Abstract
The paper examines the concept of return on investment (ROI) in the context of academic libraries. The aim of ROI is to establish a relationship between the library and its university that could be expressed in quantifiable terms which would satisfy administrators and demonstrate the library’s economic value to the institution. Various methods of calculating ROI are described essentially derived from library services and user satisfaction.

Introduction
The value of academic libraries to faculty and students has long been assumed. Increasingly, however, university librarians must demonstrate value to their funders and administrators (Tenopir, 2009b). Measuring the value of e-collections is a good place to start this process.

There are many ways to measure the value of e-collections. Those discussed here include: i) measuring usage through logs or vendor reports, ii) measuring purpose and value through surveys, iii) measuring perceived value through surveys or interviews, iv) calculating Return on Investment (ROI) using budget, income, and survey data. Both implicit and explicit methods of measuring value and quantitative and qualitative techniques have been used in studies that are demonstrating that e-journal collections improve research, help faculty be more productive, and are valuable for many purposes (Tenopir & King, 2000, 2007).

Because the exact value of e-collections may differ among libraries, and these collections must meet the specific goals and objectives of each institution and may change over time as new services or collections are added, it is recommended that libraries devise strategies to assess and measure their value to their own faculty, students, and administrators. Some of these methods and findings from recent studies in libraries are described here. This paper focuses on measuring the value of libraries’ e-collections and, specifically, of e-journals. A strategy of multiple methods is recommended.

Usage Logs and Vendor Reports
Usage is an implicit measure of the value of the library collections and services. Because our faculty and students use the library’s e-collections, use 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).

Both 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. According to the description of raw usage log analysis by Nicholas in Tenopir, et al 2007, usage logs have several advantages. They "are a direct and immediately available record of what people have done and they do not rely on memory. The data are collected routinely, automatically and quite anonymously. There is no need to contact the user or obtain their cooperation." 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).

Analysis of usage logs requires computing expertise. COUNTER-compliant vendor reports, on the other hand, are provided directly to libraries by their vendors that participate in the COUNTER standard. The reports are provided in a standard format and show a summary of that library’s use on a specific online platform. Reports can be used at a basic level to compare use between platforms or over time without much effort. (www.projectcounter.org).

As with usage logs, there are some disadvantages to
vendor reports. Although COUNTER data is in a consistent format, it does not provide many details and reports are separate for each vendor, making it difficult to compare information from all vendors. How a vendor has set up their sites (whether a search result goes first to an abstract or directly to the full text, for example) may affect COUNTER results. It is not perfect, but COUNTER data makes it easy for libraries to monitor usage and how use increases over time.

Usage logs and COUNTER reports provide information on what electronic resources are being used and play an important role in demonstrating implied value of e-collections. Library specific data can be added to show important things such as cost per use.

Logs or vendor reports have limitations when demonstrating value, however. They do not show why someone used or requested a source or the outcomes on 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.

For privacy or other technical reasons, logs typically do not show behavior by individuals or demographic groups. Previous research has shown that medical journals will get about 2 to 3 times the amount of use of humanities journals, because medical faculty read more articles than any other group (Tenopir et al 2009).

That does not mean that the value of the readings by humanities scholars is any less, just because the readings are less. Also, the relative size of the departments will skew usage logs and vendor reports.

Finally, usage logs and vendor reports show only a fraction of total use of library materials. Neither logs nor vendor reports show purpose, satisfaction, or outcomes of use. Nor do they show any use of resources in the library's print collection or outside of the library's centralized e-collections. To measure value beyond just e-useage, other methods must be employed. Surveys of faculty and students can get to purposes of use, can record use of materials other than the library's e-collections, and can be used to gather explicit measures of value.

**Surveys to Measure Purpose and Value of Use**

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 behavior 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 and King).

Typical survey questions include demographic questions (factors to test for influence on behaviors, such as age, academic discipline or department, rank, or anything else that is interesting), some recollection of behaviors questions (how often something is done), and questions that measure respondents’ opinions or reactions to services.

Surveys by Tenopir and King (2000) also use a variation on 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 and 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, or 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).

**Perceived Value through Surveys or Interviews**

Sometimes qualitative comments tell the value story better than quantitative data and can provide compelling evidence of perceptions of value by library users. In recent surveys of faculty in 8 universities in 8 countries, we asked: “How has access to electronic resources available over the university computer network and/or from the university library changed the way you work? Please comment.” (Tenopir, 2009a). Faculty contributed many comments about the value of e-resources to their work. These comments are typical:

- “With the current workload, I could not continue with research without the convenience of access from my own computer.” *(South African University)*
- “You have access to many more articles and although you do not read them completely, you are more aware of what is going on in the field.” *(Western European Research Institute)*
- “Access has made collecting research resources infinitely more efficient, and facilitated interdisciplinary research.” *(U.S. University)*

They also commented on how e-journals have
increased their productivity, leading to changes in the way work is done. For example:

- “I guess that on average the online access saves me more than 10 hours per week.” (Western European Research Institute)
- “The convenience of desktop delivery has improved my efficiency and dare I say it my ability to be a better researcher and teacher.” (Hong Kong University)
- “My productivity would drop at least four fold if I had to go to the library for all my needs.” (U.S. University)
- “Completely changed the way I work by increasing my productivity. I...spend more time reading [articles].” (U.S. University)
- “The task of finding the most pertinent articles on a new topic used to take a full afternoon. The same work can now be completed in 15 to 30 minutes.” (U.S. University)

Overall, the survey respondents described a dependency on the library for their research and grant proposal needs that can be translated into an economic value. Again, these comments are typical:

- “Such access has become an essential research tool.” (Japanese University)
- “It would be impossible to be competitive internationally without electronic access to publications.” (U.S. University)
- “It has helped me open or discard lines of research at the very beginning by knowing what other researchers have published or are soon going to publish.” (Western European Research Institute)
- “Electronic access greatly improved and simplified work for publication, preparation of proposals, and research work with students.” (U.S. University)

Surveys can provide both qualitative and quantitative information that usage logs do not, but, like any other method, surveys have some limitations. All surveys rely on truthfulness (we expect respondents will tell us the truth) and they rely on the accuracy of people’s memory. Finally, in the last 20 years we find that response rates are falling, particularly with online surveys. We usually get about 10-35 per cent response rates these days.

