Measuring the Cost Effectiveness of Journals: The Wisconsin Experience

The University of Wisconsin was thrust into the limelight of journal cost studies when Henry Barschall, Professor of Physics there, published articles on the cost effectiveness of physics titles that resulted in a series of lawsuits by Gordon and Breach, a commercial publisher whose titles were among the least cost-effective journals cited by Barschall. On top of the lawsuits, Gordon and Breach undertook an aggressive strategy–including threats of additional litigation–to challenge any adverse commentary on its journals. The actual and threatened lawsuits by Gordon and Breach are well documented.[1]

Believing that this hostile, litigious environment had a chilling effect on libraries' willingness to gather and share journal cost data, and wishing to commemorate the 10th anniversary of Barschall's publications, the University of Wisconsin-Madison Libraries undertook a cost study in the hopes of encouraging others to conduct similar analyses. Using the same methodology, the findings of this new study parallel those of Barschall:

> *By the measures employed here, commercially published journals in all three fields [physics, economics, neuroscience] are significantly less cost-effective than journals published by not-for-profit enterprises.*

The cost effectiveness data collected as part of the Barschall anniversary study were measured in cost per 1,000 characters and cost per impact factor. These statistics supplement the cost per use data that the Libraries had been collecting for the previous five years. University of Wisconsin-Madison Libraries staff have found both data sets critical in establishing effective working relationships with the faculty; they provide library staff with an objective information base from which to begin discussions about journal cancellations.

The difficulty of collecting data about journals–whether it is cost per use, cost per 1,000 characters, or cost per impact factor–may be yet another reason why libraries do not routinely gather and share information on journal cost effectiveness. The process is time-consuming and the vagaries of serial publications make the task complex. In some cases, selectors and faculty fear that data will become the single factor in deciding whether to cancel journal subscriptions. But for many institutions that have embarked on journal cost studies, the rewards far outweigh the problems. The data provide an overall context for assessing the quality, relevance, and cost effectiveness of the journals in a given field. They also highlight titles that may warrant further evaluation. The data allow selectors and faculty to discuss specific titles with a broader understanding of the quality and economic structures of the journals in a discipline.

Data on the cost effectiveness of journals are also useful in our efforts to inform policymakers in higher education; national, state, and provincial legislatures; funding agencies; and scholarly societies about the dynamics of the current journals system and the need for transformation. Data help us develop and refine strategies for change. But currently, our community lacks consistent, longitudinal journal cost effectiveness data across disciplines. We depend on the occasional reports of studies, like the one presented here, of a few key fields. To help maximize the use of existing data and facilitate the collection of more detailed information, ARL is working with the Association of American Universities on a proposal to establish a coordinated data collection effort. The creation of a central repository of data on journals–prices, number of pages, number of articles, number of citations, etc.–would provide valuable information that could be used for a variety of purposes, including policy-level discussions, local collections decisions, and increased research into the economics of scholarly publishing. Both organizations also see such a resource as a strategy to measure the impact of electronic information

resources and new modes of distributing information, such as E-biosci (see page seven for "NIH Proposes E-biosci"), on the economics of the system.

While this discussion and the following article extol the virtues of data gathering, it is important to restate the obvious: data are only part of the story. All of the libraries that collect such data would agree that collections decisions are based on many factors in addition to data, such as the research needs of individual faculty; support for small, fledgling, or struggling programs; consortial obligations; and commitments to programs that seek to sustain comprehensive collections through distributed responsibilities. Data must be evaluated in context; judgment is always the final arbiter.

The following article is an excerpt from a work prepared for the University of Wisconsin-Madison Libraries by George Soete, ARL/OLMS, and Athena Salaba, University of Wisconsin-Madison School of Library and Information Studies. In the longer work, Soete places the Wisconsin studies in the broader library-community context, while Salaba discusses the methodology used in the 1998 study and provides detailed tables of the titles and data collected. The complete work can be found at <http://www.library.wisc.edu/projects/glsdo/cost.html> and will be printed for distribution by ARL later this year.

