

BRIEF COMMUNICATIONS

Using an automated tool to calculate return on investment and cost benefit figures for resources: the Health Sciences and Human Services Library experience

Aphrodite Bodycomb, MBA; Megan D. Del Baglivo, MLS

See end of article for authors' affiliations.

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INTRODUCTION

In difficult economic times, libraries experience greater pressure to justify budget expenditures to their fiscal managers. Over the last decade, library administrators have become increasingly interested in incorporating return on investment (ROI) and cost benefit analysis (CBA) techniques into their reporting structures to provide quantitative evidence of the worth of services and resources.

The Health Sciences and Human Services Library (HS/HSL) of the University of Maryland appointed a small task force in 2009 to experiment with an automated instrument for calculating ROI and cost benefit ratios (CBRs) for its collection of books and journals. The tool was developed by the National Network of Libraries of Medicine (NN/LM), Mid-Continental Region [1], and promoted by them in a series of presentations [2, 3]. This article describes the process used to compile the statistics for the calculator, first using data from the 2008 fiscal year and then with data from the 2011 fiscal year.

The HS/HSL supports the graduate school and the schools of dentistry, medicine, nursing, pharmacy, and social work, which have a combined faculty and student full-time equivalent (FTE) of 6,797. Additionally, some of the library's resources are available to the University of Maryland Medical Center community, a 705-bed teaching hospital with approximately 6,500 employees as well as 1,000 attending physicians. The collection includes approximately 8,500 print and online journal subscriptions, 174,000 print and online books, and 96 databases. The HS/HSL is also home to the NN/LM Southeastern/Atlantic Regional Medical Library.

ROI is expressed as a percentage and represents the "rate of return" (loss or gain; in other words, benefit) versus the initial "investment" (total cost). The mathematical formula for calculating ROI is:

$$[(\text{total benefit} - \text{total cost}) / \text{total cost}] \times 100$$

CBA results in a CBR that compares a dollar spent versus dollars reaped in benefit, which is determined by dividing total benefit by total cost [4].

To complete the NN/LM calculator for ROI and CBR, the library must supply thirteen values (Figure 1, online only), across three sections, one for salary data and two with cost- and benefit-related fields for each type of resource. The specific elements are listed in Table 1.

Once all required metrics are entered, the tool automatically calculates benefit and cost figures and the resulting ROI and CBR values. The formula used to calculate the *benefit* for books or journals is:

$$\begin{aligned} & (\text{usage} \times \text{price per article or book}) \\ & + [(\text{user salary} / \text{hours worked per year}) \\ & \times (\text{usage} \times \text{time saved per article or book})] \end{aligned}$$

The formula used to calculate the *cost* of books or journals is:

$$\begin{aligned} & \text{book or journal budget} + \\ & (\text{library salary budget} \times \text{percent of staff time} \\ & \text{spent managing book or journal collection}) \end{aligned}$$

METHODS

The task force began its work in 2009, using library metrics for the fiscal year 2008 (July 2007–June 2008), since the standard reports regularly issued by the HS/HSL had been completed and were available for that fiscal year. Subsequently, an error was discovered in the 2009 calculations, and the exercise was then repeated with 2011 data. This study reports the results for both years; differences in calculations between the years are noted below.

Users' average annual salary

According to a recently completed survey conducted by an outside consultant, the HS/HSL user population consists of the following categories and percentages: undergraduates, 12.5%; graduates, 56.5%; faculty and postdoctoral fellows, 18%; University of Maryland Medical Center staff, 9%; and unaffiliated, 4%. For practical purposes, usage of the library was considered to be equivalent across all population categories.

Financial aid and stipend figures were substituted for salary totals for undergraduate or graduate students with data from the university's student financial assistance and education department. The faculty and staff salary average was obtained from the university's human resource services office. For the unaffiliated group, Baltimore salary and unemployment numbers were compiled from the US Department of Labor, Bureau of Labor Statistics [5], and the Maryland Department of Labor, Licensing and Regulation [6], with the average salary figure adjusted down to reflect the unemployment rate. The totals for each category were weighted according to the

 Supplemental Figure 1 is available with the online version of this journal.

Table 1
Library Value Calculator elements with Health Sciences and Human Services Library metrics for 2008 and 2011 fiscal years

Element	2008	2011
User's average annual salary	\$46,913	\$45,586
[User] hours worked per year	2,080	2,080
Library salary budget	\$2,906,874	\$3,279,865
Number books borrowed or used	92,233*	83,825
Average retail cost of a book	\$111	\$107
User time saved per book borrowed	0.25	0.25
Book budget	\$177,128	\$84,046
Portion of staff time devoted to managing book collection	0.076	0.133
Number of journal articles read	1,048,079	1,352,590
Per article price from vendor	\$30	\$30
User time saved per article	0.33	0.33
Journal budget	\$1,707,673	\$1,683,973
Portion of staff time devoted to journal collection	0.088	0.109

* Inadvertently inflated due to the inclusion of "page views" from one vendor.

percentage represented for a combined average to be used in the specified element.

