E-METRICS: MEASURES FOR ELECTRONIC RESOURCES

Rush Miller and Sherrie Schmidt

Keynote paper delivered at the 4th Northumbria International Conference on Performance Measurement in Libraries and Information Services

A group of 24 ARL libraries funded and participated in the ARL E-Metrics Project from May 2000 to December 2001. This paper details the rationale and context for this project; and it describes the issues identified, the lessons learned, and the possibilities and challenges that this set of issues bring to the research library community

Rush Miller, University Librarian and Director, University of Pittsburgh, USA E-mail: rgmiller@pitt.edu

Sherrie Schmidt, Dean of University Libraries, Arizona State University Library, USA

The research library today can be described as a 'hybrid' library: a library in transition from a focus on print-based collections and services to an emphasis on electronic, or digital, information resources and services. The quickening pace of change in this field is evident in the supplemental statistics data gathered by the Association of Research Libraries (ARL).[1] The percentage of acquisitions dollars that ARL member libraries devote to electronic resources has risen from 3.6% in 1992–93 to 12.9% in 1999–2000. Nine libraries spent more than 20% of their materials budget on electronic or digital materials and five libraries spent more than $2 million on such resources in 1999–2000, with the University of Pittsburgh being at the top of the list spending $2,163,220.[2] One hundred and five ARL libraries reported spending a total of almost $100 million on electronic resources out of their materials expenditures budget. The cost of mounting digital information resources is far higher when infrastructure and personnel costs are factored into the picture. Clearly, the total expenditures related to electronic resources and services within ARL libraries would be measured in the hundreds of millions of dollars if counted accurately and consistently.

That, of course, is the problem. While libraries, particularly ARL libraries, have 60 years of consistently defined and collected statistics related to budgets, collections, services, and personnel,[3] no such data is available for the electronic resources that are becoming ever more important. Problems and challenges in collecting and analyzing such data are many and obvious, including: there is a lack of clear and consistent definition of data elements; vendors do not 'count' things in the same manner as one another; membership in a consortium can skew the statistics of the individual libraries in that consortium; libraries structure themselves differently in regard to electronic resources, making

data gathering difficult; libraries do not control access to and use of important data about vendor-supplied resources; and the nature of electronic resources is changing rapidly and, therefore, data elements are shifting. Even as libraries are increasing their investment in electronic resources and the opportunities for information management are growing dramatically with the advent of the World Wide Web as a delivery vehicle, we know much less about this aspect of our collections and services than the traditional ones.

Questions related to the measurement of digital resources and services must be answered if libraries are to be accountable to their constituents and funders alike. Questions such as, 'Who uses these resources?' or 'Are these huge outlays of funds justified in terms of use, or value derived from use?' or 'What difference do all of these resources make to students and faculty in universities?' must be answered if university administrators, trustees, students, and faculty are expected to support ever-increasing levels of funding for the acquisition and development of these resources and services. Just as important is the need for reliable measures in order to make sound decisions about the acquisition or de-acquisition of electronic resources, selection of what to digitize, and development of criteria and benchmarks that can be communicated to stakeholders.

ARL has been concerned with performance measurement issues since the 1990s.[4] The ARL Statistics and Measurement Committee and the ARL Leadership and Management Committee launched the New Measures Initiative in January 1999, following a retreat held in Tucson. The New Measures Initiative arises from two challenges facing research libraries: (1) the need to demonstrate the impact research libraries have on areas of interest to their host institutions, and (2) the need to respond to pressure to maximize resources through cost containment and reallocation, which in turn requires the identification of 'best practices.'[5] Coming out of the Tucson retreat, several representatives wrote white papers in areas of acknowledged interest.[6] Those attending the retreat addressed a set of questions regarding the data needed to describe research libraries in today's environment, the need for new measures, and the means by which

useful data and measurement tools could be developed. The retreat participants recognized that 'any new measures must (a) be consistent with organizational missions, goals, and objective; (b) be integrated with an institution's program review; (c) balance customer, stakeholder, and employee interests and needs; (d) establish accountability; and (e) include the collection and use of reliable and valid data.'[7]

During 1999, the library leaders engaged in this set of activities decided that it was not enough to simply frame the issues – research libraries needed to move into testing new methods and experimenting with specific projects. With limited resources and many ideas to test and implement, a variety of projects have emerged as outlined in the annual ARL Activities Report.[8] There are five major projects that are being pursued within the Association under the aegis of New Measures. These are: (1) an investigation into higher education outcomes assessment, with an examination of both learning outcomes[9] and research outcomes; (2) measurement of library service quality;[10] (3) cost studies; (4) interlibrary loan and document delivery investigation; and (5) an examination of measures for networked statistics and electronic resources.[11]

