SYSTEMS LIBRARIANSHIP

A Practical Guide for Librarians

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Systems Librarianship

PRACTICAL GUIDES FOR LIBRARIANS

⟳ About the Series

This innovative series written and edited for librarians by librarians provides authoritative, practical information and guidance on a wide spectrum of library processes and operations.

Books in the series are focused, describing practical and innovative solutions to a problem facing today's librarian and delivering step-by-step guidance for planning, creating, implementing, managing, and evaluating a wide range of services and programs.

The books are aimed at beginning and intermediate librarians needing basic instruction/guidance in a specific subject and at experienced librarians who need to gain knowledge in a new area or guidance in implementing a new program/service.

⟳ About the Series Editor

The **Practical Guides for Librarians** series was conceived and edited by M. Sandra Wood, MLS, MBA, AHIP, FMLA, Librarian Emerita, Penn State University Libraries from 2014 to 2017.

M. Sandra Wood was a librarian at the George T. Harrell Library, the Milton S. Hershey Medical Center, College of Medicine, Pennsylvania State University, Hershey, Pennsylvania, for more than thirty-five years, specializing in reference, educational, and database services. Ms. Wood received an MLS from Indiana University and an MBA from the University of Maryland. She is a fellow of the Medical Library Association and served as a member of MLA's Board of Directors from 1991 to 1995.

Ellyssa Kroski assumed editorial responsibilities for the series beginning in 2017. She is the director of Information Technology at the New York Law Institute as well as an award-winning editor and author of thirty-six books including *Law Librarianship in the Digital Age* for which she won the AALL's 2014 Joseph L. Andrews Legal Literature Award. Her ten-book technology series, The Tech Set won the ALA's Best Book in Library Literature Award in 2011. Ms. Kroski is a librarian, an adjunct faculty member at Drexel and San Jose State University, and an international conference speaker. She was named the winner of the 2017 Library Hi Tech Award from the ALA/LITA for her long-term contributions in the area of Library and Information Science technology and its application.

Recent books in the series include:

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Preface

Systems librarianship can be a complex and bewildering world to step into, especially as a first librarian position or when unexpectedly taking on a systems role from another area of librarianship. Many MLIS programs still do not have true systems librarian tracks or do not adequately prepare new librarians for the complexities and uncertainties they will encounter. The proprietary nature of many library technology systems often makes obtaining hands-on experience prior to entering the job force unobtainable.

While *The Accidental Systems Librarian* has been a helpful reference for many new systems librarians for many years, library technology has changed a great deal since its publication and even since its update. The aim of this book is to create an up-to-date guide for both new systems librarians and LIS students interested in systems librarianship that will offer a practical view on what to expect, the best ways to prepare for and land a job in library technology, and a baseline introduction to current and emerging technology being used in libraries today. Along with this foundational knowledge, this book also includes practical tips and information for common systems librarian responsibilities such as technology planning, project management, systems migration, website redesign, technology management, and assessment.

As a brand-new librarian who ended up in a technology-focused position right out of graduate school with little more technology preparation than an LIS course on web design and some independent coursework in JavaScript and PHP, suddenly being expected to administer, configure, and troubleshoot systems like the library's ILS, EZproxy, and ILLiad was a daunting prospect. Learning on the job in a sink-or-swim situation is one way, and some might argue the best way, to acquire these specialized skills, but I also leaned heavily on library listservs, helpful colleagues and members of the library community, blogs, the professional literature, and Google to help me figure out the things I didn't know as well as the things I didn't know I didn't know. Some things I learned simply by doing—and some things by doing wrong.

It is my hope that this book will be a helpful introductory resource for new and aspiring systems librarians and other library technologists. It offers baseline foundational knowledge that should prove useful no matter what environment a new systems librarian is working in, as well as more detailed information on some of the more practical applications of knowledge a systems librarian will likely encounter in their work.

As part of the preparation for writing this book I sent out an online survey to the members of various technology-focused listservs including lita-l, eril-l, ezproxy-l, code4lib, and web4lib. In the survey, I invited anyone who self-identified as a systems librarian to anonymously answer questions about their work experiences, their educational background and preparation, technologies and tools used, skills needed, and resources they found most helpful in performing their jobs. In true librarian form, the library systems community stepped up with two hundred individuals participating to offer information, tips, and advice for new systems librarians and LIS students alike. In addition, a number of participants also agreed to answer an in-depth questionnaire for the individual profiles you will find throughout the book, to offer readers varying perspectives from systems librarians working in all types and sizes of libraries and other unique systems environments.

I would like to acknowledge each of the two hundred systems librarians who answered the survey and especially those who answered the in-depth questions with their personal experiences. This book has all of the helpful information that it does because of these librarians and their willingness to share their hard-earned knowledge and experience with the library community.

What Is a Systems Librarian?

I N THE MOST STRAIGHTFORWARD TERMS, a systems librarian can be described as "a librarian who is responsible for managing the information technology used in a library,"[1] or even more simply as "the person responsible for the maintenance of the ILS [integrated library system]."[2] However, these seemingly simple definitions belie the true complexity not just of the work of a systems librarian, but of the sheer number of possible variations when it comes to job titles, job duties, and work environments. Computer-savvy librarians or librarians with an interest in technology may pursue systems librarianship or unexpectedly find themselves in a systems librarian role. On the opposite end of the spectrum, a trained IT professional managing technology systems in a library might also consider themselves a systems librarian. The person you call when some type of technology stops working in the library is most likely that library's systems librarian. For the purposes of this book, anyone working in the capacity of a librarian who is responsible for administering all or a significant portion of the technology being used in a library environment will be considered a systems librarian.

So what technology do we mean exactly? Given today's technical environment and the importance of technology in all aspects of library service, it would be difficult for anyone working as a librarian of *any* kind to avoid both interaction with and reliance on technology. A reference librarian may create research guides using a content management system or create video tutorials to embed in the library website to guide users through an online process. A cataloger will make extensive use of the library's integrated library

system as well as online bibliographic utilities. But a systems librarian is not just an end user of these systems; they are an administrator. They will typically be the person who implements, configures, and troubleshoots the system, as well as sets up and maintains user accounts, runs reports, and performs system updates as needed.

In the 1998 text on systems librarianship, *The Systems Librarian: Designing Roles, Defining Skills*, Thomas Wilson identified the following as some of the typical responsibilities of systems librarians:

- integrated library system management
- network design and management
- server and host administration
- desktop computing
- training, documentation, and support
- application development
- planning and budget
- specification and purchasing
- technology exploration and evaluation
- miscellaneous technology support
- technical risk management
- communication and coordination[3]

Wilson's list is now more than twenty years old, and while many of the responsibilities he identified are still considered part of the systems librarian's domain, technological advances necessitate some enhancement of the original list.

Mobile technology has advanced to such an extent since the late 1990s that now all librarians regardless of job title need to be at the very least familiar with the use of e-books, tablets, and mobile phones, as these are technologies that a significant number of their patrons will be using. The advent of online databases along with the proliferation of the Internet means that systems librarians now need to be familiar with technology like link resolvers, authentication systems, discovery platforms, virtual reference technology, and more. And in more recent years, cloud computing has advanced to such a degree that it is starting to shift the main responsibilities of many systems librarians from managing their own servers in-house to instead managing web-based applications hosted by vendors off-site. The number of available systems and the need for all of these systems to communicate with one another and share information mean that systems librarians today must be especially knowledgeable about interoperability and the standards and protocols that allow for the seamless exchange of information. Many of the technology systems currently in use in today's libraries are discussed in more detail in chapters 3 through 6 of this book.

While the advancement of technology has eased some of the burden on systems librarians in certain areas, such as server maintenance and networking, the library technology landscape is now more complex than ever. While knowing everything about every possible technology in use today is not easily achieved or usually even necessary, new and aspiring systems librarians should have a broad knowledge of and comfort with technology. However, even more important to their ultimate success is "an openness to learning . . . capacity to embrace and facilitate change, and . . . foundation in the principles of librarianship."[4]

⊚ The Evolution of Systems Librarianship

Most people working in libraries today understand just how vital technology is to the function of nearly all of the library's products and services. While those who may not have entered a library in decades might still think of them as little more than book repositories, and librarians as the endlessly helpful staff who sit behind a desk and look up the answers to reference questions in dusty printed tomes, libraries have been embracing current technology and changing with ever-evolving technological developments for over half a century. Yet even though libraries have long relied on technology, they have not always had dedicated systems librarians devoted to managing that technology.

The use of computer technology in libraries dates as far back as the 1960s when mainframe computers came into use for processing print materials and for maintaining the earliest versions of the computerized card catalog and what would eventually become the first generation of the ILS during the 1970s and 1980s.[5] In this era of burgeoning technology in libraries, there usually wasn't yet a position known as a systems librarian. Instead, libraries often employed non-librarian IT staff to manage these complex computer systems.

In her seminal article on the four stages in the evolution of the systems librarian, Merri Beth Lavagnino writes that the systems librarian as we know it, a "merger of the librarian and systems roles,"[6] didn't happen in earnest until stage three, the era that saw the proliferation of the online public access catalog and microcomputers. While some libraries were able to hire a dedicated systems librarian during this time, smaller libraries would often employ tech-savvy librarians in hybrid positions who would manage the library's systems while also serving in another more traditional capacity on the library's staff. While the number of systems librarian position announcements advertised in *American Libraries* increased dramatically during this period (from one in 1974 to twenty-three in 1984 and forty-three in 1994[7]), the position was still often intertwined with more traditional IT duties. Lavagnino notes that it was still common "to see the systems librarian unjamming a printer or installing a microcomputer."[8] Depending on the size of the library, these duties may still be part of some systems librarians' responsibilities even today.

During this time, many libraries were still focused on hiring employees for their technology skills, with less emphasis placed on their librarian skills. Margaret Foote's 1997 study, for example, found that 38.3 percent of systems librarians positions did not require an MLS, a trend she noted as a potential concern at the time.[9] However, much of this changed as the use of technology became more personal and more easily accessible, and as the changes in modern technology had as profound an impact on the work of librarians as it did on technology consumers outside the library.

> The Netscape browser and the first search engines debuted in 1994, and by 1995, Netscape went public on the stock exchange. The Palm Pilot was introduced in 1996, Internet Explorer debuted in 1997, SPARC was formed in 1997–98, and Google was developed and unveiled between 1998–99. Between 2000 and 2005, the iPOD was introduced (2001), Google Print was launched (2004–5), and YouTube arrived on the scene (2005).[10]

Lori Goetsch wrote in *Library Hi Tech* that by 2005, there were few systems librarian positions being advertised; not because these positions no longer existed, but because the current technological landscape had caused libraries to begin creating even more specialized

positions, such as "Digital Applications and Systems Librarian, Digital Initiatives Librarian, Web Development Librarian, Interface and User Testing Specialist, Library System Developer, and Web Services Librarian."[11] However, along with these changes, the trend started to move back toward hiring librarians with technology skills rather than non-librarian technologists to work in these positions. Edward Iglesias wrote that 85 percent of the systems librarians he surveyed in 2009 held an MLS or equivalent.[12]

Since the mid-2000s, technology has continued to advance with the shift toward cloud computing and, in libraries, with the emergence of the discovery platform and the library services platform (LSP). Systems librarians today must know more about technology than ever, and yet, in many libraries, particularly in academic libraries, a centralized IT department has consolidated much of the responsibility for the more general technology systems, such as the deployment of computer workstations, servers, printers, scanners, and networks. This has freed up systems librarians to focus on library-specific technology such as the ILS, the discovery platform, and interlibrary loan systems and creating their own web applications for the enhancement of library systems and services, as well as for high-level management, planning, and leadership of the library's overall technology. As Rene Erlandson noted, "The role of systems librarians moved away from explicit technical skills, like programming and infrastructure installation, to focus on the broader principles of planning and development for integration of emerging technologies into libraries."[13]

However, no two libraries are organized in exactly the same way, and while the job of a reference librarian may be much the same from one library to the next, the precise duties and scope of a systems librarian's position can vary greatly depending on factors such as the size and type of the library, the size (or lack) of the systems department, the library's relationship with a centralized IT department (if any), the exact technology in use by that library, and so much more.

Work Environments and Job Duties

Because the duties of a systems librarian can vary so widely depending on the particular library in question, an attempt to generalize the most common or most likely duties of a systems librarian in different types of libraries can only provide at most an anecdotal snapshot. Each library environment is different, so the only way to truly understand the job duties and requirements for a particular position is to read the job advertisement in which the library (hopefully) articulates the skills and knowledge needed for that particular job. The following generalized information will hopefully provide new librarians with a broad sense of the type of duties that might be required in different types of libraries and serve as an aid in deciding what type of library environment to pursue and the knowledge most likely needed for each.

Education, Experience, and Skills Required by Different Library Environments

Hong Xu and Hsin-liang Chen's 2000 study on employers' hiring of systems librarians surveyed hiring managers at academic libraries, public libraries, and "other" libraries to find out who they ultimately hired for their systems librarian positions. The information they gathered includes education requirements, years of experience required, job duties, and necessary areas of knowledge. Table 1.1 summarizes the results from their study.[14]

Table 1.1. Systems librarian qualifications by type of library.

	ACADEMIC LIBRARIES	PUBLIC LIBRARIES	"OTHER" LIBRARIES
Education	• 54.55% required an ALA-accredited MLS	• 33.33% required an ALA-accredited MLS	• 40% required an ALA-accredited MLS
Experience	• 50% of positions were entry-level • 19.23% required 5+ yrs of experience	• 77.78% of positions were entry-level • 17% required 5+ yrs of experience	• 60% of positions were entry-level • 0% required 5+ yrs of experience
Responsibilities (in order of frequency)	• Technical support • Systems maintenance • Training • Programming	• Planning • Purchasing • Systems maintenance • Application development • Technical support • Training	• Systems maintenance • Technical support • Supervisory duties • Training
Areas of Knowledge (in order of frequency)	• Microcomputer applications • Installation of hardware/software • Internet • Telecommunications • Operating systems • ILS • IR technology • HTML	• Telecommunications • Automated library system • Microcomputer applications • Operating systems • Internet • Installation of hardware/software	• Telecommunications • Information retrieval • HTML • Z39.50

While many of the responsibilities and areas of knowledge appear to be relatively similar across library types, the reality is that the scope of the system librarian's responsibilities depend greatly on the size and structure of the individual library. In a small library, a systems librarian may be the sole person responsible for anything technology-related within the library, including networks, servers, printers, and even the library website. In a large library, the systems librarian may act primarily as a supervisor over more technically focused IT staff and have overall responsibility for project management within the department and long-term technology planning.

In libraries both big and small that have a strong centralized IT department, the systems librarian may not need to worry about computer hardware or printer issues but instead may serve as the library's main liaison with IT, facilitating maintenance, upgrades, and integration without being the primary technician of those things. And in academic libraries of all sizes, systems librarians may participate in additional activities such as collection development, reference, instruction, or other more traditional librarian duties.

So is a systems librarian really a librarian or are they an IT professional? As previously noted, it partly depends on the library environment and it partly depends on who you ask. Keith Kelley argues in *The Myth and Magic of Library Systems* that a systems librarian should actually be referred to as an automation librarian, a job for which he believes the MLS is not necessary. He also writes that "it is the hardest librarian job, but it is one of the easiest IT jobs. Their knowledge of what they are doing is . . . deeply shallow."[15] However, this viewpoint seems not to be widely shared by other library professionals. In her 1988 article "The Role of the Systems Librarian," Susan Martin asserts that it's often easier to turn a trained librarian into a systems librarian than to try to have

a systems analyst or programmer work within the "complex and even arcane"[16] information and procedural structures used in libraries. Lisa Goddard seems to agree, writing in 2003 that IT professionals have "a limited perspective on the workflow, culture, and users"[17] of libraries and that hiring library professionals to handle the job ultimately better serves the library's users.

Programming Languages Used in Different Library Environments

While computer programming is not a requirement for systems librarians in every library, it can be necessary for certain positions and simply useful for others. In a study of programming and scripting languages listed in job advertisements for library technologists from the Code4Lib Jobs website, including 104 job postings categorized as systems librarians, I found that the most commonly mentioned programming languages for systems librarians were, in order of frequency, HTML, XML, SQL, JavaScript, PHP, and CSS.[18] For all library technology positions, not limited to only systems librarians, table 1.2 shows the most frequently listed programming languages mentioned by type of library environment.[19]

While some of the languages differ slightly, looking at the data makes it clear that for most library environments, a librarian working with technology would probably find the most benefit in learning HTML, CSS, JavaScript, PHP, SQL, and XML. For those working in corporate environments, knowing Java might also come in handy. Even if programming or scripting knowledge never becomes necessary, just having a baseline knowledge will provide a greater understanding of how many systems operate under the hood and the ways in which they can use, provide, and share information. Additionally, knowing something about programming can provide a shared language with IT staff and other technical colleagues, facilitating better communication between the library and other departments.

Table 1.2. Most commonly listed programming languages in job advertisements for systems librarians by library type.

ACADEMIC LIBRARIES	PUBLIC LIBRARIES	SPECIAL LIBRARIES	CORPORATE LIBRARIES
XML	HTML	HTML	XML
HTML	XML	CSS	SQL
PHP	CSS	JavaScript	JavaScript
CSS	JavaScript	SQL	HTML
JavaScript	SQL	PHP	Java

ILS/LSP Platforms Used in Different Library Environments

With multiple mergers happening in recent years, the total number of available ILS or LSP platforms has been greatly reduced. However, there are a handful of vendor platforms that are commonly used throughout particular library environments, especially depending on the type and size of the library. ILS and LSP platforms are discussed in more detail in chapter 3.

Alma (Ex Libris) is currently dominant in academic libraries, whereas it is used by almost no public libraries. Instead, Sierra (Innovative Interfaces) and Symphony (SirsiDynix) are strong platforms for public library environments. Symphony is also a leading choice for school libraries. Alma and Sierra also tend to be the chosen solution for large and very large libraries, while Symphony is strongly represented in libraries of all sizes. And while Sierra and Symphony are common choices for small libraries, the open-source platform Koha (hosted by ByWater Solutions) is a popular choice for smaller libraries as well.[20]

In his 2018 "Library Systems Report," Marshall Breeding points out that academic libraries have been steadily moving away from the legacy ILS systems that they have relied on for decades and moving toward the LSP, which can provide an integrated discovery platform and easier workflows for managing both print and electronic resources. Alma currently claims the largest share of the academic market for LSPs, with WMS (OCLC) a strong second. However, Ebsco and other partners are currently working on developing the much-talked-about FOLIO, an open-source, modular LSP that could also end up being a strong competitor in the LSP market.[21] As of now, FOLIO is not fully developed or implemented and is not yet a viable solution for most libraries, but library technologists everywhere are closely watching its development and many expect it could have a strong impact on the LSP market in the near future.

Key Points

Systems librarianship is a field as complex as the labyrinth of separate technology systems in use in libraries today. It is also a field that can be challenging and fulfilling for those interested in and ready to take on a role with an ever-evolving roster of technology to select, master, manage, and maintain. Some key points to keep in mind while reading the remaining chapters of this book include:

- Systems in use in libraries are always changing as technology advances and evolves. A systems librarian will need to be able to keep abreast of current technology, aware of impending changes, adept at change management, and able to quickly pick up new technology as well as teach others how to use it.
- While client/server technology has dominated in libraries for many years now, things are moving quickly toward cloud computing and libraries of all types are starting to shift in that direction, abandoning legacy ILS systems in favor of cloud-based LSPs.
- The technology systems a particular library uses will depend greatly on the type of library, the size of the library, and the library's relationship with its parent institution and any centralized IT department in the organization. Reading a position's job advertisement is the only way to get a more nuanced idea of the duties and skills required for any particular position.

- While computer programming is not a necessary skill or job responsibility for every systems librarian, knowing something about programming or scripting languages can be a benefit in many positions, as well as allow better communication with IT staff and other technologists.

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ⓢ Interview with a Systems Librarian

Thomas C. Wilson
Associate Dean for Research and Technology, University of Alabama

How many years have you worked as a systems librarian?
[More than] twenty-nine.

What led you into working with technology?
Learned programming in high school, developed an interest in personal computing and networking, been online since 1983, learned bibliographic database searching well before library school, did tech support and tech planning for small office, developed databases, and integrated desktop computers with mainframe resources. In libraries I started working with and supporting public computing which in time led me to systems librarianship.

Do you feel that your education prepared you for work as a systems librarian?
Yes, but it wasn't the only source of preparation, and it became valuable because I chose to take advantage of formal and informal opportunities to develop a variety of KSAs.

What skills or experience did you have that helped you get your first systems job?
Having a broad understanding of how computers work, curiosity, having worked with a variety of hardware and software, persistence, demonstrated track record.

What skills have you had to learn on the job?
Planning as it relates to technology; effective time management; new languages, environments, and platforms; web development from the ground up, in part because the web did not exist when I started; juggling multiple priorities; effective communication strategies; project management; effective personnel management; understanding trade-offs.

What skills or knowledge have been most useful to you in your day-to-day work?
Communication.

Did you ever work on a project that went very wrong?
Most projects have aspects that go well and things that go wrong. I can honestly say that I have been fortunate not to have any grave disasters, but a couple of times I have had to recover from massive hardware failures, one recently that involved the storage of some critical research data. Again, communication is a key part of any experience like this. Also, keeping your head above the fray, so as to be able to function in an effective recovery mode, is important. Lessons learned: make sure everyone involved is on the same page in terms of service levels, resiliency levels, and the old adage you get what you pay for.

Have you ever led a systems migration?
I'm currently working on number eight. To date, the most complex environment migration I've worked on was a state-wide consortium. Too many details to relate here, but some things I learned are: you can never have too much communication, it's always necessary to generate buy-in so people will dedicate the time and effort to change, and don't assume others agree with you. In the end it went fairly well.

Have you ever led a website redesign project?
Yes. The first time I led a website redesign project was at the moment when information architecture, usability and user testing, and universal design were in their infancy. We did a deep dive into the analysis of the current site, what worked, what didn't, a process that generated much information that needed to be parsed into addressable chunks. We established a project group and several working groups to address various aspects of what we learned from the analysis. The process took about a year and led to some significant improvements, but it required a huge effort. I believe the participants learned a great deal about website design and management and appreciated the multiple perspectives that come to bear on the organizational and public views of the resource. Probably one of the most important things I learned was that I love this work.

Can you describe your day-to-day work or what a routine day is like?
Meetings!

What is the most challenging aspect of your position?
Personnel: developing, encouraging, communicating, guiding, inspiring, cajoling, motivating.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Seeing what others are able to accomplish given what we've created or built.

How do you see systems librarianship changing over the next five to ten years?
Mostly I see a continuance of the need to adopt and adapt, the need to explore and experiment, the need to take calculable risks, the need to migrate, the need to be open to rethinking what we are doing and how we do it, the need to eliminate sacred cows. Needs and technologies change, but often why we do what we do is a question of mission that changes far less often.

What do you think are the most important skills or qualities a systems librarian needs to have?
Curiosity, patience, communication, willingness to learn new things.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
There's always more to do, no end to the excitement.

⊚ Notes

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17. Lisa Goddard, "The Integrated Librarian: IT in the Systems Office," *Library Hi Tech* 21, no. 3 (2003): 286, doi.org/10.1108/07378830310494454.

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20. Marshall Breeding, "Library Technology Guides," accessed July 16, 2019, librarytechnology.org/.

21. Marshall Breeding, "Library Systems Report 2018," *American Libraries* 49, no. 5 (2018): 25, americanlibrariesmagazine.org/2018/05/01/library-systems-report-2018/.

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Hiring Trends in Systems Librarianship

IN THIS CHAPTER

▷ Salary Statistics

▷ Job Titles

▷ Required and Preferred Skills, Experience, and Education

▷ The Job Search

WHILE SYSTEMS LIBRARIANS have been hired in libraries for several decades now, much has changed over the years in terms of what skills employers are looking for, what type of work these librarians now do, and even what job title they use. This chapter will look more in depth at the modern experience of systems librarians and exactly what skills and qualifications are needed to be a systems librarian today.

Salary Statistics

It's well-known that getting that first job after completing the MLS can be a difficult endeavor; however, aspiring systems librarians may have it somewhat easier due to the difficulty employers often encounter in finding qualified candidates for library technology roles. Reference and instruction librarian positions are more often considered entry-level roles and do not usually require a great deal of specific knowledge beyond that which is gained through the general library school curriculum. But having some knowledge of coding or a proven aptitude for working with technical systems can immediately set one apart in the job market. Because of this, systems librarians can often command a higher salary than many other positions within the library.

▲ **13**

Table 2.1. Average salaries of library technology positions.

JOB AREA	LOW SALARY	HIGH SALARY	AVERAGE SALARY
Digital content management	$35,360	$154,000	$50,493
Emerging technologies	$58,000	$65,000	$61,500
GIS	$56,244	$56,244	$56,244
Information technology	$30,000	$93,000	$55,472
Systems technology	$52,500	$60,000	$55,833
User experience/Usability analysis	$32,500	$132,500	$82,405
Website design	$53,000	$72,500	$62,750

The *Library Journal*'s "Placements and Salaries" report from 2017 looked at the job placements and salaries of more than 1,600 LIS graduates from 2016. The report found that 83 percent of responding graduates were employed full-time, with more than 85 percent of those employed within an LIS field. Graduates working in systems technology earned an average salary of $55,833 across all geographic areas and organization types, a figure above the overall average salary of $50,239 for all graduates. The average salaries of some of the technology-focused job areas from the report are displayed in table 2.1.[1]

There is often a vast difference between the high and low salaries represented for each of these job areas, and much of that difference is due to variations in salary across geographic regions as well as across organization types. As Dolan and Schumacher wrote in 1997, "Median salaries in corporate library settings are as much as 35% higher than those found in academic libraries."[2] This holds true even today, where the average salary for all job areas across all geographic regions is $46,688 in college and university libraries compared to an average of $73,272 for private-industry jobs.

Job Titles

In addition to differences in salary, job titles can vary greatly depending on the type of organization, as well as the particular duties included within the job description. As Goetsch noted in 2008, job listings for systems librarians had almost disappeared by 2005, possibly to make way for more specialized technology-related positions taking their place.[3] Particularly as the types of technology used in libraries diversified widely during the early twenty-first century, job titles have been diversified to reflect these changes as well. Additionally, many systems jobs are combined with other job functions in the library and may have a hybrid title to reflect the combination of job duties.

In an examination of systems librarian positions advertised on the Code4Lib jobs website from January 2017 through January 2019, a total of fifty-five jobs were identified. Many of the job titles found still used the more traditional systems librarian title, while others included references to additional technologies like discovery systems, web services, or emerging technologies. Of the hybrid positions, several related to metadata, cataloging, or digital scholarship. Sample job titles from those examined include:

- systems librarian
- systems integration librarian

- discovery systems librarian
- discovery and systems librarian
- lead librarian for discovery systems
- systems and cataloging librarian
- systems and metadata specialist
- systems and digital scholarship librarian
- systems architecture and web services librarian
- web and systems librarian
- emerging technologies and systems librarian

However, in a survey of two hundred LIS professionals who self-identified as systems librarians, the job titles they provided included a much wider variety in nomenclature. Some of the job titles they provided include:

- director of library technology services
- access systems librarian
- electronic resources librarian
- IT manager
- IT analyst
- information systems specialist
- IT librarian
- systems analyst
- content innovation librarian
- librarian of application services
- technical services librarian
- assistant director digital initiatives
- infrastructure specialist
- ILS librarian
- systems and user experience librarian
- program manager

This assortment of job titles shows the high degree of variability in what can be considered a systems librarian, often depending on the size of the library and its staff, the type of organization the library is part of, and the diverse inclusiveness of the "systems" for which the position is responsible. When job searching, it is important to take this variety into account so that potentially relevant positions aren't missed because of narrow search terms.

Required and Preferred Skills, Experience, and Education

Whether still in graduate school earning an MLS or looking for that first systems librarian position, it is immeasurably helpful to know what type of skills, experience, and education employers are looking for. Unfortunately, the answer much of the time is it depends. Library technologist David Lee King recommends browsing through job ads to find out what skills are needed: "Search for job ads that match your interests, and read through them to figure out which skills are in high demand. . . . If the ad lists a skill you don't yet have—for example, creating videos—you have an opportunity to

start learning that new skill or tool and, as a result, you will be a stronger candidate for future job opportunities."[4]

Skills, Knowledge, and Responsibilities

When looking across a variety of recent job listings, certain patterns in employer expectations begin to appear that can be a useful starting point. In the examination of fifty-five recent systems librarian job listings from the Code4Lib Jobs website, a number of specific technology skills, as well as a variety of soft skills, emerged as important to employers hiring systems librarians today. Table 2.2 lists each of the required or preferred skills, knowledge, and responsibilities listed throughout the job postings and the number of times each was mentioned in postings for academic libraries, public libraries, special libraries, and overall. These job listings skewed heavily toward academic libraries, with forty-two of the total, and included ten from special libraries and three from public libraries. While this likely skews the results somewhat, it appears that there is not a great deal of difference in the skills needed for systems librarians across library types.

From the job postings examined, the most important skills needed for modern systems librarians are a familiarity or experience with integrated library systems (ILS), library services platforms (LSP), and discovery systems; knowledge of or experience with some type of programming or scripting language; and a familiarity or experience with cataloging and metadata standards. In addition, soft skills such as communication skills and the ability to work collaboratively or with teams also ranked highly overall, along with project management skills and the ability to conduct technology training. Among the least mentioned skills were networking, experience with electronic resources management systems (ERMS), and experience with LibGuides.

In addition to the more traditional systems and technology knowledge, many employers also wanted systems librarians who could take part in the more traditional librarian duties of reference, instruction, and collection development, primarily for positions in academic libraries. For students still enrolled in graduate school, this data suggests that while taking as many technology-related courses as possible, including at least one programming or scripting language, is important, those interested in working in academic libraries will not want to disregard the more traditional librarian courses offered, including courses in reference, instruction, collection development, cataloging, and metadata. Particularly in smaller libraries, librarians often wear many hats, and in many libraries, all librarians on staff take part in reference, instruction, and collection development duties regardless of their area of focus. Additionally, don't neglect to emphasize soft skills on job applications and résumés. Successful group projects, evidence of project management experience, and a well-written cover letter can often go a long way in making a good impression on potential employers as well.

Table 2.2. Percentage of job advertisements requiring specific skills for systems librarians.

REQUIRED OR PREFERRED SYSTEMS SKILLS, KNOWLEDGE, AND RESPONSIBILITIES	ACADEMIC LIBRARIES	PUBLIC LIBRARIES	SPECIAL LIBRARIES	TOTAL (NUMBER)	TOTAL (PERCENT)
ILS/LSP/Discovery systems (Alma, Primo, SirsiDynix, EDS)	35	3	7	45	81.8%
Programming/scripting languages (APIs, HTML, Perl, Python, XML)	31	4	9	44	80.0%
Cataloging/Metadata standards or tools (MARC, Dublin Core, MarcEdit)	29	2	6	37	67.3%
Communication skills	28	1	6	35	63.6%
Collaborative/able to work in teams	27	0	7	34	61.8%
Authentication and/or proxy systems (LDAP, Shibboleth, Ezproxy)	24	2	3	29	52.7%
Project management/planning skills	18	3	5	26	47.3%
Training	18	2	5	25	45.5%
Relational database systems and tools (Access, Oracle, MySQL, SQL)	15	2	6	23	41.8%
Digital repository (Dspace, Omeka, Digital Commons, CONTENTdm)	13	0	7	20	36.4%
Troubleshooting	14	1	3	18	32.7%
Link resolvers (OpenURL, SFX)	14	0	2	16	29.1%
Website development	11	1	3	15	27.3%
ILL systems (ILLiad, etc.)	12	0	1	13	23.6%
Content management systems (Drupal, WordPress)	7	1	4	12	21.8%
Linux/Unix/Windows server administration	8	2	1	11	20.0%
Analytical skills	6	0	4	10	18.2%
Linux/Unix/Windows operating systems	8	1	1	10	18.2%
Documentation	7	0	1	8	14.5%
Liaison to IT	7	0	0	7	12.7%
Problem-solving skills	5	0	2	7	12.7%
Supervisory skills/experience	6	0	1	7	12.7%
Archives management system	5	0	2	7	12.7%
SpringShare/LibGuides	6	0	0	6	10.9%
Electronic resources management system	5	0	0	5	9.1%
Networking	4	0	0	4	7.3%
TRADITIONAL LIBRARY RESPONSIBILITIES	ACADEMIC LIBRARIES	PUBLIC LIBRARIES	SPECIAL LIBRARIES	TOTAL (NUMBER)	TOTAL (PERCENT)
Reference	9	1	2	12	21.8%
Instruction	8	0	1	9	16.4%
Collection development	8	0	0	8	14.5%

Experience

Of the fifty-five systems librarian job postings, twenty-six, or nearly half, did not specify a required number of years of experience. For these postings, applicants who meet all or most of the required skills or knowledge listed for the position could conceivably apply. This experience could be gained through coursework, internships, or practicums or, in some cases, through related work done in other fields. Another eighteen of the postings, or approximately 33 percent, required just one or two years of experience. Unless directly specified, even this experience can often come from internships or other pre-professional experience. Figure 2.1 shows the breakdown of required experience in years from the job postings examined.
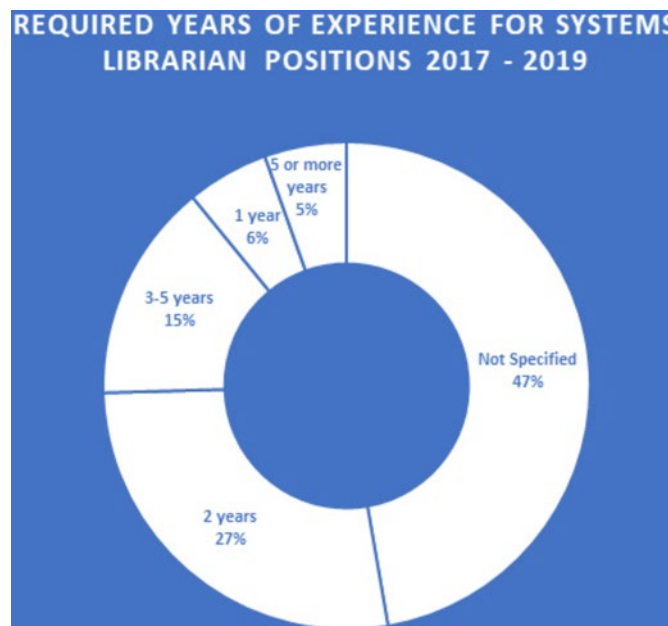
Figure 2.1. Years of experience required in systems librarian job advertisements.

Education

Most new librarians might assume that an MLS from an ALA-accredited university is required for most systems and other librarian positions, but the reality is often more complicated. It's true that while browsing through job listings, there is a high likelihood that many or most of the positions do require the accredited master's degree in library science. However, in many cases, exceptions to this requirement can be and are made. Figure 2.2 shows the percentage of job postings requesting each of a number of different educational requirements.

In the job postings examined, thirty of the fifty-five listings, or a little more than half, required the MLS or its equivalent for application. However, another ten job postings requested either the MLS or a master's degree in another relevant discipline. For systems librarian positions, this could mean an advanced degree in another discipline such as computer science, informatics, educational technology, or something related.