–Mary M. Case, Director, ARL Office of Scholarly Communication

The Barschall Legacy

In December 1986, Henry Barschall, University of Wisconsin-Madison Physics Professor and Departmental Representative to the Libraries' faculty committee, published a brief article in *Physics Today*[2] in which he looked at the costs of a small sample of physics journals (20 titles), as well as an even smaller number of philosophy and mathematics journals. Barschall compared the cost per 1,000 characters across journals–a methodology previously used by the American Mathematical Society and others. His conclusion:

> *While one would expect journals published by not-for-profit publishers to be less expensive than those published by commercial publishers, the cost-per-character ratio of over 40 between the most expensive commercial and the least expensive not-for-profit publication is larger than one might have expected. We found the variation to be similar for mathematics and physics journals. An unexpected finding was that the average cost per character is about the same for physics and philosophy journals; subscription prices for philosophy journals are less expensive because they typically publish far fewer pages, of generally smaller size.*[3]

Two years later, Barschall conducted another study using a much larger sample of over 200 physics journals. The results of the 1988 study confirmed the results of the earlier study and were published in both *Physics Today* (July 1988)[4] and the *Bulletin of the American Physical Society* (July-Aug. 1988),[5] with the former presenting the conclusions and the latter the methodology and data.

In this second study, in addition to expanding the sample, Barschall added the Institute for Scientific Information (ISI) impact factor to his analysis. The ISI impact factor is a measure of the frequency with which the average article in a journal has been cited in a particular year.[6] Barschall's tabular data show cost per 1,000 characters, impact factor (for the titles for which it was available), and cost per impact factor. The data, therefore, indicate cost effectiveness in two ways: cost per quantity of content and cost as related to value apparently placed on the publication by others in the field.

Barschall drew some important conclusions from this study. He found, for example, that the cost per 1,000 characters did not vary greatly for journals published by the same publisher. More importantly,

Barschall concluded that "all the publishers whose journals have low average costs per character or low ratios of cost to impact are scientific societies or associations, while the publishers whose journals have high costs per character or high ratios of cost to impact are commercial firms."[7] This conclusion agrees with his findings from the previous study. One further conclusion has been borne out in subsequent studies: the need to perform comparisons, as much as possible, within comparable sets of journals. Within his sample, Barschall found real differences in impact numbers among journals publishing review articles, letter journals, and archival journals.

In both studies, Barschall was careful to note the factors that might be influencing the differences that he found–from production and distribution costs to page charges. He also acknowledged the imprecision of his methods of counting characters by asserting that "differences in cost of 20% are not significant for several reasons: journals follow different practices in numbering pages, in having blank or partially blank pages, in the size of the print used in tables and references."[8] With all of these caveats, however, the data still told Barschall that there was a wide discrepancy in cost effectiveness between not-for-profit and commercially published journals.

Barschall's studies would have become part of the growing literature on journal cost effectiveness–useful but perhaps unremarkable outside the world of journal collections management–were it not for the fact that Barschall's publishers, the American Institute of Physics (AIP) and the American Physical Society (APS), decided to use his findings to promote their journals. Gordon and Breach, a publisher whose journal titles had not come off well in Barschall's comparisons, seized on this and sued the AIP and APS. Gordon and Breach contended, in suits instituted in the U.S., German, Swiss, and French courts, that Barschall's studies were flawed, even biased, representing "illegal comparative advertising" of the not-for-profit journals published by the American Physical Society and other members of the American Institute of Physics. In August 1997, a U.S. District court found in favor of AIP/APS, asserting:

> *Barschall's methodology has been demonstrated to establish reliably precisely the proposition for which defendants cited it–that defendants' physics journals, as measured by cost per character and by cost per character divided by impact factor, are substantially more cost-effective than those published by plaintiffs. Plaintiffs have proved only the unremarkable proposition that a librarian would be ill-advised to rely on Barschall's study to the exclusion of all other considerations in making purchasing decisions.*[9]

And though the German and Swiss courts also ruled in favor of AIP/APS, the French courts, under strict French comparative advertising laws, found in favor of Gordon and Breach. All rulings were appealed. The German, Swiss, and U.S. courts have recently rejected appeals by Gordon and Breach. An appeal in France is still pending.

Henry Barschall died in February 1997, six months before the U.S. District court vindicated his work.

The Barschall legacy is substantial. His studies thrust journal cost issues into the spotlight and spurred libraries and library associations to concerted action. The studies also showed that a relatively inexpensive methodology could produce data of enormous power. The lawsuits motivated by these studies, however, and the repeated threats by Gordon and Breach against others daring to criticize its titles may have had two differing impacts. On the one hand, some librarians may feel liberated by the recent court rulings to conduct and publish comparative cost studies of research journals. On the other hand, it is likely that the behavior of Gordon and Breach had a chilling effect on systematic data gathering and cost analysis of journals during the ten-year interval since Barschall published his pioneering studies. This is unfortunate because, given the pressure on libraries and research institutions to optimize the benefits of resources and control costs, "consumer comparisons" of journal value, performance, and impact are sorely needed to inform decision making.