The examination of measures for networked statistics and electronic resources has evolved into the ARL E-Metrics Project. The E-Metrics Project began in February 2000 at a retreat in Scottsdale, Arizona, attended by representatives from 36 ARL libraries. This retreat focused on the challenges involved in measuring the commitment to and impact of electronic resources and services in ARL libraries. Due to his extensive funded research in this area,[12] ARL employed a consultant for the meeting – Dr. Charles McClure, Francis Eppes Professor and Director of the Information Management Use and Policy Institute at the School of Information Studies at Florida State University. Rush Miller, Hillman University Librarian at the University of Pittsburgh, and Sherrie Schmidt, Dean of Libraries at Arizona State University, agreed to serve as project co-chairs. Martha Kyrillidou, Senior Program Officer for Statistics and Measurement, staffs the project for ARL. Susan Jurrow served as facilitator for the retreat.

The Scottsdale retreat was essential for

defining the scope of a project to be undertaken, since the project was to be self-funded as well as self-managed by libraries willing to put forth a significant commitment of money and staff time. Prior to the meeting, attendees were asked to submit answers to questions about their efforts to measure the impact of electronic services and resources and their decision-making process related to these materials. Also, some attendees provided examples of the statistics they were collecting; these examples reflected the lack of consistency in current practices, as well as the lack of adequate data provided by vendors. After a full day of intensive discussions, a project began to take shape. The group identified four major areas that should be explored in the project:

1. Study of users and uses.

2. Cost and benefit analysis.

3. Study of staff impact and needs.

4. Engagement with information providers and their usage data services.

The project co-chairs worked with McClure and his staff to develop a project prospectus.[13] In the meantime, the level of commitment in terms of the number of ARL libraries electing to participate in this project doubled initial expectations, for a total of 24 libraries agreeing to support and participate in the project:

- University of Alberta
- Arizona State University
- Auburn University
- University of Chicago
- University of Connecticut
- Cornell University
- University of Illinois-Chicago
- University of Manitoba
- University of Maryland-College Park
- University of Massachusetts
- University of Nebraska-Lincoln
- University of Notre Dame
- University of Pennsylvania
- Pennsylvania State University
- University of Pittsburgh
- Purdue University
- University of Southern California
- Texas A&M University
- Virginia Polytechnic Institute & State University (Virginia Tech)
- University of Western Ontario
- University of Wisconsin-Madison

- Yale University
- Library of Congress
- The New York Public Library, the Research Libraries

The project was formalized as the E-Metrics Project and a formal contract was negotiated with the Information Use Management and Policy Institute at Florida State University to accomplish the three phases of deliverables outlined below:

Phase One: A knowledge inventory of ARL libraries and the organization of a Working Group on Database Vendor Statistics.

Phase Two: Statistics and performance measures to collect and analyze data collected within libraries or provided by vendors.

Phase Three: An outline of a proposal for measuring outcomes of electronic resources, to be funded separately.

The Phase One Report[14] was submitted to ARL on 7 November 2000. In this report, McClure and the Institute staff report their findings from their collection of data related to the current state-of-the-art within ARL libraries in measuring electronic information resources and services. Their data was gathered using survey questionnaires as well as site visits to several libraries that were considered advanced in this area after an analysis of the surveys.

The survey responses revealed a wide range of data collection and use activities among the 24 project participants. The most consistently collected and used data related to patron-accessible resources and costs. Data related to use and users was collected less often since much of the data collected is provided by vendors and not kept in house. Collected data was used primarily when making acquisitions decisions. Not surprisingly, the largest impediment to survey respondents lay in the lack of consistent and comparable statistics from database vendors.

Site visits were conducted at Virginia Tech, the University of Pennsylvania, Yale University, and the New York Public Library. These visits documented current practices and clarified survey responses. Again it was clear that a lack of standardized reporting practices makes it difficult to collect and analyze data.

Another aspect of Phase One was the

organization of a working group to deal with vendor-supplied statistics. This working group met with 12 major vendors for ARL libraries in order to explore issues related to the perceived lack of consistency in vendor statistics and to solicit vendors' assistance in developing and field-testing standard data elements. The vendors who accepted the invitation to participate in the meeting include:

- Academic Press/IDEAL
- Bell & Howell
- EBSCO
- Elsevier/ScienceDirect
- Gale Group
- JSTOR
- Lexis-Nexis
- netLibrary
- OCLC/FirstSearch
- Ovid
- SilverPlatter

As the project entered Phase Two, the focus shifted to the definition and testing of data elements. Without solid and comparable data, measurement would be less helpful and meaningful in the long run. It was becoming clear that the project framers had underestimated the complexity of the issues and challenges. It also became clear that this project was one of many being undertaken in the United States and in other countries to accomplish similar if not the same goals.