Required Education for Systems Librarian Positions 2017 - 2019

- MLIS OR EQUIVALENT: 54.5%
- MLIS OR MASTERS IN OTHER RELEVANT DISCIPLINE: 18.2%
- MLIS OR EQUIVALENT COMBINATION OF EDUCATION AND EXPERIENCE: 14.5%
- NOT SPECIFIED: 5.5%
- OTHER: 5.5%
- MLIS OR CURRENTLY ENROLLED IN PROGRAM: 1.8%
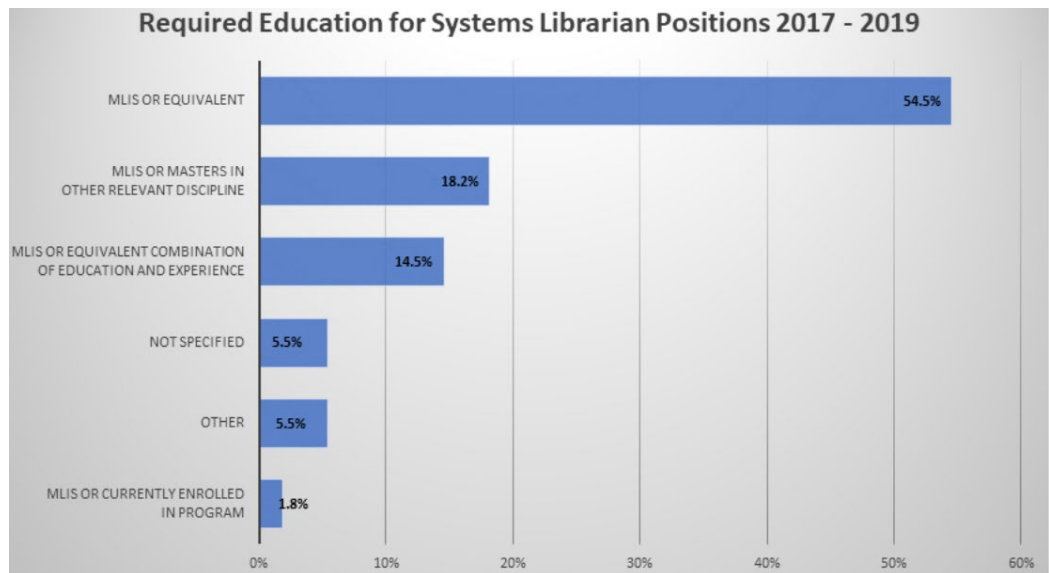
Figure 2.2. Education required for systems librarian positions.

Eight job postings, or 14.5 percent, requested either the MLS or an equivalent combination of education and experience. For these positions, the requirement is vague enough that it would be up to the applicant to convince the employer that they are qualified based on whatever education and experience they have. For some systems positions, employers might hire someone with a bachelor's degree in computer science or IT and several years of directly relevant experience in lieu of the MLS.

ALA-Accredited Programs with Systems or Technology Concentration Options

For those still deciding on a path for library school and entering the library profession, the following is a list of ALA-accredited library programs that offer either some kind of systems or other technology-related concentration options:

Catholic University of America

- Digital Libraries
- Information Analysis
- Information Architecture

lis.catholic.edu/academics/courses-of-study/

CUNY, Queens College

- Digital Resources Management

www.qc.cuny.edu/admissions/graduate/degree/Pages/degreedetail.aspx?DegreeID=86

Emporia State University

- Informatics

www.emporia.edu/slim/programs/master-of-library-science/master-of-library-science-curriculum.html

Florida State University

- Technology and Networking
- Web Design

ischool.cci.fsu.edu/academics/graduate/mslis/specializations/

Indiana University

- Digital Libraries
- Information Architecture

www.sice.indiana.edu/graduate/degrees/information-library-science/dual-degrees/index
.html

Kent State University

- Data/Information/Technology
- User Experience in LAMs

www.kent.edu/iSchool/library-information-science-2

Long Island University

- Information Systems and Technology

www.liu.edu/CWPost/Academics/College-of-Education-Information-and-Technology/
Palmer-School-of-Library-Information-Science/Academic-Programs/~/link.aspx?_id=-
C0EE1AB6F3624FD2ACD4EDC0F1575C2D&_z=z

McGill University

- Information and Communication Technology

mcgill.ca/sis/programs/mist/areas-interest

North Carolina Central University

- Digital Librarian

nccuslis.org/mls-tracks/curriculum-digital-librarianship/

Pratt Institute

- Technology and Interfaces Design and Development

www.pratt.edu/academics/information/degrees/library-and-information-science-mslis/
program-concentrations/

Rutgers University

- Technology, Information, and Management

comminfo.rutgers.edu/academics/graduate/master-information/program-information/
master-information-program-concentrations

San Jose State University

- Emerging Technologies and Digital Services
- Web Programming and Information Architecture

slisweb.sjsu.edu/mlis-career-pathways

State University of New York, Albany

- Information Management and Technology

www.albany.edu/cehc/programs/ms-information-science#concentrations

Texas Women's University

- Information Technology

www.twu.edu/slis/programs-admission-requirements/program-tracks/

University of British Columbia

- Information Interaction and Design

slais.ubc.ca/programs/specializations/interaction-and-design/

University of California, Los Angeles

- Informatics

is.gseis.ucla.edu/programs/mlis-degree/mlis-specializations/

University of Hawaii

- Library Automation/Information Technology

www.hawaii.edu/lis/programs/mlisc-degree/

University of Illinois

- Data and Asset Management

ischool.illinois.edu/degrees-programs/ms-library-and-information-science/pathways

University of Kentucky

- Information Systems

ci.uky.edu/sis/libsci

University of Maryland

- Intelligence and Analytics

ischool.umd.edu/sites/default/files/page_files/2018_intelligence_and_analytics_1.pdf

University of Michigan

- Data Science/Data Analytics/Computational Social Science
- User Experience Research and Design/Human and Computer Interaction/Social Computing

www.si.umich.edu/programs/master-science-information/areas-interest/

University of North Carolina, Chapel Hill

- Digital Libraries

sils.unc.edu/sites/default/files/MSLS-%20Digital%20Libraries.pdf

University of North Carolina, Greensboro

- Digital Collections

soe.uncg.edu/academics/departments/lis/lis-programs/master-of-library-and-information-studies/customizing-the-mlis/

University of Tennessee

- Digital Collections
- User Experience (UX)

www.sis.utk.edu/pathway-faqs

University of Texas, Austin

- UX Research
- Interactive Design
- Web Development
- Digital Asset Management

www.ischool.utexas.edu/programs/tailored/endorsement_of_specialization

University of Toronto

- Information Systems and Design
- User Experience Design

ischool.utoronto.ca/future-students/programs-of-study/

University of Washington

- User Experience
- Information Architecture

ischool.uw.edu/programs/msim/specializations

University of Western Ontario

- Information and Communication Technology

www.fims.uwo.ca/programs/graduate_programs/master_of_library_and_information_science/content_areas.html

University of Wisconsin, Madison

- Data/Information Management and Analytics
- UX and Information Technology
- Information Organization

ischool.wisc.edu/current-students/masters-degree-program/concentrations/

University of Wisconsin, Milwaukee

- Information Technology

uwm.edu/informationstudies/academics/graduate/mlis-it/

Valdosta State University

- Technology

www.valdosta.edu/colleges/education/master-of-library-and-information-science/our-program/

Wayne State University

- Information Management

sis.wayne.edu/mlis/information-management.php

Additional Education Options

While there are a number of options for concentrating on systems and technology in library school, for those who have already earned a more generalist degree or focused on another area of specialization other than technology, all hope is not lost. In the book *An Overview of the Changing Role of the Systems Librarian: Systemic Shifts*, Edward Iglesias writes that in his survey of systems librarians, 82 percent indicated that they had not taken any kind of system track in graduate school but had instead learned on the job.[5] And even if learning "on the job," there are many additional formal and informal education options for supplementing on-the-job experience. Some options to consider are listed below.

- Post-Master's Certificates

    Some LIS programs also offer a post-master's certificate as a non-degree option. This option can be expensive and also time-intensive, since it often involves taking several graduate-level courses at a university. However, it also offers the ability to earn a completely updated skill set, particularly for those who may have earned their degree years ago or in a different area of specialization.

    One example is San Jose State University's School of Information, which offers a nine-unit (three courses) certificate in digital asset management, as well as a sixteen-unit (five courses plus a one-unit introductory course) post-master's certificate with eight different specialization options including digital services and emerging technologies and web programming and information architecture.

- LIS Program Continuing Education

    In addition to their regular degree programs, many LIS programs also offer the option to enroll in single courses from the program without being enrolled for the

degree. This option can also be expensive, since it involves paying the full tuition for a course; however, it also offers the opportunity to take current, up-to-date graduate-level LIS courses without any long-term commitment. LIS programs like San Jose State University, UW–Madison, University of Illinois, University of Arizona, and many others offer this option.

- Local Junior/Community College Courses

    A less costly option is taking courses at the local junior or community college. While these courses are not graduate-level and also not specialized LIS courses, they can offer the opportunity for formal coursework in a number of technology topic areas that are directly relevant to work in systems librarianship. Some examples of the types of courses available at a community college are courses on networking, computer hardware and software, Linux operating systems, servers, VMware, firewalls and security, database design, systems analysis, and computer programming.

- MOOCs

    MOOCs, or massive open online courses, allow students to take free online courses through renowned universities like Harvard, Stanford, MIT, and others. These courses require little formal commitment but a great deal of self-motivation, since they generally involve watching recorded lectures and completing practice assignments with little interaction with other students or the professor. EDX is one website where students can access multiple free online courses on a variety of topics. Some of the courses available are ones offered on various programming languages, Android and app development, data science, virtual reality, artificial intelligence, and more.

- Library Juice Academy

    Library Juice Academy offers online classes on a variety of practical and professional development topics created specifically for librarians. The courses are usually four weeks long and taught on a Moodle platform by practicing professionals in the field. The courses are generally hands-on, and there are many courses offered on technical topics with an emphasis on direct applications to library work. Some examples of courses currently on rotation include Using MarcEdit, Metadata Implementation, Introduction to Project Management, XSLT Fundamentals, Making and Makerspaces, and Digital Repository Fundamentals and Design. In addition to regular course offerings, they also offer a certificate in user experience and a certificate in XML and RDF-based systems.

- Codeacademy

    Codeacademy is another online option specifically for learning programming languages. The courses are self-paced and involve hands-on practice. Codeacademy won't make you an expert, but it can be a great, easy-to-understand introduction to a new language and provide a solid foundation for additional learning. The basic courses are free, but they also offer six- to ten-week "intensive" programs for a modest fee that go into more depth on topics like Build Web APIs from Scratch, Programming with Python, and Introduction to Data Analysis.

- Udacity

    Udacity is another option for online learning that offers a variety of technical topics, mostly related to programming, development, machine learning, artificial

intelligence, data science, data analysis, robotics, virtual reality, and other like topics. While they do offer free, self-paced courses, they also offer "Nanodegree" programs, which are longer and more in-depth and can also cost several hundred dollars or more. While the free courses are shorter and less in-depth, they do offer a variety of relevant topics such as responsive web design, python programming, how to use Git and GitHub, Linux command line basics, computer networking, relational databases, APIs, and more.

- Udemy

    Similar to Udacity, Udemy also offers a variety of online courses (their website claims 100,000 online courses) that are self-paced and offer lifetime access. Taught by industry experts, the prices are generally modest ($10–$15 per class) and the courses cover a variety of relevant topics like networking, Linux, Active Directory, shell scripting, server administration, virtualization, and more.

- Coursera

    Another option in a similar vein is Coursera, which also offers more limited versions of their online classes that can be audited for free, along with a variety of certificates and even degree programs from participating universities that are not free. However, they also offer a number of relevant technology courses including system administration, operating systems, networking, Linux, server management, Python, C, C++, and more.

- Lynda.com

    Lynda.com is slightly different from the above online course options in that it is subscription-based rather than requiring individual payment for each course. Many libraries have institutional subscriptions for Lynda.com, either for their staff or for their patrons, but individuals can also subscribe separately for $29.99 a month (or $24.99 a month if purchasing an annual subscription). Subscribers have access to any of the courses offered through the platform, which include videos as well as exercise files and quizzes for hands-on practice. Lynda.com's library is vast and includes courses in areas like project management, database management, software development, and network and system administration for every level from beginner to advanced.

- W3Schools

    W3Schools offers free online tutorials, as well as references, examples, and exercises for a variety of programming languages and related technologies. Some of the topics covered include HTML and CSS, Bootstrap, JavaScript, PHP, SQL, Python, Java, ASP, Node.js, Raspberry Pi, and XML. While the content is free, users can pay an exam fee to apply for a certificate of completion, which is of dubious value. These types of certificates are generally not necessary, and this site in particular may be best used as a reference or as a way to explore some of the basics of a new topic while deciding whether to delve in more seriously elsewhere.

- Conference Workshops

    Many conferences, particularly conferences aimed at librarians working with technology, offer workshops either as part of the conference programming or for an additional fee. While this option requires the funding and ability to travel and attend professional conferences, it can be an excellent way to get hands-on instruction on

a specific topic from a knowledgeable professional in the field. Some examples of conferences that offer technology-related workshops include the Code4Lib conference, whose 2019 conference offered workshops on accessible websites, library apps, serverless computing, Solr, and Node, among others, as well as the LITA Forum, which includes hands-on programs on topics like makerspace activities, legal hacking, Adobe Spark, and more. The Electronic Resources and Libraries conference also offers both pre- and post-conference workshops, which have included sessions on EZproxy for beginner and advanced users and e-resources troubleshooting.

- Professional Association Webinars, Workshops, and Professional Development
    Professional associations will often offer online webinars, workshops, and other professional development opportunities, sometimes free for members of the association and sometimes with a small registration fee. Often even non-members can attend for a slightly higher registration fee. ACRL is one association that frequently offers webinars of this kind, such as a recent two-part series on "How to Think (and Act) Like a UX Librarian." The ACRL Choice unit will also often produce relevant webinars such as past offerings on "Best Practices for Building LibGuides" or "Library Technology Essentials." ACLTS also often offers relevant webinars, such as their previous "Intro to Python and PyMARC," and LITA offers a variety of both webinars and web courses with previous offerings covering topics like "Techniques in Managing a Library Services Platform Migration," "Project Management for Success," "Introduction to Schema.org and JSON-LD," and "Beginning Git and GitHub."

The Job Search

The hardest part of being a systems librarian can often be getting the job in the first place. A polished résumé and compelling cover letter, as well as knowing where to find the most relevant job listings, can go a long way toward landing that first position.

One of the first steps is being able to meet the minimum requirements, either as a new graduate or as an experienced librarian transitioning from another area of specialization. For those still in school, whether there is a systems track available or not, taking as many technology-focused courses as possible will only help, along with the more traditional courses like cataloging/metadata, reference, instruction, and collection development. Learn at least one programming language if at all possible.

The value of hands-on experience cannot be emphasized enough, and any opportunity to take an internship or practicum with a systems or technology-related focus should be taken, particularly any that offer the chance to gain hands-on experience with an ILS/LSP or discovery system, project management experience, or experience with databases or repositories.

For those already working in another area of librarianship, take any available opportunity to participate in projects that involve technology, such as taking part in a systems migration project or learning as much as possible about the back-end functionality of the ILS. In addition, getting more experience in the less technical soft skills that employers desire can also bolster marketability. Seek out opportunities for collaborative work, project management experience, writing documentation, training others on technical processes, and getting supervisory experience.

"To get a job, personal projects are great. Build a website, host a service, have a homelab. These all demonstrate interest and ability."—systems survey respondent

Creating a Résumé and Cover Letter

The résumé for a systems librarian position should emphasize technical skills, group projects, leadership experience, and soft skills. Be sure to carefully read the job posting and pay attention to the words used in the required and preferred skills section. While crafting the résumé, try to specifically mention as many of the skills the employer has listed as are relevant, using the same terminology they have used. Many employers score applications by a rubric and can only credit applicants with qualifications that they have specifically mentioned in their application materials.

The old advice of keeping résumés to a single page or less is no longer considered applicable in these days of electronic files; however, especially for new grads, it's best not to go overboard with too much information. Keep job descriptions limited to bullet points starting with action verbs and highlight accomplishments rather than day-to-day tasks. A two- to three-page résumé will usually suffice and be less likely to overwhelm hiring managers/search committees. Academic libraries are sometimes an exception to this and may request a curriculum vitae, which is generally much longer and more detailed than a résumé.

The cover letter is a great way to demonstrate the communication skills that employers find so vital. Write clearly and concisely and have a trusted friend or mentor read it over to catch any issues with grammar, clarity, or flow. The cover letter should not just repeat the information from the résumé. Instead, it's an opportunity to go into greater detail about projects and accomplishments that highlight things like strategic planning ability, creative thinking, and problem-solving skills. It is best to draw connections to the desired qualifications and skills from the job posting as explicitly as possible rather than leaving the hiring manager or search committee to fill in the gaps.

There are many excellent resources online for advice on résumés and cover letters. One great place to start is Ask a Manager, an advice blog written by an experienced hiring manager with categories for both résumé and cover letter writing. The site Open Cover Letters has not been updated in several years, but it contains several years of archives of actual cover letters (and some résumés) written by librarians and archivists that have resulted in their being hired, including a category for systems.

Where to Look for Open Positions

It's important when job searching to target those job sites that will provide the most relevant listings. While it's possible to find relevant and specific systems job listings through large job aggregator sites like Indeed or Monster, the best job sites are going to be library specific. Even better are those that focus specifically on library technology positions.

Below is a list of job sites for library technology positions, as well as a list of job sites for general library and information science positions.

Library Technology Job Sites

- Code4Lib Jobs: jobs.code4lib.org/
- Library Technology Jobs: librarytechnology.org/jobs/
- LITA Jobs: www.ala.org/lita/professional/jobs/looking

General LIS Job Sites

- ALA JobList: joblist.ala.org/
- INALJ: inalj.com/?p=1441
- LibGig: www.libgig.com/careers/job-search/

Another good option for finding relevant job postings is through technology-related library listservs. Some listservs that often have postings for library technology positions include lita-l, eril-l, ezproxy-l, code4lib, and web4lib.

◎ Key Points

Breaking into the field of librarianship can be a difficult endeavor, and when entering into the area of systems librarianship, it can be difficult to feel prepared and qualified. But many resources exist that can make this process easier and more successful. Some key points to keep in mind from this chapter include:

- Salaries for different systems librarian positions will vary greatly based on the type of organization and the geographic region. Librarians working at corporate libraries in private industry will often earn a much higher salary than those working in more traditional library environments.
- Job titles for systems librarians can vary widely due to the large amount of technology the position can now be responsible for, as well as potential combinations with other job functions in the library. When job searching, don't limit searches to only "systems librarian," as other terms such as "discovery," "integration," "electronic," "digital," or "applications" can also be relevant. Additionally, the job title may not include the term "librarian" but could include "analyst," "specialist," or "manager" instead.
- The number of years of experience a systems librarian applicant has is often less important than the type of experience they have and what technologies they have experience with.
- While the ALA-accredited MLS is still the standard qualification for systems librarians, there are times that exceptions will be made based on experience or other educational qualifications.
- There are a number of ALA-accredited programs that offer some kind of concentration in systems or technology, but there are also multiple options for gaining or expanding technology skills outside of the formal LIS program.
- When looking for systems librarian positions, library-specific job sites are often the best place to look, and those focused specifically on library technology positions will offer an even more targeted search.

⊚ Interview with a Systems Librarian

Vanessa Walden
ILS Administrator, Peninsula Library System

How many years have you worked as a systems librarian?
[Less than] one.

Was it always your intention to be a systems librarian?
I knew I wanted to stay behind the scenes in Technical Services in some capacity, and the systems/metadata track presented itself as a growing and dynamic area of the profession.

What led you into working with technology?
Necessity. I wanted to do more than my current tools and position allowed.

Do you feel that your education prepared you for work as a systems librarian?
Yes and no. The foundational principles I learned play a key role in understanding all aspects of library systems. More hands-on technical preparation would have been a good idea.

What skills or experience did you have that helped you get your first systems job?
I had a breadth of knowledge about library systems I gained through committee work and pushing the narrow boundaries of my previous job description (with the support of my co-workers and superiors).

What skills have you had to learn on the job?
Coding, project management, managing tickets, troubleshooting.

What skills or knowledge have been most useful to you in your day-to-day work?
Not being afraid of trying new things, experimenting, and failing. Dig in and figure it out. I trust myself to know I'm not going to break anything by trying to find answers to questions I have no idea about—that's where the vast majority of my current learning is coming from.

What is one of the most interesting or complex projects you led or worked on?
Writing my very first script. Started with structured online training, asked my colleagues LOTS of questions, set up a safe space for testing. That's as far as I've gotten! I'm very hopeful it will turn out well.

Can you describe your day-to-day work or what a routine day is like?
Catch up on e-mail, follow up on new and old tickets, spend some time in my online training and practice coding, occasionally attend a task force or committee meeting.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Fixing a problem is so satisfying.

How do you see systems librarianship changing over the next five to ten years?
More "traditional" tracks of librarianship will find themselves utilizing and understanding "systems" technology.

⊚ Notes

1. Suzie Allard, "Placements and Salaries 2017," *Library Journal* (2017), www.libraryjournal.com/?detailStory=explore-all-the-data-2017.

2. Donna R. Dolan and John Schumacher, "New Jobs Emerging in and around Libraries and Librarianship," *Online* 21, no. 6 (1997): 68–75, www.infotoday.com/online/default.shtml.1997.

3. Lori A. Goetsch, "Reinventing Our Work: New and Emerging Roles for Academic Librarians," *Journal of Library Administration* 48, no. 2 (2008): 164, doi.org/10.1080/01930820802231351.

4. David Lee King, "Why Stay on Top of Technology Trends?" *Library Technology Reports* 54, no. 2 (2018): 10, journals.ala.org/index.php/ltr/article/view/6579/8777.

5. Edward Iglesias, "The Status of the Field," in *An Overview of the Changing Role of the Systems Librarian: Systemic Shifts*, ed. Edward Iglesias (Oxford: Chandos Publishing, 2010), 72.

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⊚ Resources

Technology Education

EDX: www.edx.org/
Library Juice Academy: www.libraryjuiceacademy.com/
Codeacademy: www.codecademy.com/catalog/subject/all
Udacity: www.udacity.com/
Udemy: www.udemy.com/
Coursera: www.coursera.org/
Lynda.com: www.lynda.com/
W3Schools: www.w3schools.com/

Job Skills and Advice

Ask a Manager: Resumes: www.askamanager.org/category/resumes
Ask a Manager: Cover Letters: www.askamanager.org/category/cover-letters
Open Cover Letters: opencoverletters.com/

The Integrated Library System

WHILE THE JOB DUTIES OF SYSTEMS LIBRARIANS can vary greatly depending on the size, type, and overall organization of the library, one responsibility that is fairly universal is the administration of the integrated library system (ILS). In the systems librarian survey conducted for this text, 84 percent of the respondents answered that they were responsible for managing their library's ILS or LSP.

What Is an Integrated Library System?

An integrated library system is a library's main technology system for tracking library-specific data, including bibliographic records, order records, patron records, and circulation records. Library systems contain modules for completing tasks within the various functional areas of the library. Examples of popular enterprise ILS options include SirsiDynix's Symphony and Innovative Interfaces' Sierra platforms. There are also open-source ILS options such as Koha and Evergreen.

While the ILS has been around for decades and is still used by the majority of libraries of all types, it is slowly being replaced by the library services platform (LSP),

▲ **31**

> "If you support an ILS, learn the basics of MARC (and eventually newer standards) so you can more effectively troubleshoot and also imagine better solutions."
> —systems survey respondent

particularly in academic libraries.[1] Where the ILS was originally designed to help libraries manage their print collections, LSPs are designed to help libraries manage collections in the wider variety of formats in which they now exist, such as e-books, online journals, and streaming video. LSPs are also usually web-based and can be logged into through a browser rather than requiring a client download. Often the server is hosted by the vendor, but some of these still have a local installation option (such as Alma). Some examples of library services platforms are Ex Libris's Alma, OCLC's WorldShare Management Services (WMS), and the open-source FOLIO (currently still in development).

Many traditional integrated library systems use a client-server model, where a software client is individually downloaded onto each user's workstation. The server can either be hosted by the vendor, or it can be self-hosted, usually managed by either the systems librarian, other library staff, or the organization's IT department. Each option has its pros and cons. Hosted servers are usually easier on the library's staff since server maintenance duties such as backups and upgrades are handled by the vendor; however, the library must pay an annual hosting fee and staff have fewer options for customization and must rely on the vendor for maintenance, security, and upgrades. Self-hosted servers require more work from the library or its IT department, but there are also usually greater opportunities for customization and control of the system.

Open-source ILS options will also require the library to either host the server themselves or pay for hosting. Vendors like ByWater Solutions and the Equinox Open Library Initiative offer support for libraries using open-source products such as Koha or Evergreen, including assistance with migration, server hosting, and maintenance. Libraries with developers on staff may choose open-source options to take advantage of the great customization options. An open-source option can also provide an economical advantage for libraries that want to avoid the large costs associated with licensing proprietary software. However, open-source doesn't mean free, and libraries must still consider costs related to server space and personnel required to develop and maintain the system. Whether vendor-hosted or self-hosted, proprietary or open-source, the option selected usually comes down to a combination of staffing and financial considerations.

A system migration involves migrating all of the library's data, including bibliographic records, item data, patron data, and circulation data, from one system over to another. It is one of the more daunting projects a systems librarian can undertake and is discussed in detail in chapter 10.

The Online Public Access Catalog

An online public access catalog (OPAC) is the front-end search interface that a patron uses to search materials the library has cataloged in the ILS and to find relevant information about each item such as its call number, author, and summary information. An OPAC's pages can be customized to match the library's other web properties, and other settings such as relevancy ranking or filter locations can sometimes be customized as well.

The OPAC is also where patrons log in to their library account in order to place holds, renew materials, or view fees and items they have checked out. OPACs have long been the front end for the traditional ILS, but as next-generation ILS and LSPs have gained traction, many libraries have traded in the OPAC for a discovery layer. Some libraries use both the OPAC and a discovery layer while others use a discovery layer only.

Discovery platforms have been taking over the space formerly occupied by the online public access catalog as a library's main search interface since the mid-2000s. While the library catalog can be searched mainly for the library's print materials as well as any other resources the library has cataloged, discovery platforms allow users to search print holdings alongside the library's electronic resources, including databases and streaming video. A one-stop shop for searching across a library's divergent collections, discovery platforms have presented a more Google-like interface for users who have become accustomed to searching everything from a single search box. Some discovery layers are bundled together with a library services platform, but many LSPs allow a library to choose their own discovery interface, providing a wider range of options. Discovery products include OCLC's WorldCat Discovery (available with WorldShare Management Services), Ebsco's EDS, Ex Libris's Primo and ProQuest's Summon (both available with Alma), and the open-source Blacklight and VuFind.

While discovery layers make searching easier for users, they can also overwhelm users who can get back tens of thousands of results from a single search. One limitation of discovery platforms is that some vendors consider their metadata proprietary and either don't share it or share only limited metadata with other vendors. The result can be a discovery platform where resources from the platform's vendor are prioritized above other resources—or where a competing vendor's resources may not appear at all. Users may think they are searching everything a library owns while in reality many key resources could be left out of their search. Of the proprietary discovery services, currently only OCLC's WorldCat Discovery can claim to be "vendor-neutral."

The content within a discovery layer is managed through a knowledge base (discussed further in chapter 5), which uses a special file format for managing data called a KBART (knowledge bases and related tools) file for uploading and downloading holdings information. Libraries that use an LSP as their main library system will be able to manage the knowledge base within the LSP, while for libraries using an ILS, the knowledge base will be housed within a separate platform.

Commonly Used ILS and LSP Products

While there are many different library systems in use, some are more commonly used than others, particularly in certain types of libraries. In academic libraries, where the transition to LSPs has been in full swing, Alma (Ex Libris) is the most commonly used platform overall. Alma is the most used platform for academic libraries ranging from medium to very large, while for small academic libraries where Alma might be considered more system than is needed, Koha is used the most.

In public libraries, Symphony (SirsiDynix) is the most commonly used platform across all library sizes. Sierra (Innovative Interfaces) and Polaris (Innovative Interfaces) are also popular choices. In special libraries, Alma is also popular, with 17 percent of law libraries and 16 percent of medical libraries choosing the platform. Law libraries also frequently use Sierra and Symphony, while medical libraries are more likely to use Voyager

Table 3.1. The three most-used library platforms by type of library.

ACADEMIC	PUBLIC	MEDICAL	LAW	SCHOOL
Alma (22%)	Sierra (6%)	Alma (16%)	Alma (17%)	Destiny (32%)
Sierra (9%)	Symphony (13%)	Voyager (11%)	Sierra (16%)	Koha (20%)
Symphony (8%)	Polaris (6%)	ALEPH 500 (9%)	Symphony (10%)	OPALS (18%)

(Ex Libris) or ALEPH 500 (Ex Libris). School libraries are most likely to use Destiny (Follett) as their ILS, but Koha and OPALS (both open-source) are frequently used as well. Table 3.1 shows the three most-used platforms by type of library.[2]

While Alma is still the most popular choice for LSPs, Worldshare Management Services (WMS) by OCLC is also increasing in use as more libraries transition from an ILS to LSP. WMS is particularly attractive for smaller academic libraries that don't require all of the bells and whistles that Alma can provide or that have a lower price point.

Anatomy of an Integrated Library System

Most library systems, while they may have different features or look very different, consist of a similar set of tasks grouped into functional areas called modules. Common modules in an ILS include:

- acquisitions,
- serials,
- cataloging,
- authority control,
- circulation,
- course reserves,
- reports,
- administration/configuration, and
- interlibrary loan.

Each system will look and work differently, but these modules are likely to feature much of the same basic functionality.

The cataloging module, for example, will allow a user to look up a title and view or modify its bibliographic record. A user would also be able to create a new catalog record for a title, as well as add or edit an item. There is also likely to be a method for authority control within the system, allowing a user to add or modify an authority record as well. Figure 3.1 shows a bibliographic record from the cataloging module in SirsiDynix Symphony.

The acquisitions module is where tracking orders, budgets, and invoices takes place. Within the acquisitions module, there will be information about the overall materials budget for the library, as well as for individual fund codes, used to purchase items for various funds, departments, or subject disciplines. This module will also include information about the library's vendors within individual vendor records. Order records housed in the module show order lines with information about what was ordered, when, and from which vendor.
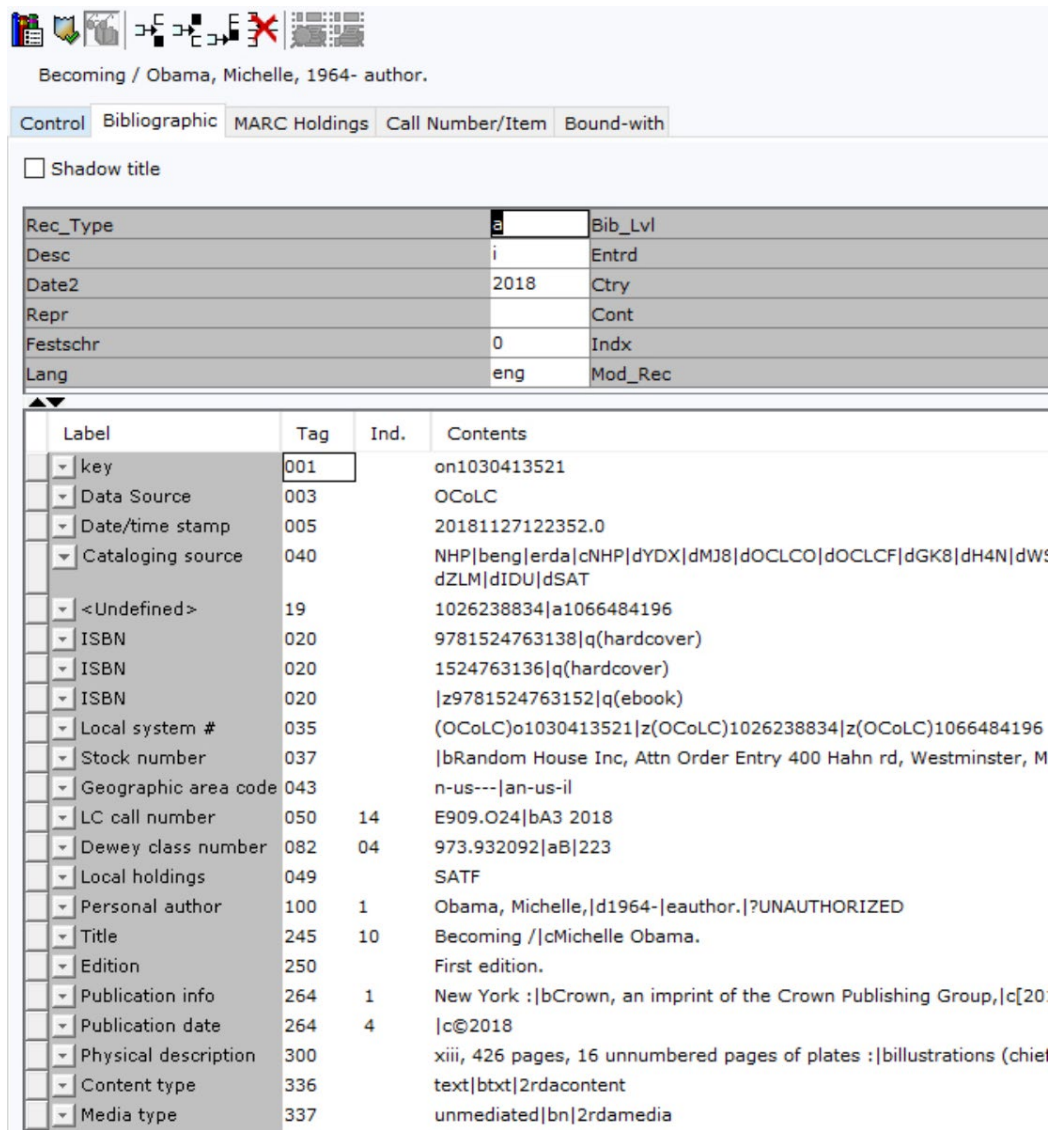
Figure 3.1. Screenshot of SirsiDynix Symphony ILS.

In the serials module, library staff can keep track of serial subscriptions, including their status, how often they are published, and which issues have been received. The module should allow staff to check in new issues of serials as they arrive and to make claims on any issues that don't arrive as expected. The cataloging, authority control, acquisitions, and serials modules are generally used by the library's technical services staff.

The circulation module will be used by the library's front desk staff and includes functions for checking items in and out; creating, editing, and viewing patron records; handling bills, fines, and holds; and marking items as lost or missing. With additional configuration, the circulation module is used for things like patron notifications and pull lists for holds. The circulation module may also provide statistics on how many times an item has been checked out, when it was last checked out, and by whom. The circulation module is usually interconnected with the cataloging module, as they share information about items from the item record. Figure 3.2 shows a patron record from OCLC's WorldShare Management Services, which includes an overview of items checked out, as well as tabs for information on the patron's holds, bills, profile, and history.

Figure 3.2. Screenshot of OCLC WorldShare Management Services LSP.

