Usage Statistics for Electronic Journals: An Analysis of Local and Vendor Counts

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Abstract

Vendor-supplied e-resource statistics are often unavailable, unreliable, or not comparable across vendors. This study compared locally-generated usage statistics to those supplied by four major publishers, and analyzed the resulting patterns of use. The additional information provided by vendor statistics was assessed to see how it might be utilized selectively to provide a better understanding of the importance of individual titles. The local statistics for all titles provided by the four publishers were then compared. A strong similarity between the two datasets was found, supporting the position that local statistics are a viable alternative to vendor statistics. Another finding was that the 80/20 rule is closer to 80/30 in the online environment. Some of the issues for subject librarians and electronic resources librarians are discussed.

Introduction

Now that the glamour of electronic journals has worn off a bit, and budgets have become increasingly limited, academic librarians are less inclined to sign on to as many e-resources as possible; they can no longer afford to take advantage of every opportunity that presents itself. Instead, they are favoring a more balanced approach to providing the content needed by their users. That is not to say that networked electronic access is not important, but rather that librarians are necessarily becoming more discerning in managing electronic resources within their collections. They are questioning the value of each title, as well as the value of purchasing large packages of electronic journals. Are all those titles really needed, especially those that an institution never required in print? Or are titles previously unavailable in print receiving significant use? To better meet user needs and make every dollar count, librarians would like to apply the same sorts of data analysis to e-journals as they have traditionally applied to print journals,

focusing on usage statistics, cost, and cost per use. However, in an electronic environment the data is much more difficult to gather, analyze, and compare across titles (Luther 2000, 3-4). What are the options?

The natural first step is to look to the data supplied by each vendor, *if* the data is supplied, and try to make use of it. However, it quickly becomes apparent that this is no easy task. Since the late 1990's, the library community has been requesting that e-resource vendors comply with the International Coalition of Library Consortia standard, *Guidelines for Statistical Measures of Usage of Web-Based Indexed, Abstracted, and Full Text Resources*, with scattered results (ICOLC 2001). According to the Association of Research Libraries (ARL) E-Metrics Phase II Report, vendor statistics are often "inaccurate, inconsistent, and unreliable" (Shim et al. 2001, 37), and thus not comparable across vendors; in short, they do not fully comply with the ICOLC standard. For example, some vendors, like Wiley, do not include the titles with zero hits in their monthly usage statistics, resulting in lists that could differ by 50 titles each month. Others, like the Institute of Electrical and Electronics Engineers, do not provide breakdowns by title. In addition, the definition of "usage" still varies from vendor to vendor. Until January 2002, Elsevier included hits to abstracts in the same counts as hits to full text, resulting in inflated statistics. And finally, every vendor provides data in its own wildly varying format, making integration and comparison of data from various publishers difficult. Some vendors offer monthly statistics, whereas others offer quarterly or even annual statistics. The American Chemical Society (ACS) combines all full-text statistics together for a 3-month period and provides the data for every individual IP address registered for an institution, or in the case of the University of Minnesota, for the entire regional consortium that licensed access. The ACS does not provide monthly statistics, nor can they separate out the IP addresses of each institution, making it extremely time consuming for each campus to extract its own usage.

More recently, Counting Online Usage of NeTworked Electronic Resources (COUNTER), a multi-agency project, was developed to address the issue. It has proposed a Code of Practice for usage reports that specifies "the data elements to be measured; definitions of these data elements; usage report content, format, frequency and methods of delivery; protocols for combining usage reports from direct use and from

use via intermediaries" (COUNTER 2002). Vendors would need to meet these standards to be considered "COUNTER compliant." The purpose of the project is laudable; its success remains to be seen.

Unfortunately, at present one of the conclusions of the ARL E-Metrics Phase II Report -- that vendors are not the solution -- is still valid: "[I]t is largely impossible to compare data across vendors, and we recommend that comparison be limited to data from the same vendors. We believe that the comprehensive standardization of usage statistics and data delivery methods (e.g., file format and data arrangement) cannot be easily achieved in the short-term" (Shim et al. 2001, xv).

To overcome some of the deficiencies of vendor-supplied statistics, and to obtain sound data to inform renewal decisions, especially of pricey large journal packages, we decided to look at a local alternative, the e-journal counter developed by the University of Minnesota-Twin Cities Campus Libraries (referred to hereafter as "the Libraries").

