Tools, Techniques, and Training: Results of a E-resources Troubleshooting Survey

Abstract: A primary role of any e-resources librarian or staff is troubleshooting electronic resources.   While much progress has been made in many areas of e-resources management to understand the ERM lifecycle and to manage workflows, troubleshooting access remains a challenge. This collaborative study is the result of the well-received 2013 survey examining workflows from libraries large and small, with e-resources staffing ranging from one person to large consortial arrangements. The authors summarize the technological tools and products, the techniques, and the training methods libraries use to manage troubleshooting for electronic resources.

Angela Rathmel is the Interim Head of Acquisitions and Electronic Resources Librarian, University of Kansas, Lawrence, KS. E-mail: aroads@ku.edu

Liisa Mobley is the E-Resources Unit Supervisor, Cornell University Library, Ithaca, NY. E-mail: lsk24@cornell.edu

Buddy Pennington is the Director of Collections and Access Management, University of Missouri - Kansas City, Kansas City, MO. E-mail: penningtonb@umkc.edu

Adam Chandler is the Technical Services Automation and User Experience Strategist, Cornell University Library, Ithaca, NY. Email: alc28@cornell.edu

As the challenges associated with managing electronic resources grew substantially in the early 2000s, librarians and vendors worked together to address the situation. A major initiative within the Digital Libraries Federation resulted in the landmark 2004 report (Jewell, Anderson, Chandler, Farb, Parker, Riggio, & Robertson), which not only organized an electronic resources life cycle but also described a blueprint for associated tools needed to effectively manage these life cycles. Many of the electronic resource management (ERM) tools on the market today trace their origins to this report.

While the 2004 report enabled significant progress in the development of library tools to support electronic resources workflows, there is still a tremendous need in this area, particularly in ensuring that librarians and library staff have the skills and expertise necessary for managing electronic resources. This complexity is aptly illustrated in the following e-resource life-cycle diagram (see Figure 1). An increasing aspect of electronic resources management is troubleshooting reported issues from library users and staff. This activity fits within the "Provide Support" section of the life cycle. While the initiatives of both TERMS (Emery & Stone, 2013a, 2013b) and NASIG's (2012) Core Competencies for Electronic Resources Librarians provide some support in outlining workflows as well as skills needed in this area, there remains a need for deeper understanding of the complex activities involved in troubleshooting access to electronic resources.

[place Figure 1 here]

The purpose of this investigation is to understand how e-resource troubleshooting is currently carried out within libraries. The authors' definition of troubleshooting includes reactive

troubleshooting in response to users reporting that they do not have access to a journal -- this is also called "fix on failure" (Collins, 2009; Collins & Murray, 2009); proactive troubleshooting, such as public or internal training documentation, or a systematic method for identifying problems; and organizational considerations, such as how user reports are received, who is responsible for resolving the issue, and how staff are trained to troubleshoot problems.

Literature Review

Libraries are searching for flexible, adaptable, technology to support workflows for acquiring and maintaining e-resources. A review of the literature regarding this technology and e-resources troubleshooting focuses on keeping track of problem reports, managing the flow of work and communication, and creating a knowledge base of issues previously reported and resolved. As Price and Arch (2009) note, systems to manage e-resources need to be centralized, standardized, and offer some measure of transparency.

Starting with the 2004 Digital Library Federation E-Resources Management (DLF-ERM) report is helpful because it summarized in great detail the issues around the management of electronic resources. The report was "intended to serve as a road map for electronic resource management (ERM)" and outlines functional requirements to support such work (Jewell et al., 2004, p. 1). Troubleshooting activities fit within this framework under resource administration and management. The DLF ERM report provides guidance on how ERM tools should be developed to assist with this, and specifically details the integration of incident logs in the ERM to record and track problems. However, the report also notes that "an external call tracking system may be used instead." (Jewell, et al., 2004, p. 95). The DLF-ERM Initiative stressed the

need for consistent information standards for the acquisition and lifecycle of e-resources, and that systems should be flexible as data needs expand or change.

Tools

Electronic resource management (ERM) systems were first designed and developed in the mid-2000s to address growing concerns with the inadequacy of traditional integrated library systems (ILS) tools in managing online collections. These new tools were intended to manage the entire lifecycle of electronic resources, including troubleshooting and other maintenance operations. It is important to note that a host of standards to strengthen the interoperability of these ERM tools with other library systems has arisen since the 2004 DLF ERM report. A report prepared by the NISO ERM Data Standards and Best Practices Review Steering Committee does an excellent job of describing emerging standards and best practices (Jewell, Aipperspach, Anderson, England, Kasprowski, McQuillan, & Riggio, 2012). Despite the intentions of the ERM, a survey of librarians and ERM vendors (Collins & Grogg, 2011) suggests dissatisfaction with ERM functionality in supporting electronic resources management workflows. The survey revealed that workflows support is viewed as the top priority for ERMs, but the current level of support is seen as "one of the biggest deficiencies (and disappointments) of ERMS functionality" (p. 23). A major challenge in resolving this issue is striking a balance between a general approach to supporting workflows and allowing individual libraries to customize the tool to accommodate their local environment, staffing levels, and workflows. Collins and Grogg (2011) noted how this challenge is being addressed in a variety of ways in next-generation library systems.

Some libraries have adopted other tools to address electronic resources management workflows that current ERM tools don't support. In a 2011 *Serials Review* Electronic Journal Forum column, Wilson describes three academic libraries' approaches. Citing workflow support as a principal need, Stanford University Libraries implemented JIRA, a bug-tracking system. Eastern Kentucky University adopted Drupal, a content management system commonly used for blogs and websites. The University of South Florida implemented Basecamp, an online project management tool. As explained in the article:

> The cases discussed in this article provide evidence that librarians in the e-resources field have begun to look beyond library-specific technologies to meet their workflow and metadata storage needs. The primary reason for the shift to mainstream tools in each of these cases has been the perceived superiority of software like JIRA, Drupal, and Basecamp over the traditional ERMS (Wilson, 2011, p. 302).

The literature provides other examples of libraries looking elsewhere for tools to support electronic resources management work. Library staff from Duke University have presented at both the American Library Association and Electronic Resources & Libraries conferences on their implementation of IBM's Business Process Manager platform to develop support for managing their electronic resources workflows. Borchert (2006) describes the University of South Florida's use of a customer relations management (CRM) tool. The CRM software enabled staff to keep track of problem reports and communications with users, while automatically creating a database of issues and statistics related to troubleshooting. Rupp and Mobley (2007) describe Cornell University Library's development of an open-source, bug-reporting system to track requests for new resources. Francouer (2013) describes some of the

ideal characteristics of tools such as ticketing systems, reference statistics reporting systems, CRM software, and various Google tools. Francouer echoed the sentiments of other authors that tools should store data regarding past incidents in a searchable database, have an easy intake of problem reports, and allow library staff to assign problems as needed.