A number of projects designed to improve the availability of consistent and comparable statistical data about electronic resources and services have been undertaken over the past several years. All of these projects are related, in one way or another, to the E-Metrics Project. However, none of them duplicated the ARL effort in terms of goals and timeframes. Close communication links and collaboration with these projects was undertaken by the project co-chairs. These projects are:

- European Commission EQUINOX Project[15]

- Publishing and Library Solutions Committee (PALS) Working Group on Online Vendor Usage Statistics (UK)

- International Coalition of Library Consortia (ICOLC) review of ICOLC Guidelines for Statistical Measures of Usage of Web-based Indexed, Abstracted, and Full-Text Resources

- National Commission on Libraries and Information Science (NCLIS) project to standardize online database usage statistics and reporting mechanisms (public libraries)

- Institute of Museum and Library Services (IMLS) project to develop national network online statistics and performance measures for public libraries

- Council on Library and Information Resources (CLIR) report by consultant Judy Luther related to network statistics[16]

- NISO Forum on Performance Measures and Statistics[17]

During Phase Two of the project, statistical data elements were discussed within the Vendor Statistics Working Group and with participants at various meetings held at CNI, ALA, and other meeting opportunities. The consultants worked with participants to develop a set of measures to be tested in the field. These included statistical elements from vendors – worked out as a separate trial with 12 vendors – and internal library statistics to be collected by library staff.

A total of 18 measures were agreed upon to be adopted for a field test. These elements were grouped into categories and included:

1. **Information Content.** This category includes elements such as the number of electronic full-text journals or reference sources to which a library subscribes. It also includes virtual 'visits' to the library's electronic resources and the percentage of all monographs represented by electronic books, among other elements.

2. **Information Services.** These elements measure usage of library digital collections as well as the percentage of reference and other transactions that are digitally based.

3. **Technical Infrastructure.** Technical infrastructure is measured in terms of the cost of digital collections along with support costs and management information, such as the expenditures for electronic journals and books and other components.

An effort to field-test vendor statistics in selected libraries was also underway. This effort was designed not only to collect and analyze data elements that are agreed upon and consistent with the ICOLC Guidelines,[18] but to gather information related to the vendor's definition and compilation of these data. Judging from the work

so far, vendors have varying methodologies and internal processes, which affect the consistency and standardization of data provided. Each vendor defines a search and retrieval set differently, which dramatically affects the statistics provided. It is safe to say that, until now, comparing the data from one vendor with that of a second vendor was unreliable and misleading. One benefit of this project will be to assist vendors and libraries alike in standardizing data element definitions to gain more consistency across the data.

Internal data elements were field-tested in 13 libraries (including the University of Texas, which is not a participant in the project, but agreed to assist with the field testing, as Sue Phillips was serving in a liaison role between the ARL project and the ICOLC revision of the related guideline). Along with the data itself, these libraries were asked to track the amount of effort expended in providing the data. There was little consistency in the number of staff hours reported – it ranged from three to 167 hours. Much of the variance can be explained by the variability of infrastructure and experience within ARL libraries in maintaining data such as these. Libraries that are already engaged in collecting and analyzing usage and management data related to electronic resources found it easier to adapt to this field-test; those with little history or experience found it much more difficult to comply.

Libraries in the field-test were also asked to analyze how useful they felt the collected data would be to them. Overall, libraries clearly saw these measures as good things to have in the absence of more detailed data.

The field-testing of these data elements was critical to a better understanding of the challenges and issues facing research libraries in systematizing e-metrics. This kind of data collection does not derive from traditional library structures, such as acquisitions, accounting, and cataloging, or from other information systems in place in libraries. Few ARL libraries have a system in place for managing electronic resources, although the number is growing. Additionally, many of the definitions and procedures for collecting this data during the field-test varied from current practices within the participating libraries, although one major outcome of the project will be to develop a more

standardized mechanism for gathering data. Defining changing concepts such as electronic books or full-text retrievals is painfully difficult and the distinctions among various resource types can often be arbitrary and fluid. And, of course, in ARL libraries, electronic resources are often dispersed throughout a large institution and are not centrally managed, making data difficult to collect centrally.

