Online Public Access Catalog (OPAC) interface (Saffady, 1994). Systems librarians' positions were created to manage different aspects of these independent automation systems such as maintaining mainframe hardware, operating systems, and graphic terminals. The evolution of the Internet throughout the 1990s and into the 2000s resulted in the appearance of the second generation ILS (Hart, 2001), commonly known as the *traditional ILS*. The traditional ILS is built on the client-server computing model (Ross & Marmion, 2000) and delivers modular functionality (Majumdar & Singh, 2004). The traditional ILS improved greatly during the 2000s. Today, most libraries are using a well-established proprietary or open source traditional ILS. While the traditional ILS handles library print materials very well, it has limitations concerning the management of details for electronic resources such as licensing information of databases and e-journals.

Because modern libraries are more heavily involved with electronic content, they now have to purchase and manage multiple systems to handle their multiple collections. In order to manage electronic materials, for instance, vendors have developed the Electronic Resource Management Systems (ERMS) and other tools that exist either as a standalone system or as a built-in module in an ILS. Accordingly, systems librarians' responsibilities and roles have been greatly expanded (Rhyno, 2013) to manage the ILS, ERMS, link resolvers, and other add-ons. The traditional ILS requires systems librarians to invest significant time in the maintenance and upgrades of hardware, software, databases, and applications. Because systems librarians are largely on their own in integrating these systems they are required to have certain advanced knowledge and skills in library information technology.

In order to provide a single, unified management system for libraries to manage their print, electronic, and digital materials, vendors started to reintegrate or reinvent their traditional ILSs. ILS vendors and open source ILS developers expect to replace their traditional ILS, ERMS, link resolvers, and other add-ons with a fully integrated unified system (Breeding, 2012b). Service-orientation architecture (SOA) principles, cloud computing technology, Application Programming Interface (API), and other modern information technologies are adopted by these vendors and open source developers in

the development of their next generation ILS (Breeding, 2012b). Since the next generation ILS will be deployed in a cloud-computing environment, libraries do not need to purchase or install anything locally. This allows libraries to "subscribe" to the next-generation ILS. In accordance with the subscription, the maintenance and updates of infrastructure, software, and applications will be provided by vendors (Breeding, 2011). This innovation will impact the responsibilities and roles of systems librarians and the knowledge, skills, and ability requirements for systems librarians supporting the next-generation ILS.

In order to identify and measure the changes mentioned above, this study will analyze the contents of online job postings for systems librarians over the last five years, and an examination of vendor staffing proposals will provide a look into the future for positions supporting the next generation ILS. This analysis will examine the changes in fundamental roles placed on systems librarians who must manage the next-generation ILS. As a response to these role changes, this study will discuss threats, opportunities, and challenges being faced by systems librarians today.

Literature Review

Many studies regarding systems librarianship have been conducted and presented in the library literature. In light of these studies, Liu and Cai (2013) found that cloud computing has a significant impact on systems librarianship. However, through needs assessment and impact analysis, Liu and Cai (2013) found there was not enough evidence to prove that cloud computing might negatively impact a systems librarian's career. While cloud computing specifically might not be a threat, Liu and Cai (2013) suggested systems librarians improve their knowledge and skills to meet the new challenges in the field.

Fu and Fitzgerald (2013) conducted a comparative analysis on how the software architecture and the workflows/functionality of the traditional ILS and the next-generation ILS may impact system and technical services staffing models at academic libraries. They suggested that "redefining staff job descriptions and reorganizing library organizational structures might be necessary in order to better adapt to the changes brought about by the next-generation ILS" (p.57).
Breeding (2012a) claimed that the next-generation ILS would eliminate many hardware and maintenance investments for libraries. Breeding (2012a) advocated that the next-generation ILS utilizes Web-scale technology deployed via cloud environment, so vendors can centrally manage the majority of systems tasks that had been performed by local systems staff in a traditional ILS environment.