The more advanced of these systems tie into the most universal tracking tool, email. Email has the advantage of being ubiquitous, and because it is universally deployed, has no additional cost to an institution. Feather's (2007) study investigates email, including shared email accounts and other communication tools, and suggests that effective e-resource management requires increasing the use of such tools that "spotlight" communication in order to reduce the more time-consuming back and forth communication, which she calls "lobs" (p. 213). Interactive communication tools such as blogs, shared email accounts, and web 2.0 tools, like LibGuides and wikis, are useful for recording and sharing e-resources-related documentation and facilitating communication, especially in complex organization or consortia (Pan, Bradbeer, & Jurries, 2011). The key benefits include real-time event notification, the ability to search for common problems by keyword or to browse by common categories, and to effectively link to additional resources.

This section of the literature also shows examples of how assessment instruments, like the READ scale (England, 2008), and usability studies (Fry & Lesher, 2011; Okello-Obura, 2011) can be used in troubleshooting. The six-point READ scale was an assessment instrument developed and tested over several years as part of a broad investigation by Gerlich and Berard (2010), and since has been applied to recording e-resource troubleshooting incidents (Heller & Gerlich, 2011) and with an online ticketing system called Gimlet (Kennedy, 2010).

Techniques

As academic libraries began to acquire electronic resources, positions responsible for maintaining them were generally in public services (Hartnett, 2014). This may be why problem tracking tools, LibGuides, blogs, and wikis are all tools that are usually part of an incident-management system already in place at public service areas in the library, like reference or information technology. However, as Elguindi and Schmidt state, "...the view of the electronic resource librarian as primarily a public service position with a few technical service responsibilities began to be replaced as electronic collections grew in size and scope." (2012, p. 47). Unfortunately, staffing levels did not keep pace with this growth. As libraries struggled to deal with these new resources, two types of model workflows evolved. The first model distributed the workflows across existing library departments, though it may have included an electronic resources librarian, often working in the serials department. The second model centralizes the workflows into a new department (Clendenning, Duggan, & Smith, 2010). Hybrid approaches that combined elements of both models were not uncommon. For example, a library might have employed a central approach for many of the electronic resources workflows but continued to rely on a separate cataloging department to manage the MARC records for those resources (Elguindi & Schmidt, 2012).

Troubleshooting activity often includes users, public and technical services staff, support staff from vendors, and IT staff within the library or university. Successful resolution requires workflows that can facilitate communication and accommodate the collection of large amounts of information that can be only partially managed through tools such as electronic resources management (ERM) systems. Because of this, effective team-based approaches are also needed

to "ensure backup to these key roles [that] is critical to prevent the 'single point of failure'" (Davis, Malinowski, Davis, MacIver, Currado, & Spagnolo, 2012, p. 30).

As management of both print and electronic resources demanded equal staff time, reactive approaches to troubleshooting print and electronic resources began to replace proactive approaches. For example, claiming print issues based upon prediction became claiming on demand, or at the point a print issue was skipped. Sometimes claiming print issues was given up entirely. Other libraries developed proactive approaches to check access to online resources. For example, William T. Murray at the University of Georgia Libraries developed SEESAU, an access-verification system that proactively checks access to a core set of online journals and reports problems to library staff. Over the course of 2 years, SEESAU uncovered serious problems with only approximately 2% of access checks (Collins & Murray, 2009). Despite these proactive attempts, or perhaps because of the minimal percentage of detected problems, "the fix-upon-failure philosophy has come to dominate the academic library landscape" (Collins & Murray 2009, p. 87). As e-resources continue to grow as a portion of libraries' overall (and already stretched) budgets, it is expected that reactive approaches will continue to dominate.

The success of these reactive approaches relies in large part on effectively managing complex networks of information and communications. In addition to identifying communication tools, Feather (2007) describes the challenges faced by Ohio State University Libraries when tracking multiple communication paths and characterizes the technique for how these different modalities are used for different purposes. The study notes an over-reliance on email and challenges the expectation that ERM software can comprehensively capture all information relevant to e-resources management. The TERMS project (Emery & Stone, 2013a, 2013b) attempts to

address workflow and how work moves from one person to another in the course of the e-resources lifecycle, which may be useful tool for identifying where communication, handoffs, and staffing are most needed.

Outsourcing some aspects of electronic resource management is another workflow strategy libraries have employed to provide access with limited staff resources (Tonkery, 2006; Medeiros, 2007). According to Medeiros, outsourcing resulted in saving library staff an estimated 35 hours per week of troubleshooting without sacrificing quality. Whether outsourced or internal, effective organizational approaches and the use of e-resource management tools are underpinned by a basic understanding of electronic resources concepts and strategies. The following section explores how staff are trained in a basic and more advanced understanding of these concepts.

Training

Training in e-resources troubleshooting is unique in that it involves opportunities for training both library staff and library users. E-resource troubleshooting directly with users at their point of need mirrors traditional services performed at library circulation and reference desks. Reference services staff may be trained in some basic technical aspects of troubleshooting, but the expertise necessary for solving more advanced e-resource issues often resides with the library's technical service staff. In addition to more technical expertise, staff in technical services bring a more intimate understanding of the complex lifecycles of e-resources, and as part of that, a direct connection to the publishers, providers, and vendors who resolve problems. Increasingly, technical services staff are directly involved in some part of answering users questions about the libraries electronic resources. This occurs either by technical services staff

physically being at the public service desk or by having questions referred from the public services desk staff. In the same way that reference staff may not have been involved in handling more technical questions, technical services staff have not traditionally been involved in handling users' immediate research needs one-on-one, and may not have the customer relationship skills that public services staff have. As a result, referral scenarios between these two staffs may complicate organizational workflows, information management, and inter-departmental communication. This section explores what the literature has to say about the specific relationship between e-resources troubleshooting and reference services and the issue of training.

Like the reference desk, training can be a reactive technique at the point of the user's need, or more proactive through various forms of guided instruction. Most commonly, both e-resources and reference staff proactively approach troubleshooting of e-resources by triaging answers to common e-resources problems through LibGuides (Bazeley & Yoose, 2013) or websites. Some are geared directly to users (Collins, 2013), while others are designed for internal staff helping users (Hartnett, 2012). Information in these guides may include information about on- and off-campus access (including alumni and other special user access); how to interpret various screens; tips for using specific databases; identifying common error messages (500 error, EZ proxy host, 404, access denied, etc.); and other basic troubleshooting tips for browsers, cache, cookies, pop-ups, Java, images, firewall, and PDF-viewing help. LibGuides can be organized simply into tabs and can also be a useful place for announcing recent acquisitions, downtimes, cancellations, or license terms, either on the guide itself or via links to a separate blog or webpage.