Users' hours worked per year

The full-time total of 2,080 hours per year was used with the understanding that it is higher than the actual number because no adjustment was made to account for those who work part time. However, it was considered to be the most "justifiable," even for the student population, given the considerable hours spent on academic activities.

Library salary budget

The sum of all regular personnel salaries including fringe benefits was used for this figure. This element required considerable manual calculation because the library currently has no single report that provides the data for both salaries and fringe benefits. Salaries for the NN/LM staff were excluded from the total.

Book and journal budgets

Expenditures for both print and electronic formats were compiled for each collection, with bindery costs added to the journal total.

Portion of all staff time devoted to the book or journal collection

Two fields are associated with the percentage of library staff time spent processing and handling books and journals. Only those individuals whose responsibilities were directly related to acquiring, organizing, and maintaining the collections were included in the figures. Therefore, the totals reflected staff primarily involved with acquisitions, cataloging, physical processing, e-resources management, shelving, and reserves. Several personnel split time between collection-related tasks and other activities. In those cases, only the hours devoted to the former were included in the calculations. Department heads reported the hours per week spent by staff on each type of resource. Total hours for the year were calculated, converted to a percentage of total staff hours, and entered in decimal

form. However, these were estimates as no time studies have been conducted.

User time saved for each book borrowed

The user time saved for each book borrowed figure, and the equivalent element for journals, were taken directly from the examples provided in the NN/LM presentation [2]. Expressed in 100ths of an hour, 0.25 (15 minutes) and 0.33 (20 minutes) were used for books and journals, respectively.

Average retail cost of a book

The Matthews Medical Books *Average Price Report* was used to calculate the average retail cost of a book, with the same value applied to both print and electronic formats.

Per-article price from a vendor

Article prices were taken directly from the examples in the NN/LM presentation. The 2 values used in these examples were \$30 and \$35; the former was chosen as the more conservative figure.

Number of books borrowed or used

Usage statistics for print books were compiled from circulation data. In-house use of print monographs (left on tables and in group study rooms) was not included in the book total since it has never been tracked.

Fiscal year 2011 usage statistics for electronic books were calculated from those vendors who were Counting Online Usage of Networked Electronic Resources (COUNTER) compliant, using either "successful title requests" or "successful section requests." Of the two non-COUNTER compliant providers, one reported the "number of downloads of a title," which was acceptable. However, existing data from the second vendor were not usable because of the high probability of multiple counts for a single access. Upon request, the provider was able to furnish the number of single "visits" per month for each book.

Usage statistics for fiscal year 2008 were also calculated from vendor reports. However, the

e-monograph figure included "page view" totals for one of the packages, which led to an inadvertent inflation of the usage figure for that year. At the same time, the first six months of usage for three e-monograph packages were unavailable for the 2008 fiscal year due to vendor error, leading to an undercount of usage for these packages. As a result, after some discussion, the decision was made to repeat the process, with fiscal year 2011 data.

Number of articles read by all users

Print usage for journal articles was compiled from re-shelving activity, with one volume shelved equivalent to one article read. Electronic article use was calculated using "number of successful full-text article requests" from COUNTER-compliant vendors. Of the two providers who were non-COUNTER compliant, one reported "number of downloads" and the other "full text visits," both of which were considered suitable. The hypertext markup language (HTML) and portable document format (PDF) figures were added together for those vendors offering users a choice between the two. The HTML count was used in the case of a single journal for which the PDF is accessible only by first going through the HTML version.

RESULTS

After entering the required data (Table 1), the calculator showed CBR and ROI figures as follows:

Fiscal year 2008 combined:

CBR=21.2:1
ROI=2,017%

Fiscal year 2011 combined:

CBR=23.3:1
ROI=2,234%

Additionally, the task force manually calculated the CBR and ROI values for journals and books separately with the following results:

Fiscal year 2008 books:

CBR=27.0:1
ROI=2,603%

Fiscal year 2008 journals:

CBR=20.0:1
ROI=1,899%

Fiscal year 2011 books:

CBR=18.1:1
ROI=1,712%

Fiscal year 2011 journals:

CBR=24.7:1
ROI=2,367%

DISCUSSION

For comparison purposes, there are only two health sciences libraries for which the NN/LM CBR and ROI

data for book and journal collections are currently available, and those are based on metrics from 2009. They are the J. Otto Lottes Health Sciences Library of the University of Missouri-Columbia and the Bernard Becker Medical Library of the Washington University School of Medicine in St. Louis, Missouri. The HS/HSL falls directly in the middle with the Lottes Library lower (CBR: 15.34 and ROI: 1,434%)* and the Becker higher (CBR: 45.67 and ROI: 4,467%) [7]. This result suggests that the HS/HSL figures are valid even though the comparison group is extremely small.

