

Cost/Benefit Comparison of Print and Electronic Journals in a University Library: A Progress Report

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Abstract

This paper presents preliminary findings of an ongoing cost benefit comparison of print and electronic journals in the University of California, Davis Library. Emphasis was placed on rapid, cost-effective data collection and analysis. This paper discusses emerging use and cost trends among print and electronic titles, and demonstrates a cost model that provides some insight to relative costs of electronic and print journals.

Background

A substantial amount has been written about growth and change in key indicators in the electronic information environment: numbers of electronic journals, linking, use; costs and complexities of licenses and workload shifts; and so on. Tenopir (2000) addresses key issues and trends in the history of electronic journals in libraries. Montgomery (2000) reviewed recent cost analysis techniques for assessing costs in the transitional library.

Citation analysis has long been a staple of print journal evaluation, yet little has been said about the effect of electronic accessibility on impact factors or similar indicators. The problem is complex: electronic journals and e-archives packaged within continually advancing technologies have been multiplying rapidly for over a decade and we still do not fully comprehend their impact on scholarly communication. On a more fundamental level, there is confusion on basic facts; this researcher even found disagreement among ISI sales representatives and trainers over whether their own product, *Journal Citation Reports*, actually covered citations in electronic journals. Research is progressing however on various other ways of evaluating the use and impact of electronic journals (Harter, 2000; Mercer, 2000; Covi, 2000). This latter area of electronic evaluation is beyond the scope of this study.

Hypothesis: effect of electronic growth on print

The effects of electronic growth on the print side of the house have been less well documented. The common assumption seems to be that print use would decline, especially if users were given a choice between a printed copy of a journal and an online equivalent, and particularly if presented with convenient links to full-text. In the UC Davis library, users have

access currently to a fairly large number of titles in dual print and electronic formats, and it was surmised that a study of print and electronic use in this environment would be useful for collection planning, particularly in making print vs. electronic decisions. The information would also inform our understanding of relative cost and value of format in different subject areas.

It is important to note that a primary goal for this exercise was to create more efficient methods for analyzing collection use, cost, and value information. Cost-benefit studies are historically among the most time-consuming and costly efforts libraries undertake. Although their value is rarely questioned to support cancellation projects, the pace of change in today's collections demands faster access to use, cost, and value information. The study team is attempting to develop routines which make better use of circulation and cost data already resident in library systems, with the goal of developing an automated system wherein collection managers can submit queries for evaluative information on journals, subject areas, and so on.

UC Davis facts

The University of California, Davis is a general academic campus with particular strengths in the agricultural and veterinary sciences, engineering, biological sciences, and more recently, humanities and social sciences. In 2000-2001, campus students and faculty numbered 20,239 undergraduates, 5,765 graduate and professional students, and 6,735 faculty and academic personnel. Ten to twelve percent enrollment growth is anticipated over the next ten years.

The University Library consists of a main library for the general arts and sciences and three campus libraries: health sciences, physical sciences and engineering, and agricultural and resource economics. An additional off-campus library serves the Medical Center. The Library is an ARL member institution with collections totaling close to three million items. UC Davis Library frequently negotiates cooperative licensing and/or purchase agreements in consortium with the nine other UC campuses and the California Digital Library.

The study

The intent of this study was to compare use, cost and value data between a set of journals owned in print

format over a specified time period, with a set of journals owned in both print and electronic formats – the “hybrid” collection – during the same time period. Our primary goal was to identify characteristics of use, cost, citation patterns, and so on, particular to the print-only and hybrid print/electronic environments.

Key questions to be answered included: what was happening to the print titles where we had an electronic copy available? How do we compute a cost-per-use of an electronic journal? How do we account for differences in licensing terms? How can we compare this to a cost per use for a print subscription? Has the availability of electronic versions of scholarly journals had an effect on citation patterns, such as might show in impact or immediacy factors? Does having a journal carried in or excluded from an aggregated product affect use?

Data collection

We started with a set of data associated with a traditional cost-benefit analysis: use and cost data, impact factors and immediacy indexes, the number of abstracting and indexing (A&I) resources providing coverage, and the number of years of library holdings. Cost and print use data was collected for the time period 1998 to 2000; electronic use for 2000; citation data for the years 1993 and 1999; and A&I coverage information for 2000.

It is important to note that at the time the use and cost data were collected, UC Davis Library did not have an integrated library system (ILS). Although the team has created and will continue to refine a database, query structure, and report formats in Microsoft Access™, data extraction routines will likely have to be rewritten for the ILS when it is brought online in 2002.

Use data for our print titles came from a DRA circulation module, cost information from an Innovative Interfaces acquisitions program. Impact factors and immediacy indexes came from ISI *Journal Citation Reports*. A&I coverage data will be extracted from the JAKE database¹, as will be full-text/aggregator availability. Electronic journal use data was provided from the vendors.