While many libraries use a separate platform for handling electronic course reserves, many library systems also include a course reserves module to handle print reserves. This module can be used to manage courses with reserve items and to organize print items on reserve. The circulation and course reserve modules are generally used by the library's public services staff.

One module that is likely to be used by library staff from all areas is the reports module. The reports module is where staff can generate information and statistics from different areas of the system. While the reports module can provide a variety of statistics on the operation of the library, in some older integrated library systems like Symphony, reports are also used to initiate batch processes such as importing bibliographic records into the system, marking records for export, or re-indexing the database.

Some information that might be obtained by using the reports module includes things like:

- how many items from a specific subject area were checked out during a particular time frame,
- how many items are in the collection in a specific subject area,
- how many items were cataloged during a particular time frame,
- how many items were ordered during a particular time frame,
- which patrons have fines over a certain amount,
- which items from the collection are marked as lost or missing,
- which items have holds,
- which items are shelved in a particular location, and
- which items are available in a particular format.

The systems librarian may also be the person responsible for running reports, so it can be important to become familiar with the process for extracting specific types of information from the system being used.

The systems librarian is also frequently the person responsible for configuring and administrating the system, using the system's configuration module. The configuration module is where various parts of the system can be configured, including things like how catalog records appear in the OPAC, circulation and billing policies, how items are selected to fulfill holds, defining patron types, and configuring user access to the various modules that make up the system.

Interlibrary Loan

Interlibrary loan (ILL) is a service provided by many libraries that allows their patrons to borrow books or other items not owned by the library. ILL software allows patrons to place a request for an item, usually through an online form, which is then routed to the library. The library can then send the request out to other libraries until it finds one that owns the item and is willing to lend it out. Many libraries participate in reciprocal borrowing agreements and don't charge patrons for items borrowed through ILL. Some examples of ILL software includes ILLiad (now owned by OCLC), Tipasa (also owned by OCLC and slowly replacing ILLiad), and CLIO (SirsiDynix). ILL software often also tracks copyright compliance when libraries borrow more than the allowed number of articles from a single publication within the previous five years.

While interlibrary loan functions can be handled by a separate but interoperating system, many integrated library systems also have an interlibrary loan module. OCLC's web-based Tipasa system is integrated into OCLC's WorldShare Management Services and appears as a module within the platform, but it can also be subscribed to and used separately for libraries not using WMS as their integrated library system.

System Configuration and Administration

When using a library system that has already been set up, the systems librarian may not be required to implement every configuration from scratch. However, it's likely that a library will need to change some of their configurations at some point in time, and the systems librarian is often the person responsible for reconfiguring things. When migrating from one library system to a new system, all of the configuration will need to be done before the system can be used.

Some of the settings that will need to be configured include:

- patron types (e.g., student, faculty, staff);
- patron accounts (creating or uploading);
- locations (where certain items belong on the shelf);
- item types (e.g., DVD, book, periodical, reference);
- loan policies (what can circulate, to whom, and for how long);
- loan limits (how many items each patron type can check out at a time);
- bill policies (how much a patron is charged for overdue items, the fine limit, how much is charged for lost or damaged items, at what point a patron is barred from checking out additional items);

> "Assume that everything you're learning how to do for the first time will take twice as long as you think, at least!"—systems survey respondent

- hold policies (how many holds a patron can place, how long a hold is active, how long an item on hold stays available);
- notifications (which notifications will be sent out to whom and when); and
- user accounts (creating, granting access permissions).

In addition to configuration, the systems librarian may also be responsible for maintenance of the system if the server is hosted on-site. This can include updating the server with new software versions and security patches, regularly backing up server data, and updating the client on user workstations. For libraries that have a library system that is hosted, the vendor will most likely take care of most of these tasks.

The systems librarian may also need to assist with the integration of any third-party systems with the ILS. This can include integrating organizational accounting or financial systems or student information systems such as Colleague or Banner. This may require collaborating with the organization's IT department. Other types of possible integration include connecting an electronic data interchange (EDI) account for transferring acquisitions information between a vendor and the ILS, implementing the ability to search for and import catalog records using the z39.50 protocol, or using APIs to exchange data with other third-party services.

Resources for Admins

New systems librarians may find the volume of information needed for managing an integrated library system overwhelming, but there are many resources available that can assist with finding the necessary information. Most library systems have documentation covering the system and its various functions, which may vary greatly in quality from product to product, and this is generally a good place to start searching for information. In addition, many library systems also have a listserv specifically for users of that system, and many have user group conferences where users can get together to share ideas, ask questions, or commiserate.

ListServs

- Koha: koha-community.org/support/koha-mailing-lists/
- OCLC: www.oclc.org/content/forms/worldwide/en/internet-subscription.html
- SirsiDynix: www.cosugi.org/listserv-subscriptions
- Ex Libris: el-una.org/about/mailing-lists/

User Conferences

- COSUGI (www.cosugi.org/conference): Customers of SirxiDynix Users Group
- EBSCO User Group (www.ebscousergroup.org/)
- ELUNA (el-una.org/): Ex Libris Users of North America
- IUG (innovativeusers.org/): Innovative Users Group

- KohaCon (koha-community.org/kohacon/)
- WMS Global Community + User Group Meeting (www.oclc.org/en/events/conferences/wms-global-comm-user-grp-mtg/2019/global-2019.html)

⊚ Key Points

While it may not be possible to be an expert in every ILS or LSP, knowing the basic tasks and features of one system will often translate to others since most library systems consist of a similar set of modules for performing a similar set of tasks. Common modules in a library system include acquisitions, serials, cataloging, authority control, circulation, interlibrary loan, course reserves, reports, and administration/configuration, representing each of the functional areas of the library. In addition, knowing how the different modules relate to and interact with each other, as well as how the settings and configuration options impact functions in each of the modules, will make managing the system and figuring out how to troubleshoot issues or change or update settings much easier. Vendor documentation can provide a basic foundation of knowledge for using the system and user conferences offer the chance to ask questions and learn from other users of the same system, while system-specific listservs provide a place to ask questions and get immediate answers and to learn more about issues impacting the system's other users.

*   *   *

⊚ Interview with a Systems Librarian

Morgan Mullins
Art and Technology Specialist, Rowan County Public Library

How many years have you worked as a systems librarian?
One and a half years.

Is there anything about your current position that makes it a unique representation of systems librarianship?
Unlike most IT staff, I am also in charge of curating and maintaining the library's art collection, as well as developing relevant programming not directly related to technology.

Was it always your intention to be a systems librarian?
No; my emphasis in college was game design, which I still pursue around my day-to-day work.

What led you into working with technology?
My familiarity with art initially led to that side of the position, and my experience with similar technologies to what the library uses landed me in my current hybrid position.

Do you feel that your education prepared you for work as a systems librarian?
Yes; although I mostly studied people rather than computers, that prepared me for an important part of the job that isn't often mentioned—understanding patrons and staff, which informs how I administrate technology for the library to the best results.

What skills or experience did you have that helped you get your first systems job?
In addition to some previous library experience, I was familiar with sales technology, which the library was implementing at the time I came aboard, and with maintaining databases and building reports, plus the day-to-day computer operations of an office setting.

What skills have you had to learn on the job?
An ILS is somewhat different than a retail inventory or client database management system, so much of what I know about them has come on the fly.

What skills or knowledge have been most useful to you in your day-to-day work?
General computer knowledge, such as basic operations and maintenance, understanding of the printing and copy machines, a good grasp of patron account functions, etc.

What is one of the most interesting or complex projects you led or worked on?
I led the transition from our previous ILS to Atriuum by Book Systems. As soon as I found out about alternatives and started comparing them to the many problems and complaints with our then-current ILS, I made the decision to try and migrate. I called other libraries, collated their reviews, spoke with sales reps, talked it up to coworkers so that they would support the transition, and then made a presentation to the board that convinced them unanimously to change over. While the details of the process were technical, the actual project itself was mostly marketing until we began physically swapping programs.

What are some other major projects you've been involved in?
Implementation of new RFID and barcode technologies for checking in and out; new security gates for the library entrance; multiple upgrades to our sales and payment software and hardware; installation of self-check kiosks; migration from typical computer hardware to thin clients imaged from the servers; installation of multiple new servers; construction of a new website from scratch following the change in ILS.

Have you ever led a systems migration?
The actual migration was stressful because of the time crunch, but after that, everything went relatively smoothly. So the hardest part was having everything in place to actually make the switch and then implementing those critical bits right beforehand. Preparedness and a comprehensive understanding of what would change, and how, was key.

Have you ever led a website redesign project?
As our previous website was hosted by our ILS provider, migration meant obtaining a new domain, exporting the old site, and building a new site from scratch. We set up a dummy site and built most of the pages in advance, when we knew the system migration had been confirmed, and started designing a friendlier and more effective site based on marketing data. Then we made the new site live on the new domain and redirected the existing address to land on that site instead of the old one, to get patrons used to using it while we finished up with the ILS before the old site was pulled. Cleaning up and rewriting/redesigning archaic or outdated pages has been challenging but fun.

Can you describe your day-to-day work or what a routine day is like?
Most days are an attempt to focus on whichever item on our team's to-do list has priority while being irregularly interrupted by patron requests for assistance, since one of our responsibilities is providing tech help to patrons.

What is the most challenging aspect of your position?
Designing programming and teaching technology classes, mostly to senior patrons who have very little familiarity with technology and who are often intimidated by it.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Seeing the library functioning smoothly, because I know that my work affects every part of that, from the satisfaction of patrons who are easily able to search our catalog and reserve or borrow items, to the low stress of coworkers who can do their jobs without hassle because we provide them with the tools to do so.

How do you see systems librarianship changing over the next five to ten years?
As computer technology continues to advance, systems librarians and IT staff will need to become ever more familiar with cloud tech. Faster and more capable computer hardware and increased miniaturization will mean more of a march toward thin clients or similar, with imaging from servers rather than individual patron computer stations. Likewise, some new technology will likely replace RFID, and librarians will need to understand the new methods.

What do you think are the most important skills or qualities a systems librarian needs to have?
Patience, organization, focus, and communication. With these, someone can eventually learn to do any job well, even if they're learning on the fly or starting from an unrelated field. Computer skills are honestly secondary to having the traits needed to get a job done in an effective and timely manner while maintaining open lines with coworkers and understanding patrons' needs. After that comes computer literacy and competence with the cloud, with printing hardware, etc.

What do you most wish you had known before becoming a systems librarian?
How much marketing and outreach is involved, which is a surprising amount. Because so much of these endeavors rely on social media and online platforms, nowadays, IT must work closely with marketing staff to manage Facebook, Instagram, Twitter, and other accounts and to make sure that advertisements and promotions roll out smoothly, are pulled at the right times, and so on.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
How much time you wind up spending at the circulation desk despite the job description. Sooner or later, no matter your job, everyone winds up checking things in and out, so circ training is critical for every position.

Notes

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Content Management Systems

IN THIS CHAPTER

▷ Popular Open-Source Content Management Systems

▷ Springshare and LibGuides

▷ Selecting a Content Management System

▷ Digital Repositories

CONTENT MANAGEMENT SYSTEMS (CMS) are platforms for creating, organizing, and publishing online content, such as a library's website, research guides, or digital collections. Content management systems are online platforms that a user can log into through a browser. By using a CMS, multiple users can easily log into and make edits to a website's content without requiring much if any knowledge of HTML or CSS. Some examples of content management systems are LibGuides, provided by Springshare, and the open-source platforms Drupal, WordPress, and Joomla!.

Once a website is set up, the content management system will usually have a WYSISYG (what you see is what you get) editor, where users can drag and drop items and edit content directly on the page rather than through any knowledge of HTML. This allows even the most non-technical librarians to create and publish their own content such as research guides or webpages. There should also be access to the HTML code, which can be edited directly by more advanced users.

Most content management systems function in a similar manner, with reusable content such as a website's header, footer, and navigation menu managed separately from the site's main content pages. There should also be an area for the CSS code, which will designate the style of the entire site. Many content management systems also assist with website SEO (search engine optimization) and will index publicly available pages online, making them discoverable through a Google search. Content management systems also

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make it easier to create a website that is both responsive and compatible with accessibility guidelines, often using a built-in framework to handle these features.

Most content management systems are run on a LAMP stack, an acronym that stands for Linux (the operating system), Apache (the HTTP server), MySQL (the database), and PHP (a programming language). This combination of components provides the foundation for web services. While LAMP is the typical model used, the components are not limited to just those mentioned above. For example, there is also a WAMP stack for Windows and MAMP for Mac operating systems. While Apache is the most popular web server in use today, a different web server such as Nginx could also be used. Alternatives to MySQL include other database systems such as MariaDB or MongoDB, and alternative programming languages such as Perl or Python can be used in place of PHP.

Popular Open-Source Content Management Systems

Among open-source content management systems, WordPress, Drupal, and Joomla! are the most widely used. WordPress in particular is the most-used content management system on the web with a market share of over 60 percent.[1] WordPress is considered to have less of a learning curve than Drupal, and new users can get up and running fairly quickly. While Drupal's platform is considered more robust and complex, it will likely require someone with some development experience to set up. Joomla! can be considered something of a middle ground as far as ease of use but offers less overall flexibility than a system like Drupal.

Both WordPress and Drupal utilize themes, or ready-to-use files that dictate the site's all-around layout, look, and feel. Using a pre-built theme to lay the foundation for a web-
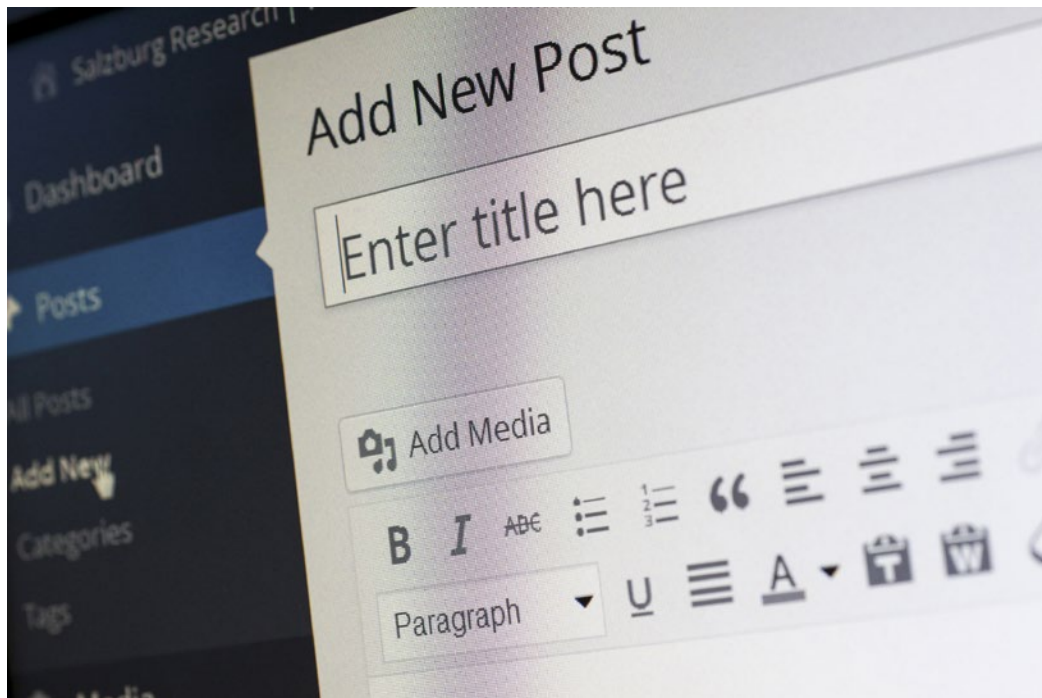
Figure 4.1. Screenshot of where new content is added in WordPress. *Pixabay, commons.wiki media.org/wiki/Category:WordPress_screenshots#/media/File:Publikowanie.jpg*

Figure 4.2. Screenshot of content area in Drupal.

site cuts down on the amount of coding that needs to be done, making comprehensive site design easier and faster to develop. In addition to themes, WordPress uses plugins to extend the features and functionality of a website. Drupal uses modules to accomplish the same thing. Joomla! differs slightly by using templates instead of themes but uses plugins for added functionality similar to WordPress.

Any content management system will have a learning curve; however, using a CMS generally allows the user to build a complete website much faster than hard-coding the entire site by hand. Most content management systems also have active user communities that continually develop new add-ons for additional functionality and provide support to other users.

Springshare and LibGuides

A popular content management system created specifically for libraries is Springshare's LibApps platform. While there are other options for creating library guides, such as Guide on the Side, SubjectsPlus, or creating a homegrown system, Springshare is used by 6,100 libraries worldwide.[2]

The LibApps platform contains separate modules that can be subscribed to individually including:

- LibGuides/LibGuides CMS: a module for creating research guides or a content management system for creating an entire library website
- LibAnswers: a module that acts as a ticketing system for fielding and tracking reference questions and includes LibChat, a library chat service
- LibCal: a calendar module that can be used for creating and tracking events, event registration, and room and equipment booking and includes Appointments, a scheduling tool for scheduling individual consultations
- LibInsight: a module for gathering and analyzing library statistics
- LibStaffer: a module for managing staff schedules
- LibWizard: a module for creating surveys, forms, tutorials, and interactive learning content
- LibCRM: a module for managing customer relationships
- E-Reserves: a module for managing and hosting electronic reserve content

While not all libraries use LibGuides, it is widely used, and the systems librarian frequently acts as its administrator.

LibGuides

One of the most attractive features of LibGuides for libraries is that it provides a way for multiple staff members to produce and contribute to website content no matter their level of technical expertise. The LibGuides module was created to provide libraries with an easy-to-use content management system for creating library guides and other library web content.

Like most content management systems, LibGuides is modular, with separate code areas for the header, footer, and CSS that is applied to all pages across the system. Once the template and styles for the site have been set up, individual users can create guides and add content without having to write any code at all.

LibGuides is based on Bootstrap, a CSS framework that uses a grid system to lay out content. Bootstrap is responsive and mobile-first, meaning that the elements of the website automatically adjust according to the size of the user's browser, and pages should be as usable on a mobile device as they are on a desktop computer. Because of this, LibGuides' templates are laid out in adjustable columns, and boxes are used to organize content.

LibGuides has separate content areas for organizing images, assets (links, documents, books, etc.), and databases, as well as widgets that allow users to generate a block of code that can be embedded anywhere in a website. Widgets feature dynamic LibGuides content such as guide or database lists or entire boxes or pages of content that can be embedded in one or in multiple guides. LibGuides' mapping feature allows users to create or upload content, such as an image or link, one time and then reuse that content throughout multiple guides.

One particularly useful feature allows users to add a book from their catalog by entering only the ISBN. Using the ISBN, the system then automatically populates the book's title, author, publication date, description, and cover art. When creating a new box of content, users can choose between a standard box, a tabbed box, a gallery box (featuring rotating images), or a profile box featuring a librarian with contact information.
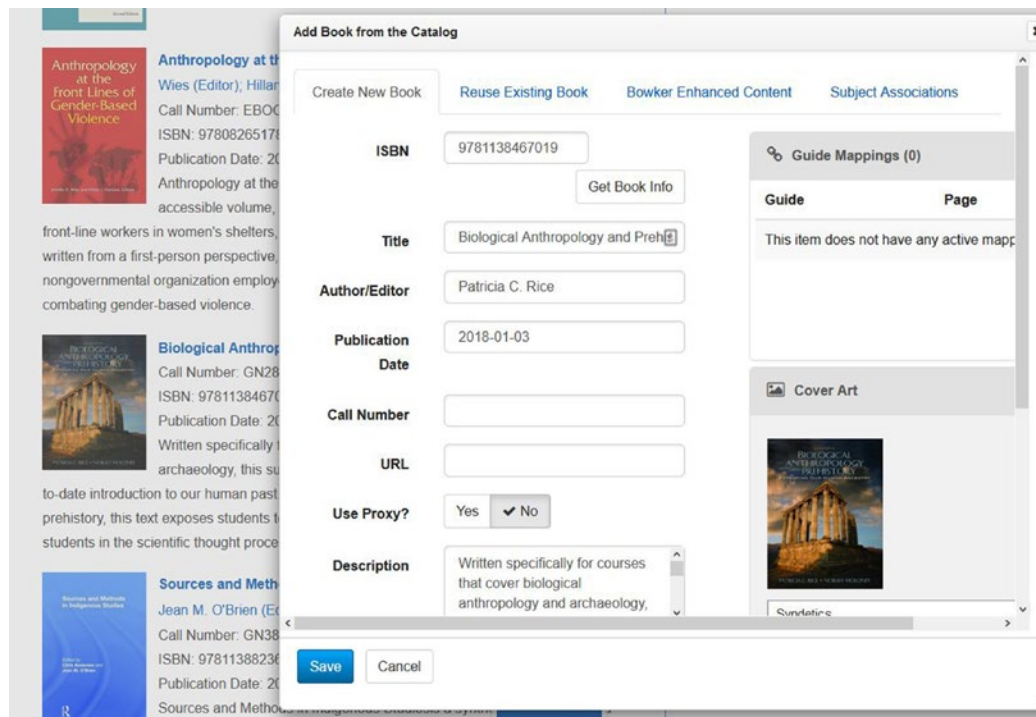
Figure 4.3. Screenshot of the "Add Book from the Catalog" widget in LibGuides.

LibGuides CMS

Springshare also provides a CMS version of LibGuides which has added functionality that allows it to be used to create a website. In LibGuides CMS, an admin user can fully customize their LibGuides templates, including using HTML to change the layout of a page entirely. Using customized templates, the admin can create a website that doesn't look anything like a standard LibGuide. The LibGuides community site provides multiple examples of libraries that have created a custom website using LibGuides CMS.

Understanding Bootstrap is key to successfully modifying and customizing a LibGuides template. In addition to the rows and columns layout of Bootstrap, LibGuides templates also use template keywords, keywords enclosed in double curly braces, that dynamically insert content into a live website page from the template. Some examples of template keywords that can be used include:

- {{content}}: inserts all of the content boxes created on a page
- {{content_col_<id>}}: inserts all content boxes created in the specified column
- {{content_box_<id>}}: inserts the content box with the specified ID
- {{public_header}}: inserts the system header code
- {{public_footer}}: inserts the system footer code
- {{breadcrumbs}}: inserts the system breadcrumb navigation

LibGuides CMS also includes the LibGuides LTI (learning tools interoperability) tool. LTI provides a framework for embedding outside content within an LMS (learning management system) such as Blackboard, Moodle, Canvas, or Desire2Learn. To use the LTI, the LMS administrator must use the LTI settings to add the tool to a course shell. The LTI then uses metadata from the guides to match the course or subject of the guide to courses created in the LMS, displaying the most appropriate one within the course shell. In addition to guides, the LTI tool can also be used to display subject librarians, LibChat or LibAnswers widgets, or LibCal room booking or research consultation widgets.

Other LibApps Modules

Besides LibGuides, other modules within the LibApps platform also provide useful functionality for libraries. The LibAnswers module provides a question form that can be embedded on a library webpage to allow users to submit questions and receive answers even when not at the physical library. Questions can also be submitted through e-mail, text message, or social media such as Twitter or Facebook. Once a question is received, library staff who have an account in the LibAnswers module can access the question and provide an answer, which the user receives through e-mail, text, or social media.

Also available separately through LibAnswers is LibChat, a chat service that allows users to provide an immediate response to patrons who start a chat session. LibChat widgets can be embedded on the library's website or other web properties (including within discovery platforms or in databases), allowing patrons to ask questions and receive assistance anytime someone is staffing the chat module.

LibAnswers also includes a section called Reference Analytics, which tracks all of the reference transactions that come through the module regardless of how they are received. Administrators can create their own dataset to track the data that is relevant to their library, such as the patron type, location, or question type.

The LibCal module provides calendar-related functionality including room bookings and event registration. One feature of LibCal is Hours, in which a library can define their open hours for a given time period, such as a semester. That information can then be used to create widgets to embed the library's hours into the website. LibCal also includes Appointments (previously called My Scheduler), which is a scheduling application that allows a user to enter their availability into the system so that patrons can schedule a personal appointment with them. With an option to sync to Outlook or Google calendars, Appointments can automatically block out times on a user's calendar when a patron has booked an appointment and remove available time slots when a meeting is scheduled on the user's calendar.

The LibWizard module is available in two varieties. LibWizard Lite includes the ability to create forms and surveys and is included at no extra charge with a subscription to LibGuides CMS. The full LibWizard module includes forms and surveys, as well as quizzes and tutorials. LibWizard forms and surveys can be used to gather information from patrons and can be embedded into any website. Quizzes and tutorials can be made interactive and used for information literacy instruction, staff training, or website tutorials.

Selecting a Content Management System

There are many factors to consider when selecting a new content management system, the most important of which are generally ease of use, flexibility, and cost.[3] Much will likely depend on the size of the library, the technical aptitude of library staff, how much customization is needed, and how much time the library has to build the site. With so many options to choose from, the choice may seem overwhelming; however, the majority of libraries that use a content management system tend to ultimately select Drupal, WordPress, or LibGuides.[4]

While Joomla! is a popular CMS overall, it is less popular for use in libraries than other content management systems, perhaps due its lack of library-specific templates and extensions. Joomla! is less flexible than Drupal but also requires less customization and technical expertise to get started, so it could be a good choice for small or medium-sized libraries.[5] And while LibGuides is a popular tool for libraries worldwide, few large libraries use it as the CMS for their website.[6] Instead, it seems better suited to smaller libraries for that purpose. "Drupal's flexibility, robust architecture, modularity, and open source license allow libraries to extend and customize it to meet their individual needs,"[7] making it perhaps a more suitable choice for larger libraries.

Whichever option is selected, it is important not to underestimate the time required for training any potential users to the new system. Since multiple library staff may be creating and publishing content for the library website, they will all need to become comfortable with using the content management system that is selected.

Digital Repositories

A digital repository is an online collection of resources, often images, scholarship, or digitized primary source documents. Digital repositories can be an institutional repository, which is a repository maintained by a university or institution to collect, preserve, and

disseminate research done by its faculty or students; a disciplinary repository, which is a repository that archives the scholarly work of a particular discipline; or a digital archive.

Some examples of disciplinary repositories include arXiv (sciences), Social Science Research Network (social sciences), and Humanities Commons (humanities). Institutions maintaining their own institutional repository use software platforms that are either hosted by the vendor or self-hosted. Examples of repository software include the commercial platforms Digital Commons (bepress) and CONTENTdm (OCLC) and the open-source platforms DSpace, Omeka, and Islandora, among others.

Key Points

Content management systems can make the process of creating and maintaining a website much easier; however, any new CMS will require a learning curve to get started. Among the content management systems most used by libraries, Drupal has a much steeper learning curve than LibGuides or WordPress but also offers more options for customization. All content management systems will provide a similar structure for organizing website content, including a modular system for housing reusable code blocks such as the site's header, footer, and navigation menu separate from the main content pages.

In addition to CMS functionality, Springshare's LibApps platform includes modules used by a large number of libraries to manage functions like help desk ticketing, event and room booking, research appointments, forms and surveys, tutorials, and research guides, consolidating the management of multiple library services under a single platform that is often administered by the systems librarian.

* * *

Interview with a Systems Librarian

Mike Cendejas
Discovery and Access Systems Librarian, Scripps Research

How many years have you worked as a systems librarian?
Seven.

Was it always your intention to be a systems librarian?
My original career goal was to be in academic librarianship, particularly instruction (which I still love).

Do you feel that your education prepared you for work as a systems librarian?
Not specifically, but I didn't take a technology track in my grad program. However, I think having a well-rounded knowledge of other aspects of librarianship that I did learn about in grad school informed and had a positive impact on how I approached the job and the relationships I had with other librarians.

What skills have you had to learn on the job?
What the different library systems were and how they interacted. Link resolvers, discovery layer, ILSs—until you're thrown into the thick of using them, it's all a bit abstract.

What skills or knowledge have been most useful to you in your day-to-day work?
Experience in using several different vendors' systems. It's helpful to see how different products do the same thing; you get a more bird's-eye view of everything.

Did you ever work on a project that went very wrong?
At my very first library job, the web presence, from a user experience perspective, was really, really bad. I took it upon myself to approach this as a challenge and spent a lot of time building up a mock-up of what could be something we move toward in the future. When I presented this to my director, she had me set up a meeting with IT for me to meet with them. We talked about how they use a particular CMS and that whatever the library wanted to use would have to be built in that CMS, but that we could work together to make iterative changes. I did learn that it's important to be sure to get buy-in from your higher-ups if you want to work on a project, so that you're not left out in the cold if things don't go as well as planned.

What is one of the most interesting or complex projects you led or worked on?
I recently re-did our website. It was previously a static HTML page, and since we already had LibGuides, my director wanted to use this as our CMS. I took my time, did UX testing, and had regular meetings to keep people up to date on the progress (and made sure to get buy-in each step of the way). It was interesting for me because I wanted to leverage LibGuides in such a way that it didn't "look like" a LibGuide, so it involved getting really comfortable with how LibGuides is built and how you can bend it to do what you want it to do.

What are some other major projects you've been involved in?
I've been part of several website redevelopments, have implemented several systems including EBSCO Discovery service, EZproxy, and ILLiad. I've also played small roles in institutional projects such as migrating to a new LMS.

Can you describe your day-to-day work or what a routine day is like?
I spend 25 to 30 percent of my day at the reference desk; I try to get some work done there, but it's difficult sometimes. Currently, there are a lot of updates I need to make to legacy systems (I'm only two years into this role, and I'm the only systems person, so I typically have one priority that I'm working on at a time). Many of our systems have things that are pretty outdated, so it's taking those one by one to update them that I spend a lot of time doing. Oh, and also whenever there are reports of access issues, I'm usually the main point of contact. Other than that, depending on the time of year, I'm pulling a lot of statistics and preparing data for the budget.

What is the most challenging aspect of your position?
Switching gears between tech and non-tech responsibilities gets difficult sometimes. Also, being the only systems person, and just in general being part of a really, really small staff, gets isolating.

What do you feel is the most rewarding or interesting part of working with systems/technology?
There's always *something* to do; it just depends on the level of effort and concentration you want to spend. I will say, though, that you have to balance that; otherwise it's really, really easy to get burned out.

How do you see systems librarianship changing over the next five to ten years?
I'm hopeful that systems vendors will continue to make their products better so that a lot of the administration of the systems is more straightforward. Being a UX-minded person, I'm of the

belief that our systems should be as easy to manage as possible, such that any librarian should be able to use them; it shouldn't need to be as hard as it is. I also think the move toward open access will resolve a lot of issues while (undoubtedly) causing new issues.

What do you think are the most important skills or qualities a systems librarian needs to have?
I think you need to be a problem solver and that you need to be a creative thinker. With shrinking budgets, a lot of times you need to figure out how to meet your library's goals in unique (affordable) ways.

What do you most wish you had known before becoming a systems librarian?
Imposter syndrome is real and it's never going to go away, so just roll with it.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
I'm surprised as to how great the community is of other people who have to do these things and also how common many of the issues we all experience are. Every time I go to systems-focused conferences, it's refreshing to meet so many open, friendly people who are struggling/rolling our eyes at the same exact things.

Is there anything else you would like to mention that hasn't been asked?
There is a huge difference between being a systems librarian at an institution that has plenty of funding vs. one that has a flat/declining budget.

◎ Notes

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Electronic Resources Management

ELECTRONIC RESOURCES MANAGEMENT is an area of librarianship that, more and more, has its own designated position, particularly in academic libraries. However, in many libraries, electronic resources management is still divided up among various librarian and staff positions, sometimes including the systems librarian. While the systems librarian may or may not be responsible for all or part of electronic resources management in a given library, it can be beneficial to understand the life cycle of electronic resources as well as the technology used to manage them.

NASIG (formerly the North American Serials Interest Group) has compiled a set of core competencies for electronic resources librarians that are useful for anyone working with electronic resources in any capacity. Some of the competencies listed include knowledge of the electronic resources life cycle, knowledge about the technology used to access and maintain electronic resources, knowledge about the use of data and statistics in research and assessment of electronic resources, communication skills, management skills, and a commitment to professional development and continuing education. The list of competencies also includes personal qualities needed for those working with electronic resources including flexibility, open-mindedness, tolerance for complexity and ambiguity, and time management skills.[1]

⌾ The Electronic Resources Life Cycle

Based on a model originally created by Oliver Pesch,[2] Jill Emery and Graham Stone created TERMS: Techniques for Electronic Resources Management,[3] which outlines and investigates workflows within each phase of the electronic resources life cycle. Due to the nature of electronic resources, their life cycle is not linear but instead is a cyclical process that repeats until the point at which the resource is either canceled or discontinued. Figure 5.1 shows the general phases of the life cycle including acquiring, providing access, administering, supporting, evaluating, and renewing or canceling the resource.

Among the areas that can be the most difficult for librarians new to working with electronic resources are licensing and troubleshooting. These are skills that are not often taught in library school and instead are often learned on the job.

Acquire
- trialing, negotiating, licensing, purchasing

Provide Access
- cataloging/metadata, discovery, proxy access

Administer
- maintain and update

Support
- troubleshooting

Evaluate
- analyzing usage data

Renew/Cancel
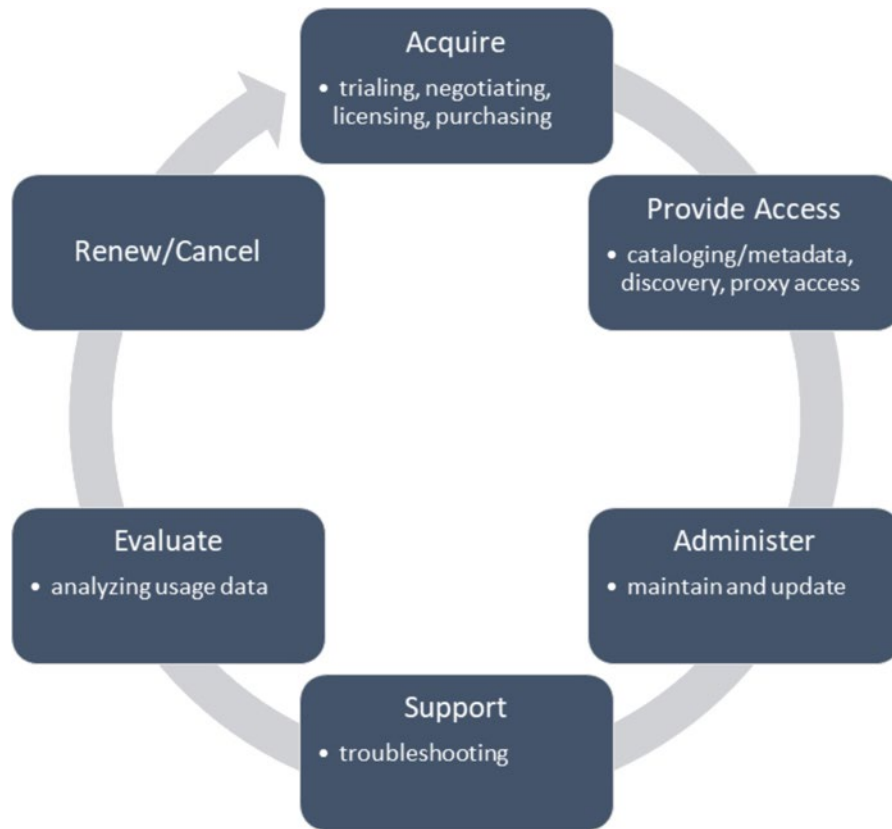
Figure 5.1. The electronic resources life cycle.