The E-Journal Counter

The simplicity of a "do-it-yourself" e-journal counter solution, the number of peer institutions who had already adopted it (Baker and Singer 2000; Porter and Sponsler 2001, 113; Montgomery and King 2002), and the recommendation of such an approach in the ARL E-Metrics Phase II Report (Shim et al. 2001, 53) provided compelling reasons to study this alternative and examine its validity and reliability.

As it happened, the Libraries' Web Services Coordinator had been experimenting with a usage counter for article indexes and databases, as an extension of the Libraries' web site statistics (to measure hits to "outside" sites). It was decided that a click-through counter on the Libraries' Electronic Journals web page, and subsequently on all e-journal links within the Libraries' online catalog, should be applied.

Simply defined, the click-through e-journal counter recorded the number of times a user clicked on a link that left the Libraries' web site or online catalog. The e-journal counter was developed as follows.

Tools Used

- MySQL: popular open source database software
  http://www.mysql.com
- PHP (PHP: Hypertext Preprocessor): web scripting language for dynamically generated web pages
  http://www.php.net/
- EZProxy: software for authenticating off-site users of licensed e-resources
  http://www.usefulutilities.com/ezproxy/

How It Works

1. Each new e-journal vendor is added to the EZProxy configuration file, ezproxy.cfg (vendor name, URL, and domain).
2. Each new e-journal title is cataloged with the counting prefix http://ej.lib.umn.edu/?url= attached to the vendor URL.
   Example: http://ej.lib.umn.edu/?url=http://www.jbc.org
   This coding is transparent to the user. All the user sees is the vendor URL: http://www.jbc.org
3. When the user clicks the title link, the library web server determines if the request is coming from on-site or off-site.
   - If the user is *on-site*, s/he is forwarded to the electronic journal URL, and a hit is logged for that title in the local statistics database.
   - If a user is *off-site*, s/he is forwarded to a login screen asking for a University Internet ID and Password. If the user successfully logs in and authenticates, a hit is logged for that title in the local statistics database. The user is then forwarded to the EZProxy server, and finally to the requested electronic journal.
4. Title-level statistics reports can be obtained immediately by searching on the Libraries' e-journal counter page, which queries the statistics database. Count totals are also run monthly. The data, sorted by hits to the current month and tallying totals to date, look like this:

Title	URL		Sept.	Oct.	Nov	Dec.	Total for Year
JBC	http://www.jbc.org	135	162	176	144	617	

This counting of local logins can also be accomplished through an OpenURL resolver program like SFX.

Objectives of the Study

We were aware of the limits to such a counter. First, it could not count usage from journal home pages that individual users had bookmarked. Second, such a counter could record only users' "knocks on the front door" of a resource (i.e., unique sessions); we would still be reliant on vendors for counts of searches and articles viewed once users got inside the door. Third, a focus on usage statistics provides an incomplete picture of user behavior; it offers important data to help inform collection decisions, but clearly further study and the personal knowledge of individual subject librarians are needed.

The objectives of our study included a means to address the first two criticisms; the third, the need to study user behavior in relation to statistics, is outside the scope of this paper. Our objectives were:

- To determine the extent to which patterns of use obtained through local statistics and vendor statistics were similar, which would indicate whether the exclusion of counts due to bookmarking and direct access to publisher web sites significantly changed the data.
- To assess what additional information was provided by vendor statistics and how that information might be utilized selectively to provide a better understanding of the importance (or lack of importance) of individual titles.
- To examine whether usage statistics in the electronic environment follow the same pattern as those in the print environment. In particular, we sought to determine whether the 80/20 rule – that 20% of the collection gets 80% of the use (Trueswell 1969) -- applies in the electronic environment, as it traditionally has in the print environment.
- To compare local usage statistics across all titles provided by four major publishers, examining:
  - Whether librarians could fulfill users' needs by selecting electronic journals on a title-by-title basis or whether usage patterns indicated that large packages were preferable.
  - Whether any difference in usage patterns existed between titles from three commercial, multidisciplinary publishers and those from a discipline-focused, society publisher.