These guided instructions have the benefit of requiring minimal staff time but may not

address the deeper training necessary for effective e-resources troubleshooting and customer service. The literature is less forthcoming, however, about more programmatic methods for library staff training. There was no mention of programs to develop reference staff in technical e-resources issues beyond the use of LibGuides, websites, and internal communication management. Likewise, there is no mention of organized training of technical services staff in customer-relationship management beyond the use of a common question-tracking tool and assessment instruments. Use of the READ Scale (Heller & Gerlich, 2009) came closest as a method for evaluating effectiveness of transactions across these two divisions, but does not address how the staff were first trained to perform the transactions this scale evaluates.

Specific competencies and guidelines that could serve as a starting point for programmatic training remains geared toward development of technical services staff in evolving technical services work. Most recently, Sutton's (2011) dissertation research seeks the specific competencies for Electronic Resources Librarians. Sutton and Davis (2011) point out that while competencies for librarians exist in the ALA Core Competencies of Librarianship, it is less clear whether these skills are being taught in MLS programs or continuing education courses. The NASIG Core Competencies for Electronic Resource Librarians (2012), which Sutton helped to develop, are the most comprehensive document of the skill needs of e-resources librarians and staff. Troubleshooting is addressed specifically in the competencies for research and assessment as *problem-solving*, and more thoroughly in effective communication competencies. But troubleshooting is also clearly relevant to the competencies for understanding concepts covered in the sections about lifecycle of e-resources and technology.

Staff who serve on the reference desk have traditionally received training in customer service

and the use of the reference interview. Such training may be developed from a variety of long-established guidelines approved by the Reference and User Services Association (RUSA) division of the American Library Association. These guidelines, some established as early as 1996, have been revised to address changes in reference work both in face-to-face and remote interactions (RUSA, 2013), and to address introducing users to e-resources (RUSA, 2006). It is not clear from the literature, however, whether similar training is being used with staff from within technical services who have increasingly direct user-focus when troubleshooting e-resources. The authors of this study sought to investigate this portion of the literature further by surveying to what extent both well-established guidelines for reference and newer competencies for e-resources were informing training in practice across the library organization.

Methodology

An invitation to participate in the survey was distributed by email (Appendix A) to listservs primarily geared toward technical services, serialists, and e-resources management professionals in October 2013, namely: ERIL-L (E-Resources in Libraries), SERIALST-L (Serials in Libraries Discussion Forum), and ALCTS-ERES (Association for Library Collections & Technical Services, Electronic Resources Interest Group). In order to gain perspective on e-resources troubleshooting that takes place in the public service areas of libraries, the survey was also distributed to the RUSA-L (Reference and User Services Association List) listserv. The survey instrument was approved by the Institutional Review Boards at Cornell University, University of Kansas, and University of Missouri, and delivered through the Qualtrics survey software licensed by Cornell University. The survey included a total of 28 possible answers for respondents to answer, but because no answer fields were mandatory, some questions received

more responses than others. The text of the survey invitation and survey instrument use the term *patron* and *user* interchangeably; the authors have opted to consistently apply the term *user* in this article.

Survey Results

Demographics

Recorded responses totaled as much as 234, although the response rate to individual questions varied, indicating questions that were left blank. Of 226 participants who identified the type of library in which they work, the overwhelming majority (203; 90%) of respondents come from academic libraries. Other library types identified were special library (9; 4%) and public libraries (8; 4%), and "other" (6; 3%), which were further identified in the comments as: institutional, academic medical, government, joint-use public and community college library, government, and medical school library. The survey asked participants a related question about the primary department in which they work. Technical services was the primary departmental demographic, comprised of 121 (54%) of 225 total responses. The rest were distributed across reference (28; 12%), collection development (26; 12%), IT (14; 6%), and administration (12; 5%). None of the respondents who selected "other" (24; 11%) added comments, so it is unclear what other departments may be represented. Table 1 illustrates the relationship between the library type and the library department of the respondents.

[place Table 1 here]

The majority of the survey results are organized by tools (what specific e-resource tracking

tools are being used); techniques (how libraries are managing e-resources workflows and what kinds of reactive and proactive troubleshooting techniques are most effective); and training (what expertise e-resources troubleshooters may have or need).

Results: Tools

Tools are essential in helping improve workflows so that staff can accomplish more tasks, more easily. Survey respondents indicated the top desired characteristics of troubleshooting tools: keep track of current problem reports; act as an archive of past issues -- which in turn helps with future problems, making collection-development decisions, and year-end reporting; make communication easier; and assume reasonable cost and staff effort. The survey's multiple opportunities for comment revealed the reality that e-resources staff often rely on tools which may or may not be optimal.

The survey asked which tools were used to keep track of e-resources troubleshooting incidents, either by strict ranking or by degree of use from "to a great extent" to "not at all." More specifically, the survey also asked which, if any, ILS, ERM, problem-tracking software, or CRM software the survey participant's library used. Other examples of tools were added by survey respondents as part of an "other" category, and respondents were allowed to make comments. The results are discussed in the sections below.

Email. Results indicated that email was the most used tool, both for submitting problem reports as well as for tracking issues. The term "email" includes individual accounts, email listservs, and shared email boxes. The vast majority (212; 96%) of the 221 total responses use

email for tracking troubleshooting incidents. Survey respondents indicated that email is also used to create archives of communication such as personal tracking systems, and to alert other library staff about important e-resources issues. Some of the problems reported with email, particularly individual email accounts, were the lack of statistics reporting and the inability to assign and track problem reports.

Email lists do allow staff to monitor and, to a limited extent, follow the progression of a problem report to its resolution. However, few libraries noted that they send problem reports to email lists. Often the actions taken to resolve a problem are taken "off list." As a result, staff may only see the initial report and may or may not see its resolution. It may be desirable in many instances *not* to see every (email) step taken in the course of troubleshooting, but this lack of transparency also lessens the value of the tool as a centralized repository of troubleshooting knowledge.

Shared email boxes, in which several people see the same pool of sent and received emails, offer a step up in functionality, according to survey respondents. Shared email boxes can be useful for tracking, and allow problems to be assigned to specific individuals on a team. They also allow the ability to generate some statistics, although not necessarily as robust as a dedicated problem-tracking system. Emails sent to and from the shared mailbox can be seen by all members of the account, so it may be easier to track the progression of a problem report from beginning to end. It is still possible for the problem report to go off list if a staff person decides to use their own email account to contact publishers or subscription agents.

In both instances of the email list and the shared mailbox, archiving can be a problem, and

may not satisfy the desire for a knowledgebase of problem reports and their resolution. Some

archives might default to a month or less of content; archives may then be relegated to personal

email accounts. Statistics that address the types of problems received, publishers involved, or

time taken to resolve issues are also generally more difficult to report from email clients.