Sutton (2011) examined the relationship between the knowledge, experience, and skills expected of systems librarians and the curriculum and support offered to library students at ALA-accredited programs. Sutton (2011) gathered and analyzed the contents of online job postings for systems librarians in the previous five years to determine what employers were looking for when hiring systems librarians. Sutton (2011) also examined the websites of ALA-accredited institutions to determine what the

schools' curricula, course offerings, and career assistance offered students interested in systems librarianship. Sutton found six of the top 10 most frequently required knowledge and skills were human/organization related. The most frequently mentioned requirement was for communication skills, required in about 70% of jobs.

Iglesias (2010) presented a series of case studies in his book on how the roles of systems librarians have been impacted by the fact that libraries now purchase or subscribe to more online databases hosted by vendors. The book explored how Web technologies and shifts in technology management impact the profession. The chapters provide insight and information on the shift in systems librarians' roles towards acquiring more expertise and experience in dealing with external library service providers.

Goetsch (2008) showed academic libraries are creating new job roles and/or reinventing traditional positions to meet new and emerging user needs brought about by technology, globalization, and financial crisis. Through a content analysis of selected job vacancy announcements in the last decade, Goetsch (2008) examined the impacts, benefits, and tensions that this change in users has brought on academic libraries.

Ingersoll and Culshaw (2004) showed that the primary responsibilities and roles ascribed to systems librarians lies in the areas of planning, staffing, communication, development, service and support, training, and daily operations. The primary work tasks of most systems librarians, however, include ILS administration, server management, workstations maintenance, software and applications maintenance and upgrades, configuration, patch management, data backup, printing issues, security, and inventory. Ingersoll and Culshaw (2004) also emphasized systems librarians should be proactive in facing constant change and keep abreast of emerging library technologies. Rhyno (2003) argued that mainstream Web technologies, such as XML, have been widely used in library systems and applications, and thereby expanded the role of systems librarians.

Guinea (2003) examined the role of systems librarians in the administration of a university ILS. Guinea (2003) found that systems librarians served as a bridge between library and other university units in the development of library-initiated projects and the promotion of information technology-based applications.
Xu and Chen (1999, 2000, 2001) in a series of studies from 1999 to 2001 examined 133 systems librarian job advertisements from January 1996 to December 1997 and compared the results with a survey of employers and newly hired systems librarians through content analysis. Xu and Chen (1999) found that a strong background in information technology is required for the job of systems librarians.

Methodology

For the purpose of this analysis, a systems librarian job is defined as a librarian whose primary responsibilities are directly or indirectly related to the management of an integrated library system where a degree from an ALA-accredited institution or equivalent is required or desired. This definition likely excludes some comparable

positions for which a MLS/MLIS degree or equivalent is not required. Different job titles, such as "Systems Librarian", "Systems Coordinator", "Automation Librarian", "Head of Systems", "Technology Librarian", will be regarded as equivalent job titles as long as they meet the definitional criteria mentioned above. Two types of positions were gathered and categorized. The first category supports the traditional ILS such as Millennium, Voyager, and Aleph, while the second category supports the next generation ILS such as Alma, WMS, and Sierra.

The analysis was conducted using free online job postings from the last five years. While Sutton's (2011) and Xu's (2001) studies focus on gathering the knowledge, skills, and abilities of systems librarians and analyze how current education meets the industry's needs, this study intends to create a list of typical responsibilities of systems librarians and then determine how the roles of systems librarians are expected to change as a result of adopting the next generation ILS. The sources compiled are from online job banks that keep an archive of past job listings, including code4lib jobs, ALA JobLIST, and various university job listing sites. The content from all sources were gathered together in a single spreadsheet in order to facilitate its organization and manipulation. Duplicates and re-posts were removed. The responsibilities and duties described in each job description were examined for similarities in order to determine a typical list. Specific responsibilities such as administering an ILS were listed individually, while more general responsibilities, definitions of which vary from one posting to another, were grouped together under an appropriate heading. All postings were examined a second time once all categories had been determined to ensure complete coverage. Due to the fact that only a few positions for managing the next-generation ILS are available in the job market, in order to support an in-depth analysis, vendors' claims were gathered and grouped from their documents, webinars, product demonstrations, and RFP responses.

