

Making it Look Easy: Maintaining the Magic of Access

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INTRODUCTION

Given the continued rise in both cost and complexity of electronic resource management (ERM), it is not surprising that Association of Research Libraries (ARL) in the U.S. and Canada are tracking and managing ongoing access to electronic resources in numerous ways. This research describes the various methods ARL libraries are using to track and manage access, both proactive and reactive, through survey and case study analysis. For the purposes of this research proactive troubleshooting of access is defined as troubleshooting access problems before they are identified by a patron and reactive troubleshooting is defined as troubleshooting access issues as problems are identified and reported by a patron. For example, proactive troubleshooting can be letting public facing library staff know about planned database down time or doing a complete database inventory to make sure that every database paid for is in fact “turned on”. Reactive troubleshooting on the other hand includes activities like fixing broken links, fixing incorrect coverage date ranges in the catalog, and patron education about accessing full text. The authors also attempt to determine who is reporting and resolving access issues as well as describe the metrics needed to measure the success of the users’ experience with electronic resources.

This research effort continues an exploration of findings that resulted from a local project at Duke University Libraries in n 2011 to investigate workflow for processing electronic resources. This effort was led by the Electronic Resources Workflow Analysis & Process Improvement Team (ERWAPIT), which comprised members from across the library from the Metadata &

Cataloging, Electronic Resources & Serials Management, Acquisitions, Information Technology (IT), Collection Development, and Acquisitions departments as well as representation from the professional school libraries at Duke. Convened by librarians Ros Raeford and Beverly Dowdy, the work of ERWAPIT is a large-scale example of how to make comprehensive changes to processes that had grown organically out of print-based workflows in response to the evolution of electronic resource management in academic libraries. ERWAPIT was charged with analyzing and improving workflows and processes for electronic resources. The analysis was based on interviews conducted with forty staff members and stakeholders. The subsequent translation of interviews into detailed workflow diagrams became the basis for improving the timeliness and accuracy of electronic resource work. ERWAPIT concluded its work in January 2012 with a set of recommendations and an implementation plan.

Major findings from the analysis were as follows (Raeford , Dowdy, presented at Electronic Resources & Libraries Conference 2012, 3/2012):

- Effective communication across units is hampered by inefficient and largely non-automated techniques;
- Existing information about resources is often inaccessible to workflow participants, or time-consuming to retrieve;
- Many existing electronic-resource processes do not follow any standards, and often result in a high level of duplication across units; and
- Quality control measures are largely reactive rather than proactive, and rely heavily on patron-initiated notifications of issues.

The authors' research project grew out the last finding regarding quality control With regard to the troubleshooting workflow, ERWAPT found communication bottlenecks and redundancies, with necessary information being inaccessible to other workflows as needed. Weak or interrupted lines of communication undercut the expectations and efficiency of electronic resource management across every workflow, for instance, if an email is stalled in someone's inbox while they are vacation. These troubling findings contributed to opaque troubleshooting processes at Duke which in turn make it difficult to measure electronic resource management processes for effectiveness.

CONTEXT AND LITERATURE REVIEW

Increasing expenditures on electronic resources

Academic libraries invest a significant, and increasing, amount of money on electronic resources. In 2007/2008, university libraries who were members of ARL on average spent about 53% of their collections budgets on electronic resources (Kyrillidou & Bland, 2009). By 2010/2011, the average was about 65% amongst the ARL university libraries with the highest percentage being 98.6% (Kyrillidou, Morris, & Roebuck, 2012). These figures reflect expenditures from collections budgets, and do not include the investments libraries make in human resources for teaching and support of electronic resources. The trajectory of the increase for spending on electronic resources is going up as more and more resources become e-only, more types of electronic resources are collected by academic libraries, and libraries invest in one-time purchases of back files, databases, and emerging research needs. Exact details on the curve of the trajectory are less transparent now that the most current (2012-2013) [ARL Statistics Questionnaire](#) does not include specific questions on electronic resource expenditures separate

from the overall collections budget. From the 2011-2012 Statistics Report, (Kyrillidou et al., 2012) the average spent on e-resources per ARL institution is \$7,280,964. The authors' university library, Duke University Libraries, expenditure is a bit higher than the average, having spent approximately \$9.1 million that year, which amounts to about 66% of the collections budget. Duke University Libraries' expenditure on electronic resources in the 2007-2008 fiscal year, however, was 48.57% of the budget, which amounts to an 18% increase in 3 years. Breaking out dollar amounts associated with selecting, maintaining, and managing electronic resources and their associated tools is difficult to glean from the available data, but it can surmised that investments in staff, discovery layers, knowledgebase data, MARC record services, and management systems for electronic resources are substantial.

The complexity of ERM

When librarians talk about electronic resources, what is generally being discussed are remotely accessed electronic resources such as databases, ejournals, ebooks and streaming media. While this article does not discuss the overall lifecycle of electronic resources (see Figure 1 below), it is worth noting that the complexity of the work to maintain access to electronic resources is not always apparent to librarians outside of technical services (Pesch, 2008). As seen in Figure 1, “provide support” is only one portion of the electronic resource lifecycle. For public facing librarians, this may be understood as the majority of electronic resource work because access problems are often reported at a public service point such as the reference desk or via IM. Similarly, librarians in acquisitions may see the complexity of their “acquire” portion of the lifecycle, yet not have much sense of the “provide access” and “provide support” workflows that makes what is acquired actually accessible to patrons. Based on the concept of the electronic

resources lifecycle as shown in Figure 1, the North American Serials Interest Group (NASIG) developed the [NASIG Core Competencies for Electronic Resources Librarians](#). These competencies were approved by the NASIG Board in 2013 and are broad in nature to attempt to encompass the complex nature of the work across the areas of the electronic resources lifecycle. While competency 4.5, under the heading Effective Communication in the Core Competencies document, does touch on the skills needed in electronic resources troubleshooting, the entire document parenthetically mentions “troubleshoot” in 2 examples of tasks.

4.5 Demonstrating the ability to frame situations according to others’ perspectives to recruit assistance with troubleshooting from vendors, agents, consortium partners, IT support, student/faculty users, etc.

Another article regarding electronic resources link failure is Nathan Hosburgh’s *Managing the Electronic Resources Lifecycle: Creating a Comprehensive Checklist Using Techniques for Electronic Resource Management (TERMS)* which comprehensively examines the electronic resources workflow, including for ‘ongoing evaluation and access.’ The article focuses on the need for proactive processes for electronic resource management, such as monitoring platform changes, however the word troubleshooting does not appear.

In her 2007 article *Boulevard of Broken Links: Keeping Users Connected to eJournal Content*, Rebecca Donlan illustrates some of the complexity of electronic resources with regard to the functionality of link resolvers such as Serials Solutions Article Linker and SFX. In her piece, she states that “Unfortunately, link resolvers aren’t doing what we want them to do as well as we want them to do it.”(Donlan, 2007) and demonstrates that part of the reason for this is the complexity of OpenURL links and the volume of links and the time it takes to prevent problems before the patron makes a single click. She provides the following example:

Earlier this year, we sent an updated Science Direct holdings list to our link provider, and 367 titles did not match. How long will it take to check each of these titles for misspellings, data normalization (“&” instead of “and”), and title changes?