1998 Follow-Up to Barschall's 1988 Study

In 1998, the University of Wisconsin-Madison Libraries commemorated the 10th anniversary of Barschall's landmark 1988 study by conducting a follow-up study using essentially the same methodology–that is, focusing on cost per 1,000 characters and the cost per impact ratio that Barschall found such a persuasive measure of journal cost effectiveness. This time, in addition to physics journals (N = 93), journals in economics (N = 128) and neuroscience (N = 72) were studied as well. From April through August of 1998, Athena Salaba of the University of Wisconsin-Madison School of Library and Information Studies gathered the data for titles published in 1997.

The results of the 1998 study confirm Barschall's findings, although there are some differences in the details, as one might expect after ten years. Following are the key findings of the study. (See also accompanying table.)

- In physics, cost per 1,000 characters varied in the 1998 study from 0.76 cents to 27.33 cents, that is, by a factor of about 36. In 1988, Barschall found that these costs for his sample varied between 0.39 cents and 31.00 cents, that is by a factor of about 80.
- Also in physics, the cost/impact ratio in the 1998 study varied from 0.20 to 182.00 cents, that is, by a factor of about 910. In 1988, Barschall found that these ratios varied from 0.063 to 54.00, that is, by a factor of about 850.
- Of the three fields, physics had the lowest average cost per 1,000 characters (9.84 cents) in the 1998 study, 8% lower than the average for economics (10.60 cents) and 40% lower than the average for neuroscience (13.83 cents). Lower costs per 1,000 characters suggest greater cost effectiveness.
- Neuroscience, on the other hand, had the lowest average cost/impact ratio (7.69), 49% lower than the average for physics (11.45) and 287% lower than the average for economics (29.76). Lower cost/impact ratios suggest greater cost effectiveness.
- The last two findings suggest that assumptions about the low cost effectiveness of STM (science, technology, and medical) journals in relation to journals in the social sciences and humanities need to be tested carefully against the data.
- By the measures employed here, commercially published journals in all three fields are significantly less cost-effective than journals published by not-for-profit enterprises.
- The measure that Barschall found most persuasive as an indicator of cost effectiveness was the cost/impact ratio. Lower cost/impact ratios mean greater cost effectiveness. In physics, the average cost/impact ratio for commercial journals (14.61) is 1.77 times higher than the average ratio for nonprofit journals (8.23). In economics, the average for commercial journals (42.62) is about four times that for nonprofit journals (11.55). In neuroscience, the average for commercial journals (8.69) is 13.63 times that for nonprofit journals (0.64).
- Also confirmed was Barschall's finding concerning U.S. and foreign publishers of physics journals. By the measures employed here, physics journals published abroad, on average, are significantly less cost-effective than those published in the U.S.
- One finding of the 1998 study was that differences between commercial and not-for-profit journals were less dramatic in physics than in either neuroscience or economics (see the *magnitude of difference* figures in the accompanying table).

For the three fields covered, these cost effectiveness data complement and extend the local cost per use data that Wisconsin has been collecting for the past five years. Together the data sets provide a strong, objective base from which to initiate discussions with faculty and inform judgments on journal cancellations.

Journal Cost Per Use Data

The University of Wisconsin-Madison Libraries received no new state funding for collections between 1989/91 and 1997/99, and 6,000 journal subscriptions were cancelled throughout the Libraries during that time. As with many libraries, cancellations have become virtually an annual ritual. In this climate of chronic reduction, the University began gathering journal use data on a library-wide basis and, for the last five years, produced cost per use statistical tables.[10]

While cost per use figures have never been the sole basis for journal cancellations, these data have been extraordinarily helpful in identifying potential cancellations for discussion with faculty. Such is their utility that they have been mounted on the Libraries' website and are freely available both on- and off-campus. In fact, what have become known as "the Wisconsin data" are used frequently by other libraries as they seek to open their own cancellation discussions with faculty.

Though a routine part of operations now, the cost per use tables did not have an easy birth. On the technical side, there were many challenges, not the least of which was making sure that every journal–every issue and every bound volume–was barcoded and use-counts were properly aligned with variable receipt and payment records. On the human relations side, there was the challenge of allaying fears on the part of both faculty and library staff that the data would be used in mechanistic ways to force cancellations. After years of use, stakeholders today wonder how they could have survived the last five years without the data.

Tom Murray, Director of the Wendt Library (Engineering), describes the basic data-gathering method:

- all journal issues and volumes are barcoded;
- as items are reshelved after use, counts are made by scanning the barcodes, with either a portable or stationary scanner;
- signs–"lots of signs!"–request that users not reshelve journals and explain the use-study rationale; and
- journals are picked up frequently throughout the day to accommodate heavy use.