Methodology

We studied the usage statistics for electronic journals from the following four publishers (when the study was begun, Academic Press had not yet been acquired by Elsevier):

- American Chemical Society (ACS)
  - 29 titles in study
  - Discipline focused (chemistry)
  - Electronic access to print subscriptions only (we subscribed to all titles)
- Academic Press IDEAL
  - 160 titles in study
  - Multidisciplinary
  - Electronic access to all titles held by participating consortial institutions
- Elsevier ScienceDirect
  - 1062 titles in study
  - Multidisciplinary

    - Electronic access to entire suite of titles
- John Wiley & Sons, Inc.
    - 345 titles in study
    - Multidisciplinary
    - Electronic access to entire suite of titles

We defined usage statistics or "hits" as follows and specified the period of coverage for each part of the study:

- Local E-Journal Counter
    - Logins to e-journals from "proxy" links in the online catalog, the Electronic Journals page of the Libraries' web site, and Libraries' unit web pages (for example, the University of Minnesota Science & Engineering Library's e-journal web pages)
    - Statistics covered September 1, 2001, through March 31, 2002

- Vendor Statistics
    - Full-text article downloads (although Elsevier statistics included hits to abstracts until they changed their reporting in January 2002 and specified full-text downloads only)
    - Statistics covered September 1, 2001, through March 31, 2002
    - Statistics from the American Chemical Society covered October 1, 2001, through March 2002 because the ACS could only provide them on a quarterly basis and could not break out the month of September separately

Because the local counts and the vendor counts were to be compared directly, their title lists had to be exactly the same from the beginning to the end of the study. Therefore, journals that changed publisher, or began or ceased publication during the study were eliminated, as were any titles for which we did not have reliable statistics from either the publisher or the local e-journal counter. In addition, data for journals that changed title, as well as for supplements such as those for ACS titles, were merged under one title. For example, from Elsevier's initial dataset, these subsets (188 titles in all) were deleted for the following reasons:

- 11 titles were acquired from other publishers during the study
- 70 journals changed title in some way (title change or merger) before or during the study
- 76 titles ceased publication before or during the study
- 31 titles were transferred to another publisher before or during the study

Usage statistics from the various vendors were then collected and presented in a consistent format in an Excel spreadsheet. This cleanup was the most time consuming aspect of the study, requiring over 50 hours

of staff time for seven months of data from four publishers. The process highlighted the need for vendor reporting standards or the success of our local e-journal counter alternative.

Finally, a program was run against our online catalog to identify all the titles in the study to which the Libraries had print subscriptions, allowing us to compare usage statistics for subscribed versus nonsubscribed print titles.

Findings: Comparison of Four Publishers

Vendor Statistics vs. Local Statistics

Two spreadsheets were compiled for each publisher, one for vendor statistics and one for local statistics. These spreadsheets included journal titles and number of "hits" or usage for every title; each spreadsheet was then ranked by usage, from greatest to least. Two calculations were then made for each title: the cumulative percentage of use, up to and including that for each title; and the cumulative percentage of titles that appeared in the list, up to and including the title, according to ranking. For example, local data for the first ten titles of the American Chemical Society appeared as shown in Table 1.

Table 1. Sample Local Data for the American Chemical Society.

American Chemical Society Titles	Local Use 9/01 through 3/31/02	Cumulative % of Use	Cumulative % of Titles
1 Journal of the American Chemical Society.	2774	21.15%	3.45%
2 Journal of organic chemistry.	1330	31.29%	6.90%
3 Macromolecules.	1281	41.05%	10.34%
4 Journal of physical chemistry A&B	1216	50.32%	13.79%
5 Organic letters	1011	58.03%	17.24%
6 Biochemistry.	808	64.19%	20.69%
7 Inorganic chemistry.	555	68.42%	24.14%
8 Analytical chemistry.	552	72.63%	27.59%
9 Accounts of chemical research.	538	76.73%	31.03%
10 Chemical reviews.	499	80.53%	34.48%

To more easily compare lists of vendor and local data, we created our own definitions of high and low use. We defined *high* use as the top 50% of use and *low* use as the bottom 5% of use and examined the usage patterns within these subgroups of usage. We chose cutoffs as close to 50% and 5% as possible, while ensuring that these cutoffs occurred at points where the number of hits actually differed. For example, if the point at which the top 50% of use occurred in the middle of an alphabetic list of titles each with 200 hits, we chose the cutoff to be between 200 and the next point at which the number of hits went down. In this case, the point at which 200 hits fell to 195 might have accounted for 50.35% of use.