Establishing local holdings information is another challenge with e-journals. Trying to set correct starting and ending dates for your particular selection of titles in a large publisher package (such as Elsevier’s Science Direct or Blackwell’s Synergy) can be a nightmare.

Our Science Direct package changes periodically, both in terms of which titles are included and which dates are covered. In June 2007, we had access to 1,568 of 2,691 total available titles. The holdings generally, but not invariably, start in 1996 and go forward.

(To complicate matters even further, not all the content within a given span of one title has yet been digitized, so there can be gaps within individual titles.) To provide the most accurate possible holdings information for our patrons, we have to go into our resolver’s administrative module and set custom holdings for each and every title. Before we can do that, however, we have to consult every individual title’s home page. With the staff we have available to us, there is no way we will ever be able to have complete and correct holdings for Science Direct in our link resolver. (Donlan, 2007) Keeping in mind that for smaller libraries, and different types of libraries, the workflows may be very different, the figure below gives a sense of the steps needed to sustain access to electronic resources.

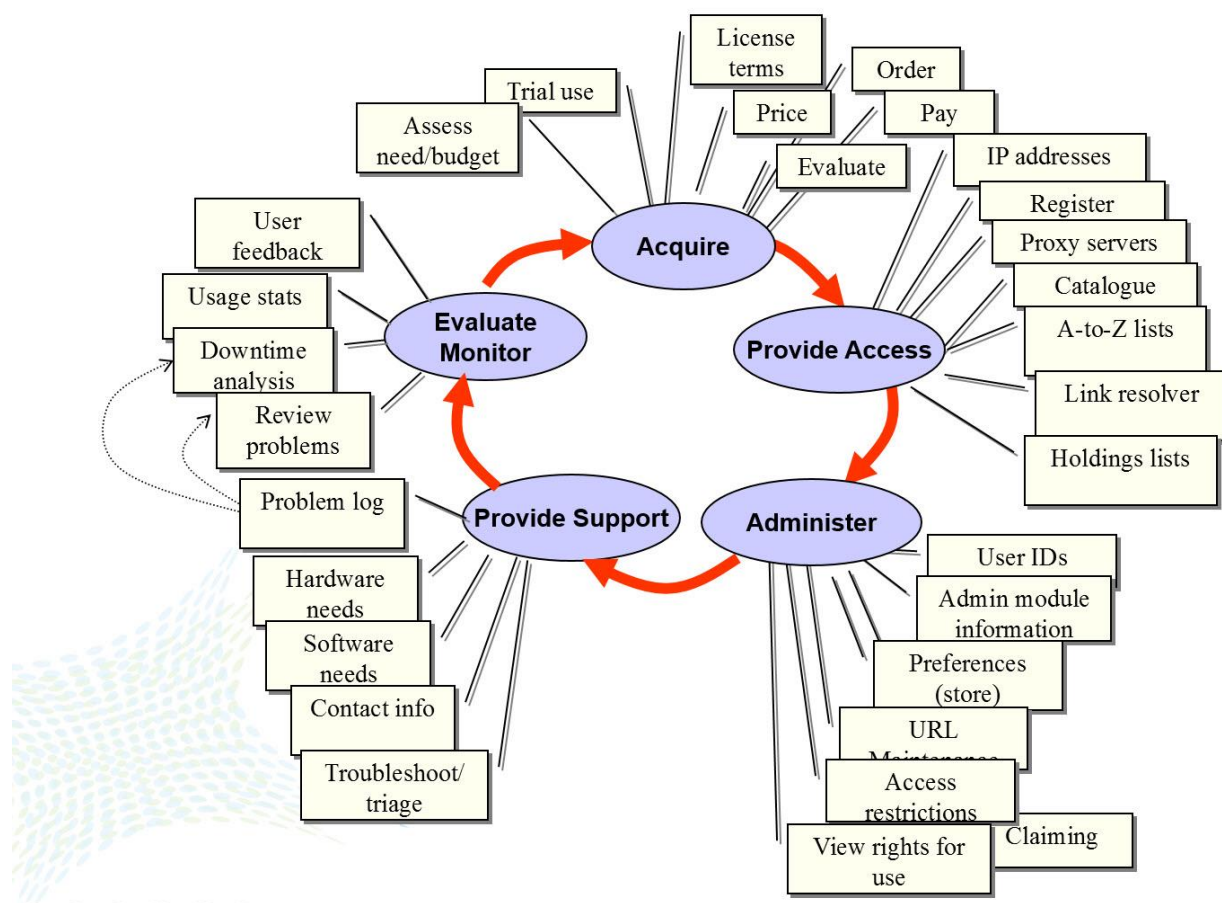


FIGURE 1 – *Electronic Resources Lifecycle*

There are many pitfalls to maintaining electronic resource access that are familiar to those managing electronic resources. (See figure 2). For those unfamiliar with electronic resource management, consider that where ever a link is present – in the catalog, in a discovery layer, in a vendor platform, to an ebook collection – there is the possibility that the link, hence access, will fail. Which link in the chain is the problem? Complexity lies in both diagnosing link failure and restoring access immediately. For example, a patron reports to a public services librarian that a link to an ebook needed for class “doesn’t work” and upon investigation it seems that the patron is correct – access to the chapter .pdf is restricted to users with a password or to those who are willing to pay yet the discovery layer shows that this item is available in full text. The problem is

reported to the troubleshooting team in Technical Services, but the resource is owned by another library on campus, so it must be forwarded to them for resolution. The solution comes from the other library and it is that the .pdf works only when a patron makes a free account, but the link to the title of the chapter leads you to an html version that does not require an account. The patron is emailed back hours later and the professor of the class is also emailed to let her students know that there is not really a problem as such but an intimate knowledge of the item at the package or title level required to gain access to the full text. As depicted below, and seen in the example given, there are many aspects to ensuring that any individual link to an electronic resource functions. These aspects range from internal communications and knowledgebase accuracy to browser incompatibility, and from patron confusion to staff training (Davis et al, 2012, Egluindi & Schmidt, 2012, Weir, 2012). It is also the case that different kinds of problems necessitate different troubleshooting approaches. For instance, troubleshooting a vender outage and troubleshooting a broken link due to bad data in an OpenURL require different approaches and expertise to come to a resolution. Many aspects of link resolution do not seem to be related and since link failure can be caused by any one of them, it is often difficult to pinpoint why a patron is having difficulty accessing the needed resource.

The impression that once a resource is acquired, it is then just “accessible” belies the actual, shifting nature of electronic resources, where continual changes in URLs, domain names, or incompatible metadata causes articles and ebooks to be available one day, but not the next. Because technical services staff seem to be able to restore access when the issue is not unfamiliarity with a particular electronic resource’s functionality, link failure resolution can be seen as somewhat magical to patrons and staff. In the example above, the librarian seemed to

“magically know” which link was the right one to click on to gain access to the full text. This appearance can also disguise the very real labor that goes into troubleshooting and restoring access.