Approximately 1,100 titles were included in the preliminary exercises reported below; 623 titles available in print and electronic formats, and 584 titles in print only. Print/electronic titles were selected from three vendors whose use statistics were reasonably consistent and whose license agreements and pricing structures were similar. Print only titles were selected at random from the balance of the journal titles whose use and cost data were quickly verifiable.

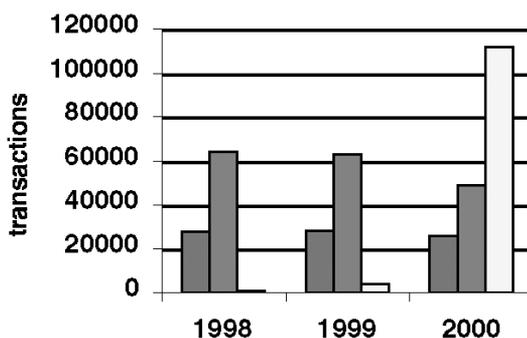
Preliminary results

Following are highlights of the preliminary cost and use analysis.

1) USE

- ◆ Total print use for all 1,100 titles in this study declined from 1998 to 2000 (figure 1). [P=print only; PE=print/electronic]

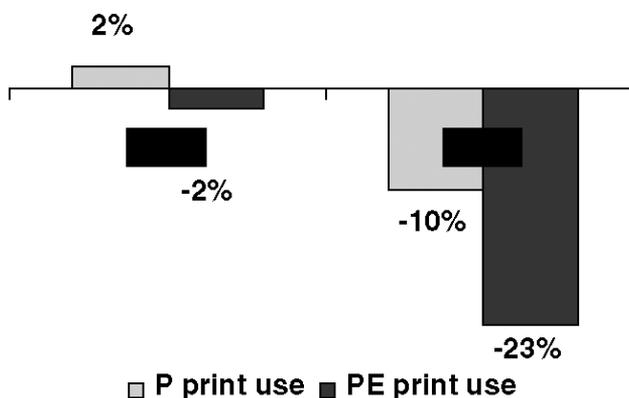
Figure 1. Print and online use



- P print use ■ PE print use □ PE online use

- ◆ Total print use of titles owned in print format only was about half that of total print use for titles also available online.
- ◆ The use of print-only titles actually increased 2 percent from 1998 to 1999. In 2000, however, print use of these titles declined 10 percent (figure 2).

Figure 2. Percent change in print use



- ◆ In contrast, print use of titles also provided in electronic format (PE) declined 2 percent from 1998 to 1999. Print use of these titles declined an additional 23 percent in 2000.
- ◆ Online use of journals continues to increase exponentially, although it is difficult to calculate use prior to 2000 because of irregular use reports (1998 and 1999 use was estimated for figure 1). Over 110,000 articles were viewed or downloaded during 2000 for the 623 titles in this study. In contrast, total print use of these titles, as measured by circulation or re-shelving transactions, was around 50,000.

2) COST

Compiling accurate costs continues to be one of the most time-consuming parts of the study. The data for these 1,100 titles are approximate, and are based on order records from Innopac as well as information from the California Digital Library and vendor lists. Title-by-title review is still necessary to assure accuracy.

- ◆ For the titles in this study, average cost per print use for print-only titles is about half that of titles also available online (\$24 vs. \$56 in 1999).

In the electronic environment, we have several other complicating issues that seem to preclude pursuing the same type of simple print cost per print use calculation. Detailed discussion is beyond the scope of these proceedings but these include access restrictions, annual fees paid by the California Digital Library, and size of back-files. As Odlyzko (1999), Montgomery (2000), and others have noted, costs of managing and maintaining an electronic journal collection are different from costs in the print collection, for example:

- ◆ print journals generate costs in stacks, processing, binding, and periodicals desk, where e-journals do not.
- ◆ acquisition of e-journals has shifted staffing patterns to accommodate online processing, license management, and trouble-shooting, among other tasks. In addition, even as estimates of staffing are accurate for the tasks being performed in the current environment, these will certainly change quickly as we begin operating an integrated library system, and as we continue to respond to changes in the external serials environment (changes in vendors, holdings, technology).