E-Resources Management (ERM) Systems. Survey responses indicated the use of both

commercial and open-source ERM products (see Table 2). Of the 225 responses to this question,

a total of 54 (25%) affirmative responses indicated use of an ERM system, while 50 (22%)

responded "no" or had a similar statement written in. Following the same trend noted in the

literature, few used their ERM systems to actively track problem reports. Only 61 (23%) of the

213 total respondents reported using the ERM "to some" or "to a great extent" for tracking e-

resources problems. Interestingly, a small number of survey respondents whose institutions

were about to implement an ERM *hoped* that the ERM would help with tracking incidents. The

ERM was noted as useful for recording licensing, contact, and administrative information

regarding resources. Survey responses also indicated that library staff use the ERM systems to

retroactively record problem incidents and resolution. Data regarding past incidents is frequently

used by library staff to resolve troubleshooting issues, as well as to make collection development

decisions.

[place Table 2 here]

Integrated Library Systems (ILS). Use of Integrated Library Systems, such as Voyager,

were used even less frequently than the ERM systems for tracking e-resources problems. Of the

210 responses to this question, only 42 (21%) indicated that they use their ILS "to some" or "to a

great extent" for tracking incidents.   Next-generation library management systems currently are

not widely used, at least among the survey pool. While these products might have more tracking

and workflow functionality built in -- one respondent mentioned specifically using Alma for

tracking problems -- few people had their systems up and running. When an ILS is used by e-

resources staff, it is most often used to make notes about resources and for payment information.

Some responses indicated that staff are using the claiming functionality of ILS acquisitions

clients to track claims to journal vendors regarding online access. Public notes may also be

added to inform users of outages or other access issues.

Problem Tracking Systems and Customer Relations Management (CRM) Systems. Al-

though problem-tracking (herein, also referred to as ticketing systems) and CRM systems offer

the potential for better tracking of troubleshooting incidents, few libraries have actively adopted

them for this use. Of 210 responses to this question, only 54 (26%) indicated that e-resources-

troubleshooting staff used a problem-tracking system "to some" or "to a great extent" to track e-

resources issues. CRM systems had an even lower adoption rate -- only 16 out of 207 responses

(8%) noted that their library used CRM products "to some" or "to a great extent" for tracking e-

resources problems.

An advantage to using ticketing or CRM system for tracking incidents, according to several

written comments, is that these systems allow for staff and users to report problems via either a

web form or by email. Survey responses that indicated that libraries used a problem-tracking or

CRM system often noted that the preferred method for receiving problem reports was to have

them funneled directly into the ticketing system. One survey respondent, whose library did not

use a ticketing or CRM system for tracking troubleshooting issues, specifically mentioned the

desire to have one implemented for intake and tracking. Other advantages for using problem-tracking or CRM systems, according to survey comments, included the importance of the archive generated as problem reports were created and solved, and the ability for library staff to search past issues in order to troubleshoot events. Another useful trait of these systems is the ability to assign issues to appropriate staff as needed. This could be especially useful to large organizations, as indicated by a respondent from a consortium of libraries which used a problem-tracking system for e-resources issues.

Table 3 lists the types of problem-tracking software, or customer relations software, which survey responses indicated using to track troubleshooting incidents. These include open-source or locally developed systems. Several of the tools are a mix of ticketing and CRM products, and others are actually reference-reporting tools and project-management software. As tools continue to evolve, it becomes more difficult to separate the category to which each tool belongs. Systems which move beyond the "traditional" ticketing and CRM roles are noted and are based on information found at each vendor's site.

[place Table 3 here]

Despite the many advantages, survey comments remarked that problem-tracking and CRM systems need to be fully adopted and supported in the organization; otherwise use will decline and the usefulness will diminish. Similarly, systems used should be robust, flexible, and able to support library needs to ensure sustained use by library staff.

Wikis, Blogs, and Other tools. The use of wikis or blogs was answered by a total of 209

survey responses, and 43 (20%) indicated using these tools "to some" or "to a great extent" to track troubleshooting problem reports. Most use is limited to internal documentation for staff or for public announcements of e-resources issues. Additional tools for tracking e-resources troubleshooting incidents were listed by survey write-in answers on a question asking which tools were used to keep track of troubleshooting incidents. These tools include chat services, some of which are incorporated into reference reporting tools; an intranet for internal communication; spreadsheets; virtual archive of problem reports; and web forms, usually mentioned as the starting point to gather incident reports.

Several survey comments also noted that email, phone, and in-person conversations were enough to keep track of problem reports, and they had no need to use specialized tracking tools. Some respondents noted that the size of the library was very small, so basic tools sufficed. Others mentioned that staff time and budgets were short and did not allow for additional tools, training, and the additional work that new systems might entail.

Results: Techniques

The survey did not ask about satisfaction with current tools, but survey comments and the literature indicate there is much room for improvement. Part of that answer lies in understanding more about e-resources troubleshooting techniques. The survey questions about technique were designed to determine whether there are common techniques, approaches, or frameworks of understanding e-resources management and troubleshooting techniques. These questions also addressed how organizational communication and workflow are designed around e-resources troubleshooting.

The challenges of creating common workflow tools and practices for troubleshooting e-resources are underscored by the 229 responses to the question of where electronic resources troubleshooting primarily takes place in the organization. Respondents ranked technical services as the primary place for troubleshooting activities (111; 49%), followed by public services (49; 21%), and library IT (35; 15%). Many libraries responding with "other" described work being done by electronic resource librarians, teams, or departments, revealing that e-resources work occurs outside the traditional organizational structures of technical or public services. Table 4 shows these and additional responses by rank.

[place Table 4 here]

Respondent explanations of the rankings reveal some common themes. The first theme centered on IT departments. Many respondents commented that they lacked IT departments within the libraries. Those that described support from campus IT departments often indicated this support was very limited and focused on technology issues such as proxy problems or campus network-connection issues. The second theme was a triage approach, wherein public-services staff encounters a troubleshooting issue when working with a user and attempts to perform some basic troubleshooting to resolve the issue before reporting it to the department that manages troubleshooting. While the makeup of the troubleshooting group may vary widely by organization, this triage represents a fairly common workflow and reveals an opportunity to provide electronic resources education and training to public services staff.

The survey responses support the assertion in the literature that techniques are primarily reactive, with 67% (157 of the total 234 respondents) reporting primarily troubleshooting with reactive approaches, and only 27% report proactively troubleshooting. The survey results further revealed some examples of each of these techniques, and where it is possible to take a more balanced approach that, as Duke University (as cited by A Truthbrarian, 2012) put it, addresses both better "internal quality control and making it easier for users to report problems."

The 226 responses to questions about staffing e-resources troubleshooting show one possible reason for a trend toward reactive approaches (see Table 5). The majority (138; 61%) have between two to five employees with e-resources troubleshooting within their job responsibility. Strikingly, there are still over a third (75; 33%) that indicate having just one person handling e-resources troubleshooting, and that includes organizations with more than 50 employees. It can certainly be difficult to be proactive, or even reactive, with only one primary troubleshooter.