The field-test allowed the project managers and consultants to refine the data elements further. The Phase Two report proposes a refined set of measures for implementation on an ongoing basis.[19] These elements include measures of the nature and size of the digital resources available within an institution, the cost of providing these resources by category, and the amount of activity documenting the use of these resources. The report from Phase Two is available on the Web and has been distributed to all ARL member libraries. It includes a procedures manual that provides ARL libraries with definitions and techniques for collecting standardized data related to electronic resources. These definitions and techniques will guide ARL libraries in the implementation of ongoing data collection relating to electronic resources measures. It is anticipated that these data elements will not be static – as the traditional ones have tended to be – but subject to continuous change. This is, after all, the nature of the networked environment.

From the outset of the E-Metrics Project, libraries looked beyond the development of metrics to the development of outcomes measures. Simple data is not sufficient to answer the question, 'What difference does this tremendous outlay of resources make to the users of libraries?' Phase Three of the project is envisioned to study and recommend strategies and a framework for measuring outcomes, i.e., assessing the impact and value of electronic resources on user behavior and effectiveness. We all want to know what difference electronic resources make, not in terms of inputs, but in terms of outputs. Some people are asking, 'Are we determined to get it right this time in terms of measuring important things rather than just convenient things?' The answer is probably that we always wanted to get it right and we always did what we thought was the right thing; yet,

what is right may differ from context to context. There is often a scientific positivism associated with statistics and measures that sometimes blinds us to the emerging context and uniqueness of specific environments. Vice versa, one could argue that too much emphasis on
the uniqueness of a local context fosters an isolationist attitude that may not be appropriate for a highly interconnected information environment with global dimensions that are changing, shifting, and affecting all libraries in similar ways.

The consultants working on this project have presented the results of Phase Two with some analysis of the strategy ARL might follow to achieve this higher level of institutional outcomes investigation. However, outcomes assessment is viewed as being a separate project, for which additional funding and time will be required.

Conclusion

The ARL E-Metrics Project is a key development in the ongoing effort to quantify and better understand the impact of emerging information technologies on library collections and services. It has provided the Association with a new measurement model – to which individual libraries have committed significant resources and effort beyond the Association structure and budget – to further develop and test in Phase Three of the project.

It is difficult to overstate the hurdles encountered in carrying out what appeared at the outset to be a rather simple idea – collecting statistics on the effort ARL libraries are making to mount electronic resources and services. The problems of definition, reliability, and consistency of data provided by the vendor community alone are daunting. But they are matched equally by librarians' lack of agreement on what is important to collect, how to collect it, and how to use what is collected. Most libraries lack experience with the collection and analysis of data related to their investment in electronic resources. This is a new, emerging, and changing field and these issues are very complex and difficult to get a handle on.

However, in less than the two years to which participants committed their funds and support, the project is producing a viable and

implementable program of data collection related to electronic networked resources in ARL libraries. This accomplishment is to the credit of the directors and staff of these 24 libraries; it is also largely due to the expertise and hard work of the director and staff of the Information Use Management and Policy Institute at Florida State University.

In developing e-metrics, libraries are only part of a larger networked community concerned with similar issues. Some libraries are concerned with the competition presented by Internet search engines, gateways, and portals. Some libraries feel the need to demonstrate large numbers of web hits and other e-metrics to justify their investment in electronic resources. Yet, no matter how large an electronic library is, it is doubtful that it will ever receive more web hits than popular search engines, gateways, and portals such as Yahoo! and Google. Libraries, though, have much more valuable resources to offer than does any Internet search engine – it is our challenge to try to measure these contributions.

References

1   Association of Research Libraries, *ARL Supplementary Statistics 1999-2000* (Washington, DC: Association of Research Libraries, 2001). Also available at: http://www.arl.org/stats/arlstat/#sup

2   Ibid., 24.

3   Martha Kyrillidou, "Research Library Trends: ARL Statistics" *Journal of Academic Librarianship* (November 2000): 427-236; "To Describe and Measure the Performance of North American Research Libraries" *IFLA Journal* 27 (4) (2001): 257-263; and, Association of Research Libraries, *ARL Statistics* (annual);

4   Martha Kyrillidou and Julia Blixrud, "Measuring the Changing Library Environment" *Developing Indicators for Academic Library Performance: Ratios from the ARL Statistics 1996-97 and 1997-98* (Washington, DC: Association of Research Libraries, 2001): 1-13.