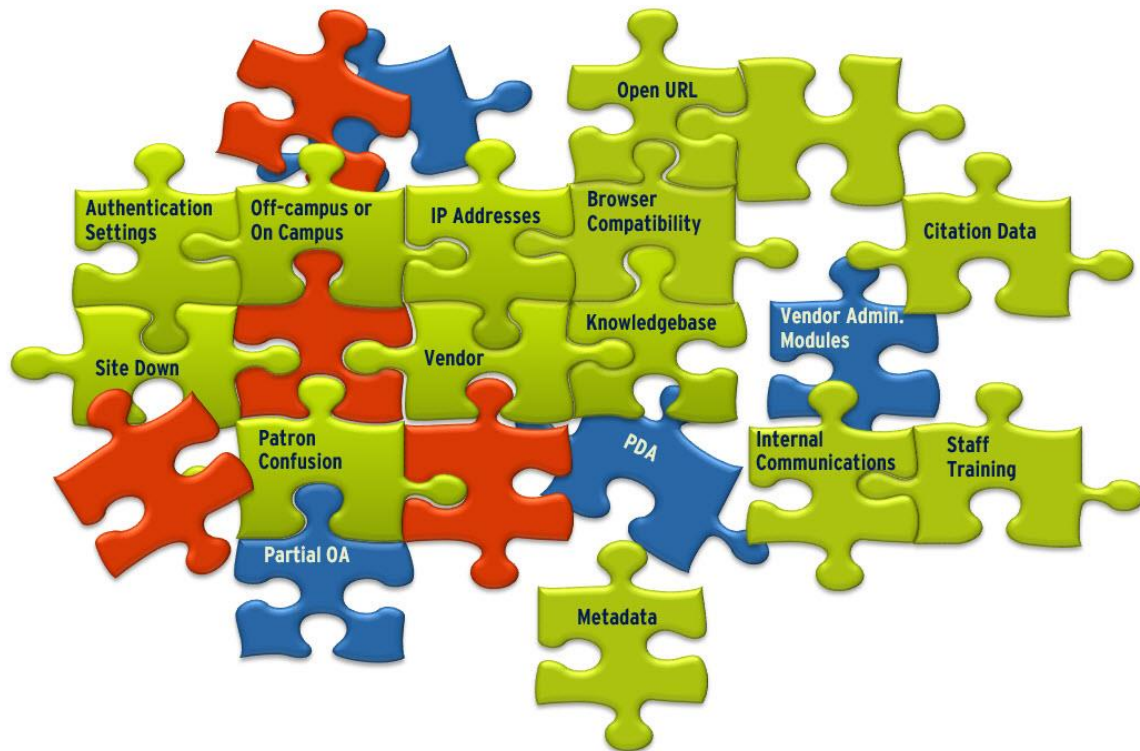


FIGURE 2 -- *Putting the Troubleshooting Pieces Together -- Maintaining Access to Electronic Resources* (figure created by Samples).

In some cases, it is not a title-level link but an entire resource that is problematic. As Emery and Stone note in their 2013 Library Technology Report, “Despite all good-faith efforts, activation and establishment of access to electronic resources at any given institution are sometimes overlooked or missed... Patron-driven e-book packages require more frequent hands-on management than A&I and full-text databases. Patron-driven e-book packages are comprised of more fluid content as titles move in and out of the package depending on the profile established” (Emery and Stone, 2013).

Great expectations of users

Much of the user experience in libraries revolves around linking to full-text resources that the library provides. As Marshall Breeding notes in his 2012 article “Coping with Complex Collections,” the greater the number of links and disparate systems in place to deliver electronic resources, the greater the complexity of providing continued access to these resources effectively (Breeding, 2012). When these links do not work, it is analogous to books not being on the shelf; in effect the resource is lost. Continued access to resources is critical to the mission of libraries to support research and education; this is further emphasized by user expectations of ubiquitous, unmitigated access to electronic resources.

A cursory review of the literature on search behaviors of university researchers, faculty, graduate and undergraduate students across academic disciplines, confirms what most academic librarians know from experience, namely that “academic journals have become central to all disciplines.” (Nicholas et al., 2010) Interestingly, it seems that access to electronic information almost immediately created this expectation. In an article from 1993, Ruth Pagell’s editorial notes that the advent of CD-ROMS changed expectations such that “end users for databases now want the full text immediately.” She concludes with a now uncontroversial statement: “Research is being driven by full text availability in machine readable form.” (Pagell, 1993). Similarly, a much-cited 1998 study by MacDonald and Dunkleberger considers a trend, not of preference for but of dependency on full text databases. The authors’ greatest fear is that “students might be too eager to take the easiest route and be satisfied with whatever article they find online, instead of the ones more ideally suited to their research.” (MacDonald & Dunkelberger, 1998) Adding ever more databases, e-books, and e-journals to academic library collections has not laid these fears to rest. (Diedrichs, 2009)

The expectation of linked full-text scholarship has only sharpened in the last twenty years. In their study of faculty e-journal use behavior across disciplines, Nicholas et al. found that “While interviewees from all disciplines claimed that journal literature formed the ‘the bulk’ or ‘the main body’ of literature consulted, for the science disciplines, journals were said to form around 95% (100% in some cases) of this – with ‘virtually all of it’ available (and used) electronically.” Faculty know of other resources, but as Haglund and Olsson observed in their case study of academic researchers,

“Several of the researchers describe themselves as “lazy,” alluding to the fact that they do not bother to get a journal article if it is unavailable in electronic form. This is primarily because they have become so used to information being just “a click away,” via library websites and Google.” (Haglund & Olsson, 2008).

Current undergraduates know of no other research milieu, of course, and their search behavior regarding linked full-text article access is characterized by “convenience” of access to full text, with “for example, 70 percent of students admitted to rejecting an article for their paper because it was not available in full-text on the computer.” (Imler & Hall, 2009). In addition, given that link failure occurs as much as 30% of the time, due to source URL errors, knowledge base inaccuracies, and target URL translation errors, (Price & Trainor, 2010) can libraries claim to get a good return on our sizable electronic resource investments? Ideally, the disparate systems in place, such as ERMS, proxy servers, knowledge bases, link resolvers, and file drawers holding signed license agreements, that are meant to facilitate access to databases, individual e-journals, streaming media clips and ebooks would all reside and work together such that reactive troubleshooting would be the exception rather than the rule.

Troubleshooting

There is a distinct lack of library science literature on troubleshooting, either proactive or reactive. In addition to Donlan's *Boulevard of Broken Links*, two pieces of research that stand out and take up troubleshooting in particular are Price and Trainor's Library Technology Report *Rethinking Library Linking* and Resnick and Clark's article *Evolution of Electronic Resources Support*. The first deals explicitly with a variety of proactive measures for optimizing access and minimizing both broken links and user experience of linked access to full text. Their recommendations for better linking include reviewing every full text provider for item- vs. title-level linking, optimizing the top 100 most requested journals, optimize top ten full text target providers and reorder the full-text provider links so that the best one is on top. (Price & Trainor, 2010) An example of this kind of optimization is SEESAU: University of Georgia's Electronic Journal Verification System (Collins and Murray 2009). The SEESAU article explains the need for and construction of a system that can verify access in an automated way that allows for a large number of titles to be verified for access. According to Collins and Murray, "Since January 2007, the SEESAU system has performed 37,000 access checks for approximately 4,000 core journal titles out of the 50,000 to which the library has access. These 4,000 titles are ones that UGA wants to carefully track and do not include aggregator titles, free titles or 'extras' provided to the library through certain packages." The automated nature of SEESAU allows for a larger number of journals, beyond Price and Trainor's top 100, to be checked but resolution still happens at the individual link level.