Acquisition

Acquiring electronic resources is also usually a very different and more complicated process from acquiring print resources. When a library purchases a print book, it can catalog the book, put it on the shelf, lend it out to other libraries, and lend it to patrons until it decides to deaccession the book. When purchasing electronic resources, however, there are many other factors to consider. For instance, many e-books and other electronic resources have digital rights management features that limit user access (options can include one user at a time, three simultaneous users, or unlimited users each at different price points), limit the number of pages that can be printed, or limit the amount of the text that can be downloaded.

And while the library may purchase an e-book, many electronic resources, such as databases, journals, and streaming media, are subscribed to instead of purchased. This means that the library must pay each year, rather than just once, to maintain continual access. Journals can be especially complicated because a library may subscribe to an electronic journal and receive access to a certain number of back issues. When or if the library stops subscribing to the journal, whether they maintain access to the back issues and the volumes they received during their subscription period may be subject to the licensing terms that were agreed upon between the library and the vendor. Even if the licensing terms state that the library maintains access to those volumes, they may need to either pay an annual hosting fee for the vendor to continue providing online access to those volumes of the journal or they may need to find and pay for their own hosting solution.

Electronic resources also often have different methods of purchase than print resources. One method that has been popular in the past is what is referred to as the "big deal." With a big deal, a library may purchase a large package of resources at a discounted price rather than separately purchase each individual item. In this model, the library may acquire access to many resources that are used very little or not at all but may find the deal worthwhile overall because of the access they receive to other more essential resources at a lower price than they might otherwise get.

Another popular model for purchase is demand-driven acquisition, also called patron-driven acquisition. In this model, the vendor may provide MARC or other records for the library to add to their OPAC or discovery platform, but a purchase is only triggered once a user clicks on the link to access a resource. In this case, the library is able to provide potential access to a larger number of items but only pay for the items that are used. The purchase that is triggered is usually for a time period of one year. This model has become increasingly popular for resources such as e-books and streaming video.

Another similar option is the pay-per-view model, in which a library will deposit a certain amount of funds with a vendor. When a user tries to access an article, e-book, or streaming video, payment is deducted from the deposited amount. Once the deposited amount is depleted, users will no longer be able to download additional content. In this way, libraries can be sure that users have access to exactly what they need when it is needed but don't spend more than the budgeted amount.

Licensing

Licensing and negotiating can be particularly difficult for new librarians because licenses are essentially contracts and not many librarians are experienced in or knowledgeable about contract law. One of the first things to keep in mind when negotiating terms is that many things can be negotiated, including price. It is also important not to sign the first draft of a license without reading over every section and being sure that the terms are acceptable to the library as well as the vendor. Some of the areas of a license to pay particular attention to include:

- Price: Price is often based on full time equivalent (FTE) for academic libraries but may be negotiable, especially if the resource will be used by only a small section of the library's patrons.
- Users: Who is allowed to access the resource? Are walk-in users permitted? Emeritus faculty? Remote users?

- Authentication method: How will users be authenticated for the resource? Can off-site users be authenticated using the method preferred or already in use by the library?
- Resource sharing: Can resources such as articles, journals, or e-books be shared through interlibrary loan?
- Archival rights: Can the library archive a backup copy of the resource?
- ADA compliance: Is the resource compliant with the Americans with Disabilities Act?
- Confidentiality and privacy: How is user data collected, what data is collected, and how is the data used?

While reading and negotiating licensing agreements can be a difficult skill to learn, there are many resources available to assist. The LIBLICENSE project[4] includes a number of resources such as a model license agreement, a glossary of terms, and a discussion forum where users can ask questions to other electronic resources librarians. Another resource that some libraries and vendors are turning to is the National Information and Standards Organization's (NISO) SERU,[5] or Shared Electronic Resource Understanding. When both the library and vendor agree to use SERU, it acts in lieu of a license to articulate standard terms and define rights and restrictions for use according to copyright law. This greatly simplifies the licensing process and can shorten the time to acquisition and use of the resource.

Troubleshooting

Attempting to troubleshoot issues with electronic resource access can be something of a mystery for new electronic resources or systems librarians. Becoming familiar with the electronic resources life cycle and the technology used to provide access to these resources, such as knowledge bases, link resolvers, and authentication systems (discussed later in this chapter), will go a long way toward providing clarity on the things that can go wrong in electronic resource access and the most commonly seen issues.

There are four main steps in troubleshooting an access issue for electronic resources:

1. Identify the issue: What is the user trying to access? Are they on-site or off-site? An on-site user having trouble could indicate an issue with the resource itself, while an off-site user having trouble could mean authentication-related issues.
2. Replicate the issue: Do you run into the same issue when trying to access the resource, either from on-site or using an authentication method? If not, it could point to an end-user issue such as credential or browser issues.
3. Determine the source of the problem: This step can be difficult but becomes easier with increased familiarity with the technology in use.
4. Correct the issue: This might involve walking the user through issues on their end, correcting an issue with the technology, or reaching out to the vendor for assistance.

When it comes to electronic resource access there are any number of things that can cause problems, ranging from the very simple to the ridiculously complex. However, often the same issues will come up over and over, creating a go-to list of things to check for first. Some possible causes of issues relating to electronic resource access are listed below:

End-User Issues

- incorrect username or password
- expired user credentials
- browser-related issues such as browser compatibility issues or browser extensions, which can interfere with some resources or with the proxy
- Internet provider issues such as a firewall or blocked sites at a workplace, military base, hospital, etc.

Global Issues

- link resolver issues such as incorrect base URL, incorrectly formed OpenURL, or incorrect or missing metadata
- incorrect IP range registered with the vendor
- lapse in subscription to resource
- vendor server issues
- proxy configuration issues
- SSL certificate/security issues

Technology

Due to the nature of electronic resources, technology plays a key role in acquiring, maintaining, and accessing these resources. Electronic resources must be made discoverable through the library's OPAC or discovery layer, either by uploading MARC records or, in the case of a discovery layer, by activating the resources within the system's knowledge base. But making the resources discoverable is only half the battle. Users must be able to access them as well.

Knowledge Base

A knowledge base is the back-end of a discovery system and acts as a central index for the library's electronic holdings. The library will activate electronic journal content, streaming video, e-books, and databases by turning on access through the knowledge base. Activating this content provides information about the library's holdings to the link resolver once a user tries to access the content. The information provided by the knowledge base includes which volumes the library has full-text access to for electronic journals and the link for accessing the content. Usually the base URL for the library's link resolver and the proxy prefix that gets appended to the access URL to authenticate users are part of the configuration settings within the knowledge base. Configuring each of these parts ensures that all of the pieces work together to provide the user with the requested content.

Link Resolvers

A key point for access is the technology that links a user from a source—the record or citation—to a target—the full text. Link resolvers have been developed to provide that link between citation and text. The OpenURL standard allows link resolvers to parse the metadata contained in a link and use it to direct a user to the correct resource. If everything works correctly, the link resolver should deliver the user to the full text of the article

they wish to read. If some of the metadata is missing or incorrect, the link resolver should deliver the user to the journal issue or, failing that, the journal homepage.

An OpenURL contains both a base URL for the link resolver and citation information that tells the link resolver what resource is being linked to. The base URL links to the knowledge base where the information about a library's electronic resources are held. An example of a link resolver base URL for a library using OCLC's WorldShare Management Services looks like this:

https://library.on.worldcat.org/atoztitles/link

The OpenURL structure used to link users to a journal article would then look something like this:

https://library.on.worldcat.org/atoztitles/link?genre=article&issn=1041-7915
&date=2018&spage=17&epage=21&aulast=breeding&volume=38&issue=3

If the article in question is held by the library and those holdings are accurately reflected by the knowledge base, the URL will connect the reader to the full text of the article.

While independent link resolver products such as SFX (Ex Libris) and Full Text Finder (Ebsco) are still in use, more and more link resolvers are being built into library services platforms, such as Alma or WorldShare Management Services, making the acquisition of an independent product unnecessary.

Authentication Systems

Once the user has reached the resource, they need to be authenticated as an authorized user per the agreed-upon licensing terms. If the user is in the library or on campus, they may be authenticated by their IP address. However, if a user is accessing the resource remotely, they need to be verified as an affiliate of the organization.

One method libraries use to provide this authentication is a proxy server. A proxy server sits between the end user and access to the library's subscription resources. When a user who is not within the organization's IP range clicks on a proxied link to a library resource, they are asked to log in with their organizational credentials. Their credentials are then authenticated against the organization's user database. When the user has been authenticated, the proxy server presents the user's IP address to the platform they are attempting to access as though they are within the organization's IP range, allowing them access to the content.

Users will often need to be authenticated to access their accounts within an ILS as well. There are different methods that can be used for authentication into both an ILS system and a proxy server. Some of the more commonly used methods are:

- Local data: Using this method, the user's username and password are both stored within the system itself, rather than connecting to an outside system.
- LDAP: An acronym for "lightweight directory access protocol," LDAP is a protocol for accessing directory information, such as Microsoft's Active Directory. A common usage is a university directory that stores student usernames and passwords. A system set up using LDAP would be able to access that directory to authenticate students using the same username and password they use to access other university systems.

- CAS: An acronym for "central authentication service," CAS is a protocol for single sign-on (SSO) authentication, which allows users to stay signed in when accessing different services through the same SSO, rather than having to log in separately each time.
- SAML: An acronym for "security assertion markup language," SAML is a newer SSO protocol that also allows for a single sign-on experience. SAML-enabled services widely used at universities include Shibboleth and Microsoft's ADFS products.

EZproxy (currently owned by OCLC) and WAM (available through Innovative Interfaces Inc.) are a couple of the proxy servers used by libraries. Particularly in academic libraries, EZproxy is used the most widely and has an active listserv dedicated for its users. Managing EZproxy can involve managing the installation, maintenance, and updates on a server; user authentication through the implementation of LDAP, Shibboleth, or a locally maintained user file; and a configuration file including access stanzas for each of the online resources a library subscribes to. However, in recent years OCLC has also begun providing a hosted solution, allowing libraries to rely on them for hosting and maintenance of the EZproxy server, updates, security, and configuration changes, easing much of the IT burden on the library.
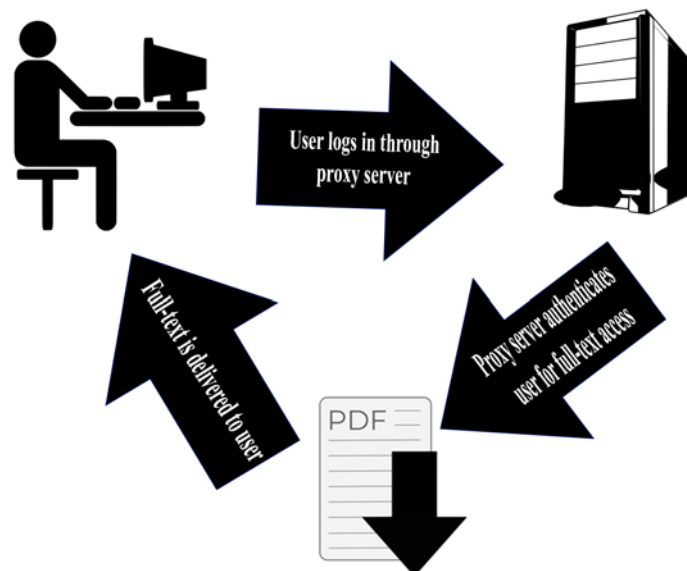
Figure 5.2. How information flows through a proxy server.

Electronic Resource Management Systems

Electronic resource management systems (ERMS) are systems that allow libraries to track their electronic resources and related data, particularly electronic journals. Not all libraries use a separate system to track electronic resources; some use spreadsheets or other low-cost methods. However, an ERMS allows a library to store all of the information about their electronic resources in one place, including renewal dates, licensing agreements, vendor contacts, URLS, ILL approval, and other information. Some also provide a means for reminding a staff member when it's time to renew a license so that access isn't interrupted.

While individual systems for electronic resources management exist, the difficulty inherent in creating a system that can handle all of a library's needs related to electronic resources has inhibited their mainstream success. Instead, the new generation of library

> "Try not to feel like you're going to be a specialist in everything. Pick a few things you'll be really good at and build from there."—systems survey respondent

services platforms has folded electronic resources management into the library system by including modules designed for that purpose, as well as providing better overall management of electronic resources through built-in knowledge bases and link resolver functionality.

There are also some open-source electronic resource management systems that have been developed, such as CUFTS (developed at Simon Fraser University) and CORAL (developed at the University of Notre Dame). While CORAL has been adopted by several academic libraries, it has also been incorporated into the development of SirsiDynix's BLUEcloud system. There has also been development done to increase interoperability between CORAL and the open-source system Koha.[6]

Data and Assessment

Part of the life cycle of electronic resources includes evaluation of the resource to determine whether or not it should be renewed. When it comes to evaluating resources, the most commonly used method is to analyze the usage data provided by the vendor. The resource's cost per use is the standard metric used to quantify a resource's value and is obtained by dividing the overall cost of the resource by the number of uses during the subscription period.

Use can be determined in different ways, however. For an electronic journal, looking at the number of full-text views is probably the best determination of use, while database vendors might offer usage statistics for searches, record views, and/or full-text views. Librarians might also consider the number of turnaways, or times that access was denied, as a useful way to identify gaps in the library's collection. For e-books, turnaways can help to identify which titles are in high demand and may need a license that allows for more simultaneous users. The total use of a resource may not provide the complete picture of its value, however, as some resources are intended for use by specialized audiences or required for program accreditation. These factors will also need to be taken into account when assessing electronic resources.

COUNTER (Counting Online Usage of NeTworked Electronic Resources)[7] is the standard used to provide usage statistics for electronic resources. COUNTER provides standardized reports for reporting usage of electronic journals, databases, e-books, and streaming media. While not all vendors are COUNTER-compliant, many have adopted these standards to allow for consistency in gathering and analyzing usage statistics. An example of standard COUNTER reports for electronic journals include:

JR1: the number of full-text article requests by month and journal

JR2: the number of times access was denied to full-text articles by month, journal, and category

JR3: the number of item requests by month, journal, and page-type

JR4: the number of total searches by month and collection

JR5: the number of full-text article requests by year of publication and journal.

SUSHI (Standardized Usage Statistics Harvesting Initiative)[8] is a NISO protocol for harvesting COUNTER-formatted usage statistics from vendors and importing them into an ERMS. While the SUSHI protocol makes it possible for electronic resources librarians to save time spent on gathering usage statistics from a variety of different vendors by automating the process of harvesting these statistics, non-COUNTER-compliant reports must still be collected manually.

ⓖ Key Points

While part or all of electronic resources management may or may not be part of a systems librarian's responsibilities, familiarity with the electronic resources life cycle and the technology used to manage electronic resources will be beneficial. Some key points to keep in mind include:

- There are a variety of acquisition and purchase models available for electronic resources today including the big deal, demand-driven acquisitions, and pay-per-view. These will likely continue to change and evolve as the technology and platforms used to manage electronic resources change.
- License agreements determine how electronic resources can be used and by whom. Those responsible for negotiating and signing licensing agreements should use a model license developed for the needs of their library or a license checklist to be sure that the license contains the clauses and language required by their library.
- Troubleshooting electronic resource access issues can be a complex process, but familiarity with the technology used to access electronic resources will help to identify and clarify potential causes.
- Electronic resources rely on a variety of technology for their acquisition, maintenance, and access, including knowledge bases, link resolvers, authentication systems, and electronic resource management systems. All of these systems work together to provide the user with access to the resources they need.
- A key part of the electronic resources life cycle is the evaluation of a resource, a step that relies on the analysis and assessment of usage data. This can include usage statistics provided by the vendor, as well as statistics generated through link resolvers or authentication systems, and can be used to determine a resource's cost per use and overall value to the organization.

*   *   *

ⓖ Interview with a Systems Librarian

Robert Wilson
Systems Librarian, Middle Tennessee State University

How many years have you worked as a systems librarian?
Four.

Was it always your intention to be a systems librarian?
As a student worker, it struck me that library systems compared to consumer information systems could be vastly improved upon. This turned out to be highly motivating with me ending

up getting a graduate degree in computer information systems and then following that with an MSLIS. Since 2011, I've worked heavily with library systems in school, public, and academic libraries as well as on the vendor side with no regrets.

What led you into working with technology?
The goal of improving the technologies in use by cultural institutions was really the heart of what led me into the technology field. I was always adept of using and understanding technology, but had absolutely no interest in using that skill until working in libraries and getting exposed to library systems.

Do you feel that your education prepared you for work as a systems librarian?
Yes, I feel very lucky that instead of going straight to library school, I took a gamble on another degree being applicable to my work that would also be useful outside of libraries if for whatever reason it needed to be. As far as the MSLIS went, I attended an iSchool specifically because the curriculum had more technology courses and options. However, I still found the curriculum wasn't as current as it needed to be. With few exceptions, most of the course work in my MSLIS program were concepts I was already familiar with by working in libraries or knew of from my personal research on librarianship.

What skills or experience did you have that helped you get your first systems job?
Past work working in circulation of an academic library as well as volunteer and then later intern work at a public library. This was extremely useful for the library-centric folks reviewing my application and interview. The computer information systems background and some past experiences with internships and corporate IT work were extremely handy in communicating with IT folks during the interview process as well as within the day-to-day of the role.

Did you do any systems/technology internships that were beneficial?
I did two. One was at a Fortune 500 corporation doing entry-level IT help desk type of work. The other was at a public library within the systems department there. Both were extremely eye-opening.

What skills have you had to learn on the job?
Collection development aspects and new technology skills like a programming/scripting language I wasn't familiar with that a predecessor or the systems in place relied on.

What skills or knowledge have been most useful to you in your day-to-day work?
Bash shell, SQL, cloud-computing and SaaS concepts, client/service architecture concepts, the OSI model, basic cataloging stuff, and MARC.

Did you ever work on a project that went very wrong?
Yeah, a discovery layer implementation that exposed that about 30 percent of our collection in OCLC wasn't actually in our collection. We got it cleaned up and our metadata quality was better than ever. I learned a few things: (1) good metadata is everything, and (2) always assume your metadata could be better.

What is one of the most interesting or complex projects you led or worked on?
A custom streaming video solution. There were a few technical challenges like authentication and access that were really challenging without serious software development. We ended

up using an IaaS provider to host and stream the content, while using EZproxy to control authentication and access. It worked quite well, and it was cheap and didn't rely on campus IT or a pricey vendor. My approach was to research options available and utilize systems we had control over to test and eventually offer a solution to a problem.

What are some other major projects you've been involved in?
Systems migrations of various sorts mostly, but other emerging technologies projects as well as applying management information systems and project management to library workflows like Jira or SharePoint.

Have you ever led a systems migration?
Yes. I was very conscious that I felt change management and buy-in were more important than the technical aspects of the migration. Everyone had to feel comfortable with the new system. It helped that the new ILS was better than the old ILS in almost every way, but training, one-on-one meetings, and documenting workflows I think played a huge part in the overall success. Also, clean data and good metadata are really important.

Can you describe your day-to-day work or what a routine day is like?
I break it down by support, maintenance, and projects. There's rarely a day when I don't work on all three, but the amount of time on each is all over the place. Depends on the day. There's also research and service work that get thrown in occasionally. I find sticking to a schedule for working on certain issues impossible.

What is the most challenging aspect of your position?
Managing expectations, time management, and assigning a priority to something. Leading change regarding library systems is also really challenging sometimes.

What do you feel is the most rewarding or interesting part of working with systems/technology?
I get to use technology to reduce or destroy barriers to library resources for my community. Those resources enrich the lives of those individuals, and the overall community and culture of the community become richer as well. How cool is that?

How do you see systems librarianship changing over the next five to ten years?
Solidification of LSPs, standard access-friendly e-resource tech, more fighting with publishers and vendors over where systems live and who has control and access to patron data, more open-source options, more CRM-like reporting and analytics on collections and those who use them . . . for better or worse. More dependence on project management and software development with perhaps more dependence on good communication skills between vendors, the library, and other parties like campus or town IT.

What do you think are the most important skills or qualities a systems librarian needs to have?
The ability to balance the ideals and values of librarianship with the technology available to you, your skill set, and budget or maybe just patience, good communication, empathy, and passion.

What do you most wish you had known before becoming a systems librarian?
Technology is not a panacea to the challenges libraries face in the twenty-first century.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
I'm never bored.

⑥ Notes

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⑥ Resources

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Other Relevant Current Technology

IN THIS CHAPTER

▷ Computers and Hardware

▷ Cloud Computing

▷ Open-Source Software

▷ Social Software

SUSAN THOMPSON WRITES in *Core Technology Competencies for Librarians and Staff* that "there are no recognized standards or common set of knowledge for systems work."[1] This is because every library systems position is different and the systems being used in libraries are constantly changing and evolving. While not all of the following technologies are used in all libraries, most of the technologies listed are being used in some combination by most libraries today.

Computers and Hardware

Every systems librarian should know something about computer software and hardware; however, there is so much to know that the average systems librarian without an IT background is unlikely to know everything. For some libraries that have an internal or external IT department, the systems librarian may not have responsibility over the library's computer hardware, but for those that do, a minimal knowledge of computer operating systems is necessary.

Windows

Microsoft Windows is still a dominant operating system in use across libraries of all types. Many libraries use Windows PCs as well as Windows servers. Basic Windows

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troubleshooting skills will come in handy as well as some networking knowledge. Since Windows PCs and servers are both vulnerable to viruses and other malicious attacks, it will be helpful to be aware of security patches, new software updates, antivirus software, and firewalls.

Mac

While Macs are less dominant in libraries than Windows computers, they are sometimes implemented for the use of particular software, primarily in school or university libraries. Macs are generally less vulnerable to viruses than Windows. Troubleshooting knowledge will come in handy with Macs too, as well as familiarity with Mac-specific software and Mac versions of common Windows software.

Linux

Linux is an open-source operating system that comes in a variety of distribution options for both desktop systems and servers. Since Linux isn't tied to any particular hardware, it can be freely downloaded on any machine, potentially extending the life of older computers that can no longer run Windows software, both things that make it an attractive option for libraries. Since there are so many different Linux distributions, there isn't a single source of information for support; however, Linux user communities for the more popular distributions are large and tend to be helpful resources for other users.

> "Practical experience is key. If you have no Linux experience, set up a system on your own and learn how to navigate the command line."—systems survey respondent

Servers and Networking

While those without a background in IT are unlikely to have the depth of knowledge possible when it comes to servers and networking technology, Susan Thompson writes that "systems librarians are expected to understand the principles if not the day-to-day operation of server and network technologies."[2] Many libraries will have a separate IT department that handles server and network administration, but for those that don't, the job may fall to the systems librarian. It may be necessary to maintain a server or set up a local network for access to a shared printer or other resources. Wireless networks are common today, and as with the responsibility of maintaining operating systems, server and network security should be a priority.

Cloud Computing

In 2017, Marshall Breeding wrote that "cloud computing stands out as one of the most important technology trends of the current era" and that "in the next 5 years few libraries will find it viable to operate local servers."[3] The cloud computing model significantly changes the job responsibilities of systems librarians, whose focus moves to communication with vendors rather than server administration. While some use the term "cloud

Technology Responsibilities of Survey Respondents

Category	Percentage
ILS/LSP	84.0%
DISCOVERY PLATFORM	75.1%
AUTHENTICATION	68.0%
LIBRARY WEBSITE	59.7%
LINK RESOLVER	58.0%
LIBGUIDES/LIBAPPS PLATFORM	53.0%
ELECTRONIC RESOURCES MANAGEMENT SYSTEM	46.4%
INTERLIBRARY LOAN SYSTEM	45.3%
DIGITAL REPOSITORY	38.7%
COMPUTER SERVERS	34.3%
NON LIBRARY-SPECIFIC COMPUTER SOFTWARE	34.3%
COMPUTER HARDWARE	31.5%
SCANNERS/PRINTERS	29.8%
VIRTUAL REFERENCE SYSTEM/CHAT	28.2%
OTHER	17.1%

Figure 6.1. The technology responsibilities of survey respondents.

computing" interchangeably with software as a service, the overall concept of cloud computing comprises several other service models in addition to SaaS, including infrastructure as a service (IaaS) and platform as a service (PaaS).

Software as a Service

Software as a service (SaaS) is a model in which a vendor hosts a software application and provides access to it online. SaaS is considered part of cloud computing and has become increasingly popular in recent years. Libraries that use SaaS products eliminate the need to host the application on their own servers, which reduces the technical workload for staff, as well as the expense of maintaining the appropriate hardware. Vendors typically automatically apply updates to the software, meaning library staff don't have to spend time downloading and installing new versions of software or security patches. While this all saves time and expense for the library, there is an ongoing cost associated with the service, and the library must depend on the vendor for security of the application and its data, must deal with any vendor downtime, and must sometimes rely on the vendor for any customizations, if they are possible.

> "Many of our systems are going SAAS (software as a service), meaning my role as admin looks very different."—systems survey respondent

APIs

In the simplest terms, an API (application programming interface) is a method for transferring data between applications. Many modern websites incorporate various APIs in order to take advantage of data sets available elsewhere, or they can be used to extend

applications by transmitting data to or from other applications. Marshall Breeding has also espoused the importance of knowing how to use APIs, writing, "For those involved with programming, especially with functionality or data exchange across different systems or services, it is essential to have a strong grasp of APIs."[4] To use most modern APIs, a knowledge of JSON is necessary in order to parse the data being transmitted, as well as knowledge of a programming or scripting language such as JavaScript, Python, or PHP.

Open-Source Software

Open-source software is software whose source code is made freely available. In contrast to proprietary software, open-source software can be downloaded, used, modified, and distributed at no cost. While the use of open-source software allows for the ultimate amount of freedom, it is not without costs. In order to successfully use open-source software, someone on the library's staff must be technically adept enough to install and configure it. The library will also need to host the software on its own server and will be responsible for any necessary modifications, unless they decide to pay for off-site hosting. However, for libraries, open-source options "offer the possibility of writing new features directly into the code, completely changing how the search engine indexes content, and allows expansive integrations with other interfaces or APIs."[5] Some examples of open-source software commonly used in libraries include the integrated library systems Koha and Evergreen; the Linux operating system (particularly Ubuntu); the repository software systems DSpace, Islandora, Omeka, and EPrints; and the discovery interfaces VuFind and Blacklight.

Social Software

David Lee King writes that using social media allows libraries to "directly connect and have conversations with customers outside the building. This ability opens new forms of reference services, online readers' advisories, and remote consultation services, as customers can communicate with library staff through social tools, like Facebook and Twitter, or through a comment box on the library's website."[6] While libraries have been using social media to communicate with and provide services to patrons for many years now, it can be difficult to establish a successful social media campaign. A coordinated effort and social media strategy may help, along with an acute awareness of the library patrons' preferences and use of social media.

Virtual Reference Systems

As more services have moved online, including more educational options for students to learn remotely, virtual reference systems have appeared that allow libraries to offer the same type and quality of service to distance patrons as they do to those on-site. Virtual reference systems allow patrons to submit questions remotely using a system that tracks the question and the response. Chat services allow libraries to offer reference services in real time, facilitating online conversation between patron and librarian. Newer systems include features like video chat or web conferencing software that allows for the exchange of both audio and video. Some examples of virtual reference systems include Springshare's LibAnswers software, which includes LibChat, a library chat service. OCLC offers the

QuestionPoint virtual reference service, a consortial service that allows libraries to offer 24/7 reference service by sharing coverage with other libraries. LibraryH3lp also offers an online reference service that includes chat, screen sharing, and text options. There are also more general options not specific to libraries for offering virtual reference including things like Second Life, a virtual world where librarians and patrons can interact in avatar form; chat services like Meebo; and VOIP (voice over Internet protocol) and web conferencing software like Skype and Blackboard Collaborate.

Key Points

No systems librarian will know everything about every library technology being used, especially at the beginning of their career, and most will never need to. Instead, most systems librarians will become experts in the specific systems used in their library through on-the-job experience. Library schools often don't have access to proprietary software to allow students to gain experience with library-specific technology, and this knowledge often has to be acquired through internships, via field studies, or on the job. Additionally, the technology being used today won't necessarily be the technology used tomorrow, and systems librarians in particular will find it necessary to frequently update their skills and knowledge through continuing education, professional development, or self-teaching.

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Interview with a Systems Librarian

John Felts
Head of Library Technology and Systems, Coastal Carolina University

How many years have you worked as a systems librarian?
Twenty-three.

Is there anything about your current position that makes it a unique representation of systems librarianship?
I'd say only that we do so much with so little. My shop has one systems/IT programmer, a digital projects librarian, and me. We handle everything library-technology-related, including all information search and discovery platform configuration and support, the ILL environment, digital projects, authentication, the website, and now an institutional repository for the university. It's nuts but unfortunately not terribly uncommon. As much as library schools seem to be focusing on teaching specialized skills, the more diverse and flexible you can be in your skill set (a jack of all trades), the better you'll be at any one specialty.

What led you into working with technology?
I started working as a second-shift serials closed stacks assistant in an academic library in 1990. We were running CD-ROM towers and dumb terminal computers that were constantly breaking. I always volunteered to take a look at things, which developed in me an interest and knowledge in library systems. That basic willingness to learn new things and adapt to new technologies has made this career a fun and exciting one for me.

Did you do any systems/technology internships that were beneficial?
During the last semester of my MLIS, I took a job at a special library (a furniture library!) where I created a database of their holdings. I bought the hardware and software, created an Access database, created my own controlled vocabulary and cataloged every item in that library, and developed an OPAC of sorts so that staff and patrons could view their holdings. I still use things today that I learned from that six-month stint so many years ago!

What skills or knowledge have been most useful to you in your day-to-day work?
Understanding the fundamentals of technology: hardware, software, general network and communications protocols, and web design. With these skills, I could go into most any direction in technology that I wanted. I also spent many hours on the reference desk, taught hundreds of library instruction classes, and have a working knowledge of cataloging, acquisitions, and collection management. Since I have a general understanding of all library services, I can better apply my knowledge of technology across the entirety of library operations.

What are some other major projects you've been involved in?
I'm currently a new committee member on the RA21 initiative (ra21.org/), now the Coalition for Seamless Access. I think this will revolutionize the way we handle identity management and authentication via federated access management. I was also a cofounder and patent holder for Journal Finder, the first OpenURL resolver and knowledge base in America.

Have you ever led a systems migration?
Yes, I'm currently in my fourth migration. There's just too much to tell here, but things have gotten easier since we've moved away from client-server architectures to cloud-based, browser-driven LSPs. But I'll just say that the technology is the easy part; it's the change management aspect of dealing with the people affected that's the most challenging. Most librarians I've worked with don't like change!

Have you ever led a website redesign project?
Sure. Let's put it this way: don't attempt a website redesign by committee. It won't work!

Can you describe your day-to-day work or what a routine day is like?
This is technology; there is no routine! Lots of coffee, then put out any fires, provide support where needed, then continue moving forward with your project plans and new initiatives.

What is the most challenging aspect of your position?
The rapid and ever-changing technology landscape. It's also the most fun aspect of my position!

What do you feel is the most rewarding or interesting part of working with systems/technology?
You can directly see the benefit to our users of platforms and services you had a direct hand in configuring, implementing, and optimizing.

What do you think are the most important skills or qualities a systems librarian needs to have?
Flexibility, patience, resourcefulness, being self-directed, and thinking fast on your feet. The rest is learned on the job.

What do you most wish you had known before becoming a systems librarian?
Had I known how fundamentally opposed to change many librarians were/are and how perfectionism would slow down if not potentially derail new initiatives, I'd have spent more time studying human psychology and interpersonal relationships!

What has been the most surprising thing that you didn't expect about working as a systems librarian?
When I started, I was seen as "the anti-librarian" since I was implementing technologies that didn't require a student to come into the library and speak to a reference librarian, the self-described "gatekeepers of knowledge." Fortunately, I think that librarians with that attitude have mostly aged out of our profession.

◎ Notes

1. Susan M. Thompson, "Management and Technology Competencies for the Systems Librarian," in *Core Technology Competencies for Librarians and Library Staff: A LITA Guide*, ed. Susan M. Thompson (New York: Neal-Schuman, 2009), 79.
2. Ibid., 91.
3. Marshall Breeding, "Elevating Tech Skills for the Cloud," *Computers in Libraries* 37, no. 8 (2017): 17, www.infotoday.com/cilmag/.
4. Ibid.
5. Simon Barron and Andrew J. Preater, "Critical Systems Librarianship," in *The Politics of Theory and the Practice of Critical Librarianship*, ed. Karen P. Nicholson and Maura Seale (Sacramento, CA: Library Juice Press, 2018), 106.
6. David Lee King, "Why Stay on Top of Technology Trends?" *Library Technology Reports* 54, no. 2 (2018): 9, journals.ala.org/index.php/ltr/article/view/6579/8777.

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◎ Resources

Windows

Microsoft Security: www.microsoft.com/security
Spiceworks: community.spiceworks.com/windows
PCWorld: www.pcworld.com/

Mac

Apple's Mac Support: support.apple.com/mac
Macworld: www.macworld.com/

Linux

Linux.org: www.linux.org/
Linux Today: www.linuxtoday.com/
DistroWatch.com: distrowatch.com/dwres.php?resource=major

APIs

ProgrammableWeb's API University: www.programmableweb.com/api-university/what-are-apis
-and-how-do-they-work
JSON.org: www.json.org/
W3schools JSON Intro: www.w3schools.com/js/js_json_intro.asp

Open-Source Software

TechSoup for Libraries, Free and Open-Source Software in Libraries: www.techsoupforlibraries
.org/planning-for-success/innovation/free-and-open-source-software-in-libraries

Emerging Technology

AS TECHNOLOGY HAS CONTINUED to advance and play a more prominent role in everyone's lives, libraries have responded by increasingly creating new positions specifically devoted to new and emerging technology. While a number of libraries have created librarian positions dedicated solely to emerging technologies, in many libraries, both traditional and emerging technology falls to the library's primary technology administrator, and in some cases, this may be the systems librarian.

Defining and Implementing Emerging Technologies

What makes a technology "emerging"? There has never been a clear consensus on how emerging technologies are defined, but Richard Hayman and Erika Smith write that emerging technologies are those technologies that are still under development, not yet mainstream, and innovatively address users' needs.[1]

But just because a technology is new and trendy and may be talked about at conferences or in blogs doesn't mean it's right for every library. Implementing emerging technologies requires a fair amount of risk and experimentation, and it is important to know the administration, the library's culture, and its patrons before diving in. Library technologist David Lee King lays out his method for developing a plan for implementing new technologies in the *Library Technology Report* "How to Stay on Top of Emerging Technology Trends for Libraries." He recommends following these steps before getting started:

1. Learn about the trend.
2. Share with and get buy-in from management.

3. Research community interest.
4. Create a plan.
5. Start small.[2]

Hayman and Smith also recommend doing due diligence before implementing any new technology by first identifying objectives, assessing how the technology can be used to meet those objectives, and then conducting environmental scanning and research to gather both hard and soft evidence from "trusted communities of practice."[3] Only once this preliminary work has been done should the work to implement the new technology begin.

