Measuring the impact of networked electronic resources: developing an assessment infrastructure for libraries, state, and other types of consortia

Terry Plum
Simmons College, Boston, Massachusetts, USA

Brinley Franklin
University of Connecticut, Storrs, Connecticut, USA

Martha Kyrillidou
Association of Research Libraries, Washington, DC, USA

Gary Roebuck
Association of Research Libraries, Washington, DC, USA

MaShana Davis
Association of Research Libraries, Washington, DC, USA

Emerald

FSC
Recycled
Supporting responsible
use of forest resources

INVESTOR IN PEOPLE

ISOQAR
UKAS

ISOQAR
QUALITY
ASSURED
UKAS

Emerald Group Publishing Limited,
Howard House, Environmental
Management System has been
certified by ISOQAR to
ISO14001:2004 standards

Awarded in recognition of
Emerald's production department's
adherence to quality systems and
processes when preparing
scholarly journals for print

Measuring the impact of networked electronic resources

Developing an assessment infrastructure for libraries, state, and other types of consortia

Terry Plum
Simmons College, Boston, Massachusetts, USA

Brinley Franklin
University of Connecticut, Storrs, Connecticut, USA, and

Martha Kyrillidou, Gary Roebuck and MaShana Davis
Association of Research Libraries, Washington, DC, USA

Abstract

Purpose – As libraries are developing a larger Web presence, issues regarding the utility, accessibility, and impact of the usage of their networked resources and services are gaining critical importance. The need to assess systematically the networked electronic services and resources is great as increasing amounts of financial resources are dedicated to the Web presence of libraries. This paper aims to address this issue.

Design/methodology/approach – This project proposes to measure the impact of networked electronic services, building on MINES for Libraries®, in a scalable way across libraries and consortia to enhance digital library service quality and impact on learning by enabling the future allocation of resources to areas of user-identified need. Short, standardized web surveys are placed at the point-of-use of networked electronic resources and services through a network assessment infrastructure that uses contemporary mechanisms of authentication and access, such as EZproxy, openURL, Shibboleth, federated searching and others as modules to interface with ARL's StatsQUAL®. A valid and reliable sampling method is proposed.

Findings – Point-of-use web surveys hold considerable promise as key tools in the assessment toolkit libraries may deploy to improve the research, teaching, and learning outcomes of their users.

Practical implications – This project enhances and deepens the information gained from vendor-supplied data.

Originality/value – The developments described will make it easier for libraries to assess the usage of networked electronic resources and services.

Keywords Electronic media, Library networks, Surveys, United States of America

Paper type Technical paper

Introduction

Building, sustaining, and servicing digital library resources involve major expenditures for an institution. Collectively, ARL member libraries spent more than $2.5 billion in the past year on operating expenses, and costs continue to rise. The escalating costs of scholarly communication – especially the prices of scholarly journals and electronic databases – are among the most volatile in postsecondary

education, increasing at rates higher than inflation for over the past two decades. The portion of the library materials budget spent on electronic resources is also growing rapidly, from an estimated 3.6 percent in 1992-1993 to 46.55 percent in 2006-2007. In 2006-2007, 112 ARL university libraries reported spending over $536 million on electronic resources with $476 million of that total spent for electronic serials and subscription services. A total of 50 ARL libraries report spending over 50 percent of their materials budget on electronic materials (Association of Research Libraries, 2002; Kyrillidou and Bland, 2008).

The goals of this ARL project are to :

- identify the various networked infrastructures that provide a gateway to networked electronic resources and services for college and university libraries and library consortia;

- provide a set of valid and benchmarked questions by which libraries can learn about the usage of their resources, and compare that usage to other similar libraries;

- modularize a web-based survey delivery system for the most popular authentication and access systems used in libraries to interface with StatsQUAL®, using a recommended set of survey rules and practices; and

- provide valid and comparable data to libraries to help them make sound management decisions about the effectiveness of electronic resources and services.

This project will make it easier for libraries to assess the usage of networked electronic resources and services. Measuring the Impact of Networked Electronic Services (MINES for Libraries®) is a protocol ARL has been using locally at individual libraries and consortia, which gives them more information on the demographics and purpose of use of their library users. MINES is currently a locally implemented evaluation protocol. This proposal scales MINES across a much wider range of libraries, consortia, and different networked infrastructures in order to survey local usage, and to collect and analyze the data centrally at ARL.

Although a variety of authentication and access management systems are in use in libraries, including EZProxy (www.oclc.org/ezproxy/), Shibboleth (http://shibboleth. internet2.edu/), OpenURL servers (http://openurl.code4lib.org/tools, www.loc.gov/ catdir/lcpaig/openurl.html), ERM (www.diglib.org/pubs/dlf102/), federated search engines with ILS authentication (www.libraryjournal.com/article/CA6571320.html), and others, ARL is initially focusing on EZProxy and OpenURL as proof of concept to collect user information on demographics and purpose of use across libraries. ARL has requested research funding from IMLS to support the development of assessment mechanisms for the collection of this type of information across libraries and consortia to help these institutions make wise decisions and build a case about the effectiveness of their networked electronic resources and services.

Brief history
The history of the protocol, Measuring the Impact of Networked Electronic Services (MINES for Libraries®), began in 1982 with the Peat, Marwick, and Mitchell library cost analysis study, designed by Brinley Franklin and Greg Baroni, to determine the

costs that academic libraries incur to support sponsored research (Franklin, 2001). Academic research libraries support their institution's multi-faceted mission, including the school's educational, research, public service and, in some cases, patient care programs. In recognition of academic libraries' support of the sponsored research enterprise, the United States Government has federal regulations in place that permit educational institutions to perform a cost analysis study which results in an equitable distribution of the costs libraries incur to support an institution's major functions. US Office of Management and Budget (OMB) Circular A-21 (US OMB, 2004) sets forth the principles by which educational institutions and their libraries can quantify and seek reimbursement for costs incurred in support of sponsored research.