[place Table 5 here]

The survey question asking whether those responsible for troubleshooting the issue communicate directly with end users revealed much about e-resources troubleshooting communication in general. This data suggests a predominantly reactive approach that involves users reporting problems and troubleshooters resolving them, either directly or indirectly, depending on the staffing or organizational approach. According to the 101 responses to this survey question, the majority (86; 85%) of e-resource troubleshooting staff do communicate directly with end users, with responses that were both equivocal (58; 57%) and dependent upon circumstances (28; 27%).

The survey comments explaining the "it depends" responses to this question reveal an interesting dynamic between proactive and reactive approaches. Proactive communication might occur in the way staff answer questions, by either limiting handoffs or bad communication experiences. Reactive communication may occur through the process of handing it back and forth, looping in e-resources staff or public services as needed. However, even when not communicating directly with those reporting problems, there may also be either proactive or reactive approaches. For example, e-resources troubleshooting staff who create general announcements and social media alerts about e-resources' downtimes are communicating in anticipation of problems. On the reactive end, the use of anonymous web forms suggest no ability to follow-up directly with end users; the main objective is to just fix the problem.

The authors concluded that comments corresponding "no" responses (11; 11%) generally reflected a policy/practice to maintain public relationship/interface with users (and, in one revealing comment, to avoid communication failures by e-resources staff). Comments corresponding to "yes" responses reflect primarily an effort to limit handoffs and avoid potential for bad customer service experience perceived by handing off communication back and forth.

Training

The kinds of training asked about in this section of the survey included training e-resources or reference staff in troubleshooting e-resources, tracking tools, and customer service-focused training. These questions also sought to understand for whom the formal training was intended -- reference training reference, reference training e-resources, e-resources training e-resources, or

e-resources training reference. Some of these questions were addressed in the workflow and

organizational staffing approaches discussed earlier. This portion of the survey also attempted to

assess the familiarity with and use of guidelines and core competencies for the profession. This

included guidelines that had been well-established, like the RUSA Guidelines for Behavioral

Performance of Reference and Information Service Providers and RUSA Guidelines for the

Introduction of Electronic Information Resources to Users, as well as those more recently

published like TERMS project and NASIG Core Competencies for Electronic Resources

Librarians. Finally, the survey asked about the most common types of e-resource

troubleshooting problems, data tracked, and the methods for assessing this data related to

troubleshooting in an effort to understand how specific training might be designed.

    Existing training. An average total of 214 respondents identified to what extent public

services or reference desk staff trained in each category (see Figure 2), and an average total of

219 respondents identified to what extent troubleshooting staff were trained in each category (see

Figure 3). Not surprisingly, most reference and public service staff (based on survey responses

of over 100 in each category) train "to a great extent" in customer service and the reference

interview, and train only "to some extent" in basic e-resource troubleshooting, access issues, and

new resources. It is less certain to what extent the READ Scale or RUSA Guidelines are used.

Most respondents indicated they did not use these at all or were not sure of whether these were

used. These staff are not at all familiar with training that might come from understanding the e-

resource lifecycle through TERMS or the NASIG Core Competencies for Electronic Resources

Librarians, affirming the opportunity demonstrated in the literature for this potential training

need.

[place Figure 2 here]

For those who are primarily responsible for troubleshooting e-resources (see Figure 3), the majority indicated that training occurs to the greatest extent in technical issues -- interpreting holdings, proxy issues, new resources, and basic and complex troubleshooting -- and not at all in the READ scale, or in either of the formal RUSA guidelines. There are about as many troubleshooting staff who indicated using TERMS or the NASIG core competencies for E-resources Librarians at least to some extent, as those who indicated they were not using these at all. However, there is not much conclusion to be drawn from this, except to note that these publications are very new and their applications are only beginning to be explored in practice.

[place Figure 3 here]

Interestingly, troubleshooting staff did indicate at least some extent of training devoted to customer service and the reference interview. Both public services and those responsible for troubleshooting also indicated a similarly even rate of response to using LibGuides, wiki, blogs, or other web-based resources or authoring tools to some extent or to a great extent. In both cases, it is unclear whether this is a result of the overlap in the organizational makeup of troubleshooting responsibility that may be occurring within public services or technical services staff -- the distinction was intentionally not specified in this question.

Training needs and common problems. Responses to the open-ended question about training needs, however, are more useful in this regard. Overall comments in this section fell into two broad categories of communication and technology, but more specifically these responses

were coded into nine categories detailed in Figure 4.

[place Figure 4 here]

Of the 101 responses to this question, the highest responses indicated training needs in basic digital literacy and troubleshooting (50; 50%), and less with the need for more technically advanced training (27; 27%) like EZProxy, openURL resolutions, and advance IT authentication issues. Rather, the second most common comment regarding training needs was for staff to understand the big picture of electronic resources (33; 33%). For example, many indicated a need for staff across the library organization to have more realistic expectations for how complex and imperfect e-resources and their platforms can be. Even though the use of TERMS for training was not highly reported, some comments did express a need for greater understanding of the lifecycle of e-resources. The following comment, in particular, spoke to that need with specific attention to each particular staff group.

> For public service and reference folks, the biggest training needs are in the area of explaining in the e-resource life cycle and at which points in the cycle access problems can arise; technical skills and familiarity with our e-resource management systems (ERM, link resolver, etc.) would need to be built up, as well. For e-resources staff more customer service training would be useful and would help contextualize the work they do as more of a public service than it's currently viewed.

According to the respondent comments, this understanding of "what is normative and what is possible" in troubleshooting e-resources would help identify the most common problems and

where to begin looking for resolutions. A better understanding of how everyone is involved in troubleshooting would also help in finding organizational resources to solve problems, and, as a result, help staff make effective referrals. Related to this were comments that indicated additional training needs to improve communication, both with users (20; 20%) and internal staff (19; 19%), as well as with others within the information supply chain (6; 6%). An additional significant portion of the comments spoke to the need to improve understanding of terminology (15; 15%), which was grouped in Figure 4 under technology. Depending on the terminology, it could reflect basic or advanced troubleshooting issues. However, this kind of training need could also easily be grouped within the issue of communication as it involves developing a common language around e-resources.

Data and assessment. While gathering productivity statistics is a common practice within libraries, the survey showed that 99 of the 149 respondents (66%) claimed that they do not currently collect statistics on electronic resources troubleshooting. The top categories of statistics libraries currently do collect, or would like to collect, include: the number of issues per reporting period, issues by type or category, issues by resource or vendor, and the time taken to resolve the issue. When asked how the statistics would be used, 134 of 175 responses revealed the top use would be in training (74%), followed by communication with vendors (122; 69%) and staffing (82; 47%). Other reasons for using statistics were to improve workflows, including identifying areas for proactive checking and improving documentation and tutorial information. A number of libraries also cited the use of statistics in reports to demonstrate the value to the organization, to justify staffing needed for troubleshooting, and so on.