> "Have an open mind and look at things sideways."—systems survey respondent

Tracking Technology Trends

With new technology being developed all of the time, it can be difficult to keep up with current trends and know where to find information about which trends are likely to impact libraries in particular. Some places to keep track of technology trends include technology-focused conferences, websites, and magazines. Social media can also be a place to find up-to-date information, by following technology-related associations such as LITA or individual librarians and technologists, such as panelists for LITA's Top Technology Trends session at ALA's annual conference. Some of the most useful resources for finding out about trending technologies are listed below.

ALA Annual Conference

Each year ALA's large annual conference features a LITA[4] panel on Top Technology Trends where panelists discuss new and upcoming technology predicted to impact libraries. Even if conference attendance is not possible, the topics of discussion are usually widely shared online, such as on the *American Libraries* website.[5] Some of the trends discussed at the 2018 panel included quantum computing, psychometrics, embedded digital libraries, the death of transparency, and next-generation learning management systems.

Code4Lib

Code4Lib's annual conference centers on technology and often includes sessions on emerging technologies and their current or potential library use as well as innovative uses of existing technology. While it may not be the place to first hear about new technologies, Code4Lib is great for providing practical examples of how libraries are using technology today. The 2019 Code4Lib conference included sessions about Blockchain, machine learning, and linked data.

LITA Forum

LITA is a division of ALA focused on information technology, and its annual forum features sessions and workshops on new and innovative technology being used in librar-

ies. LITA Forum focuses on library technology that is already in use, but sessions often include new uses for cutting-edge technology. The 2018 LITA Forum featured sessions on augmented and virtual reality, as well as Blockchain.

CES

CES, or the Consumer Electronics Showcase, is a huge annual trade show featuring the world's newest consumer electronics. While not all of the new technology featured at CES will end up playing a role in libraries, it is often technology that appeals primarily to consumers, and as these technologies gain traction, consumers may expect to find them being used in all areas of their lives including in libraries. In addition, much of the technology featured may have crossover appeal and sometimes reinforces predictions for technology found in other places. For example, technology exhibited at the 2019 CES included voice assistants, artificial intelligence, and the Internet of things.

South by Southwest

South by Southwest is another general conference not specifically aimed at libraries but that features new innovations in consumer technology that may eventually have an impact on libraries. The 2019 SXSW conference featured sessions on Blockchain, artificial intelligence, and virtual and augmented reality, all technologies that are predicted to become important to libraries in the future. Technologies that were first exhibited at SXSW include Twitter, Foursquare, and Oculus Rift.

EDUCAUSE Horizon Report

Each year EDUCAUSE publishes its Horizon Report, which features upcoming technology predicted to have an impact on higher education. The report lays out various technology along with a potential timeline for widespread adoption, from one year or less to four to five years ahead. The 2019 Horizon Report named mobile learning and analytics technologies as those likely to become widespread within the next year or less, mixed reality and artificial intelligence as those coming two to three years in the future, and Blockchain and virtual assistants as technologies still four to five years away from prevalence.[6]

TechSoup for Libraries Blog

The TechSoup for Libraries blog is an excellent place to track news affecting the library world, with a frequent focus on technology including the "Library Tech Newsbytes" column. A blog post in January of 2019 on "Library Tech Trends for 2019" cited privacy, cyberbullying, graphic design trends, fake news and fake information, the resurgence of print books, and facial recognition as technology predictions for 2019.[7]

Wired

The monthly magazine *Wired* is published both online and in print and focuses on emerging technologies and culture. *Wired* can be an excellent way to keep up with new and emerging trends in technology, among other wide-reaching topics. Recent topics include cybersecurity and digital privacy and content about Facebook, Amazon Echo, and Huawei.

Mashable

Like *Wired*, Mashable contains digital content around technology news and consumer products. Content includes product reviews, tech company news and new releases, and features about online privacy and cryptocurrencies.

> "Technology moves a lot faster than the systems do!"—systems survey respondent

Emerging Technologies to Watch

Below are some examples of what are currently considered emerging technologies. Some are already being used in libraries and may continue to be used further as they fully emerge. Others may never take off or may never find their niche for use in a library environment. Nevertheless, they are technologies on the horizon that have been predicted to have an impact on users and that innovative librarians are already finding potential uses for. Figure 7.1 shows the percentage of systems librarians surveyed for this text who answered that they are either currently using or likely to start using the listed emerging technologies in their libraries.
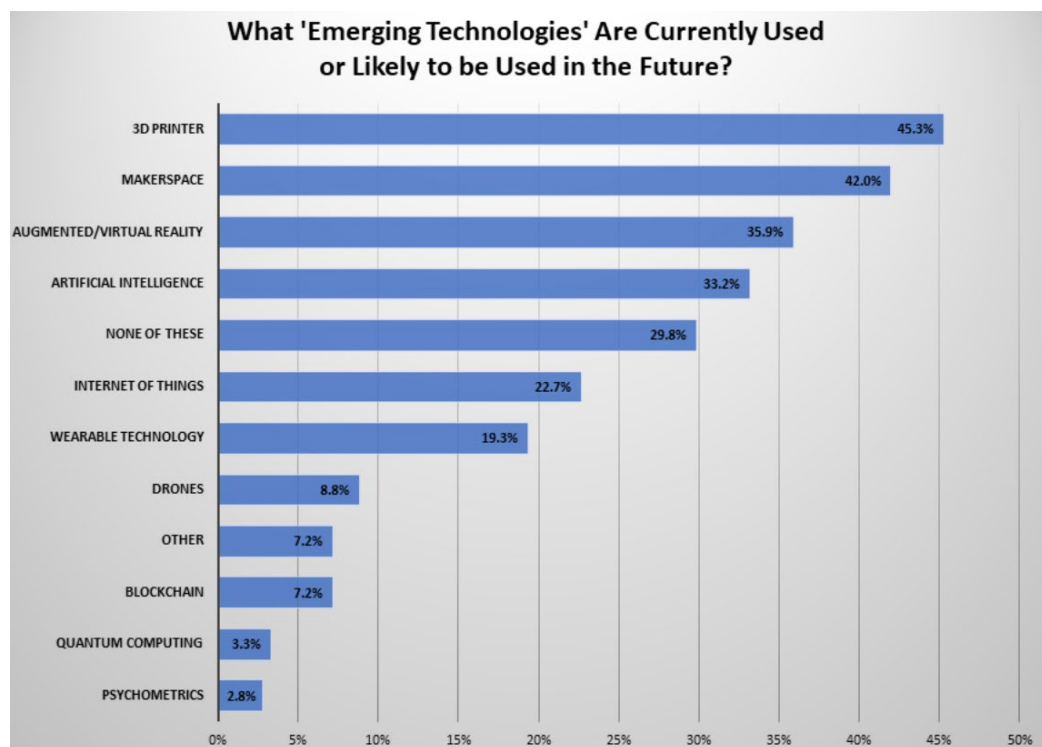

Figure 7.1. Percentage of emerging technologies currently being used by systems librarians or likely to be used in the future.

Makerspaces

Makerspaces have been around for several years and are starting to become more mainstream, but they are not yet so prevalent that they can't still be considered an emerging technology. In many public libraries, makerspaces are craft spaces, designed to allow patrons to put technology to creative use to experiment and build things. In academic libraries, makerspaces often focus more on the educational potential of technology. 3D printers are a common makerspace item, but depending on the type of makerspace, these laboratories can also include various types of tools; robots; Arduino and other circuitry kits; Raspberry Pis; photo, video, and podcasting equipment; virtual reality headsets; and anything else that might inspire innovation and creativity.

3D Printers

3D printers are often found in makerspaces, but they can also be used as a separate technology. 3D printers allow users to print out 3D models of things like toys, business prototypes, building models, parts for repairing broken items, anatomy models, and more. When launching 3D printer services, it is a good idea to have written policies in place to prevent unwanted use of the printer, such as the printing of weapons.

Blockchain

Most people who are familiar with Blockchain probably know it as the tamper-proof ledger system behind digital currencies like Bitcoin, but some researchers are already considering other potential uses for the technology, including some that may eventually impact libraries. Matthew Hoy has written about the possible uses of Blockchain technology to create distributed, verifiable medical or educational records, digital rights management, or even time-stamped journal articles.[8] Blockchain technology is still far from being in common use in libraries, but with new research being done, it may be a technology that has significant impact on libraries in the future. The San Jose State University School of Information recently received a $100,000 grant from the Institute of Museum and Library Services to investigate potential uses for Blockchain in libraries.[9]

Augmented and Virtual Reality

While augmented and virtual reality is slowly becoming more mainstream with consumer products like the HTC Vive, Oculus Rift, and their more affordable counterpart, Google Cardboard, gaining in popularity, it is still considered an emerging technology. Hannah Pope's librarian survey found that 44 percent of respondents had implemented a virtual or augmented reality experience in their library, while 34 percent responded that they were in the process of creating one or planning to in the future.[10] Virtual reality offers users the opportunity to immerse themselves in a simulated environment, while augmented reality applies an enhanced layer of information over a real-world environment. A popular example of augmented reality was the Pokémon Go craze, which many libraries found ways to take part in by turning the library into a PokéStop or hosting Pokémon-themed events. Besides games, there are many potential applications
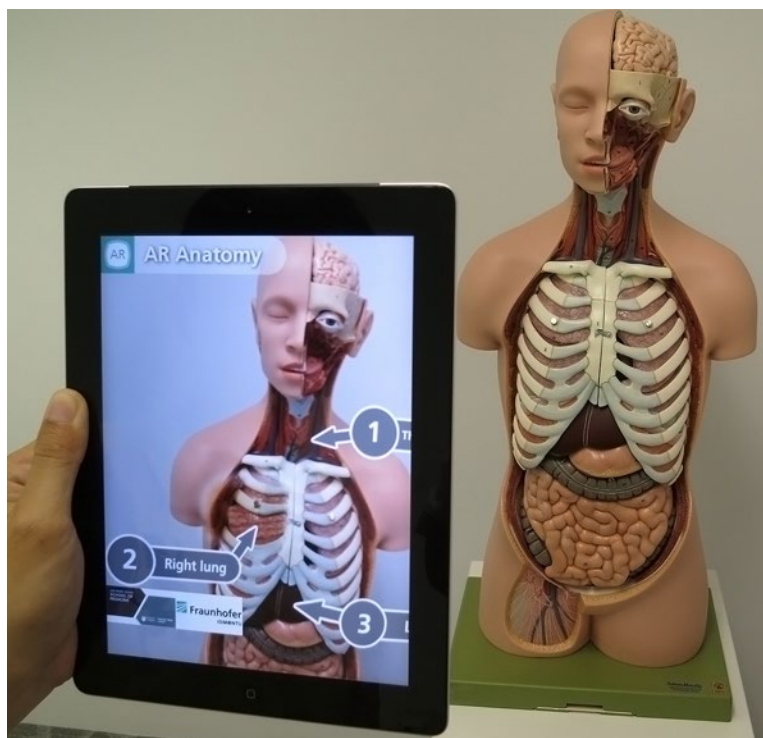
Figure 7.2. An example of an augmented reality application. *Pixabay*

for virtual and augmented reality in libraries, including virtual library tours, virtual tourism, training, and team building.[11]

Artificial Intelligence

Artificial intelligence and machine learning involve "teaching" computers how to think through the use of algorithms. Artificial intelligence technology has already made significant headway in now mainstream consumer products like Siri and Alexa, but as the technology continues to develop, the potential for use by libraries is also likely to grow. Some libraries are already using products like the Amazon Echo or Google Home for reference assistance while others are exploring the use of machine learning to automate the creation of metadata for digital collections. Like other emerging technologies, artificial intelligence has issues surrounding privacy, security, and implicit bias that are still being examined and require careful consideration before implementing in the library, but the potential for use is there as AI continues to permeate modern life and culture.

Internet of Things

Most people have become at least somewhat familiar with the "Internet of things" as the idea has become more mainstream in consumer products such as Nest, Roomba, Ring, Amazon Echo, and Google Home. The idea behind the Internet of things is that everyday objects can be connected to the Internet, transmit data, and perform tasks for us. However, for the most part, these items have not yet found mainstream use within libraries. Matthew Hoy writes that the problem is primarily one of security, that "when every connected object is passing data back and forth, there will be breaches and security concerns."[12] This is an issue that hasn't been fully resolved, yet librarians have suggested

numerous potential uses for this technology in libraries, including for climate control, way-finding, mobile reference, and resource availability.[13]

Quantum Computing

Quantum computing may be further from the mainstream than many other still "emerging" technologies, but it made the list of LITA's Top Technology Trends discussed at the 2018 ALA conference, so its potential impact on libraries as well as for consumer technology is already being evaluated. Quantum computing allows for the processing of vast amounts of information in a fraction of the time it would take classical computers, which could have "severe consequences for the encryption methods on which libraries rely today."[14] Quantum computing is a technology still being developed, but as it reaches maturity, it could impact the foundation of computing, which would affect libraries as well as all other areas of digital life.

Psychometrics

Psychometrics, the measurement of behavior and other characteristics through the use of data, is another topic that was discussed at the 2018 ALA Top Technology Trends panel. While libraries have the ability to collect a great deal of data about their patrons, the focus so far has been on preserving user privacy, protecting user data from third parties, and maintaining transparency about data collection. Psychometrics could be used to provide book suggestions to patrons or otherwise personalize or improve the online library experience, things many websites already do and users have come to expect to some extent. But as with many technologies that collect and use patrons' personal data, there are ethical considerations at play that may limit its potential use for libraries.

Drones

Drones have become more mainstream in recent years but have yet to become a significant aspect of libraries and library service. The "unmanned aerial vehicles" are flown by hobbyists, used for delivering packages, or used to take aerial photographs and video. In libraries, they are sometimes offered for patron use in makerspaces or as part of the circulating collection, but there is potential to use drones to extend the reach of Internet access or deliver items to remote patrons or disaster areas as the technology grows.[15]

Wearable Technology

Wearable technology is an Internet-connected electronic device that is worn on the body. Because they are connected to the Internet, they are considered part of the "Internet of things," but wearables also belong to their own category of technology. Some examples include activity trackers like Fitbit, as well as smartwatches and Google Glass. While so far wearable technology seems to be mostly limited to consumer products, there are still potential applications for libraries, from using Google Glass to record virtual library tours

> "Change—get used to it."—systems survey respondent

to providing library services that are accessible through a smartwatch. Libraries may need to explore new possible ways to incorporate wearable technology as users come to expect it as a ubiquitous part of their everyday life.

◎ Key Points

One of the most challenging yet exciting aspects of a library technologist's position is the ever-changing landscape of library technology. As should all librarians, systems librarians especially should be aware of new and emerging technologies and the ways they could impact users or library services. Systems librarians who are responsible, either wholly or in part, for implementing emerging technologies in their library will need to keep abreast of new technology but will also need to consider implementing any new technology in thoughtful and sustainable ways. Information about new and emerging technologies can be gleaned by attending technology-focused conferences, by reading consumer technology reports, and through library blogs and websites.

*   *   *

◎ Interview with a Systems Librarian

Marie Martino
Systems and Catalog Services Librarian, Moraine Valley Library

How many years have you worked as a systems librarian?
Nine years.

Is there anything about your current position that makes it a unique representation of systems librarianship?
My position as a faculty member requires me to teach info/digital literacy classes and participate on committees in service to the college. I also regularly work at the reference desk. My role is a tech services/public services hybrid of sorts. I love this aspect of my job.

Was it always your intention to be a systems librarian?
No. I have a background in film/photography. A few years after (art school) graduation, I found myself working at a library, loved it, and went to library school. When I graduated library school, I knew I wanted to work for an academic library, my interests being instruction and technology. Frankly, I didn't even know what systems librarianship was until a job opened up at a nearby library and I began researching it.

Do you feel that your education prepared you for work as a systems librarian?
My MLIS education did not prepare me because my program did not offer much tech-related coursework at the time (2008/2009). I took some more college courses, post-MLIS, to help me fill in some of the gaps. I ended up pursuing an MSIS after getting the systems position.

What skills or experience did you have that helped you get your first systems job?
I had a fair understanding of technology to be able to do the job, but demonstrating that I knew how to manage projects, work well with others, and teach college students gave me the advantage for this particular position.

What skills have you had to learn on the job?
Cataloging, working with regular expressions, system-admin-specific duties (how to build a batch load table, extract data from the system, configure system rules, etc.).

What skills or knowledge have been most useful to you in your day-to-day work?
Troubleshooting technology, prioritizing and planning projects, effectively communicating with others with varying levels of tech expertise (from novices to IT professionals).

Did you ever work on a project that went very wrong?
No matter how useful, just because you spend time building a tool/creating a resource, doesn't mean it will be used. Identify key stakeholders beforehand, include them in the process, get them invested/excited about the project. Helps when support comes from the top down.

What is one of the most interesting or complex projects you led or worked on?
Systems migration. Plan, implement, evaluate. Communicate throughout, be completely transparent with staff—listen to them and their concerns, involve them in the process. You won't have a successful migration unless staff is completely on board.

What is the most challenging aspect of your position?
Interoperability issues, dealing with vendors (sometimes), asking for money/budget increases from administrators.

How do you see systems librarianship changing over the next five to ten years?
More proprietary lib systems are going hosted. There will be less need to manage hardware.

More mobile. Next-gen systems will transform the way we work. Linked data/BIBFRAME will be a standard. We will be even more data-driven. User privacy will persist as an issue in the future. We may see more and more examples of IoT, wearables, AI, and augmented reality tech popping up in libraries.

What do you think are the most important skills or qualities a systems librarian needs to have?
Current awareness of the field, ability to self-teach and train others, remaining agile.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
How much my soft skill set helps me be successful at my job.

Is there anything else you would like to mention that hasn't been asked?
Professional development is key!

◉ Notes

1. Richard Hayman and Erika E. Smith, "Sustainable Decision Making for Emerging Educational Technologies in Libraries," *Reference Services Review* 43, no. 1 (2015): 8, doi.org/10.1108/RSR-08-2014-0037.

2. David Lee King, "How to Stay on Top of Emerging Technology Trends for Libraries," *Library Technology Reports* 54, no. 2 (2018): 1–35, journals.ala.org/index.php/ltr/article/view/6579/8777.

3. Hayman and Smith, "Sustainable Decision Making," 15.

4. LITA, "LITA Top Technology Trends," American Library Association, accessed May 24, 2019, www.ala.org/lita/ttt.

5. Carrie Smith, "2018's Top Tech Trends," *American Libraries*, June 26, 2018, americanlibrariesmagazine.org/blogs/the-scoop/2018s-top-tech-trends/.

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7. Jim Lynch, "Library Tech Trends for 2019," TechSoup for Libraries, January 14, 2019, www.techsoupforlibraries.org/blog/library-tech-trends-for-2019.

8. Matthew B. Hoy, "An Introduction to the Blockchain and Its Implications for Libraries and Medicine," *Medical Reference Services Quarterly* 36, no. 3 (2017): 273–79, doi.org/10.1080/02763869.2017.1332261.

9. San Jose State University School of Information, "Blockchain Technology," accessed May 25, 2019, ischool.sjsu.edu/post/blockchain-technology.

10. Hannah Pope, "Incorporating Virtual and Augmented Reality in Libraries," *Library Technology Reports* 54, no. 6 (2018): 8, journals.ala.org/index.php/ltr/article/view/6779.

11. Ibid, 9.

12. Matthew B. Hoy, "The 'Internet of Things': What It Is and What It Means for Libraries," *Medical Reference Services Quarterly* 34, no. 3 (2015): 354–55, doi.org/10.1080/02763869.2015.1052699.

13. Ibid, 356.

14. Smith, "2018's Top Tech Trends."

15. Library of the Future, "Drones," American Library Association, accessed May 29, 2019, www.ala.org/tools/future/trends/drones.

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Mindsets and Skill Sets

WHILE TECHNOLOGY KNOWLEDGE is obviously a vital part of any systems librarian position, other, non-technical skills can be equally as important to a systems librarian's success. Some examples include the communication skills, planning skills, and analytical skills needed to accomplish many technical projects within the library. There are also many skills that are technical in nature but not directly tied to particular library systems, which will be important pieces of the systems librarian's toolbox, such as programming and scripting languages, version control, and project management skills.

While technical savvy and experience with various library systems will be beneficial to a systems librarian during their career, Thomas Wilson identifies some of the specific attitudes beneficial to systems librarians as flexibility, sound judgment, curiosity and risk taking, persistence, time management, cooperativeness, skepticism, and resiliency.[1] In his

column for *Library Journal*, Roy Tennant mentions many of the same qualities, along with the capacity to learn, a public services perspective, and the ability to foster change, work with others, and work independently.[2] While the technology in use has changed significantly since these lists were written, the qualities needed to work with technology have not. Specific technologies can and will have to be continually learned, but these other traits and skills are the ones that will make it possible to survive and thrive in a world of constant change and ambiguity.

Communication Skills

One of the most important skills for any systems librarian is the ability to communicate well, both verbally and in writing. In the fifty-five systems positions analyzed for this text, over 63 percent of the job ads specifically named communication skills as either a required or preferred skill, making it the fourth most-mentioned skill after ILS experience, programming knowledge, and cataloging and metadata standards. Especially important in today's current technical environment, "systems librarians will need to communicate with library administrators about the importance of their involvement in decision-making, contribute by sharing their technical perspective, and educate non-technical staff of the new technology."[3]

Good communication skills are more than just the ability to write e-mails or give presentations. At the heart of good communication is being thoughtful and intentional about sharing information and doing so in a clear and timely manner that facilitates processes, reduces uncertainty, and builds trust among teams and colleagues.

For example, communication will be a vital part of any major technology project taking place in the library, from clearly communicating the need for the new technology; the process involved in selecting the technology; feedback and input gathered from library staff and patrons; the project's timeline, steps, and responsible parties; and progress on the new technology's implementation. All of this information will need to be gathered, organized, and shared in a logical and timely way during the process.
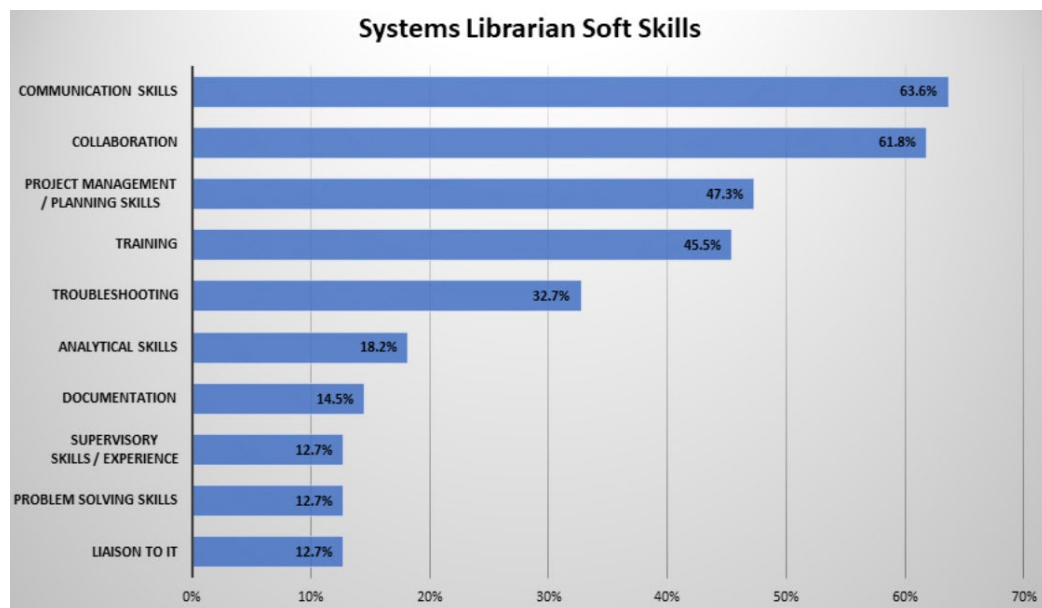

Figure 8.1. Soft skills most requested in systems librarian job advertisements.

Communicating well with staff will help keep the project on track, keep responsible parties accountable for their part of the project, and minimize worry or gossip. Likewise, communicating upcoming changes with patrons will help prepare them for the new technology so that they aren't blindsided by a sudden change and can be made aware of training opportunities and potential uses for the new technology. Some of the ways that communication about changes and new projects can be shared with library staff are through staff meeting announcements, e-mails, project management software, or staff intranet. Communicating with patrons may be done through blogs and social media, the library website, flyers, newsletters, posters, bulletin boards, or e-mail.

⟳ Documentation

An important part of communication is documentation. Systems librarians are often tasked with documenting technical workflows or writing documentation to assist library staff with learning various technical processes. When writing documentation, it is important to be clear and succinct and avoid technical jargon that may confuse readers. Images or annotated screenshots can also help clarify especially tricky processes and make it easier for unfamiliar readers to follow along and understand what is being described. Breaking the process down into small steps and documenting how to complete each step will also help readers avoid getting lost along the way.

It can also be helpful to document previous issues and troubleshooting attempts along with how the problem was resolved. It may be months or years before a similar problem comes up again, and having it documented will allow for more quickly solving the issue. Likewise, documenting rarely done tasks will assist with more easily completing the task the next time it becomes necessary, rather than having to relearn the process each time.

> "DOCUMENTATION, it's often overlooked, but it's so critical in regards to troubleshooting and also for the person coming up behind you when you move on/retire, etc."—systems survey respondent

⟳ Collaboration and Relationships

Another important skill often requested by employers is the ability to collaborate and work in teams or with other departments outside the library, such as IT. Across the systems librarian job ads analyzed, nearly 62 percent requested applicants that could work collaboratively. Much of this collaboration involves working with outside entities such as IT or library vendors; however, it is also crucial that systems librarians be able to work with teams within the library. Because systems work usually involves working with staff from both public services and technical services, as well as library administrators, systems librarians must be able to work across departments to achieve goals and complete projects. Systems librarians are also often tasked with project management for large projects, which may involve delegating tasks, gathering information, and training employees across the library.

Many academic libraries will have an IT department that manages technology across the university and may or may not have an IT department within the library as well.

Other large organizations may also have IT departments that manage technology outside of the library. In cases like these, it is very likely that the systems librarian will have to work closely with IT in order to facilitate any large technology projects that require what may be IT-managed pieces such as authentication, integration with university or organization-wide technology, ports, networks, or systems security. In order to accomplish these projects, it will be important to maintain good working relationships with IT staff, with open communication about things such as deadlines, budgets, and other needs. While IT staff are usually well-versed in many different kinds of technology, they may not be familiar with the technology that is specific to library procedures. The systems librarian will need to be able to communicate library needs in a way that makes sense to those who may not have an intimate familiarity with how library processes work and the technology used to accomplish library-specific tasks.

> "Don't assume that because you work more with systems than with people that you don't have to have people skills. It can make the difference in your success."
> —systems survey respondent

Technology Planning

Technology planning can be a major part of systems librarian work, particularly for systems librarians who are department supervisors or who are the sole technology librarian for their organization. In the study of recent systems librarian positions analyzed for this text, over 47 percent of job ads specifically mentioned project management or planning skills as either a required or preferred skill. Technology planning will generally involve needs assessment, or gathering information through staff and patron input, statistics, and benchmarking about what kind of technology the library needs or which current library technology requires updating or replacing. It will also involve evaluating technology based on a variety of criteria including cost, quality, and accessibility, as well as making decisions about whether to host new software on library or organizational servers or with the vendor. The systems librarian is also often responsible for either writing the library's technology plan or leading a team effort to do so. Both technology planning and project management, which is part of the technology implementation process, are covered in more detail in chapter 9.

Project Management

Project management skills are another area that can be either extremely beneficial or imperative for systems librarians to have. In the systems librarian survey, over 85 percent of respondents answered that project management is a skill that is either required in their position or one they use regularly. Figure 8.2 shows the percentage of survey respondents who selected project management along with other key skills as important for their systems librarian position.

A major part of project management will be communication, tying it closely into one of the other most important skills for the position. Project management involves

Skills or Knowledge Required in Systems Librarian Positions

Skill/Knowledge	Percentage
PROJECT MANAGEMENT	85.6%
WEBSITE DESIGN / MAINTENANCE	69.1%
PROGRAMMING OR SCRIPTING LANGUAGES	65.8%
APIS	54.7%
OPEN-SOURCE SOFTWARE	46.4%
GIT / GITHUB	34.3%
OTHER	16.0%
NONE OF THESE	2.8%

Figure 8.2. Percentage of skills/knowledge required in systems librarian job advertisements.

communicating with those working on the project, with administrators and stakeholders, and with patrons and other potential users. Each step of the project, from planning and decision making to implementation, should involve clear communication with those who are or will be affected.

Once decisions have been made regarding what the project will entail, who will be involved, and when the project will be completed, a project plan should be established. The project plan should outline each task that needs to be completed to implement the project, broken down into small, manageable steps. Each task should also include the person who will be responsible for completing that task and the deadline when the task needs to be complete. Having a complete project plan will keep those involved informed about what their responsibilities are and accountable for the timely completion of tasks, as well as communicate to everyone who is responsible for which parts and thus who they can go to for questions regarding that part of the project. Regular meetings in which progress on the project and any potential obstacles are discussed can keep everyone on track to complete the project in full and on time. Effective meetings should include distributing a clear agenda about what will be discussed prior to meeting, offering team members a chance to add topics to the agenda ahead of the meeting, and distributing meeting notes with clear action items and assignments of responsibility after each meeting.

In addition to regular meetings, many project managers use productivity tools or applications to facilitate communication and sharing of information with the project team. These tools can range from free tools with limited or streamlined features to full-featured subscription products. Many of these tools feature the ability to assign and track tasks, share documents and files, and communicate with project team members directly within the application. The right productivity tool for the project will likely depend on the number of people involved, the complexity of the project, and budget considerations. Some popular options include the following:

- Trello
- Asana
- Gantt/TeamGantt.com
- Slack
- Open Project
- Kanbanchi
- Airtable
- Zapier
- Smartsheet
- Teamwork
- Microsoft Teams
- Notion
- Wekan

⊚ Troubleshooting

While troubleshooting methods will vary depending on what type of problem is being analyzed (troubleshooting computer code that won't run will differ significantly from troubleshooting a printer that won't print or a computer that won't turn on, for example), it helps to be very familiar with the system that is having problems. Knowing what it is supposed to do or what a functioning system looks like is the first step to figuring out exactly what is going wrong and where. When it comes to troubleshooting, it also helps to be aware of the most common and the simplest things that can go wrong and start there. Don't start by assuming complete system failure if the computer is simply not plugged in.

Another helpful method can be creating a troubleshooting checklist or a flowchart. A flowchart can help pinpoint where exactly in the process the problem is being encountered and narrow down a possible cause.

There are a variety of other methods that can be used when it comes to troubleshooting. The IT site Spiceworks offers a four-step process for troubleshooting IT issues:

1. Ask the right questions to find out the exact nature of the problem.
2. Gather details using error messages, logs, or screenshots.
3. Replicate the problem and develop a hypothesis for the possible cause.
4. Experiment with potential solutions based on the gathered information.[4]

Troubleshooting is a skill that often comes with experience and familiarity with the systems in question. While some people may be naturally blessed with the ability to figure out complex issues, for others, a strong sense of curiosity, persistence, and analytical skills can go a long way toward developing the ability to troubleshoot effectively.

"Knowing how to figure out what users are really asking is the most important thing. You can always Google the answers."—systems survey respondent

Computer Programming

Depending on the size and type of the library, it is debatable whether or not a systems librarian will need to know computer programming at all. In a large library where there may be professional programmers on staff, either in the library itself or in the IT department, a systems librarian may not need to do much, if any, actual coding. Whether a systems librarian needs to know how to code or not also very much depends on the individual library and the job itself. But even if a systems librarian is not going to be expected to create large software applications on their own, a certain amount of coding knowledge can be beneficial regardless.

Domenic Rosati argues against those who say that librarians don't need to know computer programming if they can just copy and use scripts found online by countering that "librarians still need technical literacy to be able to find and understand scripts or APIs. Their technical literacy enables them to provide a solution, and to modify, compile, and run the script for local implementation."[5] Likewise, Lisa Goddard has argued that computer programming "is essential for developing new Web-based services, for reformatting and porting data from legacy systems, for automating daily tasks, creating reports and statistical profiles, and for integrating existing systems running across different platforms."[6] In fact, nearly 66 percent of those who completed the systems librarian survey responded that programming or scripting languages was a skill that was either required for their position or that they used regularly.

So what languages would be the most useful for new or aspiring systems librarians to learn? The answer, like so many things, is that it depends. If a library already uses a particular language or set of languages to maintain their specific technology, then it will probably be necessary to learn those. For librarians doing website development, HTML and CSS will almost certainly be needed, and JavaScript, PHP, and MySQL will likely be helpful as well. Working with APIs may require knowledge of a general-use language like Python, Perl, or PHP, along with knowledge about handling data formats like JSON or XML. From a total of fifty-five systems librarian job announcements from 2017 to 2019 that were analyzed, the most commonly mentioned language was SQL, which appeared in over 32 percent of the job ads. Python was second, appearing in just over 29 percent of job ads. Knowledge of or experience with APIs was mentioned in just over 16 percent of the systems positions. A full list of languages mentioned along with the frequency each appeared throughout the job ads studied can be found in table 8.1.

Version Control

While being familiar with version control software and processes isn't always a necessity, it may be useful or required knowledge in larger libraries or libraries that are using some type of version control like Git. In the survey of systems librarians, over 34 percent responded that knowledge of Git and/or Github was either required or used regularly for their position. A version control system allows for better collaboration on development projects by tracking changes, allowing for branches of code, allowing the combination of code changes, and letting users undo changes. Git is a popular open-source version

Table 8.1. Percentage of times programming languages appeared in systems librarian job advertisements.

LANGUAGE	TIMES APPEARING IN JOB ADS	PERCENTAGE
SQL	18	32.7%
Python	16	29.1%
HTML	15	27.3%
PHP	15	27.3%
CSS	14	25.5%
Perl	13	23.6%
XML	13	23.6%
APIs	9	16.4%
XSLT	9	16.4%
JavaScript	8	14.5%
Java	7	12.7%
Ruby	5	9.1%
Unix Shell scripting/Bash	5	9.1%
XSL	3	5.5%
ASP.NET	2	3.6%
CGI	2	3.6%
MySQL	2	3.6%
VBScript	2	3.6%
JSON	1	1.8%

control system and is often used in conjunction with Github, a web-based repository for uploading and hosting Git projects. Other frequently used version control systems include CVS, Apache Subversion (SVN), and Mercurial. Along with Github, other hosting solutions for version-controlled projects include GitLab, Beanstalk, and Bitbucket.

Perspective and Ethics

Even though a systems librarian may not always work directly with patrons as often as a public services librarian, a good systems librarian should always have a public services perspective. Like other technical areas of library work, systems work is often invisible to the end user (until something goes wrong), but it is work that has an inordinate effect on their experience of the library. Systems librarians should always be user-focused and working to ensure that library systems and technology provide a seamless, easy, user-friendly experience for all users.

One way to do this is through usability testing. Small, informal usability tests can be conducted with users to determine pain points within a system and find areas for im-

provement. While complete redesigns and major overhauls are not always necessary (and not always recommended), small, incremental improvements to user interface design can have a sometimes drastic beneficial effect on the user experience. Are users able to easily and intuitively search the OPAC or discovery interface to find a known item? If not, why not? Is there a setting or configuration that can be changed that would make a difference? Where do library website users look to find and contact a librarian if they need research assistance? Is there an easier method that they aren't finding and why? Simple changes can have a big impact on overall user satisfaction. In addition to usability testing, focus groups, surveys, and social media can also be used to gather user feedback.