Analysis and Results

A total of 52 job postings were gathered over the past five years (see Tables 1 and 2). Among these jobs, 7 advertisements (see Table 3) indicated that their libraries were one of the next-generation ILS early adopters or intended to migrate to the next generation ILS.

Table 1. Job Posting Distribution by Year

Post Year	Numbers
2008	7
2009	4
2010	4
2011	6
2012	31
Total	**52**

Source: Code4Lib, ALA JobLIST, various university job listing sites.

Table 2. Job Postings Distribution by Current ILS

Current ILS	No.
Aleph	9
Millennium	16
Symphony	10
Voyager	16
Others	1
Total	**52**

Source: Code4Lib, ALA JobLIST, various university job listing sites.

Table 3. Job Postings Associated with Supporting the Next-Generation ILS

Current ILS	Future ILS	No.
Aleph	Alma	1
Millennium	Alma	1
Millennium	Sierra	3
Voyager	Alma	1
Virtua	WMS	1
Total		**7**

Source: Code4Lib, ALA JobLIST, various university job listing sites.

The analysis result shows (see Table 4) 65% of positions use titles such as "Information Systems Librarian", "Integrated Library Systems Librarian", "Systems Librarian", and "Senior Systems Librarian", which indicate that the incumbents play a role as Systems Librarian only, while 35% of the job titles explicitly require that the incumbents must play an additional role to support another area other than systems. The job titles appear as a combination of the two areas such as "Systems and Acquisitions Librarian", "Systems & Web Development Librarian", "Systems & Serials Librarian", "Systems and Technical Services Librarian", "Systems and Electronic Resources Librarian", etc.

Table 4. Job Posting Distribution by Titles

Title	No.	%
Systems Role Only		
Information Systems Librarian	1	
Integrated Library Systems Librarian	4	
Systems Librarian	28	
Senior Systems Librarian	1	
Subtotal	34	65%
Systems Role Plus an Additional Role		
Acquisitions and System Services Librarian	1	
Acquisitions Systems Librarian	1	
Assistant Director of Technical Services for Library Systems	1	
Director, Integrated Library Systems (Librarian)	1	
Head of Library Systems	2	
Librarian - Systems Librarian - Web and Digital Initiatives	1	
Systems & Web Development Librarian	1	

Serials Systems Librarian	1	
Systems & Web Development Librarian	1	
Systems and Distance Education Librarian	1	
Systems and Electronic Resources Librarian	1	
Systems and Emerging Technologies Librarian	1	
Systems Librarian: Web Development and Support	1	
Systems Librarian Position-Web & Mobile Based Systems Specialty	1	
Systems Librarian-Web, Communications and Interface Design	1	
Technical Services and Systems Librarian	1	
Web Services/Research and Instruction Librarian	1	
Subtotal	**18**	**35%**
Total	**52**	**100%**

Source: Code4Lib, ALA JobLIST, various university job listing sites.

Regarding the responsibilities and roles of systems librarians supporting the traditional ILS, as shown in Table 5, five of the top seven roles are concentrated on information technology, which implies that systems librarians must have certain advanced knowledge and skills in information technology.

Table 5. The Roles of Systems Librarian Supporting the Traditional ILS

Roles	No.	%
Administrator/Implementer	41	79%
Operator	40	77%
Liaison	34	65%
Technology Leader	35	67%
Project Manager	28	54%
Report Generation Expert	27	52%
Webmaster	23	44%
Trainer	23	44%
Expert Source	21	40%
Supervisor	21	40%
Faculty Liaison	15	28%
Advisor	10	19%
Policy Maker	10	19%
Other roles	32	61%
Total Ads = 52		

Source: Code4Lib, ALA JobLIST, various university job listing sites.

Approximately 80% of positions indicate that systems librarians are a systems administrator who administers, supports, and enhances a variety of library systems, including but not limited to the integrated library system, link resolver, proxy server, federated search system, archives management system, and interlibrary loan management system. A systems librarian must also be a system implementer who performs activities including software installations, integrations, configurations,

upgrades, patches or other fixes, and enhancement, in addition to the day-to-day management, maintenance, troubleshooting, and user support.