In 1986, Peat, Marwick and Mitchell and representatives of the US Department of Health and Human Services agreed on a standard methodology for the library cost analysis, including the random sampling of two-hour time periods, stratified monthly over an entire year. Following this methodology (Franklin, 1989, 2001) print surveys were distributed to patrons entering the library, to ascertain the purpose of use of resources, services, and spaces in the library, specifically to assign costs to sponsored research.

However, as the web became more prevalent, more networked electronic resources were made available through library web sites. With the ARL New Measures retreat in 1999, the launch of the ARL E-Metrics project in May 2000, and the initiation of COUNTER in 2002, it was clear that libraries were dedicating increasingly large portions of their budget to electronic resources. Even as early as 2002, ARL was reporting that 110 ARL university libraries reported spending more than $171 million on electronic resources, and $20 million more were being spent in consortial purchases (Blixrud and Kyrillidou, 2003). Anticipating the need for usage data from networked electronic resources, the indirect cost library study first surveyed MEDLINE and FirstSearch through CARL in a study of the University of Colorado at Boulder in 1998. In 2000, a number of possible methodologies for capturing usage of electronic resources were discussed in the library study at the University of Arizona in Tucson. Although vendor data, which later became COUNTER data, seemed a fruitful avenue, the requirements for collecting demographic data, usage frequency, and purpose of use data necessitated a different approach, and the MINES for Libraries® methodology was born. The methodology was later christened MINES for Libraries® by Franklin, and then adopted by ARL into StatsQUAL® and the New Measures Initiatives in 2003.

Because MINES for Libraries® is locally implemented, it has undergone constant implementation refinement, depending on the capabilities of the participating libraries, and a number of talented IT staff have made significant, yet unrecognized, contributions to the protocol over the years, including Don Brunder, Associate Director for Academic Computing at the University of Texas Medical Branch, Galvaston, TX, and Sheryl Bai, Head of Network Systems, Lyman Maynard Stowe Library, University of Connecticut Health Center, Farmington, CT, and many others. Although the technical aspects of the implementation are constantly being adjusted, the MINES for Libraries® framework and survey have remained consistent.

The participation of ARL moved the MINES methodology to new levels. In 2005, as part of the study to evaluate the Ontario Council of University Libraries' (OCUL) Scholar Portal (www.scholarsportal.info) the ARL Statistics and Service Quality Programs section developed a statistical gateway to the data collected through the

MINES for Libraries® protocol (Kyrillidou *et al*, 2006). The interactive data were part of the StatsQUAL® framework, are transferable to other libraries and consortia, and are scalable to handle a large number of data sets. In 2007, ARL began talks with Chris Zagar of EZproxy to explore ways to simplify the technical implementation of MINES for Libraries®, to broaden the opportunity for libraries to participate, and to develop further the StatsQUAL® framework so that libraries can receive individual reports but also benchmark responses across similar libraries, similar to the OCUL data. These discussions have led to an IMLS grant application, and this paper reflects the thinking that went into that application.

Literature review

There is a growing need to systematically assess networked electronic services and resources as an increasing amount of financial resources is dedicated to libraries' web presence. Much of this literature review is taken from the chapter, "From usage to user: library metrics and expectations for the evaluation of digital libraries" (Franklin *et al*, 2009)

One productive approach to assessing the impact of digital content is through census counts such as the statistics of usage of networked electronic resources collected by external vendors conforming to codes of practice, like COUNTER (Counting Online Usage of Networked Electronic Resources www.projectcounter.org/) and standards-based expressions of them such as SUSHI (Standardized Usage Statistics Harvesting Initiative (www.niso.org/workrooms/sushi)), a standardized transfer protocol for COUNTER compliant statistics. The constantly updated Codes of Practice (www.projectcounter.org/code_practice.html) recommend that vendors produce library use reports containing such variables as the "Number of successful full-text article requests by month and journal", "Turnaways by month and journal", "Total searches and sessions by month and database", and other reports. The SUSHI standard (NISO Z39.93-2007) has three supporting XML schemas posted to the National Information Standards Organization (NISO) web site and are retrieval envelopes for the conforming XML-formatted COUNTER reports. These data are analyzed by libraries, either by moving the data into electronic resource management systems (ERMs) or by creating spreadsheets. The purpose of the analysis is often to generate cost per use data. Although the calculation is simple, collecting meaningful cost data from the complex bundling offered by vendors is not trivial.

COUNTER is a tremendous step forward, but not the total solution. Baker and Read (2008) surveyed librarians at academic libraries to determine how much effort is required to process the COUNTER data, how the data are used, and what data are the most meaningful. This survey is part of the MaxData project "Maximizing Library Investments in Digital Collections Through Better Data Gathering and Analysis" an IMLS-funded project from 2004-2007 in which three research teams are studying different types of usage data for electronic resources and will develop a cost-benefit model to help librarians "determine how best to capture, analyze and interpret usage data for their electronic resources" (Baker and Read, 2008). They found that librarians still wrestle with inconsistent data, both from COUNTER compliant and non-compliant vendor reports, but also within COUNTER compliant reports. In general, the census data supplied by vendors external to the library are useful for cost-use studies, although

Conyers and Dalton (2007) provide evidence that this analysis is more difficult than it appears. Combining these data with locally generated web logs or other user survey data will help analyze user behavior and motivation.

J.C. Bertot, C.R. McClure, and D.M. Davis have been pursuing a research agenda to assess outcomes in the networked electronic environment (Bertot and McClure, 2003; Bertot and Davis, 2005). The approach developed for the Florida Electronic Library looks at functionality, usability, and accessibility, and combines a number of iterative methods to assess outcomes. Functionality is defined as a measure of whether the digital library works as intended. Usability assesses how users interact with the program. Accessibility measures how well the systems permit equal access for patrons with disabilities (Snead *et al.*, 2005). This project has focused on large state digital electronic resource collections, an important target for outcomes assessment. Part of the evaluation includes usage data from the resources.