Also important are ethical considerations around user privacy. While this is an issue that affects all librarians, systems librarians in particular often have access to potentially identifying information about their users through access logs and use statistics. It is vital to keep user privacy concerns in mind when collecting data and to consider how much personal data is actually necessary when gathering statistics, as well as how that information might be used. This can sometimes mean not collecting user names or IDs even when that information is available or taking care to have that information sanitized or anonymized before use. It is also something to consider when developing data retention policies and the ways that data is stored and discarded.

⊚ Reporting and Assessment

While implementing and maintaining new systems will probably be the biggest part of a systems librarian's job, it will also be important to evaluate new technology initiatives to find out if they are working and benefiting users as expected, identify any areas for improvement, and determine sustainability needs and considerations. Some assessment may be done by gathering and analyzing usage statistics, while at other times more formal assessment may need to be done by evaluating outcomes against goals using a variety of assessment methods.

Before going out and collecting statistics, it is crucial to determine exactly what information is needed and for what purpose. Determining this ahead of time will prevent collecting and gathering unnecessary data and ensure that the appropriate data is available and is being retained. Some of the questions that usage statistics can answer include how many people are using the technology, when are they using it, and for what purpose they are using it.

How long does the average user need the technology? Are potential users being turned away or made to wait? Is usage of the technology increasing or decreasing? While the answers to these questions can be helpful, it can also be useful to answer more qualitative questions such as: Are users able to use the technology without assistance? Would they like additional training or instruction? Is there another task they would like to accomplish but aren't able to with the technology provided? These questions will be more readily answered by gathering feedback from users using methods such as surveys and questionnaires, focus groups, or rating cards.

Once feedback and statistics have been gathered and analyzed, the data can then be used to make any recommendations for improvement. The data gathered may point to one or two areas where small changes, additions, or improvements could resolve the majority of user complaints. It's also possible that the feedback gathered may point to much larger issues or overall failure of the initiative, which could require going back to

the beginning of the process or scrapping the project altogether. If changes are made, then the statistic and feedback gathering process should start again and be used to determine the effectiveness of the changes that were implemented. This process can be ongoing throughout the life of the initiative to provide continuous evaluation and improvement of the technology.

◎ Key Points

- While hard technical skills will undoubtedly be useful, equally important are the soft skills like communication and collaboration that will facilitate work as a systems librarian. Both skills are among the most-requested by employers of systems librarians.
- Well-written documentation will make life as a systems librarian easier by keeping track of workflows, instructions for performing certain infrequently occurring tasks, and troubleshooting information. It will also make things easier for future systems librarians who may later take over the position.
- Since many systems librarian positions are project-based, strong project management skills are especially important. Project management includes planning, tracking, and communicating clearly and frequently with project team members as well as potential end users.
- While systems work is inherently technical in nature, it is important to remember that at its heart the work is being done to benefit users. A strong public services and end-user perspective will ultimately benefit systems work by keeping user experience at the forefront of all systems projects.

<p align="center">*   *   *</p>

◎ Interview with a Systems Librarian

Liam Whalen
Systems Librarian/Analyst, Newfoundland and Labrador Public Libraries

How many years have you worked as a systems librarian?
Six.

Is there anything about your current position that makes it a unique representation of systems librarianship?
The provincial nature of the library system requires attention to legislation at a detailed level. A lot of my work is now information management (records management, retention, access to information, and protection of privacy). Additionally, I have helped produce reports meant to guide the technology development of the system into the future, which involved committee work and a lot of work with vendors investigating technology.

What led you into working with technology?
I worked in tech in the 1990s and 2000s. I have been programming since a young age.

Do you feel that your education prepared you for work as a systems librarian?
Yes. In most cases the technology is specific to the library system. The skills required to manage multiple projects, an understanding of MARC data and cataloging standards, and an appreciation for library business were gained in library school. If I did not understand what the various aspects of librarianship were responsible for, managing the systems they use would have been difficult. The foundation of the ALA degree gave me this understanding.

What skills or experience did you have that helped you get your first systems job?
I have proficiency with a number of programming languages. In particular SQL was essential. I had a co-op/internship as a systems librarian that was extremely important.

Did you do any systems/technology internships that were beneficial?
Yes. I worked as the systems librarian for Natural Resources Canada. They use the open-source Evergreen ILS, and my programming skills allowed me to alter the system in useful ways. My SQL skills and the open nature of the system allowed me to generate useful reports for staff.

What skills have you had to learn on the job?
Teamwork. Although there are group projects in library school, the cooperation needed to bring projects to completion and the communication skills needed to involve all stakeholders had to be learned. Specific ILS skills had to be learned at my three positions. The organization of the database is different between Evergreen, Symphony, and Horizon. Learning their schemas and how the data works together has been important. Committee work—learning the roles of chair, secretary, and the other members of committees has been invaluable. Report writing.

What skills or knowledge have been most useful to you in your day-to-day work?
SQL, scripting, Excel, MARC, AACR2, RDA. Writing.

Did you ever work on a project that went very wrong?
Not as a librarian, but when I was a programmer, I was sent to move data from one system to another and I took the completely wrong approach. My work was useless, and my boss had to help me complete the work. I should have analyzed the requirements beforehand and evaluated the tools that could have been used. I chose the wrong programming language to do the work.

What is one of the most interesting or complex projects you led or worked on?
I chaired the Technology Service Delivery Standards committee for my current system. This involved a complete accounting of the library system's technology, an analysis of potential new technologies, and a literature review of benefits of library technology to society. The work started slowly with committee members from IT and librarians identifying what needed to be accounted for and how to account for it. Next we chose areas for research. In tandem IT got data about our systems, IT and the librarians researched new technologies, and I performed the literature review. As work returned information, we evaluated it and made choices, which I compiled in a report.

What are some other major projects you've been involved in?
I have programmed improvements to the Evergreen ILS's acquisitions modules. I am organizing my current library systems' information management program, which does not exist yet.

I am managing the launch of our new discovery layer. I have modified our ILS to allow our acquisitions librarians to budget per library location.

Can you describe your day-to-day work or what a routine day is like?
I start my day by reviewing my to-do list and choosing my tasks for the day. I try to work on three projects a day. Most days I will get a call from someone or a visit from a library director asking about stats or other data. Sometimes, I have to solve issues with the ILS or a vendor's product, but this does not happen too often. If I am working on information management, I am doing a lot of reading from the Office of the Chief Information Officer and the Office of the Information and Privacy Commissioner and organizing that knowledge into an information management program. If my work includes coding, I am working in SQL Management Studio. This involves identifying information needs and designing a system to deliver that information. It may also involve scripting work to munge the data into a readable format.

What is the most challenging aspect of your position?
The distributed nature of our system requires me to effectively communicate with an IT team on the other side of the province and librarians all over the province. I am the only librarian in my location.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Making other people's jobs easier.

How do you see systems librarianship changing over the next five to ten years?
The move to the cloud will accelerate, and systems librarians will be required to interact with vendors to accomplish more of their work.

What do you think are the most important skills or qualities a systems librarian needs to have?
Communication skills. While coding and programming are necessary, if I cannot understand what people want and communicate my changes to people, the work is not very helpful.

What do you most wish you had known before becoming a systems librarian?
IT does most of the tech work. Learning to be hands off, especially in a union environment, has been difficult and requires patience.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
The degree to which I would need to understand the other areas of librarianship has been surprising. Understanding what acquisitions does makes it easier to change that module. Understanding how front-line staff do their work makes managing the search and patron systems easier. Working with tech services helps with those systems.

Is there anything else you would like to mention that hasn't been asked?
If you have a lot of tech skills, you can make much more money in other tech fields. However, that nature of library work is truly rewarding. If you are prepared to earn less over your career than peers in other tech careers, you will find this field engaging and fulfilling.

◎ Notes

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2. Roy Tennant, "The Most Important Management Decision: Hiring Staff for the New Millennium," *Library Journal* 123, no. 3 (1998): 102.

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Technology Planning and Implementation

ONE VITAL AREA THAT MAY FALL to the systems librarian is technology planning for the library. Depending on the size and structure of the library, this work may be the purview of a team including or led by the systems librarian or may be done primarily by the systems librarian themselves. While some organizations may do the work of implementing and maintaining library technology without a formal technology plan, technology planning can be an essential part of overall library strategic planning and can assist in making informed choices about technology acquisition and implementation, budgeting, and sustainability.

Conducting a Needs Assessment

The first step in technology planning is generally completing a needs assessment, which begins with taking a complete inventory of what technology is currently being used in the library. Without a thorough inventory, it will be difficult to track exactly what technology is already in place and identify where potential gaps in service may exist.

Technology Inventory

Creating a technology inventory involves creating a list of every piece of technology the library currently has, along with relevant details about each, and is often the first step in performing a comprehensive needs assessment. One way to do this is to have each department submit a list of the technology in their area since they are likely to be the most familiar with what is there. This makes it less likely that key pieces of technology may be missed along the way.

In her book *Library Technology Planning for Today and Tomorrow: A LITA Guide*, Diana Silveira lists four main areas of technology to consider when performing an inventory. These include Internet access, routers and firewalls, staff and public hardware, and staff and public software.[1] While it can be helpful to create a visual map showing the types and number of each technology and how they are interconnected, it can be especially useful to create a spreadsheet of the inventory for use not just in eventually writing a formal technology plan but also for tracking when technology needs to be updated, replaced, or re-licensed.

The information recorded for each piece of hardware in the inventory should include the item's name, ID number, serial number, description, network name, IP address, location, department, whether it is used by staff or the public, its condition, vendor, years of service remaining, version, responsible party, and its critical level. For library software, recorded information should also include log-in credentials, licensing information, and when the license is due to be renewed.[2]

Gathering a complete inventory of technology already in use in the library will allow analysis of the library's current state of technology to be done, including identifying possible gaps in service or areas where technology is lacking. Having a complete inventory will make it easier to determine what areas have dated technology that may need to be replaced or updated, what areas may be lacking needed technology, and which areas to prioritize due to their critical importance to library operations.

Gathering User Feedback

After determining what technology is already being used in the library, it will be important to gather feedback on how that technology is being used, whether it is meeting current needs, and what new or additional technology would improve users' experience or staff efficiency. There are many methods that can be used to gather feedback including surveys, focus groups, and individual interviews.

Surveys

Surveys are one of the easiest and fastest ways to gather information from a large amount of people. Surveys can be done online at a low cost using software like Survey Monkey or Google Forms and can involve a minimal time investment from users. Surveys also offer the opportunity to gather feedback from both library users and non-library users (potential users).

While gathering feedback from library users may seem obvious, gathering feedback and information from non-library users can also provide excellent information. Why don't these people use the library? What types of services do they need that the library

isn't currently offering? Are there certain types of technology the library doesn't currently have that would help meet their needs and turn them into library users?

Likewise, current library users can also offer valuable feedback. What do they come to the library to accomplish and does the current technology offered allow them to easily accomplish those things? Are there areas where current technology makes it difficult to accomplish their goals? Are they spending too much time waiting to use computers or certain software because there are too many people trying to use too few resources? The answers to these and similar questions will help to identify the areas where current technology is working for users and areas where it could be improved, as well as helping to prioritize areas for updating or replacement.

Focus Groups

Like surveys, focus groups allow libraries to gather information and feedback from users. However, unlike surveys, focus groups are often done in person and involve a greater time commitment for those providing feedback. When recruiting participants for a focus group, it can help to provide incentives such as gift cards or free lunch in exchange for their participation.

Focus groups usually involve a small group of people led by a moderator asking questions and leading conversation. It can help to have the moderator be a neutral person, such as someone from outside the group doing the technology planning, from another department, or from outside the library. A camera can be set up in the room to record the session or to live-stream the session for the planning group to watch from another location. Another option is to have a second moderator present solely to take detailed notes.

Like with surveys, the moderator can ask questions regarding users' use of current technology, pain points, or items they wish the library would acquire. However, the nature of a focus group allows the moderator to ask follow-up questions and to facilitate a natural dialogue that may lead to additional, unexpected information.

User Interviews

Like focus groups, user interviews allow a moderator to get information from users in person, in an environment that allows for dialogue and follow-up. Interviews are usually done one-on-one and involve the moderator asking specific questions and allowing the interviewee to freely offer feedback. Individual interviews can also be recorded, live-streamed, or captured in handwritten notes during the session. Since interviews often involve a greater time commitment for participants, offering additional incentives for participation is recommended. Interviewees can often be recruited through other methods of gathering feedback, such as a survey question asking respondents if they would be interested in being contacted for a follow-up interview.

While gathering information from both users and non-users is important, it is also vital to remember library staff when gathering feedback. Staff will be intimately familiar with the technology used in the library and can be a source of information regarding technology needs for users as well as for their own work. Each of the above methods of gathering feedback can also be used to collect feedback from library staff. Their input will be essential in determining where library technology is lacking as well as in determining priorities for technology replacement and acquisition.

Statistics

Like directly gathering feedback from users and staff, gathering statistics can also provide valuable insight into how technology is currently being used and help to identify areas where more, newer, or different technology is needed. In addition to collecting usage statistics on technology that is being used by the public, Silveira also recommends gathering statistics about the library's bandwidth, wireless network, and software programs, as well as looking at availability statistics.[3]

Some statistics can be gathered automatically, such as usage data collected by vendors, while others may need to be gathered manually, such as which software programs are being used by patrons, how often computers are being used and for what purpose, and how often patrons are turned away or made to wait to use certain software or other technology.

Evaluating Technology

Once a full inventory has been done and feedback has been gathered and analyzed, the work of evaluating new technology for acquisition can be done. One of the first steps will be to look at the inventory and identify any gaps where current technology needs to be updated or where new technology needs to be acquired.

Analyze the feedback gathered from staff and library users and use that information along with the statistics that were gathered to determine what types of hardware or software staff and users are using the most. Are there enough of these items or does the library need to acquire more? Are the public computers being used to full capacity every day to the point that users would benefit from additional computers? Do library staff need a newer operating system or more RAM to be able to use necessary software on employee computers? Is the library's bandwidth enough to accommodate all of the library's users? Consider the current state of the library's Internet, routers and firewalls, hardware components, and software, as well as what users and staff have asked for in surveys, interviews, and focus groups.

Other things to consider are emerging technologies and current trends in library technology. While it is easy enough to realize that computer operating systems will need to be updated and computer systems replaced after so many years, it can be more difficult to keep up with completely new areas of technology that may present themselves and even harder to know which of these are worth investing in. While some technology is not library-specific, such as virtual and augmented reality, it may have practical applications for libraries and may interest users enough to warrant investing in it.

David Lee King, who writes extensively about library technology, has offered advice on how to tell the difference between a trend and a fad in his *Library Technology Reports* issue on "How to Stay on Top of Emerging Technology Trends for Libraries," writing that "a true trend takes time to emerge."[4] His warning signs that something is simply a fad rather than a trend include that it stops being updated, its use is diminishing, and users find it difficult to use. He gives the example of Second Life, a virtual world that was trendy in libraries for a short time but has since faded away. While Second Life itself would be considered a fad, it is also an example of virtual reality, a trend which has continued to become more mainstream.[5]

> "Don't get swayed by shiny things. When designing a solution, or a new initiative, think also about how to sustain it, and when this technology might need to be sunset-ed."—systems survey respondent

◉ Selecting Technology

When deciding on specific products to purchase, Silveira recommends considering a product's usability, performance, quality, and support options.[6] Usability can be an important factor in determining which product to purchase for both end users and library staff. Product trials can be useful for examining a product's usability before purchase. Consider whether the product is easy to use and intuitive to learn. Will it require extensive training before users can get the maximum use from it or will they be able to easily start using it right away?

Performance is another important consideration. Different products have different features, some of which may be more important or useful than others. What exactly does the product need to be able to do? Does it reliably do those things? What other features are offered that may add value to those minimum requirements? Comparing product reviews online can be a good way to evaluate performance, along with a trial use period.

Also consider a product's quality before purchase. While less expensive products may be more appealing short-term, if they need to be replaced more quickly than a higher-cost product, consider whether it truly presents a savings opportunity. Again, online reviews can be useful for evaluating a product's overall quality. While cost may be an important consideration, and the need to stay within budget is real, sometimes a small difference in cost can make a big difference in quality.

Another important factor to consider is the product's support options. Does the company that makes the product offer support, and what kind? Can problems be addressed quickly and easily, or will staff be left to figure out issues on their own? Is support available 24/7 or only during certain hours? Will support cost extra or is it included in the cost of the product? These questions will be vitally important for products like library services platforms, which can be complicated and for which staff may need to rely on vendor support to resolve tricky issues.

Also important to consider is a product's accessibility. Many organizations may have requirements for accessibility that need to be taken into consideration when making technology purchases. For example, technology used by the federal government must comply with the accessibility standards described in Section 508[7] of the United States Workforce Rehabilitation Act of 1973. Also useful is the W3C's Web Content Accessibility Guidelines (WCAG), which provide standards for making web content accessible.[8]

Vendors should be able to supply a VPAT, or Voluntary Product Accessibility Template, which describes how a product complies with Section 508 accessibility standards. If a vendor doesn't have a VPAT already, a template can be downloaded from the Section508.gov website.[9]
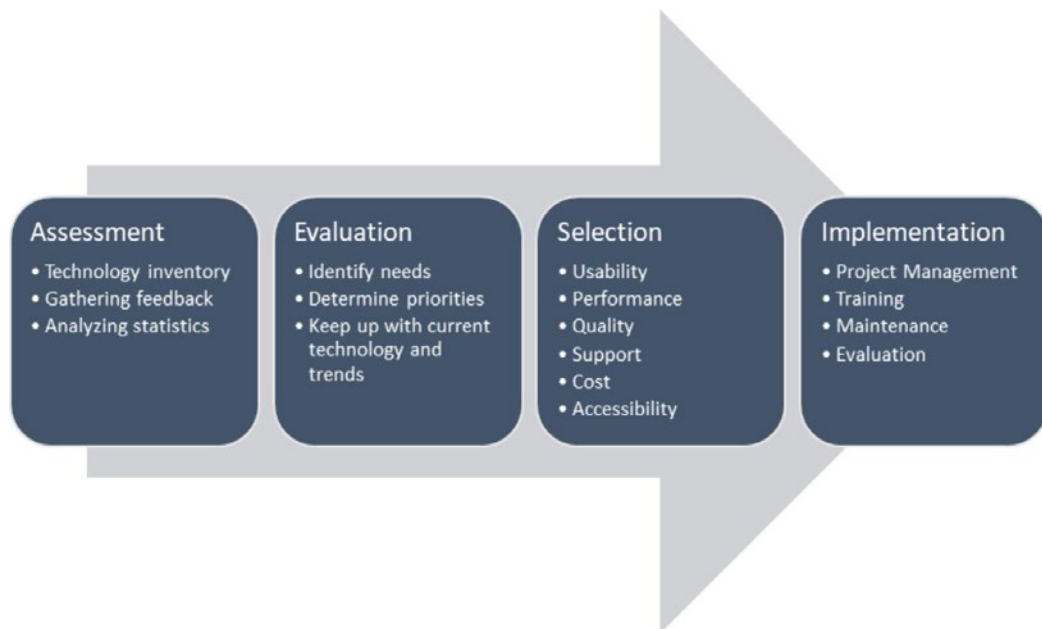
Figure 9.1. Stages of technology planning.

🌀 Writing a Technology Plan

After conducting a needs assessment and evaluating and selecting technology, a formal technology plan can be written. Many organizations may require a technology plan to be in place covering the next three to five years, but even if it's not required, a thorough technology plan can help a library stay on track with selecting and implementing new technology that will help them reach their goals and provide better service for their users.

The first step in writing a technology plan is creating goals and outcomes. Goals and outcomes should generally align with and fit into the library's overall strategic planning. The technology plan should ultimately help a library to meet its strategic goals. Like with strategic planning, the goals for a technology plan should be broad enough to include several outcomes, and each outcome should be measurable. An example of a goal may be to maximize staff efficiency, while an outcome under that goal might be to upgrade all staff computers to the newest operating system available.

While there are many different formats that can be used when writing a technology plan, Silveira suggests starting by citing the library's mission to "[put] the technology plan in context and [tie] it to both the library's role and its broader strategic plan in a concrete way."[10] While the goals and objectives should be the main focus, the plan should also include information about the time frame of each goal and objective as well as the overall time period covered by the plan, along with how the goals and objectives of the plan will be evaluated.

In *The Accidental Systems Librarian*, Nicole Engard identifies the standard areas of a technology plan as an introduction, vision statement, background statement, goals and objectives, funding, training, evaluation, conclusion, and appendices.[11] Different libraries approach this in different ways, and no one format is more valid than another. Many libraries publish their library technology plans online, and these can be used as examples for formatting and content. A few choice examples of library technology plans are listed below:

- Hammond Public Library (2017–2019): www.hammond.lib.in.us/assets/bp-7001 -technology-plan-2017-2019-nov-2016-rev.pdf
- Buffalo and Erie County Public Library (2017–2021): www.buffalolib.org/sites/ default/files/pdf/Technology%20Plan%202017-2021%20Final%20Draft%20Up dated.pdf
- Portland State University Library (2015–2020): library.pdx.edu/about/strategic -plan/
- Loyola Marymount University (2013–2020): library.lmu.edu/aboutthelibrary/ strategicplan2013-2020/

Implementing New Technology

Depending on the size and scope of the technology being implemented, putting new technology into use can be a major project. There can be many steps to managing a project of a decent size. This section will cover some of the basic project management tasks involved in implementing new technology.

> "Invest in developing your project management and leadership skills for the long term."—systems survey respondent

Project Management

One of the first steps in managing a large project is to determine what exactly needs to be done. Clearly a new technology is being implemented, but can this overall project be broken down into smaller steps? Consider what exactly needs to be done to implement the new technology. Each item on the list should be its own step. Consider, for example, installing a new network printer. Some steps in the project might include purchasing the printer, arranging for physical space in the library for the printer, connecting the printer to the network, testing the printer, training staff on how to use the printer, training patrons on how to use the printer, and communicating with stakeholders on the status of the implementation.

Creating a viable timeline is an important part of the overall project management process. Begin by setting a deadline for when the project should be completed. Now, consider how long each of the steps outlined will take and when each step would need to be completed in order to finish the entire project by the final deadline. Each step should have its own deadline and estimate for how long the step should take to complete.

Another part of project management is managing the staffing necessary for completing the project. Can the project be implemented by a single person, or will multiple people need to be involved to complete different aspects of the project? If multiple people are to be involved, make sure that everyone knows who is responsible for each step in the process.

There are many project management tools that can be used to facilitate both large and small projects in organizations. These can range from subscription enterprise-level solutions to free web applications. Some popular options that are free or include free plans are Trello and Asana. Trello is based on the concept of Kanban boards where a whiteboard can be used in conjunction with sticky notes to track individual tasks within larger projects. Trello is free and can be used to manage and track multiple projects. Asana
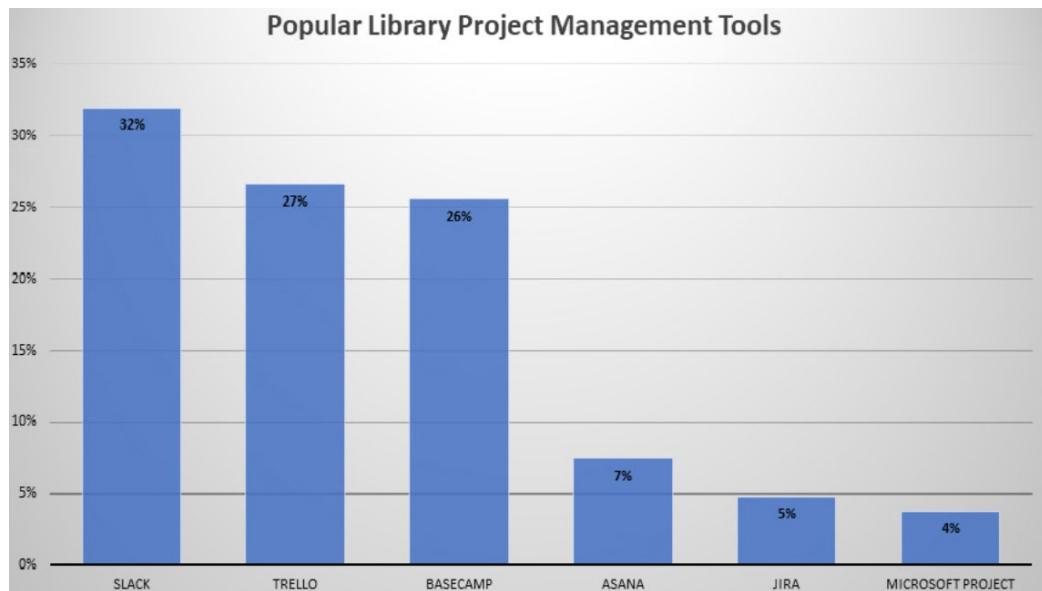
Figure 9.2. Percentage of systems librarians using popular project management tools.

is also free for teams of up to fifteen. Rather than using boards like Trello, Asana projects are made up of lists that can be assigned to individual team members and checked off when completed, allowing for easy tracking of projects. Other software options for project management include Microsoft Project, Microsoft Teams, Basecamp, Zoho, Slack, and Jira. Figure 9.2 shows the most popular project management tools used by those who answered the systems librarian survey.

Communication

Communication is a vital part of any project. It is important to keep all stakeholders informed throughout the process to minimize worry, facilitate buy-in, and prepare for a successful project implementation. Project management tools like those already mentioned can be excellent for maintaining communication about the project with those involved. If utilizing a project management application, everyone involved in the project should be a team member within the app so that they can see who is responsible for what part of the project, and how far along toward completion the project is currently.

Equally important is maintaining regular communication with staff members who are not part of the implementation process. Major library technology initiatives have the likelihood of impacting everyone on staff, whether they are directly involved in the implementation or not. Employees may worry about how the new technology will impact their regular workflow or even their job itself. Communication from step one in the process will help ease concerns and prepare employees for the eventual transition to the new technology. This can involve reporting on project updates in regular staff meetings, sharing product information as early as possible, and giving staff the opportunity to ask questions and express concerns. Emphasize the benefits of the new technology, including making workflows easier and more efficient or solving problems the old technology presented, that give staff a clearer picture of why the new technology is necessary and how it will benefit them and their work.

While end users may not need to know about upcoming technology transitions from step one, it should also not be sprung on them without warning. Technology changes that will impact end users should be communicated ahead of time, including when they should

expect to see the new technology rolled out, what will be different, how the new technology can benefit them, and any plans for training that may help them become familiar with and learn how to effectively use the new technology. Staff and end users alike will appreciate that their input has been taken into consideration if they were included in gathering feedback earlier in the process, particularly if a summary of the feedback that was gathered and how it was used to inform decisions around the new technology has been shared.

Training

When implementing any new technology, training will be vital in making sure staff and users alike are comfortable with the technology and able to get the most use out of it. Delays in training staff on a new technology may result in slowed production while they attempt to figure out how to use it and develop new workflows. This can also lead to frustration and resentment, as well as a reticence to accept new technology initiatives in the future. Libraries that have not offered users any training on new end-user technology may find that the new technology is underutilized, used incorrectly, or not used at all.

Developing a training plan is an essential part of any technology planning process. Smaller technology initiatives, such as implementing a new printer or software product, may be able to be covered adequately in a single training session, while larger initiatives, such as a new library services platform, may require multiple training sessions before users feel comfortable. The first step is to determine the level of training that will be needed. Next, determine who will conduct the training. Vendors often provide training for their products in the form of on-site training sessions or online webinars. There are also often webinars on various products that may be offered by organizations such as the American Library Association, local library associations, or consortia.

For some initiatives, it may be more effective to have a single person on staff, such as the project manager or project lead, become an expert in the new technology and then train the rest of the staff. Another option is the train-the-trainer approach, in which one person trains several others who will then be tasked with training staff in their individual departments.

For end users, methods such as a hands-on workshop or in-person class may be effective. For hands-off training, video tutorials or online instructions situated at the point of need can be effective training methods.

After Implementation

After a technology project is completed, there are still several tasks that will need to be done. Maintaining the new technology will be an ongoing task that ensures the product stays up to date, secure, and in good working condition during the time it is being used. Determine who will be responsible for maintenance of the new technology and draft a maintenance schedule that includes regular updates as well as checks for new versions of software. Many software updates include bug fixes, security patches, and new features and are necessary to maintaining security and optimum performance. And while it's not always necessary to upgrade to a new version of software, vendors will usually phase out and stop offering support for older software versions eventually. Disregarding timely updates of technology products can end up causing major issues down the road or eventually render the product unusable.

All technology will eventually reach its end of life, and it is necessary to plan ahead for this eventuality. When selecting new technology, be aware of the approximate lifetime of the product and be ready to select replacements when the time comes.

Also important is evaluating the new technology once it has been implemented. This can be done through many of the same methods used for completing a needs assessment at the beginning of this process. Gathering user feedback through surveys, focus groups, or interviews can provide insight on whether the technology is performing as expected or whether adjustments should be made. Usage statistics can also be valuable in examining whether users are using the new technology and for what purpose. This information can be useful in determining whether the goals outlined in the technology plan have been met and whether new technology initiatives have been successful.

⊚ Key Points

Drafting a thorough technology plan can help libraries to lay out concrete and measurable goals and outcomes for improving services, workflows, and user experience, along with a way to track progress toward those goals and evaluate whether or not they have been met. Some key points to keep mind from this chapter include:

- Technology planning should begin with a thorough assessment of what technology the library already has in place. Creating a technology inventory can be useful for tracking every piece of technology in use in the library and identifying areas in need of additional or improved technology.
- Before planning any new technology, conducting a needs assessment, including gathering feedback from both library staff and users, will help in prioritizing technology needs and identifying areas of importance to library users.
- New technology should be selected by evaluating its usability, performance, quality, support options, cost, and accessibility. Trial periods for testing out a potential new technology, as well as online reviews, can be useful in evaluating technology and making a final decision.
- A written technology plan will help libraries to identify goals and outcomes and to evaluate and measure success in meeting those goals. A technology plan should align with a library's overall strategic planning goals.
- When implementing new technology, project management methods can be used to organize planning and track progress on project completion. Several free or low-cost project management applications are available that can assist with tracking tasks and communicating progress to project team members. Technology implementation should also include planning for training of both staff and users, ongoing technology maintenance, and long-term evaluation of new initiatives.

*   *   *

⊚ Interview with a Systems Librarian

Elizabeth Blackwood
Digital Assets Librarian, Hillwood Estate, Museum and Gardens

How many years have you worked as a systems librarian?
Two years.

Was it always your intention to be a systems librarian?
I originally trained as a data librarian, but there are many crossovers.

What led you into working with technology?
Undergraduate study in digital humanities, especially mapping and GIS-based projects.

Do you feel that your education prepared you for work as a systems librarian?
Yes and no. I felt prepared for my role because there was little to no understanding of the best practice upon entering my role, so my basic knowledge was enough, but I also did not feel like my library school program pushed students in the library science track to gain for tech skills.

What skills or experience did you have that helped you get your first systems job?
My RA position in graduate school helped me gain the skills in digital curation/database management that I needed to speak with authority in the interview process.

Did you do any systems/technology internships that were beneficial?
I was an RA at the North Carolina Digital Heritage Center (DigitalNC) and also did a field experience with Duke's Data and Visualization Department, which gave me the reference experience that I was looking for that helps with training system users now.

Have you ever led a systems migration?
I was hired to begin the process of system migration (Scary!), but I was also in a unique position that no one else really knew what they were doing so I had free range to gather data and make decisions. I served as both the project manager and the administrator of the migration and selected, migrated, and implemented the system. It was definitely a challenge and taught me most about change management with other staff members.

What is the most challenging aspect of your position?
Honestly, being a young woman in an IT department of all men.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Training users and explaining how complex systems help/hurt workflows. Working with people is always the most rewarding for me.

What do you think are the most important skills or qualities a systems librarian needs to have?
The skills that I gained in my systems analysis class were crucial to my role as a database/systems admin now. Taking problems apart to look at them at the systems level has been one of the most useful skills. Additionally, my databases class taught me a lot of structural skills that were very helpful.

What advice would you give to new systems librarians or LIS students interested in working in systems librarianship?
Take Python.

Notes

1. Diana Silveira, *Library Technology Planning for Today and Tomorrow: A LITA Guide* (Lanham, MD: Rowman & Littlefield, 2018), 2.

2. Ibid., 5–7.

3. Ibid., 11–13.

4. David Lee King, "Current Technology Trends: How to Prepare and When Not to Pursue," *Library Technology Reports* 54, no. 2 (2018): 33, journals.ala.org/index.php/ltr/article/view/6582/8784.

5. Ibid.

6. Silveira, *Library Technology Planning*, 48.

7. U.S. General Services Administration, Section508.gov, accessed April 9, 2019, www.section508.gov/.

8. W3C Web Accessibility Initiative, "Web Content Accessibility Guidelines (WCAG)," accessed April 9, 2019, www.w3.org/WAI/standards-guidelines/wcag/.

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10. Silveira, *Library Technology Planning*, 69.

11. Nicole C. Engard and Rachel Singer Gordon, *The Accidental Systems Librarian* (Medford, NJ: Information Today Incorporated, 2012), 188–89.

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Leading a Systems Migration Project

IN THIS CHAPTER

▷ Choosing a New System

▷ Preparing for Migration

▷ Data Migration and System Configuration

▷ Going Live

A SYSTEM MIGRATION IS ONE of the most challenging projects a library can undertake and one that systems librarians are likely to encounter at least once, and potentially several times, during the course of their career. Because a library's ILS or LSP is at the heart of most systems librarian positions, the systems person is likely to play a key role from the beginning of the process to the end.

Choosing a New System

Choosing a new library system can be its own lengthy section of the systems migration process and involves several steps. Unless the library's decision-maker makes a unilateral choice, it is common for a team or task force to be assembled and charged with the selection of a new system. The project lead might be the library director, the systems librarian, or someone in the library with extensive project management experience or responsibility. To be sure that all of the key stakeholders are represented and that someone familiar with each of the parts of a library system are involved, the team should probably include someone from each of the following areas:

- library systems,
- acquisitions,

▲ **111**

- cataloging,
- circulation, and
- public services/reference.

Once the team has been assembled, the first step is to gather requirements. What functionality does the system need to have? What modules need to be included? What problems or issues have been encountered with the current system that a new system could potentially address? Are there inefficiencies in workflows caused by the current system that could be made more efficient with a new system? Consider each part of the workflow of each area that will be using the system and what features are needed or desired from a new system.

After requirements have been established, the library will most likely write a request for proposal (RFP) or a request for quote (RFQ), depending on their needs. Depending on the type of library and how it is funded, the library may be required to submit an RFP before choosing a new library system, or it may be an optional step in the process. Libraries that are not required to submit an RFP or don't need a full RFP may opt for the less comprehensive RFQ instead.