Seventy-seven percent of the jobs require systems librarians to act as an operator to perform data loading and validation. Sixty-seven percent of the positions demand that systems librarians be technology leaders to keep abreast of developments in library technologies and maintain current awareness of information tools. Fifty-two percent of the positions request that systems librarians be report generation experts who participate in the design and coordination of statistical and managerial reports. Forty-four percent of the positions require systems librarians to be webmasters who provide vision and leadership in designing, developing, and supporting library websites by integrating them with the larger library Web presence including discovery tools, digital collections, electronic resources, and other Web services. Some positions require systems librarians to identify, develop, and implement new Web applications and tools, particularly for mobile environments. Forty percent of the positions designate that the systems librarian serve as an expert resource within the library regarding core production systems and applications, and also provide advice and consultations to library staff to maximize effective use of technology.

The rest of the roles listed in Table 5 are related to the human/organization facet of the profession. This result is consistent with Sutton's (2011) finding that six of the top ten most frequently required knowledge and skills were human/organization related. Sixty-five percent of positions require that systems librarians serve as liaisons to IT units on campus to coordinate hardware network maintenance, upgrades, and integration with other enterprise systems. Systems librarians also serve as primary representatives and contacts to the designated library system vendors to coordinate systems, databases, and applications maintenance and upgrades. Fifty-eight percent of positions ask systems librarians to be project managers who lead and manage library projects that include the implementation of new applications to meet the needs of students, faculty, staff, and community users of the university. Forty percent of positions require systems librarians to supervise library IT staff and set priorities for the systems department on a regular basis. Twenty-eight percent of positions assign systems librarians as a faculty liaison for selected disciplines to participate in collection development, engage teaching faculty in selection and acquisition activities, and develop and maintain discipline-specific Web research guides. Nineteen percent of positions require systems librarians to advise library directors in regards to library technology issues, Web trends, cataloging and collection development, and to serve as members of the library's management team. Nineteen percent of positions expect systems librarians to actively participate in the formation and implementation of library policies and procedures and long-term strategic planning.

In addition, sixty-one percent of positions want systems librarians to perform general library duties such as reference service, orientations, library workshops, circulation, collection development, program planning, and evaluation. Some positions may require systems librarians to work at multiple locations within the institutions and may involve day, evening, and weekend assignments. The general duties also include curriculum

development, participation in the governance process through engagement in scholarly pursuit and other professional activities, committee work, and student activities. Sometimes systems librarians are required to serve as library directors in the absence of directors as requested.

Regarding the seven positions (see Table 3) anticipated supporting the next-generation ILS, the roles of systems librarians are listed in Table 6.

Table 6. The Roles of Systems Librarian Supporting the Next-generation ILS

Roles	No.	%
Liaison	6	85%
Technology Leader	6	85%
Administrator	6	85%
Project Manager	5	71%
Web/Discovery Support	5	71%
Trainer	4	57%
Expert Source	4	57%
Supervisor	2	29%
Operator	2	29%
Statistics report	2	29%
Other roles	6	85%
Total Ads = 7		

Source: Code4Lib, ALA JobLIST, various university job listing sites.

Because the seven positions above are tasked with maintenance of a traditional ILS while anticipating the transition to a next-generation ILS in the future, more information regarding future staff roles was needed. To supplement the low number of job postings dedicated to supporting a next generation ILS, this study also gathered ILS vendor's claims from documents, product demonstrations, and RFP responses regarding staffing requirements. Many different claims from vendors were found. For example, OCLC generally estimates that WMS can save 90% of local systems workload, while Ex Libris seems to have a more reasonable and descriptive explanation. The table below lists the expected level of local systems staffing required for managing the next-generation ILS. The content is adopted from the Ex Libris's *Response to Request for Proposal of the Orbis Cascade Alliance's Shared Library Management System, February 29, 2012.*

Table 7. The Expected Level of Local Systems Staffing Required for Supporting the Next-Generation ILS

Tasks	Local Systems	Vendor (Cloud)
Server, Network and DBA		
O/S management		X
Oracle upgrades		X
Back-ups		X
Disaster recovery		X
Test environment		X
Security infrastructure		X