Conclusion

Exploring new tools and techniques and finding ways to create meaningful and ongoing training are all indicated as important for informing and improving practice of e-resources troubleshooting. As discussed throughout the study, suggested improvements focus on increasing proactive approaches and improving upon reactive approaches.   The linking mechanism between both approaches is data. The tools that prove better at tracking down and serving good data result in better proactive and reactive decision making. This data-driven concept is core to the development of next-generation ILS systems, many of which have begun iterative releases of these products with assessment modules. While these systems promise to improve and redesign workflows to help better manage the e-resources life cycle, these systems are also still so new to the market that much of their effectiveness remains to be seen. The authors conclude from the survey that there are still data, tracking, and information management needs that these new systems do not and may not ever provide. Left to improving our existing tools, the authors identified from this study specific ways to improve uses of the most commonly reported tools, as well as improvements to e-resources troubleshooting techniques and approaches to training.

More proactive techniques in using the most popular tool, email, include personal task tracking and the use of shared email accounts, allowing proactive assignment of the best person to the task and multiple people to address problems. Web forms, a very popular and effective reactive tool for reporting e-resource incidents, can be improved when key pieces of data are included, like user information (not anonymous), and an ability to provide details of the problem, either through automated metadata or by prompts to the user. Much like the approach of the reference interview, this allows staff to avoid negative closure, provides the opportunity to

explain more about the normative problems with e-resources, and develops more self-sufficient users of e-resources.

The less commonly mentioned tools, according to the survey, also highlight some of the possibilities that lead to a more balanced approach toward proactive e-resources troubleshooting techniques. CRMs and ticketing systems, both underused according to the survey, are one of the ways reference desks have managed handoffs, tracked statistics on common questions and resolutions, and gathered user feedback. This is a tool and technique that e-resources troubleshooting staff should consider more fully. Project management, while less applicable in the day-to-day service of e-resources troubleshooting, helps with setting goals, planning work, assigning tasks, and tracking progress for projects. Centrally managing information through projects in this way improves communication and allows e-resource troubleshooting staff to find relevant information more quickly and solve problems collaboratively. A final category of underreported tools, like Sharpmoon's Callisto, offers new ways to address troubleshooting by proactively tracking a comprehensive set of resources, then reactively pushing access events as they occur in real time to a dashboard or email alert. Although not intentionally designed for this purpose, the e-journal mobile app, Browzine, also tracks as part of its usage when authentication fails or access is not available. While not providing a dashboard, like Callisto, Browzine can provide an informal email alert.

This study also revealed a need to understand the overlap between reference staff and technical services staff who troubleshoot e-resources, particularly related to organizational workflow and training. If, as the survey suggests, more ongoing and collaborative training for e-resources troubleshooting is needed, then organizational response should follow. One possible

organizational approach would be for e-resources librarians to become more involved in library instruction. A more dispersed approach would include e-resources troubleshooting literacy as part of everyone's job responsibilities. Based on library conference programming since the publication of TERMS and the NASIG Core Competencies projects, it is clear that interest and additional research is growing for the practical applications of these competencies, particularly geared toward organizational workflow assessment, job descriptions, and staff training. Easing organizational efficiencies through the use of common tools and assessments would certainly benefit training. This would in turn lead to better e-resources management and, it can be hoped, would also lead to better tools. The challenge is finding techniques, tools, and training that can improve reactive approaches, as well as help e-resources troubleshooting to become more proactive. Both approaches are needed and valuable.

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Appendix A

Text of email invitation

Email Text:

Please help us improve our understanding of how libraries manage electronic resources troubleshooting by taking this online survey. This survey is intended for library staff who have electronic resources troubleshooting within their primary responsibility.

This survey will ask a number of questions about electronic resources troubleshooting techniques, tools, and training in order to know what libraries are currently doing on this topic. It is intended for library staff who have electronic resources troubleshooting within their

responsibility, whether it is helping patrons on the reference desk, or addressing access issues directly with vendors. We anticipate that your participation in this survey presents no greater risk than everyday use of the Internet. Participation is voluntary and is neither expected nor required. You may skip answering any questions you choose. We anticipate this survey will take 15-25 minutes to complete.

If you have questions, please contact:

- Buddy Pennington, Director of Collections and Access Management, University of Missouri - Kansas City (penningtonb@umkc.edu)
- Adam Chandler, Electronic Resources User Experience Librarian, Cornell University Library (alc28@cornell.edu)
- Liisa Mobley, E-Resources Coordinator, Cornell University Library (lsk24@cornell.edu)
- Angela Rathmel, Electronic Resources Librarian, University of Kansas (aroads@ku.edu)

Figure 1. E-resource life cycle (Pesch, 2009).
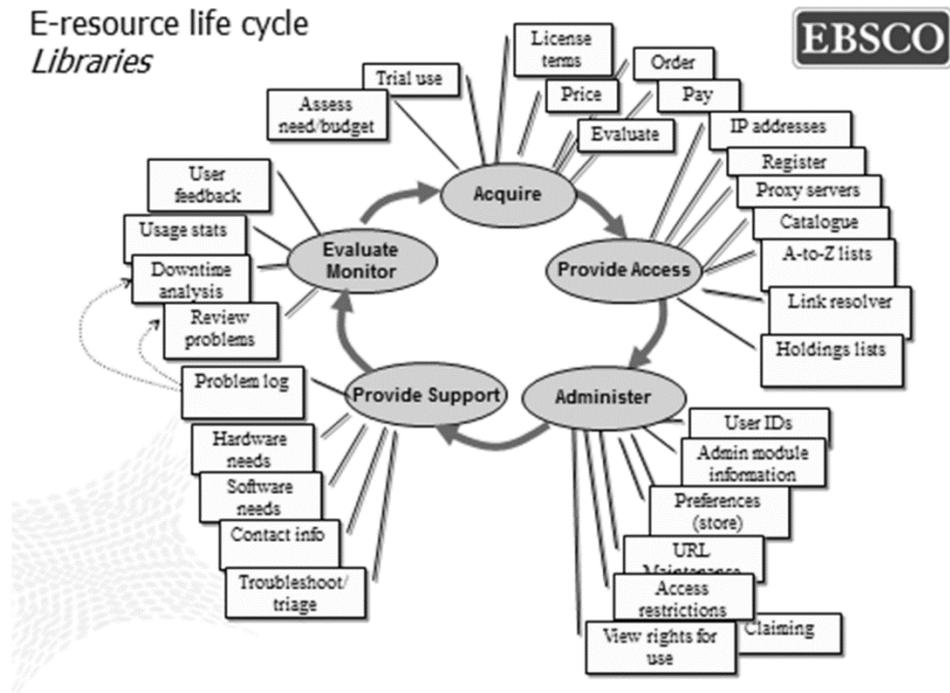
Figure 2. Types and extent of training for public and reference services staff.