The second takes up the broader issue of creating a novel reactive troubleshooting workflow as well as an evolving staff reconfiguration in light of the workflow. In that article, Resnick and Clark from Texas A&M University (TAMU) discuss a staff reconfiguration project in which they moved from a single response team to a tiered response system with Tier 1 doing the work of initial communication with patrons and provision of content if possible, with more complex resolution moving to Tier 2. Resnick and Clark conclude that, “The traditional library divisions, such as local library Reference and Technical Services are no longer helpful in enabling consistent and reliable access to electronic resources, which are purchased and managed throughout the organization, making access an integrated process that is part of everyone’s job.” Donlan’s conclusion agrees, but states more plainly, “Reference librarians should participate in this process as much as technical services and systems librarians, since they deal with the fallout of bad data every day.” (Donlan, 2007).

What all three of these articles have in common is that they detail attempts to troubleshoot while giving the reader a clear impression of the complexity of initiating, maintaining and restoring access to electronic resources. What their solutions and successes have in common is staff – technical services staff time, staff working together across traditional library units and staff working directly with users filling the gap between access to electronic resources and the expectations users have about access to electronic resources.

METHODOLOGY

In August 2013, the eProblem Reporting Questionnaire (see Appendix) created in Qualtrics was sent to electronic resources librarians at 108 North American academic libraries who are

members of ARL. The questionnaire was comprised of 21 questions about how electronic resources linking errors are handled at academic libraries. The survey queried librarians about:

- Whether form or ticketing systems are staff-facing, patron-facing, or both,
- What mechanisms are in use for reporting link problems,
- If work flows are in place for link problem resolution and troubleshooting,
- What departments are involved in electronic resource access troubleshooting,
- How work is distributed among staff and how automated the process is,
- whether or not metrics are kept, and if so how are they used to improve the user experience,
- Whether quality control methods for electronic resource access are reactive, proactive, or both
- And, what counts as a successful resolution to an electronic resource problem,
- As well as some demographic information.

There were a total of 53 responses to the survey, 40 of which were complete, resulting in a 37% return rate; Descriptive methodology was used to analyze the survey data.

In addition, video interviews were conducted via Google+ Hangouts with librarians from five ARL academic libraries to create and discuss troubleshooting case studies. (Librarians Kristen Wilson from North Carolina State University, Gracemary Smulewitz from Rutgers, Joyce McDonough and Susan Marcin from Columbia, Rachel Erb from the University of Colorado, and Galadriel Chilton from the University of Connecticut were identified from among the questionnaire respondents who indicated interest in a follow up conversation.) The following questions were asked of the case study interviewees:

- Share with us an example of eResource troubleshooting at your library.
- How would you like to see your troubleshooting workflow improved at your library?
 - How much of the troubleshooting process relies on human memory or emails?
- How do you think you could improve your troubleshooting process?
 - Proactive/reactive solutions
- Might some kinds of automation improve troubleshooting? What kinds?

Using Yin's explanation on how to use case studies in research, the resulting case studies were analyzed to "build an explanation" (Yin, 1994) for the researchers' guiding premise, which is that "both proactive and reactive troubleshooting comprises a significant portion of day-to-day electronic resources management work." Ideally, the authors' survey, and case studies would be used in conjunction with a body of literature on troubleshooting – both proactive and reactive – to check their perceptions of troubleshooting work. The authors found no such body of library science literature, however, which spurred them to inquire of ARL librarians directly what their experience and workflows for troubleshooting consisted of.

RESULTS

Resultant questionnaire data fall into roughly three types – troubleshooting workflows, for example, turn-around times and communicating problem resolutions; tracking troubleshooting metrics, such as the categorization of access problems for reporting purposes; and staffing, particularly regarding who-does-what. Discussion of the questionnaire responses will be loosely grouped into three categories: workflows, staffing, and tracking.

Workflows

Most libraries replied that initiating a troubleshooting workflow can come from two main avenues, library staff and patrons: 57% have forms that are both patron-facing and staff-facing, while an additional 16% have forms that are only patron-facing. This indicates the need to allow patrons the opportunity to report linking issues as they are found and this establishes clear evidence that the majority of electronic resource troubleshooting efforts rely, at least in part, on the patrons' willingness to report linking problems. Reporting errors might or might not be

handled with a library staff intermediary; 14% of respondents indicated that errors are reported through a staff-only form of some sort. A small number of respondents (5%) have no apparent means of collecting access error reports from patrons directly or indirectly through staff intermediation, relying instead on reviewing error logs or other web analytic tools. See chart 1.

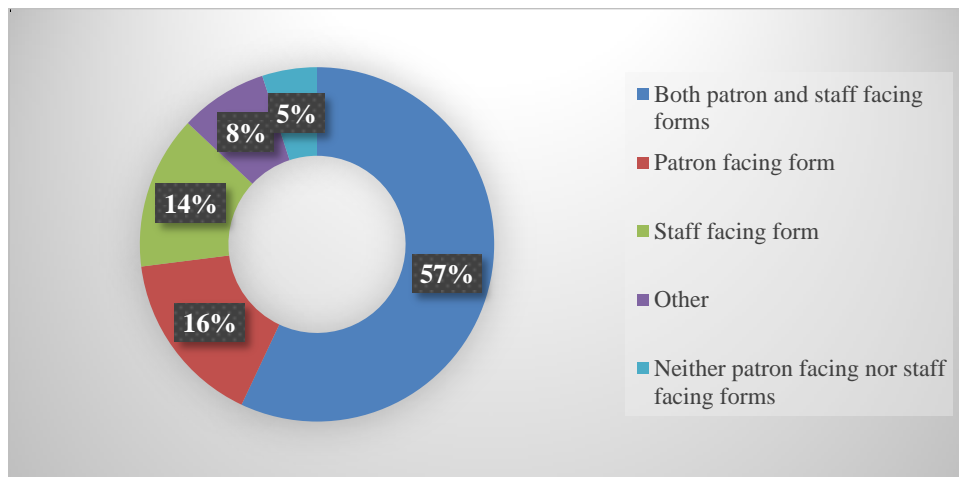


CHART 1 - *Does your library have a form or ticket submission process to report eProblems?*

Access issues are most commonly reported via email, forms, and ticketing systems or some combination: 73% use email, 49% of respondents use a form, 43% use a ticketing system. See chart 2. From these results, it is clear that multiple reporting techniques are in use at individual libraries. One respondent indicated that error logs are examined for turn-away and connection failures, but it is not known if the patrons experiencing these types of problems are contacted with a resolution afterwards.