Comparing Percentages of Titles in the Top 50% and Bottom 5% of Use

Figure 1 describes the percentage of titles for each vendor that account for the top 50% of use, for both local and vendor statistics. In all cases, a clear minority of the titles, ranging from 8 to 14%, accounted for the top 50% of use. For each publisher, the local and vendor data differed by 0-2%. In addition, the usage patterns for local and vendor data were very similar across all publishers: local data ranged from 9 to 14% while the vendor data ranged from 8 to 14% of use.

Figure 1. Percentages of Titles in the Top 50% of Use

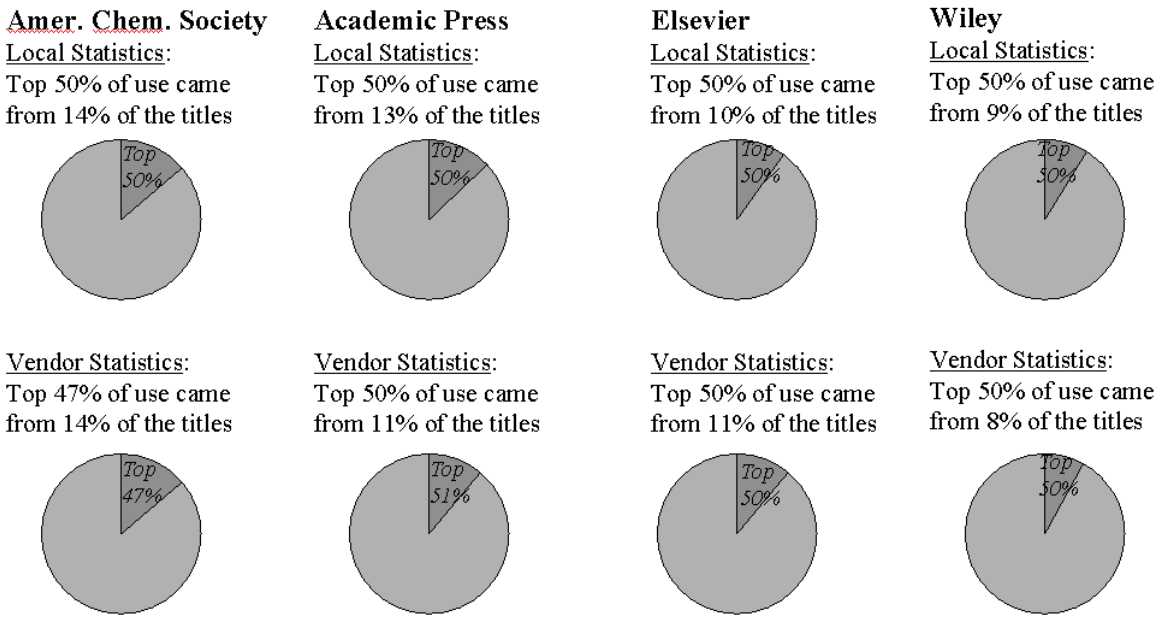
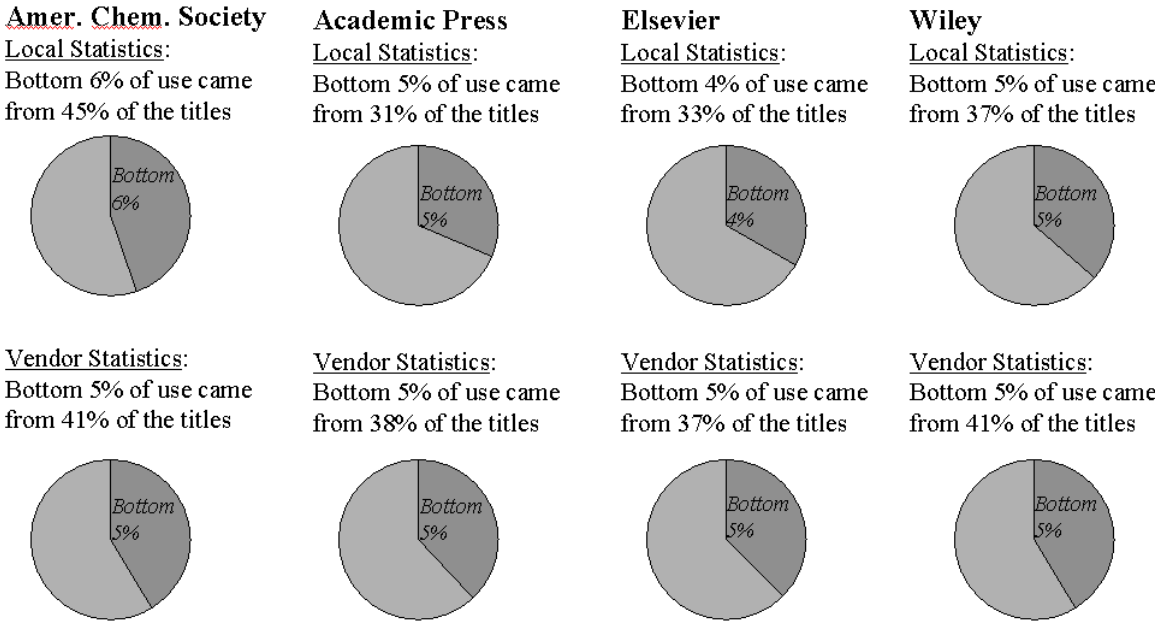