Legend: to a great extent · to some extent · rarely · not at all · not sure

	to a great extent	to some extent	rarely	not at all	not sure
IM, CHAT	40%	28%	7%	14%	11%
RUSA GUIDELINES…E-RESOURCES	1% 5%	7%	36%		51%
RUSA GUIDELINES…REFERENCE	4% 5%	8%	30%		53%
COMPLEX TROUBLESHOOTING	1% 12%	38%	38%		12%
BASIC TROUBLESHOOTING	14%	48%	20%	6%	12%
NEW RESOURCES	24%	51%	13%	1%	11%
PROXY ISSUE	8%	35%	29%	17%	12%
ACCESS ISSUE	12%	50%	21%	7%	11%
INTERPRETING ONLINE HOLDINGS	32%	41%	9%	4%	13%
MOBILE DEVICES	10%	40%	22%	12%	17%
LIBGUIDES, BLOGS, WIKIS, OR OTHER…	38%	36%	9%	5%	12%
NASIG CORE COMPETENCIES FOR E-RESOURCES	1% 1% 10%	64%			23%
TERMS	2% 7%	52%	39%		
READ SCALE	4% 5% 5%	34%	53%		
STATISTICS	9%	34%	25%	15%	17%
CUSTOMER SERVICE	51%	23%	9%	3%	15%
CONDUCTING REFERENCE INTERVIEWS	47%	28%	7%	2%	16%

Figure 3. Types and extent of training for staff primarily responsible for troubleshooting e-resources.

Legend: to a great extent | to some extent | rarely | not at all | not sure

Category	to a great extent	to some extent	rarely	not at all	not sure
IM, CHAT	30%	24%	15%	25%	6%
RUSA GUIDELINES…E-RESOURCES	2%	6%	11%	59%	22%
RUSA GUIDELINES…REFERENCE	3%	6%	7%	65%	19%
COMPLEX TROUBLESHOOTING	57%	30%	5%	6%	3%
BASIC TROUBLESHOOTING	71%	19%	4%	4%	3%
NEW RESOURCES	59%	27%	9%	3%	2%
PROXY ISSUE	55%	30%	6%	6%	3%
ACCESS ISSUE	69%	21%	3%	3%	4%
INTERPRETING ONLINE HOLDINGS	71%	18%	3%	4%	5%
MOBILE DEVICES	22%	34%	26%	14%	4%
LIBGUIDES, BLOGS, WIKIS, OR OTHER…	36%	35%	15%	12%	2%
NASIG CORE COMPETENCIES FOR E-RESOURCES	12%	25%	13%	36%	14%
TERMS	10%	17%	11%	38%	23%
READ SCALE	3%	6%	6%	60%	25%
STATISTICS	42%	32%	13%	7%	5%
CUSTOMER SERVICE	42%	33%	12%	9%	4%
CONDUCTING REFERENCE INTERVIEWS	24%	35%	16%	21%	4%

Figure 4. Training needs categories and responses.
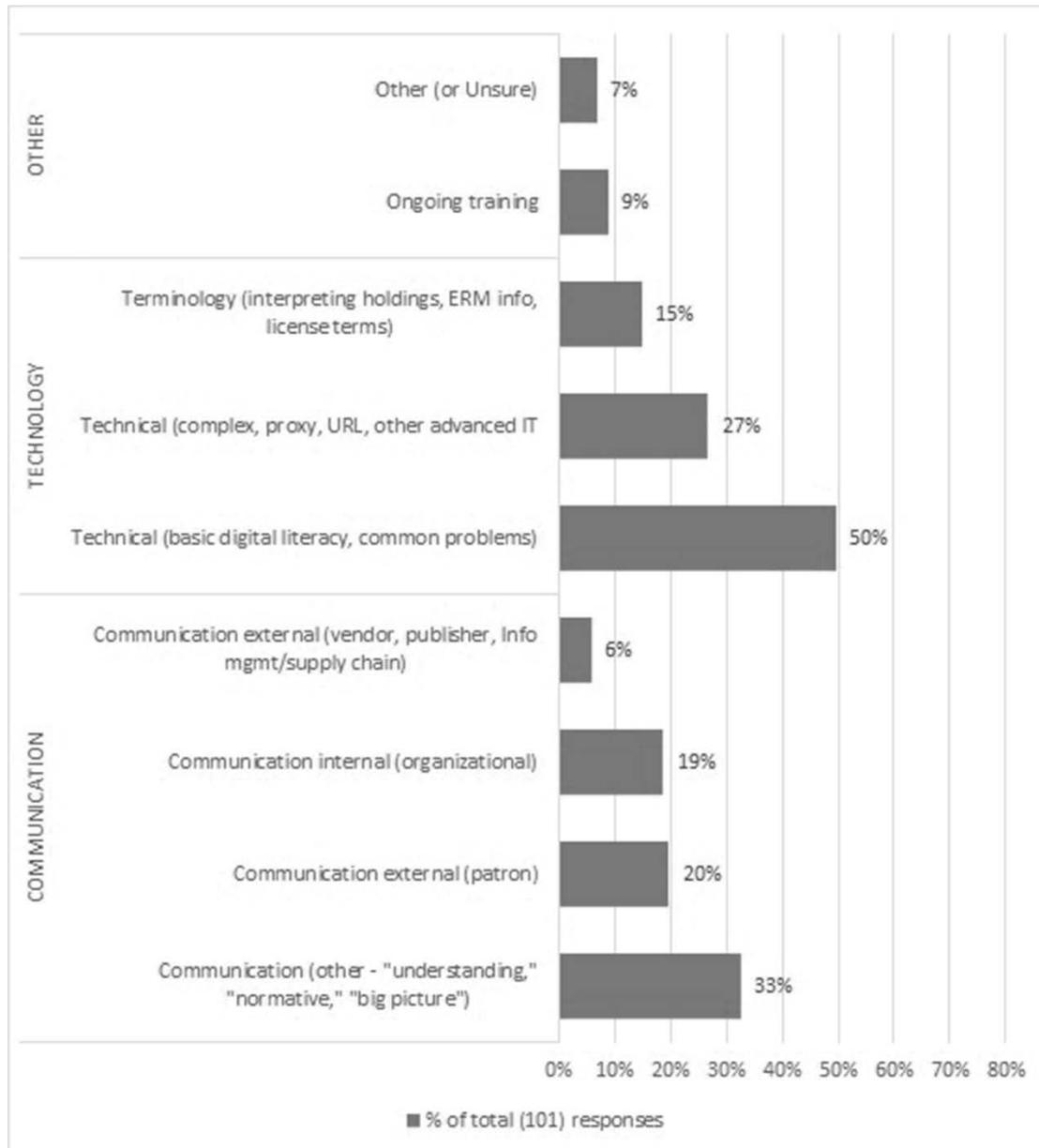
Table 1. Responses by library department and type.