The MESUR project seeks to employ usage data to expand the possibilities of scholarly assessment. The purpose is to generate a model of the scholarly communication process involving usage, citation, and bibliographic data. It will create a reference set and generate a wider range of usage-based metrics than we presently use, with guidelines for their application. MESUR (Metrics from Scholarly Usage of Resources) identifies the current datasets, for example, harvestable usage statistics for scholarly journals (COUNTER and SUSHI); the Interoperability Repository Statistics Project (http://irs.eprints.org) defines usage data for OAI-PMH-compliant repositories and CiteBase (www.citebase.org) collects citation data (Bollen and Rodriguez, 2007). The deliverables from this project are a survey and model of the scholarly communication process, a large scale reference data set for the investigation of viable usage-based metrics, an examination of the clusters of practices found in this data set, and finally the definition and validation of usage-based metrics of scholarly impact.

A useful literature survey of data collection of usage of networked resources at the local library level is found in White and Kamal (2006). Locally developed census counts are generated from click-through scripts, rewriting proxy server logs, virtual private networks (VPNs), or openURL server logs, or other methods to capture data of networked electronic resource usage at the local level. White and Kamal also present some creative models of the network infrastructure necessary to collect these data locally, including electronic resource management systems (ERMs) (99), VPNs (108), and re-writing proxy servers (109). The MINES for Libraries® protocol is in the tradition of locally developed data, although it is a sample, not a census count, and it is anonymous, despite sometimes using the local authentication for delivery. Unlike external vendor-supplied data, other local data studies can be mapped against authenticated users or internet protocol addresses to determine usage by local demographics such as client group, school or discipline. Library web sites are routinely evaluated by web server logs and web traffic analysis software. Stemper and Jaguszewski (2003) point out that "local use data allows us to compare usage across publishers and disciplines". They concluded that: [...] it may be useful to occasionally compare local statistics with vendor statistics to understand usage in more depth" and "both local and vendor usage data have their own strengths and weaknesses ... Both have their place in the digital library's suite of quantitative evaluation measures (Stemper and Jaguszewski, 2003).We anticipate linkages

between COUNTER/SUSHI data and the scaled and enhanced MINES for Libraries®, which will give libraries valid data about the usage and the users of networked electronic resources.

Transaction logs capture all local usage, yet because of the simplicity of the IP and HTTP protocol elements, they are not particularly useful. If the logs can be tied to a session, that is, one person searching over a period of time, they become more informative. The interaction within the electronic resource is unavailable to the locally collected data, but commensurable counts can be generated across disparate resources. Log files are especially attractive for closed environments, like digital libraries, OhioLINK, and OCUL's Scholar's Portal, and they have relevance to any gateway server, through which requests to e-journal vendors must pass. Jamali, Nicholas, and Huntington, in a review of transaction log file analysis and web log analysis, note that there are advantages and disadvantages to the technique and that researchers have taken both sides. The advantages include: log file data is collected automatically, data are collected unobtrusively, the data are good for longitudinal analysis, and are based on a census not sampling. Log analysis can provide data for the evaluation of digital library performance while providing useful data about information seeking behavior (Jamamli *et al.*, 2005). The disadvantages include the difficulty of differentiating user performance from system performance. It is difficult to identify users, and IP address alone is not sufficient; sessions are hard to determine and many researchers assume 30 minutes is a session. Additionally, caching proxy servers may thin out the data, and activity by spiders and other crawlers should be segregated in the data. With log file analysis we do not know why the user did what he or she did.

Deep log analysis (DPA) enriches web log data with user demographic data, drawing from a user database or online questionnaires. Since log files provide little explanation of behavior, deep log analysis follows up with a survey or with interviews. DPA was developed by the Centre for Information Behaviour and the Evaluation of Research (CIBER) (www.ucl.ac.uk/ciber/). Deep log analysis technique is employed with OhioLINK and is part of the MaxData project, described elsewhere in this paper. The technique is attempting to provide methods for obtaining good quality usage data through transaction logs, and in this method items used, viewed or requested are counted as use (Nicholas, 2005).

One of the best examples of locally developed census collection of usage data is Joe Zucca and the Penn Library Data Farm. In this service oriented, data collection tool, information is pulled from the online catalog, acquisitions, circulation, electronic resource management systems, open URL link resolvers, interlibrary loan data, web service logs, and rewriting proxy server logs, bringing together resources, services, and the data they produce when patrons use them. The basic concept is the desire to capture in a data warehouse library related events or interactions. Using these data, Zucca (2008a) can track resources, people and location, creating a management information framework. A sample report from this system may produce for example a view of "Faculty Use of Electronic Journals by School by Journal Topic". This system is particularly useful for libraries assigning library resource and service costs to specific user groups (Zucca, 2008b). The possibility of extending this system through an XML schema of standardized event descriptors is under consideration.

What is MINES for Libraries®?

This methodology deepens the institutional understanding of COUNTER/SUSHI data, and addresses some of the weaknesses of web-based survey. Most web surveys are non-probability-based samples, and therefore not open to inferential statistical statements about the populations. The non-response rate for most web surveys is high, and may introduce bias. Web surveys have in the past been used to collect data about users or about sessions, but not about usage. Therefore, the data they collect are not related to the usage data collected by vendors of networked electronic resources. Web surveys, because they focus on users, are often collections of impressions or opinions, not of more concrete actual usage, and are therefore not trusted to yield reliable data that can be compared to itself longitudinally. They are often not based on actual, point-of-use usage, but upon predicted, intended or remembered use, introducing error. Web surveys may not appear consistently when viewed in different browsers, thus affecting the results in unanticipated ways. Because users have unequal access to the Internet, web surveys introduce coverage error (Franklin and Plum, 2006).