Figure 2 describes the percentage of titles for each vendor that account for the bottom 5% of use. Here, the opposite is true: a significant number of titles account for the "least important" percentage of use, although the lowest use for one publisher, the ACS, was still fairly high, as discussed later. For each publisher, the local and vendor data differed by 4-7%. In addition, the usage patterns for local and vendor data were somewhat similar across all publishers: local data ranged from 31 to 45% (though the commercial publisher data were more consistent, ranging from 31 to 37%) while the vendor data ranged from 37 to 41% of use.

Figure 2. Percentages of Titles in the Bottom 5% of Use



Comparing Actual Ranked Title Lists in the Top 50% and Bottom 5% of Use

We then examined the actual titles that appeared in each ranked list. Although the *percentages* of high-use and low-use titles for both local and vendor lists were similar, we wanted to know whether the *actual* local lists would provide subject librarians with reliable indicators of the most important and least important titles for their users.

As shown in Figure 3, results showed significant overlap for all publishers for the top 50% of use, ranging from a low of 70% overlap for Academic Press to an impressive high of 95% for Elsevier.

Results for the bottom 5% of use, as shown in Figure 4, were almost the same. The lowest amount of overlap was 72% for Wiley; the highest amount of overlap was 92% for the American Chemical Society.

Print Usage vs. Electronic Usage

We were also interested in examining whether usage statistics in the electronic environment follow the same pattern as those in the print environment. The logical first question is whether the 80/20 rule for print journal usage still applies.

Table 2. Does the 80/20 rule apply in the electronic environment?

	Local	Vendor
American Chemical Society	81/34	79/34
Academic Press	80/38	80/33
Elsevier	80/35	80/33
Wiley	80/31	80/29

The differences between the local and vendor data were minimal. The numbers were roughly the same (for ACS) or differed by 2-5% (for the commercial publishers). So usage in the electronic environment did differ from the print, but not by much – roughly one third of the titles accounted for 80% of the use. Again, a minority of titles accounted for the majority of use. It is worth noting that in most cases, the vendor statistics showed slightly lower percentage of use than the local statistics.

As a point of comparison, Davis found that the NorthEast Research Library (NERL) consortium's cumulative use of IDEAL (not including the Harcourt Health Science collection – i.e., the same title set used in our study), as reflected in vendor-supplied statistics for article downloads, came to 80/24; "[f]or the large research institutions, nearly 80 percent of the use was satisfied with 20 percent of the collection"

(2002, 487-88). Our vendor statistics for IDEAL came to 80/33, so NERL's use was even lower. However, a study of all OhioLINK consortium libraries, covering article downloads from six publishers in 2000, found 80 percent of the use coming from 40 percent of the titles (Kohl 2002).

We then looked at the percentage of print subscriptions in the top 50% and bottom 5% of use. How well did subject librarians anticipate user needs in the online environment? In most cases, in the top 50% tier – for both local and vendor statistics – the findings showed most titles were already subscribed in print (from 96-100%). Of more interest is the bottom 5% tier, as shown in Figure 5. For each publisher, the local and vendor data differed by 3-6%. For Elsevier, both sets of data show that we subscribe to less than 50% of the titles in print; for Wiley, both sets of data show that we subscribe to less than 40% in print. The percentages held in print for Academic Press were significantly higher, but this reflects the terms from a 1996 state-funded consortial contract that offered an attractive 75% discount on print copies for individual libraries.

