

# Value and Future of Library E-Resources

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**Abstract:**

*Academic libraries are under increasing pressure to demonstrate the value of their collections to their stakeholders and to focus on products and services that support e-science. If the costs of library services increase and the perception of the importance of the library decreases, a value gap can result. Measures of value, including usage, explicit value, contingent valuation, and return on investment can help demonstrate the current value of the library and help librarians set priorities for the future. Recent studies demonstrate that library journal and book e-collections hold many implicit and explicit values in helping staff and students do their work, obtain grants, and improve their research. Libraries can also play a role in data archiving and distribution and in many phases of research.*

## Introduction

Academic research librarians are increasingly called upon to demonstrate the value of the university library in quantitative terms. Many university administrators ask librarians to provide measurements that demonstrate the return to the university on the investment made in the library and to prioritise their products and services to focus on those that are the most effective in serving the university's mission in a changing environment. In the past, the academic library's value to students, staff, and faculty of research institutions was assumed and the library's role was relatively clear. Today, those assumptions must be demonstrated to stakeholders, including university administrators and funders, by accurately measuring and reporting the library's value, both in general, and for specific products or services. In addition, academic research libraries serve the teaching, research, and social engagement mission of their universities and must adapt to changes in scholarship such as e-science, collaborative work, and the focus on dynamic forms of information such as data, born-digital assets, and multimedia in order to remain central to that mission.

Where once input measures, such as volumes held, were sufficient indicators, today's librarians are being asked for a variety of measures of outcomes, impact, and value (Matthews 2007). These measures may take several forms, including, in increasing order of complexity:

- 1) **Usage.** Amount of reading from library e-collections and increases in usage are an implicit value of the library. E-resources make it easier to measure usage and track increases in use.
- 2) **Measures of outcomes.** Academic staff and students explicitly value e-journals for the role that increased access has in improving productivity, expanding research, and uncovering previously unknown information.
- 3) **Contingent valuation.** Not having access to a library's collections and services carries a cost. The value of the library to students and faculty can be measured against the cost of not having the library.
- 4) **Return on Investment (ROI).** The library provides a return on investment to its parent institution. This ROI varies according to the purpose of the institution (research dominated or teaching) and how return is measured. In research institutions, return can be directly measured in monetary terms by the role of library collections in grant proposals and grant reports. Recent international studies of ROI in academic libraries show a wide range of ROI for grants. Other roles of the library can be monetised to calculate ROI.

Measurements cut across all areas of the library. Figure 1 illustrates the major functional areas of the academic library and the relationship with measurements. This paper focuses on how e-collections support the functional areas and how their value can be measured.

Figure 1. Library Functional Areas and Measurement Within the University Mission



In addition to measuring the value of current products and services, the library has new roles to play in e-science now and into the future. One example is the archiving and distribution of data that is collected by university scientists for their research. These data are now difficult to access and are vulnerable to loss. Major international initiatives funded by U.S. and U.K. national agencies are recognising that librarians and scientists working together can provide new value in the area of data and improving the future of e-science. The future of the library's role in e-collections is one of an expanded vision.

## Measures

Use of the library's e-collection by faculty and students implies that these collections are of value to them. Increased use shows increased value. With electronic collections, there are several ways to collect data about usage, including usage logs, vendor reports (specifically COUNTER-compliant reports), and surveys of use (Tenopir et al. 2007; Tenopir 2009).

Usage logs and vendor reports are factual measures of how many interactions occur with the library's e-collections. Although they do not show if something that was downloaded was useful (or even read), logs have the advantage of being automatically generated and are unobtrusive measures of implied value (Tenopir 2009). The Ciber research centre at University College London has done many analyses with raw usage logs directly supplied by online systems or from libraries (for example, Nicholas et al. 2006).

Logs over time show continued increases in amounts of use. When many e-journal titles are made available, reading is highly skewed to certain popular titles, but the tail is long—at least a few articles are looked at in almost all titles (Nicholas et al. 2006). The value of the library e-journal collection can be implied from this increased amount and diversity of use. At the University of Tennessee, for example, downloads grew from 1.34 million in 2004 to nearly 2.04 million downloads in 2008.