Most sample counts are user studies, but are not linked to usage collected systematically, nor are the results comparable to peer institutions. Tenopir, updated by Rowlands, surveys user studies (Tenopir, 2003; Rowlands, 2007). One difference between the MINES approach and many of the other web-based user surveys recounted in Tenopir and Rowlands is the emphasis on usage. Although user demographic information is collected, this web survey is really a usage survey rather than a user survey. The respondent must choose the web-based networked electronic resource in order to be presented with the survey, therefore memory or impression management errors are prevented. Once the survey is completed, the respondent's browser is forwarded to the desired networked electronic resource. This approach is based on the random moments sampling technique. Each survey period is at least two hours per month, so each survey period in itself is only a snapshot or picture of usage. Because the survey periods are randomly chosen over the course of a year and result in at least t24 hours of surveying, the total of the survey periods represents a random sample, and inferences about the population are statistically valid with a 95 percent confidence level and a low standard error (e.g. less than 2 percent). The MINES methodology is action research, historically rooted in indirect cost studies. It is a set of:

- recommendations for research design;
- recommendations for web survey presentation;
- recommendations for information architecture in libraries; and
- validated quality checks (Franklin and Plum, 2006).

If scaled, this approach can serve as the basis for a plan for continual assessment of networked electronic resources, and an opportunity to benchmark across libraries.

MINES has been administered at 50 North American libraries in the last five years through locally implemented indirect cost studies. More than 100,000 networked services uses have been surveyed at those 50 universities since 2003 (Franklin and Plum, 2008a, 2004, 2003, 2002; Franklin, 2004). Under the aegis of ARL, the protocol has been administered at the above-mentioned Ontario Council of University Libraries, where the study will be repeated and expanded in 2009. It has also been done at the University of Iowa, Iowa City (Association of Research Libraries, 2008), and the

- recommended method of designing the web-based survey, with a recommended set of survey rules and practices, also beginning with the work done on MINES, but expanded the protocol to include best practices.

(2) To survey common network topologies and web architectures in libraries and consortia and to construct an assessment infrastructure so that the web survey can be administered at the point-of-use with the maximum number of users seeing the survey. This assessment infrastructure will use popular authentication and access mechanisms such· as EZproxy, openURL, ERMs, federated search, Shibboleth and others to develop a functioning survey gateway through which all user requests for networked electronic services and resources must pass. This gateway would redirect requests to the ARL StatsQUAL® servers to administer the survey, to collect and analyze data, and to return the request to the local resource. This approach is modular, based on existing technologies, but would set up a protocol between the gateway or authentication module and the StatsQUAL® servers.

(3) To propose sampling methods for assessing the usage of networked electronic services and resources, which permit libraries and consortia to make valid and reliable inferences about their user populations by:

- analyzing the existing sampling method employed by MINES for Libraries and to develop other, equally or more reliable and valid, sampling plans so that libraries and consortia can choose among several sampling plans for their particular environment; and

- analyzing the differences between mandatory and optional surveys and survey questions, so that libraries and consortia can understand the differences between these possibilities.

(4) To provide valid and comparable data to libraries and consortia based on the survey method to help them make sound management decisions about the effectiveness of electronic resources and services by:

- collecting the results of the surveys seamlessly on the ARL StatsQUAL® servers;

- analyzing the results of the surveys and presenting them back to the participating libraries and consortia; and

- providing tools for interpretation of the data and recommendations for actions that can be taken based upon the data.

(5) To use the recommended questions and survey design, assessment modules, including EZproxy, openURL, ERM, Shibboleth, etc., sampling plans, and the ARL StatsQUAL® analysis to set up and implement simple and scalable survey methods for libraries to assess the usage of networked electronic resources and services that complement COUNTER vendor-supplied data. As the literature survey shows, a current trend is to enrich census data with deeper sample data. This proposal can build on COUNTER data to give libraries a richer picture of who is using which resource for what reason.

ARL has been working with authentication mechanisms such as EZproxy (which at present has a market penetration of approximately 2600 libraries and consortia) to

explore the scalability of collecting user information on demographics and purpose of use across libraries. There are a number of universities that have implemented the survey through EZproxy, and it has proven to be one of the best mechanisms for administering the survey. Recently, the MINES survey has also been redirected from openURL link resolver such as III WebBridge, Ex Libris SFX, and Serials Solutions 360 Link (Franklin and Plum, 2008b). If the library uses the openURL server to generate lists of journal titles in addition to links to articles, then the openURL topology is reasonably comprehensive, especially when coupled with other systems. Proxy rewriters and openURL applications are attractive survey points because they can be placed in front of many web resources and services, and they pick up both on campus and off campus activity.

Shibboleth (http://shibboleth.internet2.edu/), based on OASIS's Security Assertion Markup Language is a productive avenue for survey redirects, but to date Shibboleth is more common in consortial implementations outside of the US, despite the lengthy list of universities and colleges in InCommon (www.incommonfederation.org/participants). As Shibboleth becomes more inclusive of web services in US university libraries and as it is adopted by more libraries, it would be a useful survey module to develop, but not in the first year.

Another opportunity for collaboration would be to arrive at a common understanding of the "session." ARL would collaborate with COUNTER and NISO to generate session definitions, perhaps similar to the definitions found in the COUNTER Code of Practice Release 3, which recognizes different definitions for a single resource and a federated search engine search. Session decisions would be made at the StatsQUAL® application servers.

StatsQUAL® (www.statsqual.org/) is a mature statistical gateway for assessment tools for the library community. In addition to MINES for Libraries®, it now includes the following interactive datasets:

- ARL Statistics®, a series of annual publications that describe the collections, expenditures, staffing and service activities for ARL member libraries;
- LibQUAL+®, a rigorously tested web-based survey that libraries use to solicit, track, understand, and act upon users' opinions of service quality;
- DigiQUAL®, a project for modifying and repurposing the existing LibQUAL+® protocol to assess the services provided by digital libraries; and
- ClimateQUAL®, Organizational Climate and Diversity Assessment, that measures staff perceptions about the library's commitment to diversity, organizational policies, and staff attitudes.

These tools help to describe the role, character, and impact of physical and digital libraries on teaching, learning, and research. The StatsQUAL® system allows for the presentation of these tools in a single interactive framework that integrates and enhances data mining and presentation both within and across institutions.