As noted above, the HS/HSL fiscal year 2011 CBR and ROI values for monographs were lower than those found for fiscal year 2008, partially due to the inadvertent inclusion of "page views" in the latter. However, the difference in actual usage totals between the 2 years was only 8,408, a drop of 9%. There are several possible explanations for the smaller-than-expected difference. The 2008 total was missing 6 months' worth of statistics for 3 packages. Print book renewals were included for 2011, whereas they were excluded in the earlier calculations. Finally, the e-monograph collection has grown since 2008 with a corresponding increase in usage. A contributing factor in the decline of the values for monographs over the 3 years was a \$372,991 rise in the library salary budget, 49% of which is attributable to the cost of fringe benefits. Approximately one-third of the total increase is due solely to a change in the State of Maryland accounting procedures for retiree health benefits.

Despite the decrease in CBR and ROI values for monographs, the combined CBR and ROI for 2011 was actually higher than in 2008, primarily due to e-journal usage, which rose by 30%. The HS/HSL migrated the majority of the journal collection to online over the intervening years with the result that print usage dropped by 46% (17,055 for fiscal year 2008; 9,157 in fiscal year 2011). The increase in the salary budget noted above had far less of an impact on journals than monographs because the number of articles read is so much greater than the number of books used.

The NN/LM's automated tool incorporates only those expenditures that are entirely attributable to each collection. Indirect costs such as those associated with physical plant operations, and software and hardware purchases are not included. However, apportioning these expenditures to books and journals would be extremely difficult. Therefore, the ROI and CBR values should be evaluated in the context of the calculator's limitations.

CONCLUSIONS

Compiling the figures for the calculator for 2008 was a time-consuming process. Some elements required

* The J. Otto Lottes Library's values are a "quick look" and do not reflect a complete analysis because their data are often combined with that from other campus libraries (via personal communication with Barbara Jones, 11 Oct 2011).

significant manual computation (e.g., average user annual salary and library salary budget), while data obtained from departments often required repeated clarification to ensure that there were no misunderstandings regarding what was or was not included. Despite all of the efforts to ensure accuracy, the original monograph usage total was flawed. Therefore, when the process was repeated using data for the 2011 fiscal year, considerable time was spent reviewing and discussing the different types of usage statistics reported by vendors, especially from those vendors who were not COUNTER compliant.

Having learned from the initial experience, the compilation process for 2011 was less time consuming, although manual computation was still necessary for the same elements as had been required when analyzing data for 2008. However, the effort was worthwhile because the results provided yet one more justification for the annual expenditures for journals and books. Detailed documentation for the compilation process has been maintained for both years. Suggested improvements for the future include conducting a time study for staff involved in managing resources and instituting a method for collecting usage statistics for print monographs that have circulated "in house." The HS/HSL is considering repeating the project on a triennial basis. Not only are the final results informative, but the entire process serves to clarify and define all of the data associated with the two collections.

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REFERENCES

1. Kelly B, Jones B. Library value calculator [Internet]. Salt Lake City, UT: National Network of Libraries of Medicine, MidContinental Region [rev. 29 Sep 2009; cited 3 Nov 2009]. <<http://www.nnlm.gov/mcr/evaluation/roi.html>>.
2. Kelly B, Jones B. Breezing along with the RML: tools for determining library value [Internet]. Salt Lake City, UT: National Network of Libraries of Medicine, MidContinental Region; 2010 [cited 14 Oct 2009]. <<https://webmeeting.nih.gov/p85613275/>>. (Also available from: <<http://www.nnlm.gov/mcr/evaluation/docs/ValuingServicesandCollections.pdf>>. [cited 3 Jan 2012].)
3. Jones B, Kelly B. Beyond the SEA presentation: calculators for measuring the impact of health science libraries and librarians [Internet]. Baltimore, MD: National Network of Libraries of Medicine, Southeastern/Atlantic Region; 20 Jan 2010 [cited 20 Jan 2010]. <<https://webmeeting.nih.gov/p77583286/>>.
4. National Network of Libraries of Medicine, MidContinental Region [Internet]. Salt Lake City, UT: The Network [rev. 14 May 2008; cited 14 Oct 2009]. <<http://www.nnlm.gov/mcr/evaluation/CBAROabout.html>>.
5. US Department of Labor, Bureau of Labor Statistics. County employment and wages in Maryland—second quarter 2009 (PDF) [Internet]. Philadelphia, PA: The Bureau;

2011 [rev. 27 Jan 2011; cited 14 Sep 2011]. <<http://www.bls.gov/ro3/qcewmd.htm>>.

6. Maryland Department of Labor, Licensing and Regulation. Civilian labor force, employment & unemployment by place of residence (LAUS)—Baltimore City [Internet]. Baltimore, MD: The Department; 2010 [rev. 13 Aug 2011; cited 14 Sep 2011]. <<http://www.dllr.state.md.us/lmi/laus/baltimorecity.shtml>>.

7. Personal communication with Elizabeth Kelly, 15 Aug 2011.

AUTHORS' AFFILIATIONS

Aphrodite Bodycomb, MBA, abodycomb@hshsl.umaryland.edu, Associate Director for Operations and Technology; **Megan Del Baglivo, MLS** (corresponding author), mdelbagl@hshsl.umaryland.edu, Serials Metadata Librarian; Health Sciences and Human Services Library, University of Maryland, 601 West Lombard Street, Baltimore, MD 21201-1512

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