Logs or vendor reports have limitations when demonstrating value, however. They may be manipulated by publishers so the results are suspect (Shephard, 2007). Also, they do not show why someone used or requested a source or the outcomes

for their work from using that source. Downloads may not equal actual use or satisfaction—someone may download an article and find it worthless for their task or they may be unhappy because they did not find what they needed. Usage alone cannot be used easily to show behaviour by individuals and does not show purpose, satisfaction, or outcomes of use (Tenopir 2009).

Other methods can show things that usage logs or vendor reports cannot. That is why a recent major study in the U.K. combined usage with publication and citation data (RIN 2009) and found that universities with more downloads have higher publication rates. Tenopir and King (2000) supplement usage logs with surveys to measure purposes of use, use of materials other than the library's e-collections, and to gather explicit measures of value.

Surveys have many purposes, depending on the types of questions. They may be used to gauge satisfaction with library services, gather opinions on future needs or services, gather information on behaviour beyond what usage logs deliver, and can provide analysis to better segment groups of users. They can provide both implicit and explicit measures of the value of the library collections and services (Tenopir 2009; Tenopir & King 2007).

In addition to typical demographic and recollection of behaviour questions, our ongoing surveys also use the critical incident technique to measure the instance of last reading. By focusing on a single event of reading, questions can be asked about the outcomes and value of this specific event. With the critical incident technique, we ask respondents to tell about their most recent reading, assumed to be random in time. This technique asks respondents to focus on the specific last incident of reading, for which their memory will be better. We include all reading--electronic and print, library-collections and personal subscriptions and from the web. We ask questions about their purpose, motivation, and outcomes from this reading so we can examine the value more closely. Sampling the most recent reading is equal to taking a random sample of readings—so our population is all readings done by the user group (Tenopir & King 2000). Asking the same questions every few years provides a picture of how things change over time and how changes in the collections and services of the library influence use, outcomes, and perceptions.

One of the dangers of relying just on usage logs or vendor reports is that value does not necessarily just equal frequency of use. Critical incident can be used to show purpose, value or outcome of use, as well as just frequency of use. For example, in recent surveys using the critical incident technique, we found that readings for research are more likely to come from the library e-collection, are rated as highly valuable, and influence the purpose in many positive ways (Tenopir et al. 2009).

## **Outcomes**

Several studies have examined academic libraries and their value to faculty and students. Both quantitative and qualitative data can demonstrate outcomes.

Tenopir and King (2007) describe both implicit measures of value based on usage statistics and time spent reading library-provided collections, and explicit measures such as direct statements from faculty of the importance of the library to their work.

Questions included critical incident questions on the last article reading, such as where the article came from (library, open web, personal, other), purpose of the reading (research, teaching, etc.), and how valuable that reading was to the purpose. These questions about a specific reading provide a second stage sample of readings that can show the value to purpose of readings from, for example, the library. Combined with questions on how many articles an individual read in the last month, provides a quantitative analysis of amounts of reading and value of readings.

Jones (2007) looked at library spending in the top 50 liberal arts colleges (per the 2004 U.S. News and World Report) related to faculty size, finding a “clear pattern of higher expenditures and resources in the higher-ranked colleges.” Another study developed a framework for understanding and depicting measurable library inputs and outputs in the context of indicators of institutional outcomes (Fraser, McClure & Leahy 2002).

Comparisons between faculty publishing productivity and library budgets in the top 20 ARL institutions denote a positive correlation between funding of libraries and tenured faculty output (Budd 2006). Faculty members who publish more or who have won awards, also read more from their library collections (Tenopir and King 2000). Total readership of articles in medical journals shows a “highly favorable” cost to benefit ratio per reading of the article or journal in key titles” (King, Tenopir & Clarke 2006). Another study looked specifically at scientific articles and computes the value of access to a given journal at more than 4 times the purchasing price of the journal (Tenopir & King 2000).