Logging-debugging	X	
Firewall	X	
Application		
Service packs		X
Version upgrades		X
Client Deployment		X
Test application environment		X
Command line	X	
Configuration and customization	X	
Support and Service Calls		
Under the hood diagnostics		X
Implementing proposed fixes and testing solutions		X
Capacity planning & tuning		X
Liaison to vendor	X	
Logging & tracking service calls	X	
Total	**6**	**13**

Source: Ex Libris' Response to Request for Proposal of the Orbis Cascade Alliance's Shared Library Management System, February 29, 2012

As shown in Table 7, the essential tasks of supporting the next-generation ILS have dropped to six from the 19 associated with supporting the traditional ILS. It seems that the systems administration role still appears at the top of the roles in Table 6. However, one reasonable explanation is, as shown in Table 7, that systems administration responsibility is potentially limited to managing the following: service calls tracking, configuration and customization, discovery interface, firewall, local LAMP (Linux operating system, Apache HTTP Server, MySQL database software, and PHP, Perl or Python), and the external cloud environment. Therefore, the actual systems administration responsibility might drop greatly. This result offers evidence to support Breeding's (2012a) claims that the next-generation ILS will eliminate many hardware and maintenance investments for libraries.

As shown in both Table 6 and Table 7, the liaison role stands at the top of the list, which is more human/organization related, as compared to the sixty-five percent that supports the traditional ILS. The analysis result suggests that greater communication is crucial, whether it is between systems librarians and IT for issues of network firewall management, or with vendors to solve issues such as logging and tracking service calls and upgrades coordination. The weight on the roles of serving as a technology leader and an expert source are expected to be greatly increased as well. The next-generation ILS will bring many new technologies and challenges to library staff. The analysis results support Fu and Fitzgerald's analysis (2013) that the more integrated workflows and functionality of the next-generation ILS "allow library staff to work with more modules, play multiple roles, and back up each other, which will bring changes to traditional staffing models" (p.57). Thus, systems librarians need to develop more human/organization skills than ever before. Training and communications skills take on a larger role as systems librarians are asked to provide training for staff to help them adapt to the change, and assist staff to better understand technological possibilities

including changes to workflows and functionality offered by the next-generation ILS. Since the next-generation ILS utilizes a discovery layer interface, systems librarians should expect to take care of the discovery interface's maintenance, configuration, and customization.

Additionally, the weight on the role of serving as a project manager is expected to be increased, particularly during the transition and migration from the traditional ILS to the next-generation ILS. Systems librarians must show leadership and project management skills in ILS migrations during the phases of planning, preparation, data extraction and loading, configuration, project management, training and coordination.

Conclusion

The analysis demonstrates a shift in the primary roles and responsibilities of systems librarians brought about by the adoption of the next-generation ILS. Positions for systems librarians supporting a next-generation ILS are becoming more human/organization related, while those positions supporting the traditional ILS show that top roles are concentrated on information technology. As the next-generation ILS becomes the norm, systems librarians will be expected to manage much less in terms of tasks directly related to information technology. Going forward it seems the maintenance and upgrades of computers, servers, operating systems, databases, and client applications will be centrally managed by vendors or cloud hosting services. Systems librarians no longer need advanced knowledge and skills to handle hardware and software; however, they do need some knowledge and skills to manage firewalls and customize cloud resources. Meanwhile, systems librarians are expected to increase their responsibilities and roles greatly in more human/organization related tasks. These tasks include communication with vendors and coordination with university IT, strong familiarity with workflows and functionality, staff training, and discovery interface configuration and customization. Additionally, systems librarians are expected to show strong leadership capabilities and excellent project management skills for the transition from the traditional ILS to the next-generation ILS. The role change of systems librarians in the direction of human/organization skills requires systems librarians to reengineer their knowledge and skills. This knowledge and skill will facilitate the process of becoming an expert source for staff regarding new workflows and functionality of the next-generation ILS.

Ideally this analysis result can provide some useful information and insight for potential systems librarians, library schools, and employers. Finally, future studies should be considered to reexamine the conclusion of this study when more positions associated with supporting the next-generation ILS are available.

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