We then tested the similarity or dissimilarity between the vendor and local ranked title lists. Using a local statistical analysis software called MacAnova, we compared each title's ranking on the local data list to its ranking on the vendor data list. For example, *Journal of Molecular Biology* was ranked tenth in hits on the local list, and it was ranked sixth on the vendor list – a difference of four places. We calculated the vendor-local differences for each title, ranked them from greatest to least, and then normalized the data sets by dividing each difference by the total number of titles for each publisher, providing us with "percentage differences." We then examined the percentage of titles for each publisher that accounted for a range of percentage differences, in 5% increments. A histogram of the results for Elsevier titles is shown in Figure 6. Table 3, which accompanies the histogram, shows the proximity of titles on the two lists at percentage differences of 5, 15, 25, and 35%. Overall, the results showed that the two title lists were fairly close. For all publishers, at least 3 out of 4 titles on the vendor list were within 25 percentage points of that title on the local list; roughly 2 out of 3 titles (or better) on the vendor list were within 15 percentage points of that title on the local list. So, acknowledging that the two measures are counting different methods of access (logins vs. full text views), the degree of similarity between the results list is substantial.

Table 3. Comparison of Ranked Title Lists –

How far apart were journal titles when ranked according to usage for local and vendor data?

	Percentage of titles with a percentage difference in rank of **5% or less** between local and vendor use data	Percentage of titles with a percentage difference in rank of **15% or less** between local and vendor use data	Percentage of titles with a percentage difference in rank of **25% or less** between local and vendor use data	Percentage of titles with a percentage difference in rank of **35% or less** between local and vendor use data
American Chemical Society	45%	90%	100%	N/A
Elsevier	32%	67%	86%	94%
Academic Press	31%	64%	83%	97%
Wiley	28%	61%	79%	91%

Aggregated Data of Local Statistics for All Publishers

Although the patterns of use between local and vendor data for each publisher corroborate one another, the numbers themselves do not have much meaning until one combines the data of all the publishers into one list, and is able to rank all the titles according to use. In our case, we combined all of the local data for all publishers into one spreadsheet and the results of our analysis are shown in Figures 7 and 8.

Figure 7 shows the average use per title for each publisher in the top 50%, top 80%, and bottom 5% tiers in the aggregated list. The first thing that jumps out is how much higher the ACS use is in the Top 50% than that of the other three publishers – about three times greater than each. ACS did not fall in the bottom 5% at all. Also, it is striking that the results for the commercial publishers were so similar in these two tiers. The low use for these publishers in the bottom 5% represents roughly one login a month.

Figure 8 shows the percentage of each publisher's titles in each tier. Again, the numbers for ACS are startling when compared with the others; roughly two thirds of its titles were in the top 50%, whereas less than 10% of the other publishers' titles were in that tier. As noted previously, there are no ACS titles in the bottom 5%. A significantly larger percentage of the commercial publishers' titles were in this bottom tier.

The numbers for Elsevier and Wiley were very similar here, and Academic Press had a smaller percentage than its commercial counterparts.

Conclusions and Recommendations

Both local and vendor usage data have their own strengths and weaknesses. Both have their place in the digital library's suite of quantitative evaluation measures. In a study done around the same time as the present study, North Carolina State University Libraries found that its local use counter and vendor-supplied statistics (for indexes as well as e-journals) "correlate[d] well in terms of use patterns, but that actual usage values differ[ed] for many products" (Duy and Vaughan 2003). It is worth noting, however, that the e-journal part of their study focused exclusively on access at the vendor home page level, not at the title level, comparing login "sessions" only and not article downloads.

Local Counter

Advantages	Disadvantages
A viable alternative to vendor data – offers consistent, reliable data.	Does not count sessions by users with bookmarks / favorites to specific titles or who access the publisher's site directly.
The ability to compare data among titles from different publishers.	Does not reflect the number of article downloads per title – libraries are still reliant on vendors for this data.
Ease of use by subject librarians.	

Vendor Data

Advantages	Disadvantages
May provide more specific data: tables of contents, abstracts, full text.	Can be questionable or not completely reliable, due to inconsistent definitions and content.
	The inability to compare data among different publishers.
	Data often requires a great deal of clean-up and manipulation; very difficult for subject librarians to use.