Open-ended questions on surveys can provide qualitative evidence of the value of the library. Studies from 2005-2008 asked faculty members to describe how access to e-journals has changed the way they do their work (McClanahan et al. 2009). They reported many positive outcomes, including:

- They are dependent upon electronic access to do their work: they cannot function without e-journals.
- E-journals are convenient and flexible, which allows them to spend more time involved in actual research, reading, or writing, rather than in searching for and obtaining articles.
- They are more likely to share more articles with their colleagues and students.
- Reading patterns are broadening; faculty are more likely to search and read out of their own discipline, they read more journals within their discipline, and they are more likely to use older works that are available electronically.
- They use virtual library services such as accessing the electronic journal collection and interlibrary loan more and visit the physical library less.
- They are doing a better job of keeping up on issues and developments in their fields.

Hundreds of quotations illustrate these positive outcomes; they can be grouped into several recurring themes (McClanahan et al. 2009):

- E-Collections transform the way research is done (for example, “The kinds of resources I can access electronically have transformed my research. Even more than the supply of journals in my field (early modern literature), ...[other

collections] allow me to read from my office texts that once required me to go to microfilm or, more often, to major collections in D.C. or abroad. Search functions on both databases have revolutionized my abilities to do the kind of philological work that I am currently engaged in.”)

- Library e-collections save time and effort. (for example, “It has been a wonderful boon to my research...Making the trek over to [library], particularly in the heat of August, and hauling 5 or 6 books or journals back up the hill to [building] was always a taxing experience (the library's delivery service has been fantastic in this regard as well as the electronic resources). The bottom line is that I spend less time looking for or waiting for articles and books, and more time reading and thinking about them...”)
- E-collections enhance teaching and foster interdisciplinary work. (for example, “Electronic access has dramatically changed the way I carry out research and teaching. I now access articles from a much wider range of sources (especially journal articles and websites), instead of relying on just the main journals in my field. It's easier to assign readings for classes and I find that students have gotten very good at finding their own electronic resources. I tend to avoid resources that are not in electronic format (including some of my own older publications).”)

## **Contingent Valuation**

Contingent valuation is a method often used in corporate and public libraries, most notably in the studies by Griffiths and King (1993). It is a method to “assess the benefits of non-priced goods and services (e.g., libraries or specific library services) by examining the implication of not having the product or service” (Aerni & King 2006).

Contingent valuation can be used in academic libraries as well as public and corporate libraries. By asking faculty where they would have gone to find the information or services they found in the library if the library was not available to them, a value in their time and direct potential expenses can be calculated. Contingent valuation measures the time and money saved (Tenopir & King 2007).

Contingent valuation—estimating the time or cost of not having a service and comparing that with the time or cost of the service—can be used to calculate an implied value of journal collections. We use contingent valuation in conjunction with critical incident in surveys. Respondents are asked to indicate what they would do if the source they used for their last reading (e.g. library collection or personal subscription) were not available to them. We ask if they would bother getting the information at all and, if so, to specify where they would get the information. Respondents are then asked to estimate what it would cost in terms of time or money to get the same information if the source they used were not available to them (Tenopir & King 2007).

In surveys conducted in 2004-2005 at seven universities in the U.S. and Australia, 81% (889 of 1098) of faculty respondents who answered this question indicated they would obtain the information from another source. A wide range of possible sources

was given, with libraries or library services frequently mentioned (including another library, a library print or electronic collection, and interlibrary loan as some most frequently mentioned.) For those who obtained their most recent reading from either a library source, a personal source, or another source, the number one alternative source was a print or electronic library resource. Inter-library loan was the second choice for those who first obtained the article from a library and the fourth choice for those who first obtained it from a personal or other source (Tenopir & King 2007).

One study estimated that the cost to obtain information from a university library's journal collection is \$5.90 per reading (King et al. 2004a). More detailed estimates found that the cost to use the e-journal collection is \$3.00 per reading vs. about \$13.80 per reading to use the print collection. The cost to obtain information from another source is \$50.70 per reading (i.e., \$42.80 in readers' time and \$7.90 in purchase, etc.). Extrapolated to all reading by faculty and the current reader purchase cost (value) is \$1.56 million and the cost of using alternative sources is \$13.48 million. The saving in time due to having the library journals collection amounts to over 100 full-time equivalent (FTE) faculty (4% of the entire faculty and staff at this university). Having remote access to the e-journal collection saves about 23 FTE faculty (King et al. 2004a; Tenopir & King 2007).