Despite these limitations, we can examine these “other direct costs” for print and electronic subscriptions at a given point in time to get a more accurate picture of the costs of print vs. electronic. For example, in 1999, subscription and other direct costs for current journals amounted to approximately (figures 3 and 4):

Figure 3. Print journal costs

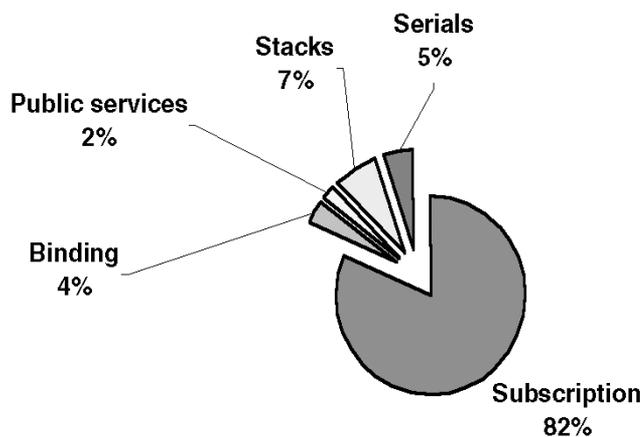
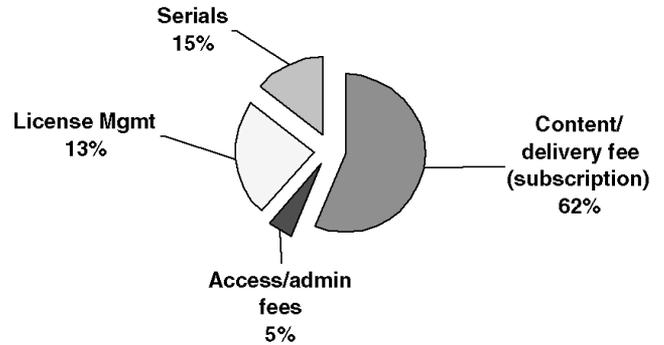


Figure 4. Electronic journal costs



Applying this model to a very simple cost-per-use formula using the data collected on the 1,100 sample titles, the differences between electronic and print average cost-per-use amount to \$24 per use for print titles and \$11 per use for electronic. While this oversimplified approach does not take into account indirect costs of facilities, systems, public services, and administrative activities spread throughout the library, it does indicate that despite added licensing and other acquisitions and management costs, higher levels of electronic use have resulted in more cost-effective access.

Measuring print and electronic use

An important variable to be addressed at this point is the inherent difference in measurement techniques between print and electronic journals. As McClure and Lopata (1996) have noted, the ways we calculate print and electronic usage do not measure the same thing. How can we compare the two?

In our study, print use is derived from scanning items as they are re-shelved, and includes all use: outside circulation and in-house use, as well as use by all users: students, faculty, staff, non-UC. No attempt is made to prevent users from re-shelving their own materials, nor do we observe any other characteristics of use. Because of this, we know that our estimate produced by scanning will thus be less than some unknown “actual” value. We can assume, however, that the amount of error between our transactions records and the unknown actual use will approach a constant rate for the collection as a whole. In other words, our system is not exact but it is consistent. And more importantly for trend analysis, it is consistent over time.

Electronic use on the other hand, is purported to be a more precise figure, despite the current wide variation in vendors’ methods for calculating article “views”, “downloads”, etc. This variation will likely continue to decline over time as pressure is brought to bear from various library groups for better consistency. For now however, we could assume, based on our limited knowledge of user behavior, that the amount of electronic use is possibly over counted to some also unknown degree.

Here too we can assume that this rate of error will also approach a constant for the collection.

As our sample size increases, accepted statistical methodology tells us that our observed rates of error will approach these constant rates. So, while we do not have an exact apples-to-apples comparison, we do have two sets of data which we can rely on to be consistent in what they represent in terms of relative use of the collections. This is vitally important for understanding emerging trends in use in the hybrid print/electronic environment.

Measuring costs of electronic journals

So far our study has confined itself to three electronic journal vendors whose license terms are somewhat similar although not identical. We have calculated and included license-specific costs for content, media delivery, and annual access for the titles in this study. There are, however, other license conditions regarding access, cancellations, and interlibrary loan (ILL) which are more difficult to quantify and these latter conditions are not included, although they may be considered later.

The cost sharing that occurs in the system-wide consortium environment and especially the cost contributions of the California Digital Library (CDL) have a substantial impact on local costs. In order to accurately assess total costs of electronic journals, however, our cost model should provide some visibility for annual "administrative", "access", or "platform" fees charged by a vendor, even if those costs may be paid for in whole or in part by the CDL. The formulas for including these fees were approximated based on ratios of subscription costs among campuses for the titles in the study.

Conclusion

Results of the preliminary exercises in the UC Davis study suggest that electronic journals do affect use and cost of the print collection to a significant degree. More discrete analysis by title and subject area will provide locally useful information for collection managers. Future tasks in the study include 1) analyzing changes in impact factors from these journals to explore whether there is a relationship between electronic access and impact; and 2) assessing the rate and quality of online A&I coverage and linking of journal titles.

References

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Note

1. The JAKE database is a free dataset containing a large body of information on specific electronic journal titles and other resources. It is cooperatively maintained by librarians and programmers in several institutions. <<http://jake.openly.com/>>