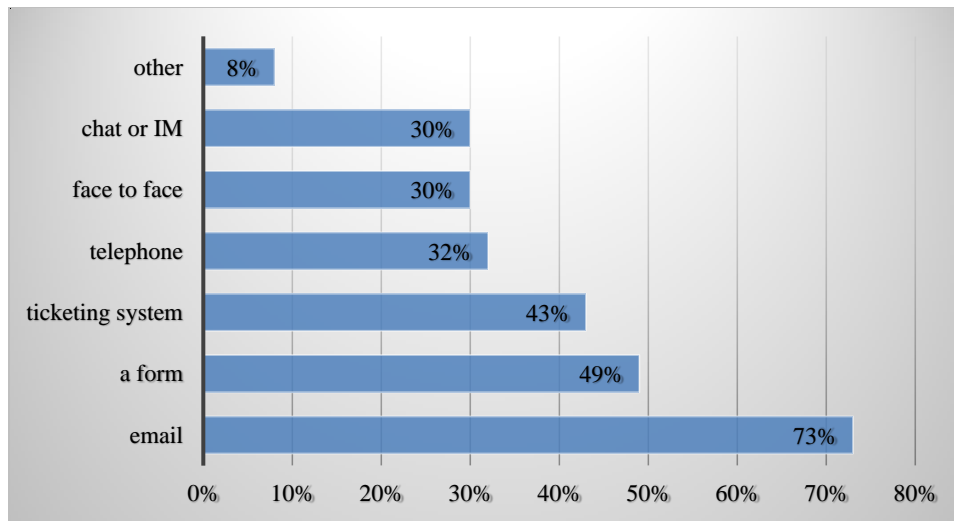


CHART 2 - *What is your library's eProblem Reporting mechanism?*

Another question regarding troubleshooting workflows indicated that there is a workflow in place at most libraries, but the majority (64% of respondents) does not have a clear understanding of the workflow. See chart 3. Based on the questionnaire responses and personal experience, the authors speculated about the reasons why this may be the case. First, the complex interaction of link resolver and OpenURL parts, any one or more of which may be the problem. Second, libraries may lack step-by-step documentation such that librarians do not have a clear idea of their troubleshooting workflows. Finally, the lack of top-level description of the overall lifecycle of electronic resources management may not exist to guide an individual workflow over time. Based on most respondents' claim that their libraries only 'sort of' have a workflow in place, comments from case studies and personal experience, the authors conclude that reactive troubleshooting workflows have likely grown up organically as more electronic resources (ebooks, streaming media, and databases) have been acquired. These organic structures may not be deliberately revised with an eye toward improvement, due to time and staffing constraints.

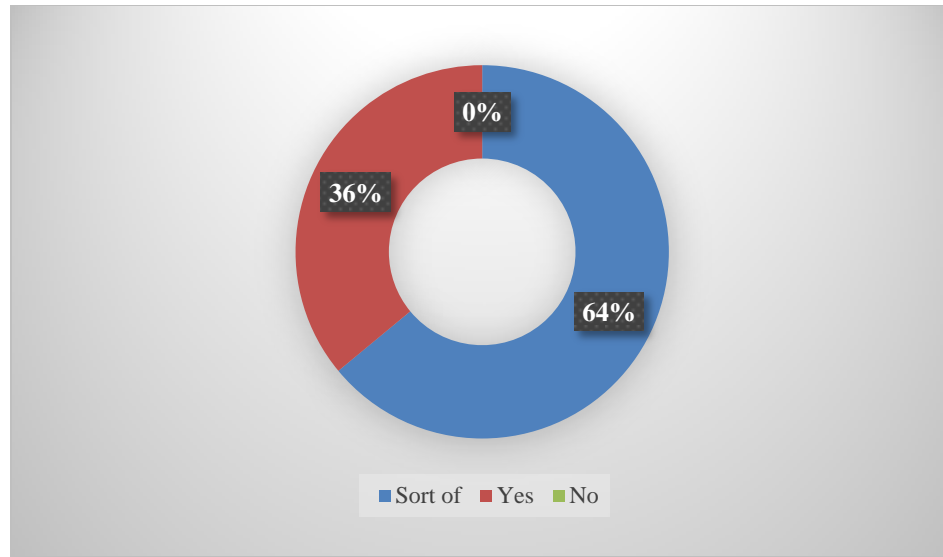


Chart 3 -- *Do you have a workflow for eProblem resolution and troubleshooting?*

When asked, “Does your library have a time frame for resolution and troubleshooting of reported eProblems,” the responses were divided equally: Yes (33%), No (33%), Sort of (33%). A positive interpretation is that these responses assume an awareness of the importance of helping patrons get to the resources they were seeking, and so may not need to have explicitly stated expectations of how quickly a response should be sent to the patron. Also, the complexity in troubleshooting also means that it is often not possible to have a single expectation for the amount of time required to resolve all types of problems and report back to the patron. Many of the respondent libraries have multiple ways for patrons to report errors and given the multiple channels for reporting, 34% of respondents claim that only reactive methods, such fixing broken links, fixing incorrect coverage date ranges in the catalog, and patron education based on individual problem reports are being used. See chart 4.

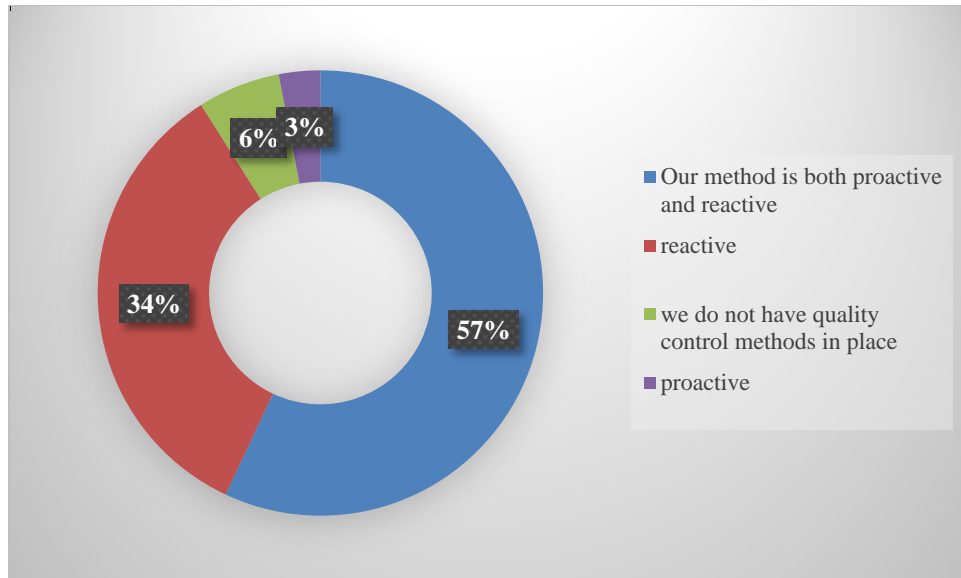


Chart 4 - Which phrase best captures your eResources quality control methods?