This proposal would establish a survey protocol for the values of the survey, session ID, new resource definition, which StatsQUAL® could ingest. The survey protocol would interact successfully from a number of different, currently used, authentication and access mechanisms in libraries. StatsQUAL® is a tool that allows for the authoring, mounting, administration, and management of web-based surveys,

the collection and storage of response data, and the dissemination and analysis of this data via export, reports, and online interactive capabilities for data analysis.
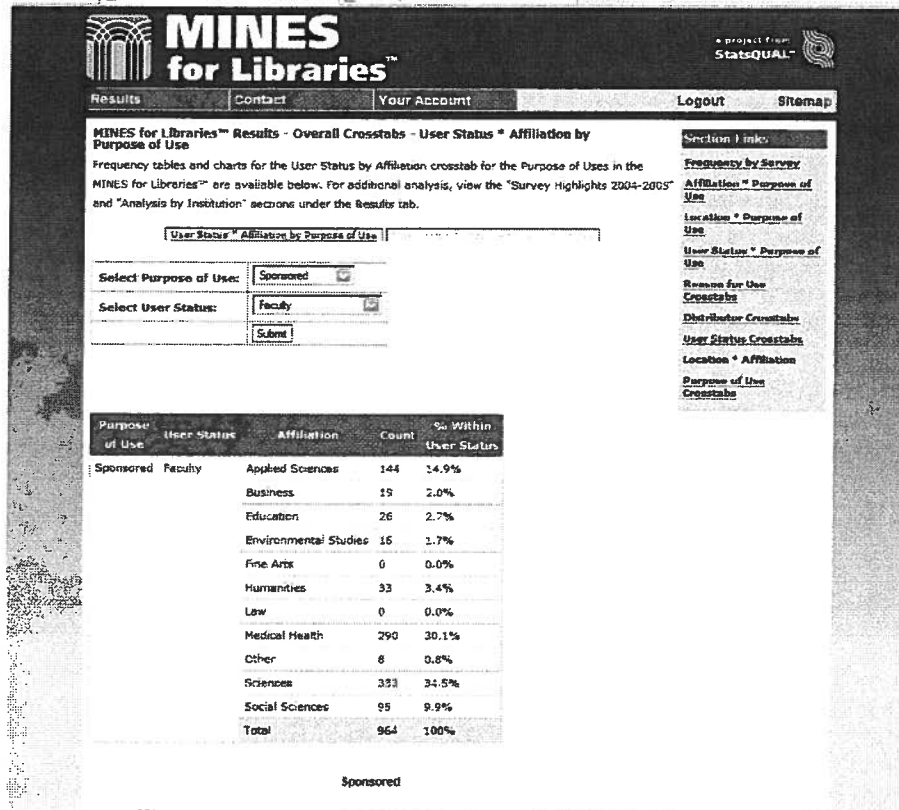
Figure 2 is a model of how the different modules might work with StatsQUAL®, using EZproxy as the example module.

This project will collect data based on actual usage of networked electronic services and resources, and will provide libraries and consortia information about their user population and their reasons for using the resources. Based on these data, libraries and consortia can adjust their resources and services to better meet the needs of their users. These adjustments are more than collection development decisions – they are fundamental decisions about who the actual audience for these resources is, where that audience is working, what resources different client groups are using, and why they are using those resources. Figure 3 shows an example of the interactive nature of StatsQUAL® reports developed specifically for the OCUL project.

Under this proposal, StatsQUAL® will accept web-survey data from a variety of different modules, different institutions, and different questions, analyze them according to the needs of the participating libraries and consortia, and return that analysis to the institution. As data are collected, benchmarking categories will be developed so that institutions can compare their results to other similar institutions. These data will be of particular value to library consortia or digital state libraries, with a single point of entry or gateway. Online tutorials will be developed to support understanding and use of the results.
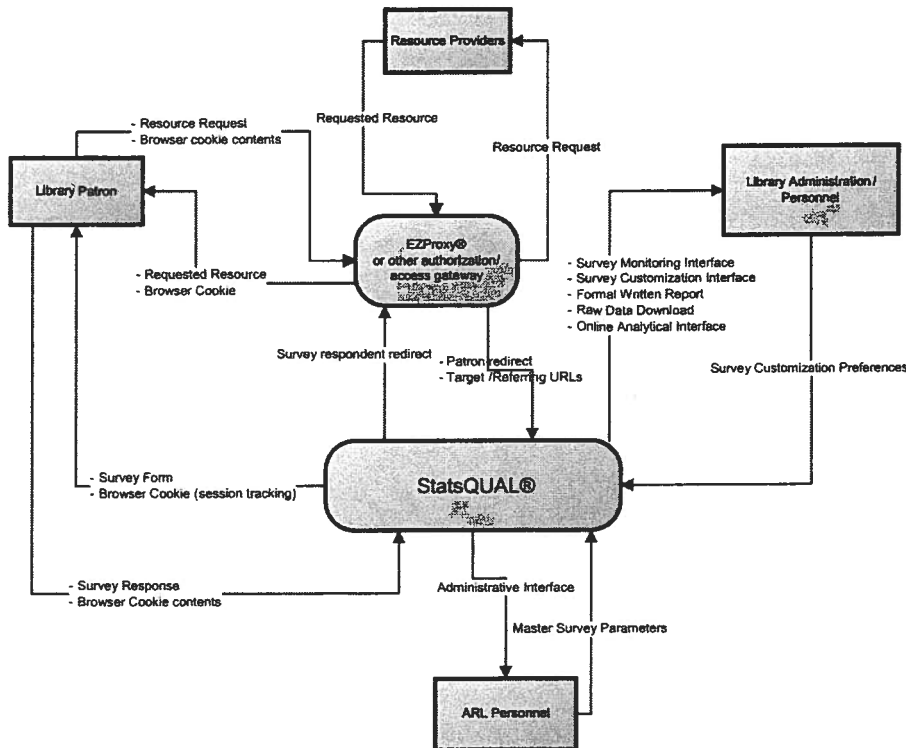
Figure 3.
StatsQUAL® interactive
analysis reproduced by
kind permission of the
Association of Research
Libraries

The evaluation of networked electronic resources and services are key elements in the delivery of digital library services. Building capacity for assessment and technical development in libraries is a critical element for delivering services effectively in the virtual world. Collaborative, iterative, and multi-dimensional assessment deploying mixed methods (qualitative and quantitative approaches) strengthens the role of libraries and their ability to meet the needs of their users. Point-of-use web surveys holds considerable promise as key tool in the assessment toolkit libraries may deploy to improve the research, teaching, and learning outcomes of their users.