5   See: http://www.arl.org/stats/newmeas/newmeas.html

6   Shirley Baker, "Ease and Breadth of Access" Available at: http://www.arl.org/stats/program/Access.pdf; Brinley Franklin and Danuta Nitecki, "User Satisfaction White Paper" Available at: http://www.arl.org/libqual/geninfo/usersatisfaction.pdf; Carolynne Presser, "Library Impact on

Research: A Preliminary Sketch." Available at: http://www.arl.org/stats/ program/presser.pdf; Cliff Haka, Joan Giesecke, and Jennifer Gargill, "The Measurement of Facilities Utilization in ARL Libraries." Available at: http://www.arl.org/stats/ program/Facilities.pdf; Paul Kobulnicky and Carla Stoffle, "Market Penetration in Research Libraries." Available at: http://www.arl.org/ stats/program/ Market.pdf; Kathryn J. Deiss "Organizational Capacity White Paper." Available at: http://www.arl.org/stats/program/ capacity.pdf

7   Julia Blixrud, "The Association of Research Libraries Statistics and Measurement Program: From Descriptive Data to Performance Measures," 67th IFLA Council and General Conference, August 16-25, 2001. Available at http://www.ifla.org/ IV/ifla67/papers/034-135e.pdf

8   Association of Research Libraries, *ARL Activities Report 2001* (Washington, DC: Association of Research Libraries, 2001); also, see *ARL Activities Report 2000* and *ARL Activities Report 1999*.

9   Ken Smith, *New Roles and Responsibilities for the University Library: Advancing Student Learning through Outcomes Assessment* (Washington, DC: Association of Research Libraries, 2000).

10 Fred Heath, Colleen Cook, Martha Kyrillidou, and Duane Webster, "The Forging of Consensus: A Methodological Approach to Service Quality Assessment in Research Libraries—The LibQUAL+™ Experience" and Colleen Cook and Bruce Thompson, "Scaling for the LibQUAL+ Instrument: A Comparison of Desired, Perceived and Minimum Expectations Responses vs. Perceived Only," forthcoming at the 4th Northumbria Proceedings. For more information and an extensive bibliography on LibQUAL+, see http://www.libqual.org/

11 ARL E-Metrics Project homepage: http://www.arl .org/stats/newmeas/emetrics/index.html

12 Charles R. McClure, *Economic Benefits and Impact from Public Libraries in the State of Florida* (Tallahassee, FL: Information Use Management and Policy Institute, 2000) also available at http://dlis.dos.state.fl.us/bld/finalreport/; John Carlo Bertot, Charles R. McClure, and Joe Ryan,

Statistics and Performance Measures for Public Library Networked Services (Chicago: ALA, 2000); John Carlo Bertot and Charles R. McClure, *Public Libraries and the Internet 2000* (Washington, DC: NCLIS, September 2000) also available at http://www.nclis.gov/statsurv/2000plo.pdf; John Carlo Bertot and Charles R. McClure, *Developing National Data Collection Models for Public Library Network Statistics and Performance Measures* (funded by the National Institute of Museum and Library Service, August 20, 2000) see http://slis-two.lis.fsu.edu/~cmcclure/IMLS.html

13 Charles R. McClure, "Developing Statistics and Performance Measures to Describe Electronic Information Services and Resources in ARL Libraries" http://www.arl.org/stats/newmeas/ emetrics/phasetwoappendix.pdf

14 Wonsik "Jeff" Shim, Charles R. McClure, and John Carlo Bertot, *ARL E-Metrics Project: Developing Statistics and Performance Measures to Describe Electronic Information Services and Resources in ARL Libraries: Phase One Report* (Tallahassee, FL: Information Use Management and Policy Institute, 2000) also available at: http://www.arl.org/stats/ newmeas/emetrics/phaseone.pdf

15 EQUINOX Homepage: http://equinox.dcu.ie/index.html

16 Judy Luther *White Paper on Electronic Journal Usage Statistics* (Washington, DC: Council on Library and Information Resources, 2000).

17 National Information Standards Organization http://www.niso.org/stats-rpt.html

18 Guidelines for Statistical Measures of Usage of Web-based Indexed, Abstracted, and Full-text Resources prepared by the International Coalition of Library Consortia (ICOLC), November 1998. (under revision)

19 Wonsik "Jeff"Shim, Charles R. McClure, Bruce T. Fraser, John Carlo Bertot, Arif Dagli, and Emily H. Leahy, *Measures and Statistics for Research Library Networked Services: Procedures and Issues: ARL E-Metrics Phase II Report* (Washington, DC: Association of Research Libraries, 2001). Also available at: http://www.arl.org/stats/newmeas/emetrics/phas etwopreface.pdf