We asked respondents to state their troubleshooting workflow points of failure. Unsurprisingly, or perhaps comfortingly, the types of issues reported regarding the common points of failure seen in the troubleshooting workflow are similar to those found by ERWAPIT. These pain points include inefficient communication; siloed storage of the information needed for resolving access problems, making resolution take longer; lack of explicit standards for electronic resources processes, resulting in duplication of effort across units; and a predominance of reactive troubleshooting in response to access problem reporting. Additionally, the lack of staff to provide back up in those libraries with very small numbers of trained staff to troubleshoot, leads to delays in reacting to problem reports. From the open-ended survey question responses (full list of responses listed in the Appendix):

- Ticket does not contain enough info to solve the problem; ticket is assigned to a staff member who does not act quickly
- Emails may get lost or ignored
- The most common point of failure would probably be reporting problem resolution or updates back to the patron

- No backup for the work (or very difficult to manage backup)
- Some staff are more knowledgeable than others. Some questions have to be referred to the ERM Librarian.

Although most libraries have been collecting electronic resources for much longer than 2-5 years, 48% of respondents have had a troubleshooting workflow in place at their institution only 2-5 years. Certainly, it is an uncontroversial statement that as long as there have been electronic resources, there have been patron access problems. Interpreting this response leaves the authors with more speculation than conclusion. Does this mean that newer workflows have been developed at these libraries in this time frame? Perhaps respondents thought the authors meant automated workflows, or, as suggested from the responses to questions about documentation, many libraries do not have a clearly documented workflow for eProblem resolution.

Staffing

Most libraries (81% of respondents) rely on email or ticketing systems in conjunction with email to distribute work among staff for troubleshooting. Once an email or ticket is sent, who handles the troubleshooting work? Responses indicated that there is a wide range in the number of departments involved in electronic resources troubleshooting (from 1 to 6 departments) indicating that depending on the organizational structure and size of the library, management of electronic resources can be either very distributed or very contained. More specifically, 76% of libraries have a very few number of staff members (1-5) working on electronic resources troubleshooting, also indicating that the work is either quite distributed or quite contained. See chart 5. Following up with communication to library staff or the patron regarding a resolution also takes place most often via email or a ticketing system notification, with technical services staff, broadly construed, taking the most responsibility for reporting back to librarians (76% of the time) and public services staff taking responsibility (46% of the time) for reporting

resolutions back to patrons. The responses to this question are neatly summarized by one of the respondents:

“A successful resolution would depend upon the problem reported. We consider a problem resolved when the patron has been able to get what they need, or an explanation as to how to get to something is provided. Further tasks and troubleshooting often comes out of these reported problems (i.e. - coverage dates for an entire collection is incorrect, a collection is not activated, etc.).”

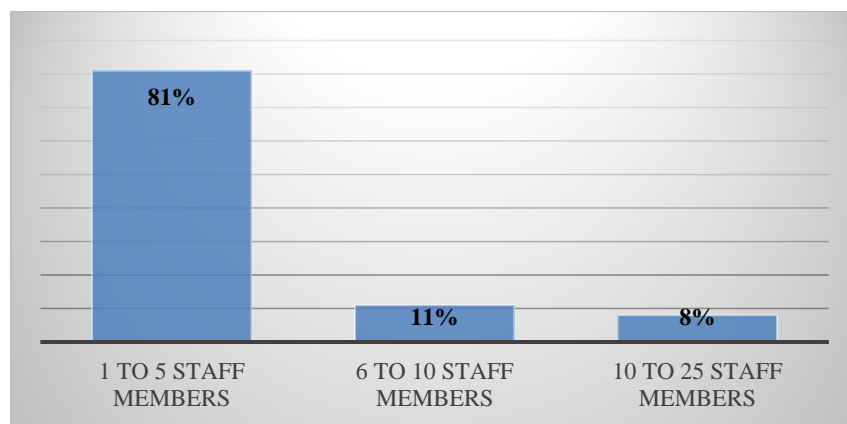


Chart 5 – *About how many library staff members work on resolving or troubleshooting eProblems?*

At least 85% of the respondent’s libraries have a third-party discovery layer interface to search for and display library holdings to patrons. For electronic resources management, this often adds some layers of communication and delay to resolving access problems, as there are other systems in which data might be incorrect. In terms of staffing, adding a discovery layer also adds a layer of “resolution staff”, including vendor staffs who respond via discovery layer ticketing systems and the like. However, when there is a system-wide issue with a discovery layer, library staff is often the first to note and report to the vendor that their system is down.

Tracking

While almost half (47%) of the respondents do track problem reports, 56% of responses indicate that there is either an unclear method for tracking (45%) reported problems or no method whatsoever (11%). This indicates that metrics on issues reported are not collected, not collected well, or not used at all in establishing quality control methods (proactive troubleshooting) for electronic resource access. The responses to this question bring to light the inconsistent tracking of problems with accessing full text electronic resources in ARL academic libraries. Respondents could state the type of quality control methods used, indicating that many libraries (59% of respondents) perform both proactive and reactive troubleshooting. A significant percentage of libraries (32%) indicated that only reactive quality control methods are in place. Although the need is acknowledged, few libraries seem to have the staff or technology resources to move from mainly reactive troubleshooting to proactive quality control.

Considering the responses to questions discussed previously; if most workflows rely on email or ticketing systems to initiate troubleshooting, unless there are deliberate, and perhaps labor intensive, processes in place for gathering and analyzing metrics, it is likely that the sole metric will be number of problems submitted. And, this metric is likely to be used for quarterly or annual reporting rather than for designing projects and developing processes for proactive troubleshooting. This seems especially true with access problem reporting that is mostly email based; counting emails is easy but figuring out what the email is really reporting and using emails to expose large patterns or repeated problems with a particular vendor can be prohibitively time consuming. While ticketing systems are somewhat better in this regard, they also lend themselves to counting reactive troubleshooting totals as a measure of effectiveness.

DISCUSSION OF QUESTIONNAIRE FINDINGS AND CASE STUDIES

The impetus of this research was to check in with colleagues from similar institutions to identify trends and best practices regarding troubleshooting processes in place at ARL academic libraries. What the authors have discovered is that they can, at best, offer a snapshot of what ARL libraries are currently doing to troubleshoot access problems, as there seem to be few best practices and the trends remain somewhat flat. Specifically, what the authors found is that troubleshooting practices and workflows are very often reactive, with communication about problem resolution relying on email and statistics difficult to quantify apart from the number of access problems reported. Furthermore, few libraries have comprehensive proactive troubleshooting procedures and practices in place, often due to a lack of time, staff, and the volume of electronic resources acquired to enact annual resource inventories, confirm coverage dates or respond to and implement feedback from user experience research.

If Price and Trainor, in “Rethinking Library Linking,” are correct in their estimate that there is about a 30% link failure rate, it can be concluded that, combined with the large budget allocation for electronic resources and user expectation of one-click full text access all of the time, libraries must at the very least find the time and staff to become systematic about proactive troubleshooting. Automating this process using a diagnostic tool like SEESAU can make it more manageable, even though the access issues SEESAU exposes must still be tracked down and corrected link-by-link.

Case study interviews further highlighted concerns about troubleshooting access problems as well as strategies to maintain both proactive and reactive troubleshooting efforts. The authors

found common cause with colleagues about the state of troubleshooting for access to electronic resources including the need for better communication among troubleshooters, tracking troubleshooting problems and resolutions in an easily quantifiable way to as to see patterns in troubleshooting efforts and preventing broken links; that is, proactive troubleshooting. In addition, there was a commonality with regard to staffing – who does the proactive and reactive troubleshooting, the statistical work and initiates guidelines for communication across the library and libraries on campus? While these strategies cannot be considered either trends or best practices, they offer useful suggestions for troubleshooting improvements.