References

Association of Research Libraries (2002), *Measures for Electronic Resources (E-metrics)*, Association of Research Libraries, Washington, DC, available at: www.arl.org/bm ~ doc/e-metrics.pdf.zip (accessed 10 April 2010).

Association of Research Libraries (2008), *Mines for Libraries®: Measuring the Impact of Networked Electronic Services, University of Iowa Libraries, June-December 2007*, Association of Research Libraries, Washington, DC.

Baker, G. and Read, E.J. (2008), "Vendor-supplied usage data for electronic resources: a survey of academic libraries", *Learned Publishing*, Vol. 21, pp. 48-57.

Bertot, J.C. and Davis, D.M. (2005), *Planning and Evaluating Library Networked Services and Resources*, Libraries Unlimited, Westport, CT.

Bertot, J.C. and McClure, C.M. (2003), "Outcomes assessment in the networked environment: research questions, issues, considerations, and moving forward", *Library Trends*, Vol. 51 No. 4, pp. 590-613.

Blixrud, J.C. and Kyrillidou, M. (2003), "E-metrics: next steps for measuring electronic resources", *ARL Bimonthly Report No. 230/231*.

Bollen, J. and Rodriguez, M.A. (2007), "MESUR: usage-based metrics of scholarly impact", in *Proceedings of the Joint Conference on Digital Libraries, Vancouver 2007*, available at: www.mesur.org/Documentation_files/JCDL07_bollen.pdf (accessed 10 April 2010).

Connell, T.H. (2005), "OhioLINK electronic journal use at Ohio State University", *Portal: Libraries and the Academy*, Vol. 5 No. 3, pp. 371-90.

Conyers, A. and Dalton, P. (2007), "Electronic resource measurement: linking research to practice", *Library Quarterly*, Vol. 77 No. 4, pp. 463-70.

Dillman, D.A., Smyth, J. and Christian, L.M. (2008), *Internet, Mail, and Mixed-mode Surveys: The Tailored Design Method*, 3rd ed., Wiley, Hoboken, NJ.

Franklin, B. (1989), "Recovering academic library expenses related to sponsored research through a library cost analysis study", *Grants Magazine: The Journal of Sponsored Research and Other Programs*, No. 12, March, pp. 31-6.

Franklin, B. (2001), "Academic research library support of sponsored research in the United States", *Proceedings of the 4th Northumbria International Conference on Performance Measurement in Libraries and Information Services, 12-16 August 2001, Pittsburg, PA*, Association of Research Libraries, Washington, DC, pp. 105-112.

Franklin, B. (2004), "Managing the electronic collection with cost per use data", *IFLA Journal*, Vol. 31 No. 3, pp. 241-8.

Franklin, B. and Plum, T. (2002), "Networked electronic services usage patterns at four academic health sciences libraries", *Performance Measurement and Metrics*, Vol. 3 No. 3, pp. 123-33.

Franklin, B. and Plum, T. (2003), "Documenting usage patterns of networked electronic services", *ARL: A Bimonthly Report*, Vol. 230 No. 231, pp. 20-1.

Franklin, B. and Plum, T. (2006), "Successful web survey methodologies for measuring the impact of networked electronic services (MINES for Libraries)", *IFLA Journal*, Vol. 321, pp. 28-40.

Franklin, B. and Plum, T. (2008a), "Assessing the value and impact of digital content", *Journal of Library Administration*, Vol. 48 No. 1, pp. 1-57.

Franklin, B. and Plum, T. (2008b), unpublished data.

Franklin, B., Kyrillidou, M. and Plum, T. (2009), "From usage to user: library metrics and expectations for the evaluation of digital libraries", in Tsakonas, G. and Papatheodorou, C. (Eds), *Evaluation of Digital Libraries: An Insight to Useful Applications and Methods*, Chandos Publishing, Oxford.

Jamali, H.R., Nicholas, D. and Huntington, P. (2005), "Use and Users of scholarly e-journals: a review of log analysis studies", *Aslib Proceedings*, Vol. 57 No. 6, pp. 554-71.

Kyrillidou, M. and Bland, L. (Eds.) (2008), *ARL Statistics 2006-2007*, Association of Research Libraries, Washington, DC.

Kyrillidou, M., Roebuck, G. and Davis, M. (2008), *MINES for Libraries®: University of Macedonia*, Association of Research Libraries, Washington, DC.

Kyrillidou, M., Olshen, T., Franklin, B. and Plum, T. (2006), *MINES for Libraries™: Measuring the Impact of Networked Electronic Services and the Ontario Council of University Libraries' Scholar Portal*, final report, Association of Research Libraries, Washington, DC, January 26.

Nicholas, D. (2005), "What deep log analysis tells us about the impact of big deals: case study OhioLINK", *Journal of Documentation*, Vol. 62 No. 4, pp. 482-508.

Rowlands, I. (2007), "Electronic journals and user behavior: a review of recent research", *Library & Information Science Research*, Vol. 29 No. 3, pp. 369-96.

Snead, J.T., Bertot, J.C., Jaeger, P.T. and McClure, C.R. (2005), "Developing multi-method, iterative, and user-centered evaluation strategies for digital libraries: functionality, usability, and accessibility", *Proceedings of the 2005 Annual Meeting of the American Society for Information Science & Technology*, available at: http://eprints.rclis.org/archive/00005268 (accessed 10 April 2010).

Stemper, J.A. and Jaguszewski, J.M. (2003), "Usage statistics for electronic journals: an analysis of local and vendor counts", *Collection Management*, Vol. 28 No. 4, pp. 3-22.

Tenopir, C. (2003), "Use and users of electronic library resources: an overview and analysis of recent research studies", Council on Library and Information Resources, Washington, DC, available at: www.clir.org/pubs/reports/pub120/pub120.pdf (accessed 10 April 2010).