The book *Library Technology Buying Strategies* contains two chapters devoted specifically to the RFP, including what it is, what it includes, and how to go about writing one. The chapters' author, Nikki Waller, lays out in detail each of the sections an RFP should contain, including:

- instructions for bidders: a section containing the introduction, the library's critical requirements, exceptions and definitions, how to submit proposals, a project schedule, selection criteria, and how proposals will be evaluated;
- general system requirements: a section that specifies the system traits and modules the library requires;
- detailed functional requirements: a section that details the capabilities required by each individual function of the system;
- minimum hardware requirements: a section that describes the library's hardware configuration and requests information about disaster planning and data recovery;
- vendor support: a section devoted to the vendor's responsibilities for migration, installation, training, and maintenance; and
- ongoing responsibility: a section that describes the system's reliability, downtime, and response times.[1]

There are many resources available online for additional information about preparing and writing an RFP, including the NISO publication *The RFP Writer's Guide to Standards for Library Systems*.[2] In addition, Marshall Breeding's website Library Technology Guides includes a procurement section where a number of active library RFPs are available for download.[3] Looking at other libraries' RFPs can provide a guideline for what content to include as well as various options for how to format an RFP, but Waller advises against copying any boilerplate templates, writing that "if you want a vendor's product to help achieve the unique goals or address the special concerns of your library, then write a unique, original RFP."[4]

After the vendors' responses to the RFP have come back, the top choices can be selected and those should be invited on site for library-wide demonstrations of their product. As many members of the library staff as possible should attend the demonstrations,

as seeing how the products function in person can give staff a clearer understanding of potential workflows, features, and any potential issues with the product.

After the product demonstrations, the best choice for the library's new system may already be apparent. If not, some factors to take into consideration when making the final decision include:

- the initial cost of the installation/migration as well as ongoing maintenance costs,
- vendor support during migration as well as ongoing support of the product,
- vendor viability including financial viability and continued product development, and
- to what extent each vendor meets the requirements specified in the RFP.
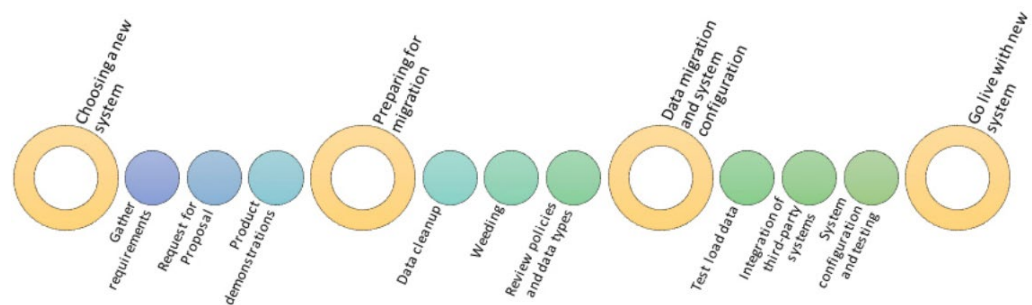

Figure 10.1. Steps in the process of a systems migration.

⊚ Preparing for Migration

Once a new ILS or LSP has been selected the work can begin on preparation for system migration. If time permits, doing some extensive cleanup of system data before migration can help the entire process to go more smoothly. One method that can help with this is a reclamation project,[5] during which library bibliographic records are matched to World-Cat records and holdings are brought up-to-date. A thorough weeding project can also be beneficial before a migration as there is no reason to migrate records for items that the library plans to get rid of anyway.

In addition to these larger projects, it can also help to do cleanup on individual sets of data within the system. Siôn Romaine writes in *Migrating Library Data* that "migrating only what you absolutely need will make post-migration cleanup easier and your new database less cluttered."[6] Some areas to consider include:

- items marked as lost or missing;
- invalid MARC records;
- records without items attached, items without barcodes, etc.;
- locations no longer in use;
- item types no longer in use;
- reserve items no longer on reserve;
- expired patron records;
- patron types no longer in use;
- order records for canceled orders; and
- standing order records no longer active.

At some point during the process, the library will need to map the data from the current system to the new system. This process can be muddy, but if pre-migration data cleanup has already taken place it should be much easier. This is a good opportunity to consider the library's circulation policies and overall system setup and decide whether any changes should be made. Fines and fees, billing structures, loan policies, patron types, and item types are all areas that may benefit from some revision or updates when going from the old system to the new one. The new system may have a very different structure for data than what is used in the current system, and this can make mapping data types cumbersome. "When migrating to a system from another vendor or to one structured differently than your current system," Kelley McGrath recommends in *Migrating Library Data* that staff "contact institutions that have made the same transition to find out what surprised them."[7]

The vendor will likely provide a timeline or roadmap of processes or deliverables that must be completed along the way to launching the new system. It will be up to the project lead or project manager to make sure that each part of the process is complete and that each person on the migration team knows what pieces they are responsible for completing and when each piece needs to be completed. Good communication is important during this time so that team members are kept in the loop about each step of the process and are aware of where in the migration process the library is at any given time, as well as kept aware of any issues or concerns that might come up along the way. Clear communication will help to head off potential issues that can arise when team members aren't certain who is doing what or what has already been done, as well as alleviate anxiety about the changes currently taking place or on the horizon.

The system vendor is likely to establish a training schedule, and the project lead should make sure that all staff attend any relevant trainings and are fully prepared to use the system once it goes live. Training may be conducted online during live or recorded webinars or by a representative of the vendor who may come to the library in person to train staff. Another option is a "train the trainers" model in which one or more members of the library staff receive training on the system and are then responsible for training the rest of the staff. Different options may come at different costs, and regardless of which option is selected, it is important that all staff feel comfortable about being able to perform their jobs using the new system. Training may need to be scaffolded or occur over the course of several sessions for staff to reach an acceptable comfort level with the new technology.

🌀 Data Migration and System Configuration

During the migration process the library will likely need to extract various types of data from the old library system and either send it to the vendor or upload it directly to the new system. Some of the data that may need to be migrated includes:

- Acquisitions data

  - invoices
  - order records
  - standing orders
  - vendor records
  - purchase orders

- Bibliographic and item data

  - MARC records
  - item records
  - holdings records

- Circulation data

  - current checkouts and overdues
  - active holds
  - circulation history and statistics
  - unpaid fines
  - patron records

Not all data may migrate and not all of the data that does migrate will migrate correctly. Some types of data may be particularly problematic, including acquisitions data. Siôn Romaine writes that "the lack of international standards for acquisitions data generally makes it very difficult to migrate orders, invoices, and other acquisitions records, particularly if the institution's ILS is from a different vendor."[8] In a later chapter from the same book, Al Cornish recommends doing at least two separate data loads, "one of test data that can be reviewed by staff for a significant period of time (at least one month), and a second load to support the cutover to production."[9] In the end, some data may need to be re-entered into the new system manually if it fails to migrate properly.

In addition, there will probably be a period of time after the data has been migrated to the new system but before the new system has been put into live production. During this time, it will be necessary to decide how to handle cataloging newly received items. One option is to hold off on cataloging new items until the new system is ready and then catalog them using that system. With this option, new materials may not be available to users during the time before the new system is live. Another option is to dual catalog in both systems, so that new items will be added to the new system and ready for use when that system goes live but also cataloged in the old system so they can be searched and found during the time before the new system is live. The dual cataloging option temporarily creates more work for the cataloging department; however, it eliminates the problem of new items not being made available to users during the transition.

If a separate discovery layer is being implemented on top of the new system, such as WorldCat Discovery or Ebsco Discovery Service, the knowledge base for electronic resources will likely need to be set up separately. In that case, it might mean uploading holdings for electronic journals, databases, and e-books as part of a separate process. The vendor may assist with this or it may require manually preparing and uploading KBART[10] (Knowledge Bases and Related Tools) or CSV files.

In addition to data migration, the new system will need to be configured to function according to the library's needs. This will involve configuring authentication methods, bibliographic utilities setup, circulation policies, patron notifications, course reserves, acquisitions funds, budgets and vendors, and EDI (electronic data interchange) setup, as well as integration of any other third-party systems being used such as bursar or finance systems, student information systems, or organization-wide authentication systems.

Going Live

Once all of the data has been migrated and the system has been fully configured, there should hopefully still be time before the launch date to do as much testing and data verification as possible. Each of the workflows in each module of the system should be tested both to make sure that the system is working as expected and that staff are fully trained and knowledgeable about how to use the system. In addition to workflows, each of the data types that have been migrated should be tested to make sure that data is appearing in the new system the way it is supposed to. Did all of the fields for each record type migrate and do they appear in the correct location? Do patron records appear the way they should with all of the relevant patron information intact? Is information like current fines, active holds, and current checkouts attached to the correct patron record? Does each bibliographic record have an item attached and does each item have a barcode? All of this information will need to be tested and verified to ensure that everything has migrated properly.

It is inevitable that some data will be lost during the migration. Decide what information is vital and be sure to extract as much information as possible from the old system. In the case of data that did not survive the migration process, reports and spreadsheets extracted from the old system can provide a backup archive for any critical information that might be needed going forward. It is advisable to keep the old system running concurrently with the new system for at least a short time while any wrinkles in the new system get ironed out.

Once the new system is live, there will be a period of adjustment for everyone involved, including patrons. If the patron-facing side of the system is vastly different from the previous system, consider offering training, handouts, or short tutorials on using the new interface. Communicating the library's plans to roll out a new system to patrons before going live can prepare patrons for the upcoming change and also provide public-facing staff some leeway if there are any hiccups during the first few days using the new system. There will almost certainly be some hiccups as staff adjust so having someone knowledgeable about the new system on hand to help during the transition can ease staff anxiety and help things go more smoothly at the circulation desk.

As things settle down and staff get used to using the new library system, there will most likely be post-migration cleanup projects to undertake. Testing may reveal certain data abnormalities or issues with migrated data that need to be addressed, but if the project team was thorough in its pre-migration data cleanup, these issues should hopefully be minimal.

⑥ Key Points

A system migration can be a daunting undertaking, especially for those inexperienced in the process or for libraries with very messy data. Assembling a strong team and managing the project with clear communication and a step-by-step process can make the transition go more smoothly. However, managing a system migration can be a great experience and add vital and highly desirable skills to a systems librarian's résumé. Some key points to keep in mind during the process include:

- When preparing an RFP, make sure it is original and unique to the specific needs of the library so that vendors are more likely to give useful and specific responses.
- Doing major data cleanup projects before starting the migration process, such as a reclamation or weeding project, as well as cleaning up as much data as possible, can help make the transition easier and minimize post-migration cleanup.
- Reach out to other libraries that have gone through the same transition to get advice and tips or to ask questions.
- Follow project management strategies to keep the project moving forward and in conjunction with the established timeline, and maintain clear and consistent communication with everyone involved with the migration.
- Know that lost data and other migration issues are to be expected and be prepared to work through them with thorough and systematic testing before going live with the new system.
- Don't underestimate the importance of training. The migration process and launch of the new system will go undoubtedly go more smoothly if everyone knows what they are doing.

* * *

⑥ Interview with a Systems Librarian

Leigh Duncan
Head of Library Technology Services, Wright State University

How many years have you worked as a systems librarian?
Twenty years.

Do you feel that your education prepared you for work as a systems librarian?
Yes—particularly classes geared toward the organization of information.

What skills have you had to learn on the job?
General technology skills (operating systems, networking, authentication, etc.), PHP, SQL, content management systems.

What skills or knowledge have been most useful to you in your day-to-day work?
Knowledge of authentication systems—that is key in academic librarianship; an understanding of MARC records; thorough understanding of our ILS and how it ties into other systems.

Did you ever work on a project that went very wrong?

We've had system upgrades that didn't work as planned and required extra downtime, which is never ideal. We've never had a project that went wrong with devastating effects (loss of data, etc.). From upgrades-gone-wrong, the lesson I've learned is to always have backup systems in place. For example, during ILS upgrades, have a paper system ready for checkouts. Have a plan to post notices on the website and your social media channels if services are unavailable. And work closely with any vendors or colleagues involved when planning the project to determine accurate downtimes, etc.

What is one of the most interesting or complex projects you led or worked on?

Upgrading to a new ILS interface in 2012 was probably one of our most involved projects because it affected nearly all library staff and encompassed our core services (borrowing/lending and authentication). We approached this project like we do most others:

1. Identify key stakeholders and determine their availability/willingness to assist.
2. Logically think through each step of the implementation process and create a detailed project plan, identifying deadlines and stakeholders for each step.
3. Work closely with the vendor for new hardware ordering, delivery, and installation.
4. Collaborate with campus IT to install and configure new hardware.
5. Consult with library administrators to determine the most opportune time to go live with the new system.
6. Provide training sessions for staff; ask the vendor for a sandbox environment for staff to gain familiarity with the new interface.
7. Communicate (I can't say this enough) the timeline and each step with staff so they know what to expect and are a part of the process.
8. Survive the implementation day.
9. Diligently document and report any issues after the implementation.
10. Follow up with staff to ensure they are able to complete their normal work.
11. Follow up with the vendor on any ongoing problems.
12. Update internal support documentation for the new system.

What are some other major projects you've been involved in?

Discovery service implementation (two different systems), central depository implementation and records transfer, EZproxy implementation, authentication upgrades (moving from ILS to LDAP to Active Directory), electronic resource management system implementation, automated patron loading, LibInsight implementation, LibCal implementation, website redesigns, content management systems (Joomla, SharePoint), web catalog redesigns.

Have you ever led a systems migration?

We've migrated software with the same ILS vendor but have not migrated our data to a new vendor. As part of a multi-university project, we migrated a portion of our bibliographic record data to a centralized depository system—that involved very careful data checks, countless record exports, careful import tests, etc. This was a multi-year project, during which I learned a lot collaborating with systems librarians from all over the state.

Have you ever led a website redesign project?

Yes. As a member of our web team, we've done multiple website redesigns. As the leader of our web team, we did a redesign in 2018, moving to a responsive site. The project went well—we

followed the same basic steps identifying stakeholders, getting their input, creating a project plan with deadlines, etc. For web projects, we incorporate usability testing (formal and informal) along the way, to ensure we understand user needs for our site.

Can you describe your day-to-day work or what a routine day is like?
Day to day I have projects I am moving forward. These are determined by our technology department or web team in conjunction with library administrators. I am also responsible for administering several systems so on any given day I may be investigating problem reports, updating system settings, testing new functionality, reading about upgrades or upcoming changes, or responding to campus technology changes that necessitate changes to our systems. As a department head, I also have management responsibilities for reports and special projects that are mixed into my day-to-day work.

What is the most challenging aspect of your position?
Not having enough time and funding to do everything we'd like to do.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Seeing our librarians efficiently provide service to library patrons. Seeing students seamlessly access the information they need (knowing how much work we put in behind the scenes with authentication to ensure that seamless process for them). Seeing materials move in and out of the library without delays because the ILS is working efficiently.

How do you see systems librarianship changing over the next five to ten years?
Depending on the library, there may be more or less computing/programming experience needed. We're seeing an increase in good vendor systems (Springshare is a great example), so our technology department does not need to custom program an events system or hours calendar. We're seeing a move away from programming and toward application support in our library.

   Other libraries, particularly non-academic libraries that do not have a campus IT for core IT services, may have a need for systems librarians with more technical expertise in networking, server management, etc. Big data is another trend we're seeing. Our institutional repository is expanding rapidly.

What do you think are the most important skills or qualities a systems librarian needs to have?
Analytical thinking, curiosity (an eagerness to learn about new technology trends or data trends), communication skills, technical writing skills, a firm understanding of all services offered by your library and how they intersect . . .

What do you most wish you had known before becoming a systems librarian?
More about web programming and design.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
Cataloging skills come in handy—a firm understanding of MARC record format is essential. Systems librarians are often the "reference librarian" to other librarians—our knowledge about systems/services and how they work together is essential for other librarians to do their work effectively.

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Leading a Website Redesign Project

IN THIS CHAPTER

▷ Preparing for a Website Redesign

▷ Designing for User Experience

▷ Prototyping and Usability Testing

▷ Preparing to Go Live

AS A SYSTEMS LIBRARIAN, website design, development, and administration may or may not be part of the job description, depending on the size and staff organization of the library. Some larger libraries may have a separate librarian or non-librarian staff member devoted to the library's web properties, while smaller libraries may task the systems librarian with sole or partial responsibility for the website. The systems librarian survey found that 69 percent of survey respondents answered that website design and maintenance were either a required skill for their position or one they used regularly. In the analysis of systems librarian job advertisements done for this text, just over 27 percent of job ads specifically mentioned website development. Chances are good that a systems librarian will need to lead or participate in a website redesign project at some point during their tenure.

Preparing for a Website Redesign

Forming a Website Committee

While it may not be possible in all situations, convening a website committee for handling redesign decisions as well as ongoing user testing and improvements to the website can go a long way toward achieving buy-in during the redesign process. Designing a website by committee is not necessarily a recommended practice (and can sometimes be the road

to madness), but having a committee available to serve in an advisory capacity can allow everyone in the library to feel like they have a voice in the decisions being made. The website is a part of the library that nearly everyone will have an opinion about, and while it's not possible for everyone on staff to be part of the committee, the committee should have enough members to represent each functional part of the library, such as technical services and public services, or teen services, children's services, and adult services, and so on. Having a committee can also be helpful for gathering information and feedback from users so that these time-consuming tasks do not necessarily fall to just one person.

Gathering Information

One of the first steps in preparing for a website redesign project is to begin gathering information. An environmental scan, or comparison of other library websites, can be helpful to learn about what kind of designs and features are currently in use across different types of libraries. It may be especially helpful to compare websites of similar libraries, such as libraries of the same type (academic, public, etc.) or the same size (large library system or small private school library) and take notes on what things are featured, what design aspects are used, how things are organized, and how things are labeled. While library websites and their users will have needs that differ from e-commerce or marketing websites, popular non-library websites can also be perused to discover overall current design trends and possibilities.

Prior to beginning the design process is also a good time to gather information from website users and potential users. This can be done in a number of ways including through surveys and questionnaires, focus groups and interviews, or informal feedback requests, such as a question written on a public whiteboard or bulletin board. User analytics collected through Google Analytics or other types of statistics can also be analyzed for information. Questions that may be useful to try to answer include what information on the website is the most important or the most sought-out by users, what tasks are users trying to accomplish when they come to the library website, what aspects of the current website do users use or appreciate the most, what do users feel is missing or needed on the current website, and are there things on the website that users have difficulty finding or often require assistance with. Knowing the answers to these questions and others will help with designing a website that meets users' needs and prioritizes the things they find most important.

"A successful systems librarian must be interdisciplinary, dipping into concepts from statistics, computer science, engineering, graphic design, and more."—systems survey respondent

RFPs, RFQs, Developers, and Other Options

Some organizations will require that libraries that are planning to contract with an outside developer for the design and creation of the website submit either a request for proposal (RFP) or a request for quote (RFQ) before doing so. If this is necessary, it is important to fully consider what is needed, including design, development, or ongoing maintenance, before putting together and submitting an RFP. Multiple developers should be evaluated and compared, including looking at previous work, requesting references, and considering working styles, before deciding on one to work with. In their book *Redesign Your Library*

Website, Stacy Ann Wittmann and Julianne Stam write that "you want a developer who is not afraid to tell you when you are wrong but who will also listen to you when you do not like a design element."[1]

Another thing to consider is web hosting options. If hiring a developer, will that person also host and maintain the website after completing the design, or will it need to be hosted elsewhere? If the website is being hosted elsewhere, will the library pay for cloud server space to host the website or host it on their own server? Will that server be maintained by the library or by an outside department such as IT?

It's also important to consider what type of content management system (CMS), the platform where the library website pages reside, will be used or if one will be used. Some popular CMS options include Springshare, which allows libraries to create and host their own website using the LibGuides CMS module, as well as the open-source WordPress, Drupal, and Joomla!.

Developing a Timeline

Finally, it will be important before beginning the design process to develop a timeline, including a projected date for the new website to go live. This may later need to be revised, but having a deadline will help to establish target dates for other milestones along the way and keep the project moving forward on schedule. Similar to the project management task of developing a timeline for any new project, it will be necessary to determine what milestones need to be met along the way for the project to be complete, including design of the site and usability testing, and the time projected to complete each milestone. Including the person to be responsible for each step and keeping the timeline somewhere that everyone involved in the project can read it will maintain transparency in the process as well as open communication between project members.

Designing for User Experience (UX)

When designing the new website, it is important to keep the end user in mind at all times and, when possible, involve the end user in design decisions through user testing. While it may be tempting to try to use flashy designs and innovative features, a good website will feel familiar to users, meet their expectations, and be easy and intuitive to use. Steve Krug wrote the seminal text on web usability in his 2000 book *Don't Make Me Think: A Common Sense Approach to Web Usability*, which he updated in 2013 with *Don't Make Me Think, Revisited*. In these books, Krug lays out how to create a usable website through the use of website conventions, concise wording, helpful navigation, and usability testing. His 2010 follow-up book, *Rocket Surgery Made Easy*, is a quick and easy guide to conducting usability testing that can further improve a website's design.

Web Conventions

Krug writes that "conventions have also evolved for different kinds of sites—commerce, colleges, blogs, restaurants, movies, and many more—since all the sites in each category have to solve the same set of problems."[2] Here is where a close examination of other library websites can help, by illuminating the particular web conventions specific to this type of website. Some useful general web conventions to keep in mind include:

- the site logo should appear in the top right corner and link back to the site homepage;
- the primary navigation should generally run across the top of the site and be consistent on all pages of the website;
- certain icons are commonly used for links, search, social networking, etc.;
- a website search box should generally appear near the top of the page;
- buttons and links should be readily identifiable as buttons and links through color or design (buttons should not be flat, links should not be the same color as regular text);
- fonts, colors, sizes, terminology, and general layout should be consistent from page to page.

Consistency is vital and can make a huge difference in how easy users find a site to use and understand. Wittmann and Stam write that "a consistent design flow for information makes a site easier to read, easier to comprehend, and even easier for users to scan for information. And a consistent, uniform presentation of information can make a considerable impact on users' perception of the professionalism of your site and of your library."[3]

> "Working with patrons and teaching will help you see the shortcomings of your systems from a user perspective."—systems survey respondent

Terminology

When choosing terminology for the website, it is important to avoid library jargon and use natural language as much as possible. In a 2012 article on library terminology, John Kupersmith examined fifty-one usability studies to determine the best way to label library resources and services from a user perspective. He found that some of the terms that were most often confusing for users included library acronyms and terms like "database," "catalog," "interlibrary loan," "periodical," "reference," and "resource." Instead phrases like "find books," "find articles," or others that used natural language were easier for users to understand. Some best practices he determined from these usability studies include:

- Conduct tests to see what terms users understand.
- Avoid using frequently misunderstood terms.
- Use natural language equivalents.
- Enhance or explain potentially confusing terms.
- Provide intermediate pages.
- Provide alterative paths.
- Be consistent in the use of terms.[4]

One way to determine the best terminology and navigation methods to use is through user testing. Card sorting is an easy user test that can be done either in person or through online tools like Optimal Sort or User Zoom. In a card sorting test, users are asked to sort a set of cards, each of which has an item on it that represents something on the website (such as databases, books, or interlibrary loan) into groups that make the most sense to them. In an open card sort, the participants group the items and label each category themselves. In a closed card sort, the participants group the items into

predetermined categories. Card sorting tests can help determine the best ways to group information on a website as well as the types of labels that make the most sense to users.

Responsive Design

With users moving away from desktop computers and toward mobile screens of varying size, including laptops, tablets, and mobile phones, it's important to be sure that the website can be easily accessed on any size device. In the past, it was common for websites to have a completely separate mobile version, and while some still do, more and more website creators are moving toward responsive design instead. Responsive design ensures that elements on a page resize according to the size of the user's browser so that the website can be viewed and used on any size device. A responsive design generally uses a fluid grid design, where elements are sized relatively to one another rather than absolutely. Where older websites might design a page where the main container of the website was a static 800 pixels wide, a responsive website might specify that the container fill 100 percent of the available space. This allows the size of the container to adjust along with the size of the browser window. CSS media queries, which use different sets of CSS depending on what size window is detected, also allow specific customization based on the size of the user's device.

Many content management systems also offer options for creating a responsive website using CSS frameworks. For example, the widely used framework Bootstrap[5] is the basis for the LibGuides CMS. There are also many responsive WordPress themes already available.

Accessibility

For a website to be designed with good user experience in mind it must function equally well for all users, regardless of ability. Many websites, including government websites, are required to be fully accessible by Section 508 of the U.S. Rehabilitation Act,[6] which also covers what it means for a site to be accessible. Websites that are accessible will work with assistive technology such as screen readers and through the use of the arrow keys for users who cannot use a mouse and will be easily usable by those with color blindness or low vision. Using the principles of Universal Design, a website can be accessible for all users. All users, regardless of ability, can benefit from the use of accessibility standards in a website design. The Seven Principles of Universal Design[7] are:

1. equitable use,
2. flexibility in use,
3. simple and intuitive use,
4. perceptible information,
5. tolerance for error,
6. low physical effort, and
7. size and space for approach and use.

There are three levels of accessibility for websites according to the Web Content Accessibility Guidelines (WCAG) developed by the World Wide Web Consortium (W3C). Level A covers the most basic web accessibility features, Level AA covers the most common barriers for disabled users and is the level often used as a benchmark by government, and Level AAA covers the most complex level of web accessibility. As many of the guidelines as possible should be applied for the highest level of accessibility that can be reasonably obtained. Table 11.1 describes many of the accessibility guidelines covered by WCAG.

Table 11.1. Accessibility guidelines described by WCAG.

FEATURE	DESCRIPTION	LEVEL
Non-Text Content	Images should have "alt" text (alt="text") Spacer images should have empty "alt" text (alt="") Image links should use "alt" text to describe link Audio/video/plugins should have "title" text Form controls should have "name" Icons should be made accessible through "alt" text	Level A
Captions and Media Alternatives	Multimedia should be captioned Text transcripts should be provided	Level A
Website Structure	HTML should use headings and subheadings with tags HTML should use structural elements Page layout should make sense without CSS All code should be validated	Level A
Forms	Forms should use clear/helpful labels for input fields <input>, <textarea>, and <select> need descriptive labels	Level A
Color	Website elements and instructions should not rely solely on color There should be sufficient contrast between text and background colors	Level A
Bypass Menu	Pages should have a "skip to content" link to skip menu navigation	Level A
Page Titles	Each page should have a clear and helpful title	Level A
Links	Link text should make the destination clear Image links should use "alt" text to describe the link purpose (if image is of text, alt text should be the same as image text, use <title> tag as a tooltip)	Level A
Language	Each page of the website should have the language encoding assigned	Level A
Error Identification	Errors should be clearly identified In forms, if a certain format is required, show/describe format In forms, mark required fields with an icon; icon should be explained before the form	Level A
Data Tables	Must have column and/or row headers identified using <th> elements Must have captions Tables used for layout should not use <th> tag	Level A
Multimedia	Prerecorded video should have audio description (if necessary)	Level AA
Contrast	Contrast ratio between text and background should be at least 4.5:1. Text that is 18 pt or larger (or 14 pt or larger if bold) must have a contrast ratio of at least 3:1	Level AA
Resize Text	There should be no loss of content or function if text is resized to 200% Users should not have to scroll horizontally at 200%	Level AA
Images of Text	Do not use images of text	Level AA
Headings and Labels	Use semantic labels (header, footer, aside)	Level AA
Focus	Keyboard focus should be visible and clear	Level AA
Multimedia Alternatives	Prerecorded video should have audio description, if needed Prerecorded video should provide transcripts	Level AAA
Contrast	Contrast ratio between text and background should be at least 7:1	Level AAA
Keyboard Access	Entire website should be accessible by keyboard only, with no mouse required	Level AAA

⟳ Prototyping and Usability Testing

Once a design has been created, but before the actual coding of the site takes place, is the time to create a prototype that can be approved by any relevant parties before the site is created. Making changes to the design is much easier to do before the site has been completely put together than after. At the same time, a prototype can also be used to do some preliminary usability testing to discover any potential usability issues and make any necessary changes to the design, again before the actual coding work has been completed. A prototype can take one of many forms but is generally a basic outline of the design and the elements that will be included, without going into too much detail. A prototype can be created in Photoshop or hand-drawn. One popular way to mock up the design is with a wireframe. "The purpose of the wireframes at this point in the process is to show a visual representation of items to be included before any actual coding takes place."[8] Figure 11.1 shows an example of a wireframe outlining basic elements of the page, including the navigation as well as the overall layout.

Once a design has been approved, the wireframe can be used to do basic usability testing. Usability testing can also be done on the full website once it has been completed.

Figure 11.1. Example of a wireframe drawing. *Braden Kowitz (Flickr)*

Usability Testing

While Steve Krug (literally) wrote the book on web usability, his follow-up book, *Rocket Surgery Made Easy*, provides easy instructions for performing usability testing. Usability testing doesn't need to be formal, expensive, or time consuming in order to be effective.

In fact, frequent small-scale tests that result in small, iterative updates to the website are often better since they don't result in huge design changes that users need to adjust to. Rather, the result is that one or two specific issues may get fixed at a time, the user has a better experience without being required to learn to navigate a new design, and the website consistently improves over time.

Jakob Nielsen, another leading usability expert, suggests that you only need to test five users to get useful results but also gives exceptions where testing more users might be necessary.[9] Steve Krug recommends testing just three users because "the first three users are very likely to encounter many of the most significant problems related to the tasks you're testing."[10] Instead of testing more users at the same time, it can be more effective to test a smaller number of users but perform more tests.

A usability test can be fairly simple. Krug's book provides a complete checklist of things to do in preparation for, and during, the testing, but the following list provides the basic steps for performing usability testing:

- Decide what you want to know, for example:

  - Do users understand the terminology used on the website?
  - Can users find a specific book using the website?
  - Are users able to get help if they get stuck?

- Recruit and schedule participants.

  - Offer incentives such as gift cards, candy, food, branded items, etc.
  - Schedule slightly more participants than you need to account for no-shows

- Create a list of tasks (enough for an approximately thirty-minute session) for users to perform that will answer the questions above, for example:

  - Click on the link that would let you request a book from another library.
  - Find the call number for *The Grapes of Wrath* using the website.
  - Where would you click if you needed to request assistance from a librarian?

- Conduct the sessions.

  - Run through each task and either record the user or have a second person take detailed notes about their actions.
  - Do not interfere or give the user hints.
  - Record what the user does, where they have trouble, and if they are able to complete the task.
  - Encourage the user to talk aloud during the task to explain their thought process and share their reactions to the site.

- Summarize the most common and the most serious issues discovered during testing.
- Adjust the design to fix the issues that can be fixed.
- Conduct more usability testing.

Even after the new website has gone live and is being regularly used by patrons, it's a good idea to continue regular usability testing. Even regularly surveying users (and non-users) can provide a good overview about which features on the site are working and which ones aren't, what features are needed by users but not included on the site, and

what parts of the site aren't being used and could be eliminated. Regular user testing will allow for continual improvement of the website while also preventing the need to do a major website design overhaul sooner than necessary.

◎ Preparing to Go Live

Before going live with the new website, it can be helpful to communicate plans for the new site with users. Rather than taking them by surprise with the sudden appearance of a completely new website, prepare users by sending out several communications about the upcoming design changes. This can be done on the current website and through e-mail newsletters, flyers, and whatever other forms of communication are used to reach the user community. In addition to communicating the plans for the new design, it can also be useful for users to understand the process that went into the new design, including the testing process, and how that information was used to inform design decisions. Knowing their feedback was considered as part of the design process can give users buy-in to the upcoming changes.

If other staff members will be able to create and publish content on the website, such as research guides or LibGuides, independently or without webmaster oversight, a style guide is an essential part of the preparation. Be specific in the style guide about what things can and can't be included and how library staff should style and format their content. Some important details to include are:

- what font style, size, and color should be used;
- what heading styles should be used;
- what overall colors should be used;
- specific language and terminology to use;
- rules for photos and graphics;
- general layout rules; and
- how to make page elements accessible for users.

◎ Key Points

While a website redesign can be a huge undertaking, the right preparation is key to making sure the project is a success. Some things to keep in mind during the process include:

- Gathering input from users is a vital first step. Knowing what users want, need, and expect before beginning any design work will ensure that the end product is one that patrons are happy to use and that meets all of their needs.
- It is important to keep the end users in mind from the beginning of the process to the end, which includes designing for user experience. Designing for user experience means collecting user feedback and using it to inform the design process; using the web conventions that users expect to see and are already familiar with; avoiding jargon and instead using terms that users can easily understand; avoiding large blocks of text and instead using bullet points, easily scanned headings, images, and plenty of whitespace; and making sure the website is accessible to all users regardless of ability.

- Creating a prototype of the design will allow design adjustments to be made before the work of creating the entire site has been done. A simple prototype gives stakeholders a clear idea of how the page will be laid out, what elements will be included, and how navigation will function. A wireframe or other prototype can be used for preliminary user testing to discover potential usability issues that can be fixed before the entire site has been coded.
- A style guide for any staff who will contribute content to the site will help maintain consistency across the site and ensure that the site looks professional and well-maintained.

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Interview with a Systems Librarian

Vickie Kline
Systems Librarian, York College of Pennsylvania

How many years have you worked as a systems librarian?
Thirty-one.

What led you into working with technology?
I took a temporary academic position (2.5 years) during the early wave of library automation to gain experience. I learned about reference, cataloging, and systems.

Do you feel that your education prepared you for work as a systems librarian?
I believe my education prepared me to work as a librarian, but not a systems librarian. The systems that are a central part of my work now didn't exist.

What skills or experience did you have that helped you get your first systems job?
The ILS implementation skills I learned at my first temporary position led to a job implementing the same system at another library. Other systems followed (webpages, online databases, ERM, etc.).

What skills have you had to learn on the job?
I've learned almost everything on the job.

What skills or knowledge have been most useful to you in your day-to-day work?
I'd answer with qualities instead, determination and patience. I'm willing to sit down and read documentation and ask questions. I engage in a steady diet of free-range learning to explore new areas. I'm also willing to ask for help when something is beyond my current abilities.

Did you ever work on a project that went very wrong?
I'd reframe this as projects that didn't live up to our expectations and interim ideas that we outgrew. For example, federated searching was a brilliant idea at the time, but it was impossible to achieve a decent response time and reliable simultaneous connections to different databases. The OCLC CORC project to catalog Internet resources using DublinCore was a wonderful idea when Internet sources were difficult to locate; once the Internet exploded, it wasn't scalable.

We also learned not to oversell new technologies. When discovery searching was first introduced, it was positioned as the tool that would allow us to search *everything* in the library. The reality is an ongoing stream of metadata and full-text linking issues that continue to this day.

What is one of the most interesting or complex projects you led or worked on?
Trying to get discovery and full-text linking working is probably the most interesting and complex project I've worked on. Trying to make connections between the online catalog, a discovery service, a proxy server, and a multitude of vendor databases seamless for our users is the holy grail of systems work. You have to approach the work with persistence. All pieces of the puzzle are moving targets—trying to identify the source of problems one by one is a Sisyphean task.

Have you ever led a systems migration?
I've led an ILS migration and a discovery migration. The biggest thing I've learned is the importance of clear communication and being careful to translate terminology between vendor products. You have to immerse yourself in the worldview of your new vendor so that details aren't lost in translation.

Have you ever led a website redesign project?
We are currently managing our website with Springshare CMS. Originally we used whatever CMS was used for the campus site. We went through some painful redesigns and software migrations over the years. Trying to shoehorn the complex functionality needed for our library users into admissions designs that appealed to prospective parents and students was always frustrating. We also had bad experiences with web design consultants who "migrated" library content without understanding what library users do on our pages. In one instance, we had to scrap the custom work and engage in emergency coding to rebuild our site within a few days' time—right before the beginning of the semester. I learned that it's very important to have a seat at the table during design. I also learned the importance of being able to explain the advantages of using a library-specific CMS.