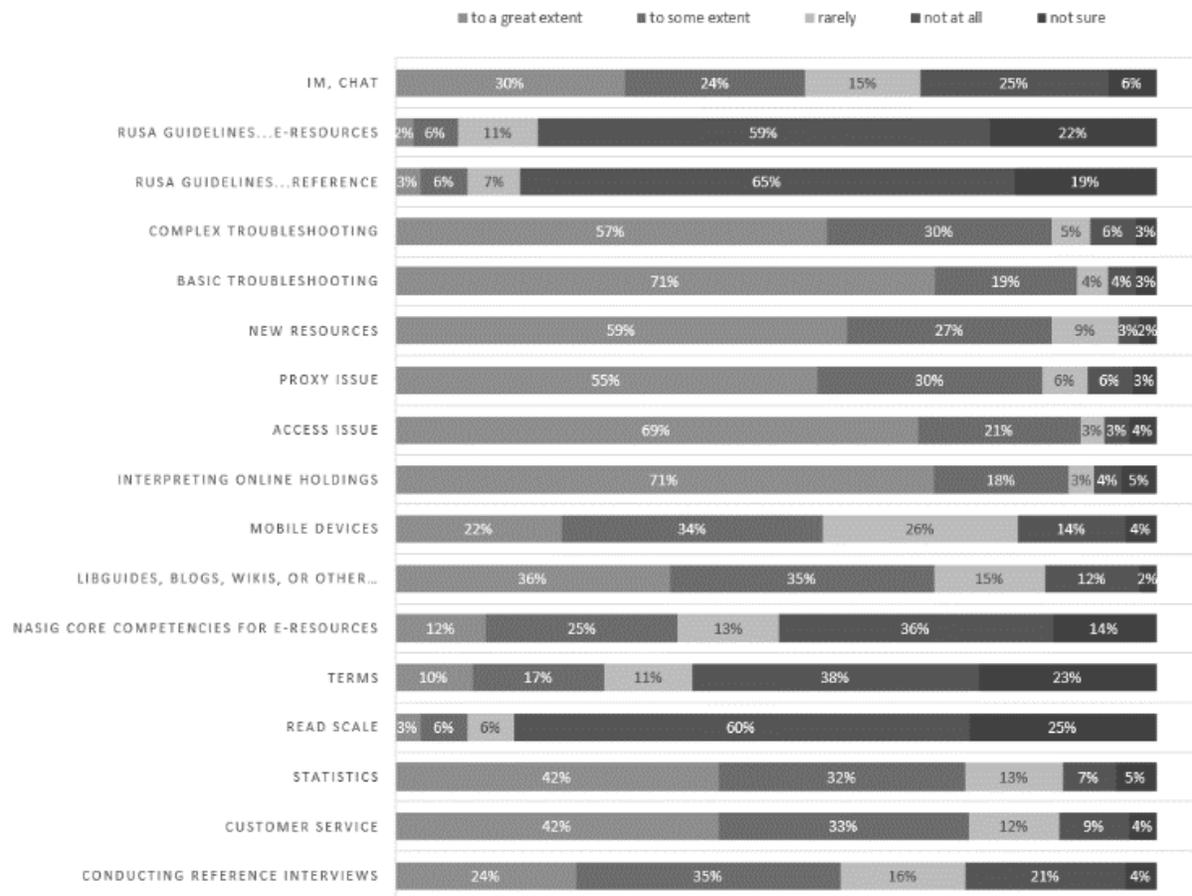|		Library Department						
		Reference	Collection Development	Technical Services	Administration	IT	Other	Total
Library Type	**Academic**	23	23	114	9	13	20	202
	Public	4	1	1	1	0	1	8
	Special	1	1	4	1	1	1	9
	School	0	0	0	0	0	0	0
	Other	0	1	2	1	0	2	6
	Total	28	26	121	12	14	24	225

Table 2. ERM products used (in alphabetical order by vendor).

Vendor	ERM Product
Ebsco	ERM Essentials LinkSource Discovery Solutions Usage Consolidation
Ex Libris	Alma Innovative Millenium Sierra Verde
WT Cox	Journal Finder
Open Source (Univ of Notre Dame)	CORAL
Open Source (Univ of Wisconsin, LaCrosse)	ERMes
Serials Solutions [ProQuest]	360 RM Summon

Table 3. Types of problem tracking, customer relationship management (CRM), and other systems.

Vendor	Product	Description
Altarama	RefTracker	reference request manager
Atlassian	JIRA	tracking system for managing issues and projects
Avensoft	PerfectTracker	customer service, help desk software, bug tracking; replaced by nService
Best Practical Solutions	Request Tracker	issue tracking system
BMC Software	Footprints	incident and problem management

Compendium Library Services	Desk Tracker	tool to gather statistics for reference staff
Ex Libris	Alma	part of the Alma library management service
Fog Creek Software	Trello	tool for organizing [tasks, information]
Google	Docs, other tools	adapted for problem tracking
iSupport Software	iSupport	IT helpdesk software and customer services solutions
Microsoft	SharePoint	collaborative office tool
	Access	locally built system to track incidents
OCLC	QuestionPoint	reference [question] management service including chat and statistics
Open source software	Libstats	reference statistics tool
Oracle	PeopleSoft	vendor offers multiple tools for organizations
Other	n/a	locally built ticketing system, not described
Sharpmoon	Callisto	specialized tool which checks subscription access
Sidecar Publications	Gimlet	reference statistics system
SolarWinds Worldwide	Web Help Desk	IT help desk
SpiceWorks	SpiceWorks	IT help desk
Springshare	LibAnswers	reference statistics, chat, and additional functions
	LibAnalytics	platform to gather all library data
UserScape	HelpSpot	helpdesk software
Zoho	Zoho CRM	customer relationship management software, plus additional collaboration tools

Table 4. Organizational structure for e-resources troubleshooting responsibility.

		Responses	
		# Top Rank	**% Top Rank**
	Technical Services	111	49%
	Public Services	49	21%
Organizational department	**Library IT**	35	15%
	Other	14	6%
	Campus IT	13	6%
	Consortial Office	7	3%
	Total	229	

Table 5. E-resources troubleshooting staff by total employees.

		Total library staff with troubleshooting within primary job responsibility				
		1	**2-5**	**6-10**	**more than 10**	Total
	1	0	0	0	0	0
Total library staff in organization	**2-10**	21	15	0	0	36
	11-50	39	67	2	0	108
	more than 50	14	56	7	4	81
	Total	74	138	9	4	225