White, A. and Kamal, E.D. (2006), *E-metrics for Library and Information Professionals: How to Use Data for Managing and Evaluating Electronic Resources Collections*, Neal-Shuman, New York, NY, p. 129.

US Office of Management and Budget (OMB) (2004), *Circular A-21*, Revised 5 October 2004, available at: www.whitehouse.gov/omb/circulars/a021/a21_2004.pdf (accessed 10 April 2010).

Zucca, J. (2008a), "Building frameworks of organizational intelligence", paper presented at the ARL Library Assessment Forum, University of Pennsylvania, Philadelphia, PA, January 11, available at: www.libqual.org/documents/admin/zuccaarl08.ppt (accessed 10 April 2010).

Zucca, J. (2008b), "Building frameworks of organizational intelligence: strategies and solutions stemming from the Penn Libraries Data Farm Project", *Proceedings of the 2008 Library Assessment Conference: Building Effective, Sustainable, Practical Assessment August 4-7, 2008, Seattle, Washington*, Association of Research Libraries, Washington, DC.

Further reading

Franklin, B. and Plum, T. (2004), "Library usage patterns in the electronic information environment", *Information Research*, Vol. 9 No. 4, p. 187.

Gunn, H. (2002), "Web-based surveys: changing the survey process", *FirstMonday*, Vol. 7 No. 12, available at: http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1014/935 (accessed 10 April 2010).

Corresponding author
Terry Plum can be contacted at: plum@simmons.edu

Performance Measurement and Metrics: The international journal for library and information services

Copyright

Articles submitted to the journal should not have been published before in their current or substantially similar form, or be under consideration for publication with another journal. Please see Emerald's "Originality Guidelines" at http://info.emeraldinsight.com/authors/writing/originality.htm Use them in conjunction with the points below about references, before submission, i.e. always attribute clearly using either indented text or quote marks as well as making use of the preferred Harvard style of formatting. Authors submitting articles for publication warrant that the work is not an infringement of any existing copyright and will indemnify the publisher against any breach of such warranty. Please see Emerald's "Permissions for Your Manuscript" at http://info.emeraldinsight.com/authors/writing/permissions.htm For ease of dissemination and to ensure proper policing of use, papers and contributions become the legal copyright of the publisher unless otherwise agreed. The Editor may make use of iThenticate software for checking the originality of submissions received. Submissions should be sent to:

The Editor

Steve Thornton, 29 Manor Road, Rushden, Northamptonshire NN10 9EX, UK
E-mail: stephen.thornton137@ntlworld.com

Editorial objectives

The journal aims to provide a crucial international link for all information professionals, whether practitioners or academics, addressing the issues of metrics, quantitative approaches to measurement across the spectrum as well as the qualitative aspects of the provision of library and information services.

Coverage

- Quantitative and qualitative analysis.
- Benchmarking.
- The measurement and role of information in enhancing organizational effectiveness.
- Quality techniques and quality improvement.
- Training and education.
- Methodologies for performance measurement and metrics.
- Standard assessment tools.
- Using emerging technologies.
- Setting standards or service quality.

The reviewing process

Single-blind peer review.

Manuscript requirements

Three copies of the manuscript should be submitted in single line spacing to conserve paper during the review and production processes. The author(s) should be shown and their details must be printed on a separate cover sheet. The author(s) should not be identified anywhere else in the article.

As a guide, articles should be between 3,000 and 5,000 words in length. A title of not more than eight words should be provided. A brief autobiographical note should be supplied including full name, affiliation, e-mail address and full international contact details.

Authors must supply a structured abstract set out under 4-7 sub-headings: Purpose; Methodology/approach; Findings; Implications/limitations either for further research, for practice, or for society; and the Originality/value of the paper. Maximum is 250 words in total. In addition provide up to six keywords which encapsulate the principal topics of the paper and categorise your paper under one of these classifications: Research paper, Viewpoint, Technical paper, Conceptual paper, Case study, Literature review or General review. For more information and guidance on structured abstracts visit: www.emeraldinsight.com/structuredabstracts

Where there is a methodology, it should be clearly described under a separate heading. Headings must be short, clearly defined and not numbered. Notes or Endnotes should be used only if absolutely necessary and must be identified in the text by consecutive numbers, enclosed in square brackets and listed at the end of the article.

All Figures (charts, diagrams and line drawings) and Plates (photographic images) should be submitted in both electronic form and hard copy originals. Figures should be of clear quality, in black and white and numbered consecutively with arabic numerals. Graphics may be supplied in colour to facilitate their appearance in colour on the online database.

Figures created in MS Word, MS PowerPoint, MS Excel, Illustrator and Freehand should be saved in their native formats.

Electronic figures created in other applications should be copied from the origination software and pasted into a blank MS Word document or saved and imported into an MS Word document by choosing "Insert" from the menu bar, "Picture" from the drop-down menu and selecting "From File ..." to select the graphic to be imported.

For figures which cannot be supplied in MS Word, acceptable standard image formats are: .pdf, .ai, .wmf and .eps. If you are unable to supply graphics in these formats then please ensure they are .tif, .jpeg, or .bmp at a resolution of at least 300dpi and at least 10cm wide.

To prepare screenshots, simultaneously press the "Alt" and "Print screen" keys on the keyboard, open a blank Microsoft Word document and simultaneously press "Ctrl" and "V" to paste the image. (Capture all the contents/windows on the computer screen to paste into MS Word, by simultaneously pressing "Ctrl" and "Print screen".)

For photographic images (plates) good quality original photographs should be submitted. If supplied electronically they should be saved as .tif or .jpeg files at a resolution of at least 300dpi and at least 10cm wide. Digital camera settings should be set at the highest resolution/quality possible.

In the text of the paper the preferred position of all tables, figures and plates should be indicated by typing on a separate line the words "Take in Figure (No.)" or "Take in Plate (No.)". Tables should be typed and included as part of the manuscript. They should not be submitted as graphic elements. Supply succinct and clear captions for all tables, figures and plates. Ensure that tables and figures are complete with necessary superscripts shown, both next to the relevant items and with the corresponding explanations or levels of significance shown as footnotes in the tables and figures.