Can you describe your day-to-day work or what a routine day is like?
It usually starts with working on any critical problems that have been identified or time-sensitive requests. I then chunk any remaining tasks by system and rotate through them. I may spend one afternoon working on the proxy, the next working on record loads or extracts, and the next troubleshooting full-text linking problems . . .

What is the most challenging aspect of your position?
As our library's digital footprint expanded, we added two system administrators to assist with the workload. Unfortunately, the economic situation changed over time—we lost both positions. When I started, we had an ILS with a few subsystems and a handful of online databases. We're now trying to support an ILS, an ERM, a website, several ILL systems, and more than one hundred databases/vendor packages. As the only systems person, I spend a lot of time putting out fires. Some issues are only addressed when other librarians and library administrators who don't primarily identify as "techies" are willing to develop additional skill sets to create their own solutions.

What do you feel is the most rewarding or interesting part of working with systems/technology?
To me the most rewarding part of library systems work is that there is always something new to explore. Services change continually and new opportunities appear on the horizon.

How do you see systems librarianship changing over the next five to ten years?
I believe the core set of technology skills needed to enter the field will continue to expand. I think the emphasis on UX and accessibility will deepen.

What do you think are the most important skills or qualities a systems librarian needs to have?
Curiosity, determination, patience, problem-solving, self-directed learning, communication, project management, coding . . . and a sense of humor.

What do you most wish you had known before becoming a systems librarian?
I would really have benefited from a programming/coding background. I also wish I could have had more empathy for the technology fatigue that librarians and library administrators can experience after being in the profession for many years. I didn't understand colleagues who said, "If X changes, I'm retiring!"

What has been the most surprising thing that you didn't expect about working as a systems librarian?
Well, in high school, I didn't think I wanted to have anything to do with computers or typing. My a-ha moment was the introduction of the Mosaic browser. At that point, I started to sense the extent of the information universe that I would get to explore over my career. Internally, I had the sense of "this is why I became a librarian."

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5. Bootstrap, getbootstrap.com/.
6. U.S. General Services Administration, Section508.gov, www.section508.gov/.
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WebAIM. "Section 508 Checklist." Accessed May 7, 2019. webaim.org/standards/508/checklist.

WebAIM. "WAVE Web Accessibility Evaluation Tool." Accessed May 7, 2019. wave.webaim.org/.

WUHCAG. "WCAG 2.0 Checklists." Accessed May 7, 2019. www.wuhcag.com/wcag-checklist/.

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Usability Testing Tools

Optimal Workshop: www.optimalworkshop.com/

User Zoom: www.userzoom.co.uk/software/card-sorting/

UXSuite: usabilitytools.com/ux-suite/

UsabiliTest: www.usabilitest.com/CardSorting

Simple Card Sort: www.simplecardsort.com/

CMS Options

Drupal: www.drupal.org/

Joomla: www.joomla.org/

Springshare: www.springshare.com/libguides/cms.html

WordPress: wordpress.org/

Help and Support

IN THIS CHAPTER

▷ Professional Associations and Organizations

▷ Professional Literature

▷ Conferences

▷ Listservs

▷ Online Resources

THE LIBRARY COMMUNITY has numerous resources available to help new librarians or those needing assistance, guidance, or answers. Joining a professional association is not always necessary but can be a good source of networking and other professional opportunities. These associations often have their own resources available to members. Conferences are also a great way to network with other technologists and learn more about trends in the field and innovative projects other libraries are working on. Listservs offer a virtual community where librarians can find quick answers, in-depth discussions, and other shared ideas.

Librarianship is also an academic field, and as such, there are many options for professional literature that will offer up-to-date research, case studies, and analysis. Finally, there are a number of online resources available, including blogs and social media, that can provide informal discussion on current ideas in library technology, how-tos, Q&As, and more. This chapter will provide some popular examples of each, many suggested by the practicing systems librarians who responded to the systems librarian survey.

Professional Associations and Organizations

- ACRL (Association of College and Research Libraries [ALA division])
  www.ala.org/acrl/

- ALCTS (Association for Library Collections and Technical Services [ALA division])
  www.ala.org/alcts/

- ASIS&T (Association for Information Science and Technology)
  www.asist.org/

- CNI (Coalition for Networked Information)
  www.cni.org/

- DLF (Digital Library Federation)
  www.diglib.org/

- EFF (Electronic Frontier Foundation)
  www.eff.org/

- LITA (Library Information Technology Association [ALA Division])
  www.ala.org/lita/

- NASIG (Formerly the North American Serials Interest Group, Inc.)
  www.nasig.org/

- NISO (National Information Standards Organization)
  www.niso.org/

- State and local associations
  Most states have their own library association, which will often have an annual conference or other gatherings, offer professional development opportunities, and provide opportunities for professional networking or collaboration. There are also many local associations that are specific to a region or metro area that offer similar benefits. These state and local associations can sometimes offer less expensive opportunities for conference attendance or online learning and often provide new librarians with easier-to-access leadership opportunities than national associations.

Professional Literature

- Code4Lib Journal
  journal.code4lib.org/

- Computers in Libraries
  www.infotoday.com/cilmag/

- Digital Library Perspectives
  www.emeraldinsight.com/loi/dlp

- Electronic Library
  www.emeraldinsight.com/loi/el

- Information Technology and Libraries
  ejournals.bc.edu/ojs/index.php/ital/index

- Information Technology and People
  www.emeraldinsight.com/loi/itp

- International Journal on Digital Libraries
  link.springer.com/journal/799

- Journal of Electronic Resources Librarianship
  www.tandfonline.com/toc/wacq20/current

- Journal of Information Technology
  www.palgrave.com/us/journal/41265

- Journal of the American Society of Information Science and Technology
  onlinelibrary.wiley.com/journal/23301643

- Journal of Web Librarianship
  www.tandfonline.com/toc/wjwl20/current

- Library Hi Tech
  www.emeraldinsight.com/loi/lht

- Library Hi Tech News
  www.emeraldinsight.com/loi/lhtn

- Library Technology Reports
  journals.ala.org/index.php/ltr

- Smart Libraries Newsletter
  journals.ala.org/index.php/sln

- Technical Services Quarterly
  www.tandfonline.com/toc/wtsq20/current

- Weave: Journal of Library User Experience
  www.weaveux.org/

Conferences

Conferences are an excellent way for librarians to connect with others working in similar positions or on related projects and learn about what other libraries and librarians are doing with new technology and other trends in libraries. Although many conferences, including ALA Annual, will have technology-related sessions, the following conferences are particularly popular with library technologists and focus specifically on the use of technology in libraries and other related topics.

Access (accessconference.ca/)

Access is a library technology conference held annually in cities throughout Canada for library technologists to discuss "cutting-edge library technologies." The conference features "in-depth analyses, panel discussions, lightning talks, hackfest, and plenty of time for networking and social events." The conference is also live-streamed, and recordings of past conferences are available on the conference YouTube site starting with the 2015 conference.[1]

An Event Apart (aneventapart.com/)

An Event Apart is not specific to libraries, but it is a conference that focuses exclusively on web design and user experience, a topic relevant to many library technologists. The three-day events are held throughout the year in various cities around the United States and include practical tips and ideas on topics like design, CSS, mobile, and accessibility.

Charleston Library Conference (www.charlestonlibraryconference.com/)

The Charleston Library Conference is an annual conference held in Charleston, South Carolina, where librarians and vendors come together to participate in sessions focused on topics like analytics, library collections, library services, management, scholarly communication, and technology. The conference has a YouTube site where recorded sessions going back to 2013 can be found.[2]

Code4Lib (code4lib.org/conference/)

Code4Lib is a volunteer-driven community of technologists working in libraries, archives, and museums that has grown to include a listserv, an open-access journal, and, since 2006, a national conference. Code4Lib also has smaller, regional gatherings. The main conference is held in different cities around the United States and includes preconference workshops often on specific systems (such as ArchivesSpace or Islandora) or technologies (SQL, ARIA, Python), as well as several days of sessions on highly technical and practical technology topics. Code4Lib also has a YouTube channel where past conference recordings are available going back to 2014.[3]

Computers in Libraries (computersinlibraries.infotoday.com)

Computers in Libraries is an annual library technology conference held by Information Today, Inc., in the D.C. area every spring. Information Today, Inc., also publishes the *Computers in Libraries* magazine. The conference features preconference workshops as well as several days of sessions following tracks on topics such as navigation and search, UX design, community engagement, leadership, and school libraries. There are recordings of some of the conference's keynotes, sessions, and interviews going back to 2012 available on the conference website.[4]

Designing for Digital (designingfordigital.com/)

Designing for Digital is a relatively new conference that takes place in Austin, Texas, directly following the Electronic Resources and Libraries conference. Initiated in 2015, Designing for Digital "is meant to bring together UX professionals, web designers, managers, researchers, strategists and librarians of all types" with a focus on website and user experience design. The conference can also be attended online, and recorded sessions are available to online attendees for up to one year after the conference.

DLF Forum (www.diglib.org/dlf-events/past/)

The Digital Library Federation's annual forum is held in different cities throughout the United States each year and features content geared toward those working with digital

> "Make connections with other people from other institutions that do the same thing. The knowledge sharing is great, as well as the commiseration."—systems survey respondent

libraries, archives, and museums. The forum features a variety of hands-on workshops as well as sessions on technology used and other topics of interest around digital libraries.

Electronic Resources and Libraries (www.electroniclibrarian.org/conference-info/)

The Electronic Resources and Libraries conference is an annual conference held each spring in Austin, Texas. While its focus is on electronic resources, the conference often includes sessions on topics such as EZproxy, discovery platforms, user experience, and emerging technologies. The conference features both preconference and post-conference workshops on practical topics as well.

Internet Librarian (internet-librarian.infotoday.com)

Internet Librarian is essentially the West Coast version of the Computers in Libraries conference, held every fall in Monterey, California. The conference often features the same or similar tracks, sessions, and workshops as the Computers in Libraries conference and is also held by Information Today, Inc.

LDCX (library.stanford.edu/projects/ldcx)

LDCX is an "unconference" held annually by Stanford University Libraries and is geared toward libraries, museums, and archives working with shared technologies like Blacklight, Solr, and Hydra. Held for library technology practitioners, attendees include developers, data modelers, devOps, project managers, librarians, archivists, and more.

Library Technology Conference (libtechconf.org/)

The Library Technology Conference is an annual technology-focused conference held at Macalester College in Saint Paul, Minnesota. A smaller conference with capped registrations that tend to fill up quickly, the Library Technology Conference is especially popular with academic librarians from the upper Midwest, though attendees come from across the United States and Canada. The conference covers a wide variety of technology topics such as virtual reality, makerspaces, virtual reference, instructional technology, and more.

LITA Forum (forum.lita.org/)

The LITA Forum is another smaller annual conference held each fall in different cities across the United States. The conference is held by ALA's Library and Information Technology Association division and features sessions from information professionals "working at the cutting edge of library technology." LITA Forum features hands-on workshops, discussion sessions, and lectures on topics ranging from practical technology implementations to the newest innovative technology currently in use in libraries.

NASIG (www.nasig.org/site_page.cfm?pk_association_webpage_menu=700)

NASIG holds a conference in various cities across the United States in the early summer each year. While the content is geared mainly toward serialists and those working with other electronic resources, it also often touches on topics like metadata, discovery, ILS, and institutional repositories and features preconference workshops with hands-on learning for things like MarcEdit, KBART, and Linked Data.

Product-Specific Conferences

There are also several annual conferences for users of vendor products, which can be useful for networking with other users of the same ILS/LSP or discovery product, learning about new product features, and learning how other libraries are using or enhancing the product in innovative ways. Some product-specific conferences are listed below:

- ELUNA (Ex Libris Users of North America)
  el-una.org/

- IUG (Innovative Users Group)
  innovativeusers.org/

- COSUGI (Customers of SirxiDynix Users Group)
  www.cosugi.org/conference

- EBSCO User Group
  www.ebscousergroup.org/

Listservs

Listservs are invaluable as a quick way to reach hundreds of other librarians and other information professionals interested in the same topics. Listservs exist for sharing information, and librarians with questions will usually find many helpful people ready to offer tips, suggestions, or resources. Multiple listservs exist for almost every individual technology, including vendor products. The listservs below are some of the most useful for systems librarians and other technologists.

ALCTS (lists.ala.org/sympa/info/alcts-eforum)

ALA's Association for Library Collections and Technical Services division has several listservs, among them the e-forum listserv where members have semi-regular moderated discussions on topics of interest to technical services librarians. Some recent topics have included weeding, user experience and electronic resources, and technical services workflows.

Code4Lib (lists.clir.org/cgi-bin/wa?A0=CODE4LIB)

The same group of library technologists who put on the Code4Lib conference also run the Code4Lib listserv, a discussion list created for librarians to discuss programming languages used in libraries. While the list of topics has diversified since its inception,

Code4Lib is still an excellent place to find library technology job postings as well as discussions on all manner of highly technical topics.

Collib (lists.ala.org/sympa/info/collib-l)

Collib is a listserv focused on college libraries, but it will appeal to academic librarians of all kinds. While the topics are not solely focused on technology, it is a good place to find information and discussion on the use of technology as it pertains specifically to academic libraries.

ERIL (lists.eril-l.org/listinfo.cgi/eril-l-eril-l.org)

The Electronic Resources in Libraries discussion list is a place for librarians working with any type of electronic resources to share news, ideas, and issues. It can also be a good place to find job announcements for technology-related positions. Subscribers to ERIL include librarians and others from all areas of library work, including systems and technical services, public services, vendors, and publishers.

> "Listservs—find the ones most specific to your job and follow them. The folks posting there are knowledgeable, friendly, and give their scripts freely!"—systems survey respondent

EZproxy (listserv.oclclists.org/scripts/wa.exe?A0=EZPROXY-L)

The EZproxy listserv is an invaluable resource for anyone managing an EZproxy server or resolving authentication issues for their library. The list is friendly to newcomers and full of experienced EZproxy administrators and users who are quick to share tips, hacks, and strategies or help troubleshoot access issues shared by other members.

LITA (lists.ala.org/sympa/info/lita-l)

Not just for members of ALA's LITA division, the LITA listserv focuses on library technology and is an excellent place to find library technology job announcements, calls for authors and conference proposals, and general discussion on all manner of technology used in libraries, from APIs and Raspberry Pi to scanners and software for managing public computers.

Publib (listserv.oclclists.org/scripts/wa.exe?A0=publib)

Like Collib, Publib is not focused solely on technology but rather includes discussion on areas of concern to public libraries and their employees. Those working in public libraries and looking to share or find information on the use of technology in this environment will find it useful.

Web4Lib (web4lib.org/)

Web4Lib was created for "the discussion of issues relating to the creation, management, and support of library-based World Wide Web servers, services, and applications."

Anyone can join, but the listserv specifically offers news and information about technology-related conferences, online courses, and job postings, as well as discussion on all types of technologies in use at libraries of every kind.

Product-Specific Listservs

There are a number of listservs created specifically for users of vendor products, such as lists for SirsiDynix, Innovative Interfaces, Ex Libris, OCLC, and other products. Some of these will require registration by the vendor as only current customers are allowed to join. It is worth checking for listservs of any specific products an individual library uses as these will provide direct communication with other users of the product, which can be particularly effective for troubleshooting, getting answers to questions, or just sharing tips and ideas.

Online Resources

Digital Humanities Now (digitalhumanitiesnow.org/)

Digital Humanities Now is a site that aggregates feeds from multiple sources on digital humanities scholarship. The site also includes sections for job announcements, calls for proposals, conference announcements, and other resources.

EDUCAUSE (library.educause.edu/search#?publicationandcollection_search=Horizon%20Report)

EDUCAUSE is a nonprofit group focused on information technology use within higher education. Of particular interest for librarians working in academic libraries are its annual Horizon Reports, which discuss technology trends that are set to impact higher education environments within the short-term, mid-term, and long-term.

Google (www.google.com)

When in doubt, Google it. Chances are that someone, somewhere has encountered this problem before and chances are equally good that they posted something on the Internet about it. Sometimes the answer gets posted as well, but it can often take a great deal of sifting and creative searching to find. Still, for non-library-specific technology issues, Google can often be the quickest way to solve a problem.

Library Technology Guides (librarytechnology.org/)

Library Technology Guides is a site created by Marshall Breeding, a longtime library technologist and well-known speaker and author in the field.[5] The website offers comprehensive information on library technology products and vendors. It is also an invaluable resource for any library preparing to go through a systems migration.

LibTechWomen (libtechwomen.org/about.html)

LibTechWomen is an informal group created as a supportive space for women working in library technology. The group meets monthly to chat on IRC and also has a Slack channel and active social media presence.

LITA Blog (litablog.org/)

The LITA Blog can be a good source of information including weekly job postings, association announcements, and news. It also features blog posts written on a variety of topics by various LITA members.

Musings about Librarianship (musingsaboutlibrarianship.blogspot.com/)

Musings about Librarianship is a blog written by former *Library Journal* Mover and Shaker Aaron Tay. The content is focused on practical technology use in libraries and covers topics such as library analytics, discovery, open access, mobile, and more.

ResearchBuzz (researchbuzz.me/)

ResearchBuzz is a blog that covers a variety of current technology-related topics. While not specifically written for librarians, library technologists should find the content interesting and relevant.

> "Honestly, I learned a lot of what I know from Google."—systems survey respondent

Spiceworks (community.spiceworks.com/group?source=navbar-subnav)

Spiceworks in an online community of IT professionals sharing tips, reviewing products, and seeking advice. While not geared directly to library professionals, it has a multitude of individual forums for nearly every topic and technology including hardware, software, networking, cloud computing, databases, programming, and more. There is also a user group called Library IT Pros Unite.

Springshare Blog (blog.springshare.com/)

While not relevant for all systems librarians, any library using any or all of Springshare's suite of products will find their blog particularly useful. Regular content includes postings on upcoming features, bug fixes, planned maintenance, and more. The Springshare community site also includes community discussion forums for all of their products and recorded and synchronous online training sessions.

StackOverflow (stackoverflow.com/)

StackOverflow is a community of developers where users can ask questions about highly technical topics, usually programing-related, and get answers or assistance from experts. The community has a reputation for not always being welcoming to new users and for occasionally harsh responses to questions not deemed appropriate. However, particularly for coding questions, if no amount of Googling has solved an issue, there is a chance StackOverflow can come up with the answer.

TechSoup for Libraries Blog (www.techsoupforlibraries.org/blog)

The TechSoup for Libraries blog provides regular content on technology topics aimed at public libraries, including news, tech trends, use cases, and resources. While its main focus

is public libraries, its content on tech trends and the technology year in review content will likely appeal to library technologists in all environments.

⊚ Key Points

- New systems librarians just starting out are never alone. Joining a professional association can offer networking and learning opportunities with others in similar positions.
- Listservs are an informal way to connect with hundreds of other information professionals at once to share questions, tips, and ideas. They can also be a great source for finding job announcements.
- While conferences are often expensive and can be difficult to attend, the benefits can be substantial. Conferences provide librarians with an opportunity to meet other professionals in the field and learn more about what other libraries across the country are doing with technology. Conferences that offer workshops provide an opportunity for hands-on learning that can be especially beneficial.
- Professional literature will provide new and experienced librarians with peer-reviewed, scholarly articles exploring issues in library technology, use cases, or quantitative and qualitative research. Informal non-scholarly resources available online, like blogs and websites, can also offer practical information and problem-solving assistance.

<p style="text-align:center">*   *   *</p>

⊚ Interview with a Systems Librarian

Patsy Yang
Digital Services Librarian, Gateway Seminary

How many years have you worked as a systems librarian?
Ten.

What advice would you give to new systems librarians or LIS students interested in working in systems librarianship?
Take as many technology classes as possible but also take a management class because you'll be doing projects that involve people from different areas of the library and possibly your organization as a whole. Also, work on website skills and languages on your own.

Are there any other comments you would like to make regarding systems librarianship?
Assume that everything you're learning how to do for the first time will take twice as long as you think, at least! Take notes when learning a new process that is done very infrequently, so that you don't have to relearn it every time you need to do it.

What led you into working with technology?
[I] always enjoyed tinkering with things and trying to figure out how they work. I have great music and math skills, so am analytical and creative in problem solving. I approach new tasks

in my job as a problem to solve, whether it is redesigning a website or dealing with database/ILS vendors. I started working as a regional campus librarian half-time in 1999 and was known on my campus as the "tech" person because I could usually solve problems people were having with computers, printers, cell phones, etc. When I decided to start working on my MLS, my library director said that when I finished, she wanted me to become full-time (half digital services and half regional campus), so I took some tech-related courses while in the program. The program did not have classes on different computer languages, so I worked on those on my own before and after I started working full-time. The position became full-time digital services (helping in other areas as needed since I had a lot of experience in them already) in January 2009.

Do you feel that your education prepared you for work as a systems librarian?
Yes and no. It gave me the broad strokes of what it meant to be a systems librarian, but I learned most of it on the job, going to training sessions with our ILS vendor at the time, using W3schools and other websites to learn HTML, CSS, etc.

What skills or experience did you have that helped you get your first systems job?
My library director already knew me, she knew that I enjoyed learning new things, I already knew the ILS system we used in the library, so just needed to learn how to "talk" with the server (UNIX) and make it do what I wanted. I had learned some HTML in school. In other words, my library director trusted that I would grow into the job.

What skills have you had to learn on the job?
CSS, additional HTML, how to talk in UNIX, website design, proxy server configurations, openURL resolver configurations, how to deal with vendor support personnel, being more assertive in dealing with vendors, working with teams—website redesign, problem solving for online resources, etc.

What skills or knowledge have been most useful to you in your day-to-day work?
HTML, CSS, relational skills, patience when dealing with patrons having a tech issue, UNIX until two years ago when we changed ILS vendors (no longer have our own server), ability to work with faculty, my director, coworkers in the library, our IT department, etc.

Did you ever work on a project that went very wrong?
First time I upgraded our ILS on our own server. Even though my director reminded me that I needed to get the ILS and the website set up in a sandbox before making them live, I didn't and it was a mess! I had to roll back the upgrade, redo it, and then slowly integrate all the OPAC customizations, testing each one to make sure it worked before going on to the next one, etc.

What are some other major projects you've been involved in?
Moving a library, which entailed hosting our ILS (moved to a new system) and hosting our website. Purchasing a new library server in 2011. We have a small staff, so I also helped develop our library's collection development policy, implemented LibGuides two years ago, implemented LibraryH3lp chat last fall.

Have you ever led a systems migration?
Yes, in 2016. We moved from Voyager (Ex Libris, now owned by ProQuest) to OCLC's Worldshare Management/WorldCat Discovery. We also moved from having a server with computer-based

staff interfaces to being hosted with a web-based staff interface. We had a committee consisting of the director; our cataloging, collection development, reference, and circulation librarians; and one regional campus librarian and myself. We spread it over five months because we were also preparing to move our seminary's main campus 600 miles two months after completing the migration. The project took much more time than we expected. The OCLC sales manager whom we worked with assured us that we would be able to do things that we later discovered were not possible. Records for periodical and multi-volume titles in the main collections migrated very poorly, which we were warned about in advance for periodicals but didn't realize it applied to all multi-volume works. We are still cleaning up those records three years later. Our implementation manager was very helpful in breaking the huge project down into small steps for us. What I learned? Only do this once in your career if you want to stay sane! Migrations are never clean. There are going to be problems during and after the migration is "done." We have five campuses with a unified catalog, which complicated things a bit. Weed before the migration, not during or after—we continued to weed journals and some books at our main campus (prepping for the move) after we sent the catalog to OCLC for conversion but did not keep track of those titles. They were removed from Voyager but were in WMS when we went live. The first time we did inventory at our new campus, we found many missing books, some of which were at other campuses, but many of which had been discarded just before the move but never removed from WMS.

Have you ever led a website redesign project?
Yes, I did. I had a website redesign team of six members—five library staff and one faculty member, and two student focus groups (grad and post-grad students). My library director required me to write up a proposal including a purpose, timeline, resources needed (people, money, and things), history, benefits and needs, implementation process. We looked at historical data on website usage and what links were most popular, asked the focus groups what they wanted the website to do and look like, developed wireframes, etc. Our library director and one member of the redesign team left during the process, so we had to bring our new director up to speed on our goals and ideas. I broke the project down into as small bites as possible, so that no one felt overwhelmed during the process. It took longer than planned (think I mentioned above somewhere that everything in systems librarians' work seems to do that), but we now have a much better front page and are working on updating the secondary and tertiary pages now.

Can you describe your day-to-day work or what a routine day is like?
Routine day: I usually have two or three projects going on, so I spend about an hour or so on each of those. Right now, those are (1) getting our print journal runs into our A–Z List (openURL resolver), so patrons can request articles that aren't available online, (2) updating our individual online journals (ones that come with a print subscription or aren't available in a database) and making sure that they are accessible from both on and off campus (proxy server, in the A–Z list, etc.), and (3) cleaning up the patron database in our ILS. I also work to update links on the website, respond to e-mails with requests like this, solve problems with online resources (students', faculty's, and my boss's are dealt with the same day if possible). I try to spend half of one day a week on the website, continuing to fine-tune it. I spend a few hours a week in LibGuides, making sure database links are correct and doing final reviews of pages before they are published. I help with reference work if our reference librarian is already working with someone else or is unavailable, maybe two to three hours a week.

What is the most challenging aspect of your position?
Organizing my time. There are days when I get multiple "help me" e-mails from patrons and staff related to issues with online resources or the library catalog/WMS. I tend to want to put all the fires out before working on a project, but if I do that every day, I won't get anything done on my projects.

What do you feel is the most rewarding or interesting part of working with systems/technology?
Making something work better than it was and having a staff member or student notice it!

How do you see systems librarianship changing over the next five to ten years?
I think more libraries will move to hosted ILS's and websites, but they will be working with digital repositories, digitization, dealing with safety of personal information in our systems, and helping our patrons understand the need to do the same. Every time I see someone click "save my password" on a computer that isn't theirs, I cringe and remind them that's not a good idea on public computers.

What do you think are the most important skills or qualities a systems librarian needs to have?
Be able to explain technical issues in "normal" language. Learn as many web and server languages as you can and be able to use them appropriately. Relational skills . . . you'll spend a lot of time working with vendors, and if you build relationships with your representatives, problem solving with them will be much easier. Don't be afraid to try something new and fail. Don't be afraid to say that you don't know how to do something. Always be ready for change.

What do you most wish you had known before becoming a systems librarian?
How to work with a UNIX server.

What has been the most surprising thing that you didn't expect about working as a systems librarian?
How much it involves problem solving for other library staff members.

Is there anything else you would like to mention that hasn't been asked?
I love my job, but I need to work with students once in a while, not just to remind myself that's why I do my "normal" work, but also to get away from my computer. Systems librarianship is not for extroverts. You'll need to be able to work by yourself for extended periods as well as to work with other library and IT department staff.

*   *   *

Interview with a Systems Librarian

Michelle Henley
Discovery Services Manager, Ohio State University Libraries

How many years have you worked as a systems librarian?
Thirteen years.

Is there anything about your current position that makes it a unique representation of systems librarianship?

Due to the size of the institution, my focus is more narrow than it had been at smaller institutions. I'm also lucky to have support to further my training, which not all institutions can do for their employees.

Was it always your intention to be a systems librarian?
I was always interested in library technology, but I concentrated in human-computer interaction because I felt like a lot of our systems make things harder for people to use than necessary.

What led you into working with technology?
I was already a paraprofessional at a small academic library. While the institution couldn't afford to financially support my degree, they were supportive in many other ways and encouraged me to learn as much on the job as possible. They also gave me time off to take classes part-time. I had minored in computer science as an undergrad, so it felt natural to me to focus on technology with my graduate degree.

Do you feel that your education prepared you for work as a systems librarian?
As I stated earlier, the title systems librarian can cover a lot of different responsibilities depending on the type and size of the institution. I have worked at a small private liberal arts college, a medium-sized public library system, and a large academic university. Every job had some overlapping responsibilities but were also very different. I don't know how a two-year master's degree can really prepare someone for the different expectations.

What skills or experience did you have that helped you get your first systems job?
Problem solving, willingness to learn, and just plain luck. I was finishing up my graduate degree around the time a librarian at my current place of employment decided to retire. A position was created for me when I graduated because it was mutually beneficial for both me and the library.

Did you do any systems/technology internships that were beneficial?
I worked as the head of Circulation for many years before I became a systems librarian. I also worked for a short time in Technical Services and Government Documents. Prior to that, I helped cover a Help Desk for the Information Technology department at the college—that gave me a foundation in troubleshooting and working with people to solve problems.

Did you ever work on a project that went very wrong?
Many years ago, I was trying to upgrade some software and I uninstalled the old version without confirming that a new install file existed. Panic ensued! Took some time, but was finally able to get the correct files and finish the upgrade.

What is one of the most interesting or complex projects you led or worked on?
I took a grad class that taught the basics of PHP and MySQL. My final project at the end of the semester was the beginning of a rudimentary version of a homegrown version of LibGuides. After I updated it considerably, we were able to use the program to keep our research guides up to date.

Notes

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2. CharlestonConference, "CharlestonConference," YouTube, accessed February 21, 2019, www
.youtube.com/user/CharlestonConference.

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4. Computers in Libraries, accessed February 21, 2019, cil.brightcovegallery.com/.

5. Marshall Breeding, "Systems Librarian Column," Library Technology Guides, accessed February 21, 2019, librarytechnology.org/systemslibrarian/.

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Appendix: Systems Librarian Survey Results Summary

Q1. What is your current job title?

Responses	Count
Open-ended responses	200
Answered question:	**200**
Skipped question:	**0**

Q2. How many years of experience do you have working in library systems?

Responses	Count
More than 10 years	90
6 to 10 years	45
3 to 5 years	40
1 to 2 years	25
Answered question:	**200**
Skipped question:	**0**

Q3. Is your position considered supervisory?

Responses	Count
Yes	77
No	123
Answered question:	**200**
Skipped question:	**0**

Q4. What type of institution are you employed by?

Responses	Count
Academic Library	152
Public Library	22
Special Library	4
Library Vendor	3
Corporate Library	2
Other	17
Answered question:	**200**
Skipped question:	**0**

Q5. How many total librarians are employed at your institution?

Responses	Count
1	0
2 to 5	26
6 to 15	81
16 to 30	38
31 to 50	19
More than 50	36
Answered question:	**200**
Skipped question:	**0**

Q6. Do you have a master's of library and information science (or some variation thereof—MLS, MSLS, etc.)?

Responses	Count
Yes	180
No	19
Answered question:	**199**
Skipped question:	**1**

Q7. Did you follow a systems/technology "track" in library school?

Responses	Count
Yes	50
No	130
Answered question:	**180**
Skipped question:	**20**

Q8. Do you feel this background has helped you in your work as a systems librarian?

Responses	Count
Yes	42
No	8
Answered question:	**50**
Skipped question:	**150**

Q9. Which library school did you attend?

Responses	Count
Open-ended responses	49
Answered question:	**49**
Skipped question:	**151**

Q10. Did you take any technology or systems-related courses during your MLIS program?

Responses	Count
Yes	83
No	47
Answered question:	**130**
Skipped question:	**70**

Q11. Please list any technology/systems courses taken here.

Responses	Count
Open-ended responses	74
Answered question:	**74**
Skipped question:	**126**

Q12. Were any of these courses helpful to your work as a systems librarian?

Responses	Count
Yes	61
No	16
Answered question:	**77**
Skipped question:	**123**

Q13. Was your undergraduate major in a computer science/technology-related field?

Responses	Count
Yes	32
No	161
Answered question:	**193**
Skipped question:	**7**

Q14. Do you feel this background has helped you in your work as a systems librarian?

Responses	Count
Yes	32
No	0
Answered question:	**32**
Skipped question:	**168**

Q15. Do you have any other advanced degrees?

Responses	Count
Yes	61
No	132
Answered question:	**193**
Skipped question:	**7**

Q16. Please list any additional degrees you have earned here.

Responses	Count
Open-ended responses	60
Answered question:	**60**
Skipped question:	**140**

Q17. When starting your first systems librarian position, did you feel well prepared for the position?

Responses	Count
Yes	83
No	101
Answered question:	**184**
Skipped question:	**16**

Q18. What is the technology structure like in your organization?

Responses	Count
I am part of a systems/technology team in the library	98
I am the library's only technologist	52
I am part of a technology/IT team outside the library	10
Other	24
Answered question:	**184**
Skipped question:	**16**

Q19. How much of your position is devoted to library systems?

Responses	Count
25% or less is devoted to library systems	10
Less than half but more than 25% is devoted to library systems	19
50% is devoted to library systems	27
More than half but less than 100% is devoted to library systems	81
100% is devoted to library systems	47
Answered question:	**184**
Skipped question:	**16**

Q20. Does your position involve any responsibility in any of the following areas? Check all that apply.

Responses	Count
Collection development	80
Reference	74
Instruction	62
Cataloging	56
Acquisitions	47
Patron programming	26
None of these	35
Other	79
Answered question:	**184**
Skipped question:	**16**

Q21. Which, if any, of the following technologies do you have administrative responsibility for? Check all that apply.

Responses	Count
ILS/LSP	152
Discovery platform	136
Authentication system	123
Library website	108
Link resolver	105
LibGuides/LibApps platform	96
Electronic resource management system	84
Interlibrary loan system	82
Digital repository	70
Computer servers	62
Non-library-specific computer software	62
Computer hardware	57
Scanners/printers	54
Virtual reference system/chat	51
None of these	0
Other	31
Answered question:	**181**
Skipped question:	**19**

Q22. Do you use or foresee using any of the following "emerging technologies" in your library environment now or in the future? Check all that apply.

Responses	Count
3D printer	82
Makerspace	76
Augmented/virtual reality	65
Artificial intelligence	60
Internet of things	41
Wearable technology	35
Drones	16
Blockchain	13
Quantum computing	6
Psychometrics	5
None of these	54
Other	13
Answered question:	**181**
Skipped question:	**19**

Q23. Do you have any additional comments regarding technology and systems librarianship?

Responses	Count
Open-ended responses	52
Answered question:	**52**
Skipped question:	**148**

Q24. Which of the following skills/knowledge are required for your position/do you use regularly? Check all that apply.

Responses	Count
Project management	155
Website design/maintenance	125
Programming or scripting languages	119
APIs	99
Open-source software	84
Git/Github	62
None of these	5
Other	29
Answered question:	**181**
Skipped question:	**19**

Q25. What type of project management tools do you use in your position, if any? Check all that apply.

Responses	Count
Slack	60
Trello	50
Basecamp	46
Asana	13
None of these	64
Other	43
Answered question:	**181**
Skipped question:	**19**

Q26. What support resources (listservs, associations, conferences, blogs, journals, websites, etc.) would you recommend to new systems librarians?

Responses	Count
Open-ended responses	129
Answered question:	**129**
Skipped question:	**71**

Q27. What advice would you give to new systems librarians or LIS students interested in working in systems librarianship?

Responses	Count
Open-ended responses	125
Answered question:	**125**
Skipped question:	**75**

Q28. Are there any other comments you would like to make regarding systems librarianship?

Responses	Count
Open-ended responses	57
Answered question:	**57**
Skipped question:	**143**

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