Library e-collections have provided an increasing percentage of articles to faculty members over time. At the same time, the number of personal subscriptions per faculty member on average has steadily declined over time. Researchers in all workplaces received, on average, over 5 subscriptions in 1977, down to fewer than 2 by 2003. The number of subscriptions held by faculty members is slightly higher (just over 3), but also has decreased over time (Tenopir & King 2007). The cost in time and money of not having access to the library's collections has increased over time.

### **Return on Investment (ROI)**

Going one step further than contingent valuation, Return on Investment (ROI) of academic libraries can be used to measure the value of the library's collections, services, and facilities to the teaching, learning, research, and social/professional/public engagement missions of the university and its faculty, staff, and students. Developing an ROI model and tools to implement that model which include the full spectrum of returns is a challenging task that needs to be undertaken within the unique context of the academic library. ROI methods must be complete, but they also must be practical in terms of what can be collected without incurring unreasonable costs for data collection.

Although library ROI studies have proliferated over the past decade, rarely do they focus on academic libraries. Early ROI studies were performed in special libraries. For example, Strouse (2003) addressed both the quantitative measures (money saving and generating) and qualitative measures (user perception and value) of ROI in special libraries. He focused on understanding the user because to understand and compute ROI, the user's perception of the value of the information must be known.

Griffiths and King (1993) addressed some additional issues of ROI in special libraries, focusing primarily on corporate libraries. While promoting the value and

savings of reading, Griffiths and King also took into consideration the contingent value of the library by computing what it would cost business professionals to acquire the information and resources their library provides if the library did not exist. The total cost to perform their research without the assistance of a library was more than 4 times the cost of operating a library.

In the past ten years, several studies have measured ROI in public libraries, often on a very large scale. Such studies have been performed in Florida (Griffiths & King 2004), Southwestern Ohio (Levin, Driscoll & Fleeter, Inc. 2006), South Carolina (Barron et al. 2005), St. Louis (Holt, Elliot & Moore 1999), Wisconsin (Northstar Economics, Inc. 2008), and Pittsburgh (Carnegie Mellon University 2006), with a comparison of both large and small scale studies being compiled in publications by the Urban Libraries Council (2007) and by Imholz and Arns (2007). In public libraries, the average ROI was \$4.11 in direct and indirect benefits for every \$1 invested by taxpayers.

On the whole, however, because the constituents and purposes of academic libraries differ from corporate and public libraries, calculating ROI in academic libraries involves different measures or at least different methodologies. ROI also has some dangers, in undertaking an ROI study the metrics and functions tested must be aligned with the administrative values (Luther 2008) and quantitative data must be gathered to supplement quantitative (Strouse 2003).

Mezick (2007) looked at the library's ROI by student retention rates, taking into consideration the use of performance indicators that measured positive institutional outcomes (in this case, retention of students) and its correlation with library spending. A positive correlation was found between library spending and retention of students. King et al. (2004b) estimated a return-on-investment (ROI) in the journal collection made by one university. The investment or cost to the university is \$3.43 million; that is, \$ 1.56 million in faculty time and \$1.87 million in library expenditures. The cost of alternatives is \$ 13.48 million so that the net benefit of the collection is \$10.05 million (i.e., \$13.48 minus \$3.43 million). The return-on-investment is 2.9 to 1 (i.e., \$ 10.05/\$ 3.43 million).

A recent case study at the University of Illinois at Urbana-Champaign (UIUC), funded by Elsevier, looked at the ROI of the university library in grant funding (Luther 2008). This study developed a model that includes a calculation of the average size of successful competitive grants that used the library to prepare the proposals. The data was obtained through university administrators and librarians, with a follow-up survey of faculty that was used to calculate the percentage of grant proposals that were prepared using library resources and services and to collect qualitative statements on the value of the library to their work. Using these methods, at UIUC it was determined that the ROI in competitive grant dollars awarded to grant recipients who used the library to prepare their grants was \$4.38 for every \$1 invested in the library (Luther 2008).