One way that the case study interviewees incorporated proactive troubleshooting was to gather metrics on the types and frequency of access problems reported. Sometimes this was done for the purposes of presenting on the topic of troubleshooting and other times for the purposes of annual reporting. From the survey, it was discovered that most libraries have staff-facing problem reporting forms, or an email list for submitting access problems (forms can be received via email or sometimes just an email is sent to a queue) while many also have patron-facing forms. Everyone agreed that gathering statistics from troubleshooting work was crucial, but finding the time to pull details from emails or correlate information in Excel from forms with disparate fields or fields that have changed over time was mentioned as problematic by most of the librarians interviewed. Sometimes the task of pulling stats of various types was assigned to other members of a working group or added to a staff member's list of duties. The problem of making sense of the raw data was reiterated – it is not always clear what access problems amount to and less clear what to do about problem patterns that emerge. This is yet different from planned proactive troubleshooting that may be regularly scheduled, for example, an annual database audit

or looking at statistics related to renewing a particular electronic resource. Statistics review can reveal patterns in link failure which can lead to proactive projects such as an access verification project based on the amount of link failure from a specific provider, or the review of the coverage statements of journal packages when data errors have been identified.

Yet another strategy gleaned from our case studies is the use of patron-facing forms. For the purposes of reactive troubleshooting, if a form is to be made available, as opposed to an email list for access problem reporting, the most useful kind of form to have is one that is patron-facing that also scrapes information about the patron's system, such as what browser they are using, what their patron category is, which is related to their permissions and includes a link to the problematic resource or page that the patron is having trouble with. There are a couple of reasons why this kind of form is useful. First, it allows for a shorter communication chain because information relevant to resolution is contained in the form itself. For example, if a patron is a visiting scholar and they may not have the permission to access some electronic resources, it is apparent immediately what the cause of the access issue is and who in the library can resolve it. Second, it can help with triage; that is, identifying the nature of the problem and then directing the access issue to the people who can resolve it, if those people are outside of the library, such as University Computing/IT.

One of the shortfalls of form that includes scraped details about the resource is that problems reported to public-facing librarians via IM, email or face-to-face do not have the benefit of this information. Training staff to gather this information when the problem is reported or requiring additional communication with patrons or librarians can be a complicating factor. The earlier

points about the complexity of maintaining access to electronic resources and shaping patron and librarian expectations about access comes in to play when having to communicate directly with patrons about their access issues. Mostly, the expectation is that all links should just work and explanations about proxy servers or special characters that can break an OpenURL can seem irrelevant to patrons and librarians alike, yet can be crucial for restoring access. And this presumes that restoring access in a particular case can be done in-house, as opposed to working with a vendor or discovery layer ticketing system to rely on a fix.

The librarians interviewed all reported that communicating with those who report access issues is a crucial aspect of troubleshooting. Communicating can be as simple as an immediate response to reassure a patron or librarian that a solution is on the way. These responses can be canned for consistency and convenient use by troubleshooting staff. Though not every library surveyed had a stated turnaround time for resolution of access problems, in conversations the authors learned that communication should be a part of the process along the way, even if the resolution is delayed for days. Direct communication via email with the patron is important, as is follow up with librarians who report the problem on a patron's behalf. This is a way to shape librarian expectations about access issues, electronic resource management and the "under the hood" work of technical services staff. When public-facing staff has reasonable expectations, they can use their connection to patrons to educate them about how the library works and what to expect about access. Patron education is also proactive troubleshooting that benefits electronic management teams.

At least one library has taken this proactivity a step further and created a wiki that lists known problems with electronic resources, such as planned outages or resource-wide problems as they occur. Public-facing staff can do access problem triage by consulting the wiki and getting back to the patron with an explanation without having to submit a form or email to the troubleshooting team. At the authors' library, Duke University Libraries, this role of triage happens at the Research Services Desk, as the librarians at that desk receive all of the report-a-problem forms initiated by patrons. Many do not warrant the submission of the e-problem form. For example, students often think that the ILL landing page that lets them request an item that is not held by Duke is a problem with electronic access. This is not in fact an access problem; this is a patron education opportunity that many reference librarians are glad to take on: ILL is a solution! For those problems that reference librarians can replicate and determine are true access issues, the form can be sent on to AskTech, Duke's troubleshooting email list, for resolution.

How problems are reported and who solves and responds broadens the notion of who is in fact "working" on troubleshooting. The case study interviews revealed that there is a clear distinction in the types of troubleshooting and that some problems are best handled by technical services staff, confirming findings discussed in Resnick and Clark's 2009 case study.

Their conclusion is largely agreed upon by the librarians interviewed, especially with the caveat that what Resnick and Clark consider Tier 2 work has become much more complex and requires expertise to solve, and increased analytical reasoning skills among staff members. Training, retraining or recruiting staff from outside of departments that directly manage electronic resources to help with metrics, triage and resolution has become the way to meet the

shortcomings of the existing automated systems in place to manage electronic resources. Duke Libraries' ERWAPIT committee was cross-functional for exactly this reason. So, what one of the case study interviewees referred to as "clerk work" is no longer enough for resolving electronic resource access issues; a sophisticated understanding of the electronic resources lifecycle and which silos - staff silos and system silos - to look into to find necessary information in a timely manner is required, as is a firm commitment to communication and follow through.

CONCLUSIONS

Based on the survey of ARL librarians, the authors conclude that the current state of electronic resource troubleshooting is almost entirely reactive and often unevenly coordinated which makes the money already spent on databases a poor investment. The reasons for the reactive and uncoordinated approaches to troubleshooting include relying on a range of disparate systems for managing and storing electronic resource information that make tracking and resolving problems difficult; staff members working across Technical Services departments organized on print-based models; and, workflows that have grown in response as new types of electronic resources (ebooks, streaming media) have been acquired. The authors call for librarians to develop best practices and for electronic resources as such, and create workflows for both proactive and reactive troubleshooting to insure more seamless access to full-text electronic resources.

The results of this study indicate a need for libraries to develop best practices for troubleshooting electronic resources. Workflows for both proactive and reactive troubleshooting should be established to insure more seamless access to full-text electronic resources. Significant challenges to crafting solutions include a level of detail and complexity of managing and

maintaining access to full-text electronic resources. Recall that *any* link may fail, and libraries rarely have in-house control over links created and served up on vendor platforms or in knowledge bases, yet to the patron, the problem is “the library”. If links continue to fail, on average, about 30% of the time, troubleshooting will remain a primary task for electronic resources staff. When we do not have the time outside of troubleshooting to mine our own data regarding access failure, or improve electronic resource troubleshooting workflows, librarians cannot see the situation improving except perhaps with the purchase of yet another automated system solution designed to help.