The disadvantages of the local counting method were known from the start, but the extent of the bookmarking effect was not. It was suggested at the start that the bookmarking could be an equalizer of sorts, since all of our e-journal publishers would be subject to the same limitation on counting. We did

wonder, however, whether the effects of bookmarking would be more pronounced for a smaller package of discipline-focused titles such as that from the American Chemical Society compared to larger, more interdisciplinary resources like IDEAL, ScienceDirect, and InterScience. We did not find that to be the case, noting a strong similarity between local and vendor use data. If the chemists were bookmarking those journals, it did not noticeably detract from their standing in the local statistics. So the bookmarking effect may not be so great after all.

The subject librarians who have taken advantage of the local counter are pleasantly surprised at the ease of gathering the statistics via a web interface. They do not have to inquire of the vendor or figure out how to manipulate the data into a format they can use. Since the definition of a hit is the same for all publishers, they can safely run comparisons across publishers. All in all, they can now easily and quickly customize a statistical report to a degree that was previously not possible or was exceedingly difficult and time-consuming (or subject to the charge of comparing apples and oranges).

The disadvantages of vendor-supplied data were certainly known from the start, but the magnitude of the problem was amplified when working simultaneously with local counts for the same vendor. The problems with the vendor data noted in the Methodology section echo those noted by ARL E-Metrics project staff. The need for a project like COUNTER shows that a critical mass of publishers who can supply libraries with reliable, comparable data is still lacking – and that local counting efforts are worthwhile for the near future. The comparison of the ranked title lists showed a strong similarity between local and vendor statistics, supporting the position that local statistics are a viable alternative to those supplied by vendors.

On the basis of this evaluation, we offer the following recommendations for subject librarians and electronic resources librarians:

Put data in context.

Usage data provides a basis on which to analyze a serials collection. However, other elements must also be considered -- e.g., selector knowledge of the discipline and the needs of primary users. It is very easy for an administrator to take numbers out of context. For example, a journal may receive low use but be

extremely important to a key faculty member or an emerging area of departmental research. Or the title may receive low use compared to other titles in that package, yet be of higher use when compared to titles across all publisher packages. Another possible scenario is that one could just report the total number of hits for a large package like InterScience or ScienceDirect, leaving out the fact that the number of hits for many of the included journal titles may be very low (as the bottom 5% findings here indicate).

Reconsider Big Deals.

Although the 80/20 rule is expanded to 80/30 or almost 80/40 in an electronic environment, a very large number of titles are receiving little use. Therefore, librarians should consider moving away from package deals and focus on title-by-title selection (when vendors provide the option). Where they do not offer this option, librarians should exert their considerable market pressure and demand it.

In its response to Ken Frazier's D-Lib Magazine article "The Librarians' Dilemma: Contemplating the Costs of the 'Big Deal,'" the OhioLINK Library Advisory Committee stated that librarians who "claim to know precisely what their patrons need" and pursue title-specific selection "do a disservice to the patrons" and should opt instead to buy all titles from a publisher and let their users be the selectors (2001). Yet the number of subscribed titles in the top 50% of use in this study showed that subject librarians can and do choose the titles most needed by their patrons. In an era of state budget deficits and sharply-reduced funding for libraries, subject librarians will increasingly find multi-year all-or-nothing packages with built-in price increases and no-cancellation policies to be both unaffordable and dangerous to small but important society publishers (whose titles must often be cancelled to sustain these agreements). They will be forced to make tough choices for their patrons, which may mean paying higher per-title costs to obtain far fewer journals, but with the flexibility to maintain subscriptions from a variety of society and commercial publishers.

Use local usage data to inform fund allocations as well as collection decisions.

Local use data allows us to compare usage across publishers and disciplines. We should consider this data in evaluating how acquisitions funds are allocated and how electronic resources are paid for (centrally or through subject funds). If some discipline-specific resources like the American Chemical Society e-

journals end up receiving much greater use than interdisciplinary resources like InterScience and ScienceDirect, then securing ongoing funding for those disciplines should be reviewed in light of institutional priorities.

Use vendor usage data for in-depth studies.

It may be useful to occasionally compare local statistics with vendor statistics to understand usage in more depth. For example, important titles to small user groups may show lower use in locally-gathered statistics, but higher use in vendor-supplied statistics (although we did not find this to be the case for ACS). Amount of use will have to be balanced against the needs / priorities of distinct user groups (perhaps a small but emerging department or area of campus research) and their importance relative to others on campus.

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