For Murray and Collections Officer Lou Pitschmann, the cost per use data have helped them avoid the huge crises weathered by other libraries. First, they say, there is the power of the data themselves. But beyond that, faculty see that the Libraries are using the best data available, consulting closely with them, and making decisions that simply make sense. Wisely, the Libraries have not instituted specific cutoff points. If there is one, it is the cutoff point of common sense. They ask, Does it make sense for us to continue paying this high price to own a paper copy of this low-use journal, especially when alternative means of access are far less expensive?

In fact, the provision of alternatives to faculty–speedy document delivery and electronic versions of journals–has been of critical importance in the Libraries' success. Thus, often the trade-offs are discussed in these terms: "Suppose we were able to provide you an electronic copy of any article from this journal, delivered to your desk, at no cost. Would that be an acceptable alternative to our holding the print journal?"

Though getting started can be quite expensive and labor-intensive, says Pitschmann, the results of the initial expense have been well worth it.

Next Steps

For the University of Wisconsin-Madison Libraries, according to Director Ken Frazier, there is no going back to the old ways of evaluating journals. The journal cost effectiveness studies are part of a larger cultural change taking place within the University. These changes are evident in the most recent annual

report of the University Library Committee.[11] Ten years ago, the faculty would have been likely to demand that the Libraries buy all "their" journals, no matter what the cost. Today, faculty are not only supportive of the journal cost studies, they are taking a leadership role within their disciplines to demand changes in the scholarly communication system.

While librarians and faculty agree that cost alone should not be the sole means of assessing the value of journals, the accumulating data are compelling. The measurable differences between journals in cost and usage are huge. High-cost journals are not simply more expensive, they are ten, twenty, sometimes thirty times more costly than the most cost-effective publications. The studies also confirm (as Henry Barschall rightly observed) that the publications of professional societies are a relative bargain. Indeed, the Wisconsin data show conclusively that nonprofit publishers are continuing to produce high-quality journals in both print and electronic formats at prices that are cost-effective for research libraries.

Another consequence of the cost studies for Wisconsin is that the journal subscriptions cancelled during the 1990s will not be reinstated, regardless of the future budget situation of the University of Wisconsin-Madison Libraries. Frazier notes that there are simply too many new information products that are potentially useful and reasonably priced for librarians to spend much time looking back. The Libraries' experience since the cancellations has generally confirmed that the indicators of the cost and use studies were accurate. That is, the high-cost journals cut from the collection were so rarely used and marginally significant in their impact that they are neither missed nor mourned by library users.

During the 1999-2000 academic year, the University of Wisconsin-Madison Libraries will conduct three additional journal cost effectiveness studies in chemistry, engineering, and another social science discipline, probably education or psychology. The concentration of high-use electronic journals in these disciplines is expected to provide the Libraries with their first systematic assessment of the impact of digital publishing on the cost effectiveness of journals. The challenge will be to integrate Barschall's methodology for measuring the cost effectiveness of print journals with new measures of usage for electronic information resources.

The cost effectiveness studies will be an enduring legacy of Henry Barschall. The University of Wisconsin-Madison Libraries are working with the University of Wisconsin Foundation to establish an endowment account that will support the ongoing work of "Barschall Fellows" in cooperation with the School of Library and Information Studies. Professor Barschall would have been pleased by this commitment, but, considering the tenacity with which he investigated the cost effectiveness of journal literature, he probably would have expected no less.

Endnotes

1. See Ann L. O'Neill, "The Gordon & Breach Litigation: A Chronology and Summary," *Library Resources and Technical Services* 37, no.2 (Apr. 1993): 127-133; and Leonard B. Sand, U.S. District Court, Southern District of New York, Opinion of August 26, 1997, 93 Civ. 6656 (LBS), 10-16.

2. Henry H. Barschall, "The Cost of Physics Journals," *Physics Today* 39, no. 12 (Dec. 1986): 34-36.

3. Ibid., 35.

4. Henry H. Barschall, "The Cost-Effectiveness of Physics Journals," *Physics Today* 41, no. 7 (July 1988): 56-59.

5. Henry H. Barschall and J. R. Arrington, "Cost of Physics Journals: A Survey," *Bulletin of the*

American Physical Society 33, no. 7 (July-Aug. 1988): 1437-1447.

6. The Institute for Scientific Information reports impact factors annually in its *Journal Citation Reports.*

7. Barschall, "Cost-Effectiveness of Physics Journals," 57.

8. Barschall and Arrington, 1437.

9. Sand, 32.

10. These cost per use data can be accessed at: <http://www.wisc.edu/wendt/journals/costben.html>.

11. This report can be found at: <http://www.library.wisc.edu/libraries/News/ULC/reports/98_99.pdf>.

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