This narrowly-focused methodology was then tested in academic libraries in eight countries (phase 2) by a team led by Tenopir (2009). Both qualitative and quantitative data were collected in this phase 2, including 1) interviews with university administrators to get qualitative assessments of their perception of the

value of the library to the university; 2) university-wide data on grant proposals submitted and grant dollars received for a ten-year period; 3) surveys of faculty to gather their estimates of the role of library collections in their grant proposal and reporting process; and 4) total library budgets for the corresponding ten years. Together, phases 1 and 2 compared the nine universities' total investment in the library with a portion of the income generated by grant proposals that used the library collections in the proposal. ROI from grants varied from 13.2-15:1 in research science institutions to 1.3:1-5:1 in research universities that also do teaching and that include science, to under 1:1 in institutions with a major focus on teaching and humanities.

There are several explanations for the variation in ROI values. The highest ROI values come from institutions with a purely research mission or with a concentration in science and technology. The middle ROI values are from research-oriented institutions that cover all disciplines and include both teaching and research, but which are located in countries or environments where seeking externally funded competitive grants is a priority and funds are available. Lower ROI values are from universities that are comprehensive liberal arts institutions with a mix of research and teaching, institutions which have limited monies or which rely on government funding instead of competitive grant funding. The national environment and the mission and goals of the institution that houses a library both influence the ROI from grants, making it difficult to compare ROI values across different institutions.

Administrators voiced common ways that libraries can bring value::

- 1) Attract outstanding faculty
- 2) Retain outstanding faculty
- 3) Foster innovative research
- 4) Build research reputation of institution
- 5) Promote seamless integration of the library with institutional research activities

In all cases the value of the library goes far beyond helping to generate grants. The academic library plays numerous roles on the academic campus; thus an expanded focus is vital to understanding full ROI in academic libraries. To state it simply, "the library is the only centralized location [on a university campus] where new and emerging information technologies can be combined with traditional knowledge resources in a user-focused, service-rich environment that supports today's social and educational patterns of learning, teaching, and research" (Council on Library and Information Resources 2005).

Because an academic library provides such a rich variety of services in support of an institution's mission, funding for the services supplied by the library must be maintained. Higher education as a whole has been hit by budgetary restraints, which means that libraries are seeing a decrease in available university funds. Thus, academic libraries must seek to prove their value to the campus community to secure a strong position within the academic hierarchy while in fierce competition with academic and athletic programs (Martin 2000). The goal of developing a ROI measure for academic libraries is to provide a tool for demonstrating their value and to determine which products and services are most relevant in a changing academic world. Redirection of funds, for example, to support e-science, collaborative

scholarship, and institutional repositories, is a necessary decision facing all academic libraries. Good quantitative measures will enable the library to use its funds more responsibly before asking for more, as well as demonstrating that the library is a good financial investment for the university.

## **Conclusions**

For all types of libraries, the goal of measuring value, whether through usage, outcomes, contingent valuation, or ROI, is to demonstrate the value and impact of the investments in the library and to help determine which products and services carry the highest value or return. An academic library must be able to show how it is supporting an institution's mission and goals, be it through supporting research for grant applications or other academic endeavours, improving the availability of resources that assist in the instruction of students, or providing the necessary services for the retention, socialisation, and matriculation of students.

While in days past the importance of the library was understood, tightening budgets are forcing the library to reassess its services, making measurement and ROI studies an essential part of demonstrating a library's value and keeping it relevant into the future. Academic librarians must measure the value of all aspects of library services and collections and better understand how to measure the value of university libraries to the overall mission of the university and what products and services are the best investments for the university.

Returns are more difficult to measure. While not all of the metrics for measuring return are yet developed, return measurements include several progressively downstream measures for each functional area of the library.

Eventually, academic libraries must develop ways to demonstrate their value through downstream measurements. Focusing on usage, outcomes, contingent valuation, and return on investment of all library functional areas are a way to begin.

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