No one method tells everything. For a complete picture of your users, use, and future needs, you must use multiple methods gathered on a regular schedule. Usage logs to get information on use of e-collections, surveys to get opinions, preferences, and behaviors of individuals, and critical incident questions or experiments, and focus groups to get ideas for the future and preferences. Derived calculations such as Return on Investment provide another level of measurement.

### Return on Investment

Recent studies by Kaufmann, Luther, Mezick, and Tenopir (2009a) have used Return on Investment techniques to measure the value of e-journal collections in academic libraries. Return on investment (ROI) is one way to measure the value of the academic library to its institution.

The basis of ROI studies is to quantify and demonstrate the library’s economic value to the institution. For every dollar spent on the library, the university receives dollars back in the form of additional grants income or donations, or long term value to the community from an educated work force, more productive faculty and more successful students and graduates. ROI must be articulated within the mission and objectives of the specific institution.

An international team is working on this topic over several phases of increasing complexity. Phase 1 was a case study at the University of Illinois, funded by Elsevier, that tested just one aspect of ROI; that is, the value of the library in the grants process—proposals, the return in grant funding, and grants reporting (Luther). Phase 2 expanded this methodology to eight institutions in eight countries. (Tenopir, 2009a). Both Phase 1 and Phase 2 focused on grants income because it has a definable source of income, is a priority in research libraries, and has identifiable data that can be collected using multiple methods.

Essential at the beginning of the ROI process are meetings with the top level administration who provide insights into what they value for supporting the mission of the university and where the library might fit into that. The input from provosts, chancellors, or vice presidents helped to direct the type of data collected and the ways to present it that will speak to administration. The interviews are also a source of qualitative data that illustrates the value of the library. (Tenopir, 2009a).

It is important to stress and get buy-in from the university administrators that the library be viewed as an asset and not as a cost center or as overhead. The aim of ROI is to establish a relationship between the library and its university that could be expressed in quantifiable terms and that would satisfy administrators. To do this, the library needs to be viewed as an asset within the definition of ROI, where income is generated as a proportion of the amount invested in the asset. From that vantage point, the relationship between the library and the income generated through its use might be formulated. (Kaufmann).

First, the grants process itself has to be considered. While the researchers are first and foremost in this process, the resources offered through the institutional library are pivotal to their endeavors. Much of the research process depends upon access to information, and most of that information is provided by the library.
The library has a role in all aspects of the research grants process, especially providing resources to conduct research, write articles, reports, and proposals. The key is to tie the library directly to obtaining grants. (Tenopir, 2009a).

In phases 1 and 2 quantitative and qualitative data were gathered directly from tenure track faculty through a survey; while data on the number and value of grant proposals and grants and library budget figures were obtained from the university research and budget offices. Interviews with administrators both guided what is important and provided additional qualitative input on the value of the library. (Tenopir, 2009a).

The phase 1 study at the University of Illinois, based on faculty applying for grant funding, and factoring in the survey responses, showed that more than 78 per cent of faculty with grants use citations in their proposals and just over 50 per cent of grants awarded are from proposals with citations obtained from the library. Data from their research office shows that the average grant income at UIUC is just about $64,000. Multiplying these three numbers gives an average grant income generated through the use of the library of just over $25,000. Multiplying this number by the number of grants expended in a year at Illinois and dividing that by the total library budget yielded a return on investment of $4.38 for every dollar invested in the library. This is just the value in grants—total ROI will be greater. (Luther).

The University of Illinois is a major research university with a long tradition of grants. Phase 2 tests to see if the method works in other universities and is applicable in other countries.

In the first look at phase 2 surveys, references are considered essential in all the institutions surveyed, although how important does seem to vary somewhat from institution to institution. References were rated as essential, very important, or important to grants by a range of 71 per cent to 98 per cent of faculty respondents. The average of the reported number of citations per proposal also varies, from 20-46 citations per proposal, as does the average percentage of citations that were accessed through the library’s online system or university network. The mode percent of citations from the e-library ranged from 50 per cent to 99 per cent. For every article cited, faculty members reported reading many more articles, so the value of the library collection is higher than just those selected for citing. (Tenopir, 2009a).

Actual ROI calculations vary from a ratio of over 15:1 to under 1:1. This variation has much to do with the purpose of the institution, with the high being for a pure research institute and lower for teaching/research universities in countries without a high number of competitive grant funds. Caution is recommended when comparing ROI across institutions.

ROI is only one method for measuring the value of a library’s collections and services. The benefit of multiple methods is that numbers in and of themselves rarely tell the full story. Interviews and surveys allow the faculty to tell their story of how they use the library in their grant proposal process, in teaching, and in their research and work life. Logs and vendor reports provide an unbiased picture of downloads and usage. Together, these methods show the increasing value of the library to its constituents.

References