If it is also the case that there is less and less “clerk work” to be done in electronic resource management and that maintaining access is now part of every librarian’s job, how can we ensure a unified and well-designed approach to troubleshooting library wide? The authors’ research shows that conceiving of and improving electronic resource troubleshooting workflows on their own terms is a good starting place. Additionally, guidelines are needed to establish consistency and set expectations for how to proactively and reactively troubleshoot access problems and service points. Training library staff in ways that may cut across traditional technical services boundaries is also supported by survey and case study conversations conducted during this research project, given the relatively small number of staff in ARL libraries working on maintaining the bulk of the library material held. We have also discovered that there are no magic solutions at hand and the trends and best practices that the authors hoped to find are those yet to be implemented. Electronic resources managers can be comforted by the fact that we are in this together, however. This research should provide a baseline for ARL libraries to measure their progress toward a more measured and proactive management of access to electronic

resources. Future research areas which could build on the results herein might be focused on ways in which ARL libraries and vendors can work together to create best practices for proactive troubleshooting and other measures to improve link reliability. Other research could analyze the effectiveness of implementations of proactive and reactive troubleshooting measures based on those suggested by Trainor and Price, namely optimizing the top 100 most used databases and focusing on annual proactive measures to lower the average 30% link failure rate. Yet another may be programs which include librarians outside of technical services in troubleshooting workflows, training and benchmarking. Finally, libraries outside the ARL community might also be the subject of similar research of peer institutions' practices and needs based on their own criteria.

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Appendix A - *eProblem Reporting Questionnaire*

1. Does your library have a form or ticket submission process to report eProblems?
2. What is your library's eProblem Reporting mechanism?
3. What library departments are involved in eProblem resolution or troubleshooting?
4. Do you have a workflow for eProblem resolution and troubleshooting?
5. How is eProblem resolution and troubleshooting work distributed to staff?
6. Are eProblem Reports tracked?
7. Which phrase below best captures your eResources quality control methods?
8. About how many patrons does your library serve?
9. For patron reported eProblems, how is the troubleshooting work triggered?
10. Who is responsible for communicating back to patrons regarding the resolution of the eProblem?
11. Who is responsible for communicating back to library staff regarding the resolution of the eProblem?
12. About how long have you had an eProblem resolution or troubleshooting workflow in place?
13. Does your library have a time frame for resolution and troubleshooting of reported eProblems?
14. How automated is your method of work distribution for eProblem resolution or troubleshooting?
15. What are the common points of failure in your eProblem work distribution system, if any?
 - Ticket does not contain enough info to solve the problem; ticket is assigned to a staff member who does not act quickly
 - Emails may get lost or ignored
 - The most common point of failure would probably be reporting problem resolution or updates back to the patron
 - Right now we are dealing with a hiccup in our ticketing system. The system is not emailing the submitting staff member whenever a ticket is updated with more info. Or a resolution. Otherwise, the system works pretty well.
 - Sometimes tickets linger without resolution or get assigned to people that are out of the office

- Problems that take time to solve or involve outside parties like publishers or vendors; occasionally we don't hear back from them and the person who was assigned to handle it here may forget to follow up
- For the most part, one person is responsible for the troubleshooting for eresources and off-campus access problems. She gets reports from users and staff members, and troubleshoots those she can. She distributes other issues relating to the OPAC, the discovery system, the Library Web to the appropriate people. Failure happens because she checks for problems on the weekends and others do not provide that level of service. Eresource questions come to other outlets but she doesn't get them until they are already a couple of days old.
- Slow publisher response
- Two individuals, one in our main library, and one in our health sciences library, handle the majority of e-resource problems. They develop great expertise, but service suffers when they're not available. Three serials staff also assist, but usually when the problems have already been triaged. Proxy issues are handled by one individual. Again, a backup would improve service.
- We're currently working to improve documentation of our troubleshooting. I'm new to the position and am relying heavily on colleagues to create a system that includes scripts, decision trees, etc.
- We use the same email address for troubleshooting, vendor relations, invoicing/renewal of eresources, usage statistics, etc. Because so many types of emails come to this address, the biggest point of failure is not responding to an email because it was overlooked.
- Public service staff not taking the contact information of patron so that problem resolution can be communicated to them. They are left frustrated even after the problem has been fixed.
- One problem we have is that we have two different systems, one that is used more, but not always, for internal problems, and another one specifically for patron reported problems. Some people may have access to one but not the other so it's not always easy to get the ticket transferred to the appropriate person.
- Vendor response problems, some problems with communication between units/departments
- A ticket is distributed to a staff member who does not act on it quickly or at all; a ticket is distributed to the wrong staff member
- There is much more activity in, and training/experience/structure for, troubleshooting within the serials team, less so with monographs team. (Not sure I've understood your question correctly)
- No backup for the work (or very difficult to manage backup)
- We assign staff to manage the Electronic Resources Error Report system on a weekly basis. Each staff member who receives an ERER stays with that ERER until it is resolved and the ticket is closed. This is working well. I don't see that there are any

points of failure in our distribution of the work involved in resolving ER access problems.

- Overlap of systems and responsibilities. For example, systems has in-depth knowledge of proxy functioning but the troubleshooting team has only superficial knowledge -- if a problem is on the cusp of those systems the problem, the resolution, and the responsibility for the fix can be difficult to determine.
- One person who does the job. If that person is gone we can't do much.
- Tracking is not automated at this point. One staff member is assigned to capture each query and post it to a spreadsheet. The spreadsheet is designed to sort and filter on categories of problems. Also, the individual who resolves the problem is captured as well as the type of problem and the resolution and whether follow up is needed.
- managing the complex communications sometimes involved in resolving single issues (for example. initial response to patron who reported the issue, then back and forth with vendor/publisher or even consortium, then communications with library systems, then reporting back to original patron)
- Checking back up on tickets that are in process is the major pain point; a ticket may languish for a long time after the initial patron contact, if there's a high volume of work.
- Following up on eproblems; waiting for vendor/publisher responses
- Following up with vendors/providers/publishers on open/outstanding access issues.
- I was recently put in charge of following up on emails to our problems listserv if they are not replied to within one day. Previously, our main problem was emails falling through the cracks. We also don't have a good system for following up on issues.
- Some staff are more knowledgeable than others. Some questions have to be referred to the ERM Librarian.
- A new form was created a couple of years ago and it's difficult to determine if all those responsible for troubleshooting receives the email notification. This causes problems because you don't know if the person who resolves the problem is alerted to the issue. On the previous form all the responsible staff were able to see their name appear as recipients. With the new form you have to assume that everyone received the problem request so the responsible staff can resolve. I've forwarded many requests only to get a reply back that they indeed did receive it. It would be nice that the new form worked liked the old. I guess the real issue is there's a concern on my part that I receive report that I am not able to resolve and not immediately knowing if the staff responsible for it also received it or is the trouble report sitting out in cyber space waiting for action. I hope this scenario makes sense.

16. About how many library staff members work on resolving or troubleshooting eProblems?

17. At your library, what counts as the successful resolution of an eProblem? (For example, contacting a vendor, changing a coverage statement, the patron information need is satisfied etc.)

18. Please list what types of eProblem metrics that you track, if any. (e.g. patron status, on/off campus, platform)

19. Do you keep metrics on any of the following kinds of eProblems? Check all that apply.
20. Do you use your metrics to improve user experience?
21. Does your library use a third party discovery layer, such as Summon or EBSCO Discovery Service?