References to other publications must be in Harvard style and carefully checked for completeness, accuracy and consistency. This is very important in an electronic environment because it enables your readers to exploit the Reference Linking facility on the database and link back to the works you have cited through CrossRef. You should include all author names and initials and give any journal title in full.

You should cite publications in the text as follows: using the author's name, e.g. (Adams, 2006); citing both names if there are two authors, e.g. (Adams and Brown, 2006), or (Adams et al., 2006) when there are three or more authors. At the end of the paper a reference list in alphabetical order should be supplied:

- For books: surname, initials (year), title of book, publisher, place of publication. Harrow, R. (2005), No Place to Hide, Simon & Schuster, New York, NY.
- For book chapters: surname, initials (year), "chapter title", editor's surname, initials (Ed.), title of book, publisher, place of publication, pages. Calabrese, F.A. (2005), "The early pathways: theory to practice – a continuum", in Stankosky, M. (Ed.), Creating the Discipline of Knowledge Management, Elsevier, New York, NY, pp. 15-20.
- For journals: surname, initials (year), "title of article", journal name, volume, number, pages. Capizzi, M.T. and Ferguson, R. (2005) "Loyalty trends for the twenty-first century", Journal of Consumer Marketing, Vol. 22 No. 2, pp. 72-80.
- For published conference proceedings: surname, initials (year of publication), "title of paper", in surname, initials (Ed.), Title of published proceeding which may include place and date(s) held, publisher, place of publication, page numbers. Jakkilinki, R., Georgievski, M. and Sharda, N. (2007), "Connecting destinations with an ontology-based e-tourism planner", Information and Communication Technologies in Tourism 2007 Proceedings of the International Conference in Ljubljana, Slovenia, 2007, Springer-Verlag, Vienna, pp. 12-32.
- For unpublished conference proceedings: surname, initials (year), "title of paper", paper presented at name of conference, place of conference, date of conference, available at: URL if freely available on the internet (accessed date). Aumueller, D. (2005), "Semantic authoring and retrieval within a wiki", paper presented at the European Semantic Web Conference (ESWC), Heraklion, Crete, 29 May-1 June, available at: http://dbs.unileipzig.de/file/aumueller05wiksar.pdf (accessed 20 February 2007).
- For working papers: surname, initials (year), "title of article", working paper [number if available], institution or organisation, place of organisation, date. Mozier, P. (2003), "How published academic research can inform policy decisions: the case of mandatory rotation of audit appointments", working paper, Leeds University Business School, University of Leeds, Leeds, 28 March.
- For encyclopaedia entries (with no author or editor): title of encyclopaedia (year), "title of entry", volume, edition, title of encyclopedia, publisher, place of publication, pages. Encyclopaedia Britannica (1926), "Psychology of culture contact", Vol. 1, 13th ed., Encyclopaedia Britannica, London and New York, NY, pp. 765-71. (For authored entries please refer to book chapter guidelines above.)
- For newspaper articles (authored): surname, initials (year), "article title", newspaper, date, pages. Smith, A. (2008), "Money for old rope", Daily News, 21 January, pp. 1, 3-4.
- For newspaper articles (non-authored): newspaper (year), "article title", date, pages. Daily News (2008), "Small change", 2 February, p. 7.
- For electronic sources: if available online the full URL should be supplied at the end of the reference, as well as a date when the resource was accessed. Castle, B. (2005), "Introduction to web services for remote portlets", available at: www.128.ibm.com/developerworks/library/ws-wsrp (accessed 12 November 2007). Standalone URLs, i.e. without an author or date, should be included either within parentheses within the main text, or preferably set as a note (arabic numeral within square brackets within text followed by the full URL address at the end of the paper).

Final submission of the article

Once accepted for publication, the Editor may request the final version as an attached file to an e-mail or to be supplied on a CD-ROM labelled with author name(s); title of article; journal title; file name.

Each article must be accompanied by a completed and signed Journal Article Record Form available from the Editor or on www.emeraldinsight.com/jarform

The manuscript will be considered to be the definitive version of the article. The author must ensure that it is complete, grammatically correct and without spelling or typographical errors.

The preferred file format is Word. Another acceptable format for technical/maths content is Rich text format.

Technical assistance is available by contacting Mike Massey at Emerald. E-mail: mmassey@emeraldinsight.com

Authors' Charter

This highlights some of the main points of our Authors' Charter. For the full version visit:

www.emeraldinsight.com/charter

Your rights as an author

Emerald believes that as an author you have the right to expect your publisher to deliver:

- An efficient and courteous publishing service at all times
- Prompt acknowledgement of correspondence and manuscripts received at Emerald
- Prompt notification of publication details
- A high professional standard of accuracy and clarity of presentation
- A complimentary journal issue in which your article appeared
- Article reprints
- A premium service for permission and reprint requests
- Your moral rights as an author.

Emerald represents and protects moral rights as follows:

- To be acknowledged as the author of your work and receive due respect and credit for it
- To be able to object to derogatory treatment of your work
- Not to have your work plagiarized by others.

The Emerald Literati Network

The Emerald Literati Network is a unique service for authors which provides an international network of scholars and practitioners who write for our publications. Membership is a free and unique service for authors. It provides:

- A dedicated area of the Emerald web site for authors
- Resources and support in publishing your research
- Free registration of yourself and your work, and access to the details of potential research partners in Emerald Research Connections
- The opportunity to post and receive relevant Calls for Papers
- Information on publishing developments
- Awards for outstanding scholarship
- Usage information on authors, themes, titles and regions
- Access to tips and tools on how to further promote your work
- Awards for Excellence.

To discuss any aspect of this Charter please contact:

Emerald Literati Network, Emerald Group Publishing Limited, Howard House, Wagon Lane, Bingley BD16 1WA, United Kingdom
Telephone +44 (0)1274 777700
E-mail: literatinetwork@emeraldinsight.com

Emerald

Research you can use