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Leveraging Use-by-Publication-Age Data in Serials Collection Decisions

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Abstract

Traditionally, usage figures for electronic serials have lumped all years of publication together. New tools give librarians information about usage according to the year of publication. They allow us to analyze the usage of current material separately from usage of content published in prior years. The relative value of current subscriptions and backfiles has important collection development implications. For example, many libraries subscribe directly to titles that are offered in aggregated databases, but with embargoes. The relative value of current content distinguished from prior years may be useful in reevaluating such subscription decisions.

This paper discusses tools and techniques for analyzing usage by year of publication according to several measures—including COUNTER's JR5 report, Google Analytics, ILL reports, and token reports, and discusses how librarians can use these tools to aid in decision-making about serials collection development decisions.

The "serials crisis"—of periodical subscriptions eating up the budget for other materials—that libraries have endured since the late 1980s has spurred many laudable efforts to develop methods of identifying the serials of the most value to a library's patrons. Dozens of models for such evaluation have been published, involving any number of metrics as well as qualitative judgments. Amid the welter of bibliometrics ranging from Impact Factor to altmetrics, one measurement seems to always be included in serials evaluation models: usage (along with its derivative metric, cost-per-use—CPU).

Although a valuable metric, CPU is problematic for a number of reasons; in this paper, we will focus on complications that arise related to the publication date of materials. Traditionally, usage figures have counted all uses from a periodical title that occur in a given time period—regardless of the date of the article's publication. As Blečić, Wiberly, Fiscella, Bahnmaier-Blaszczak, and Lowery (2013) note, "the cost is for one given year while the retrievals reported in a year can derive from multiple volumes and years of the journal" (p. 180). So a reader who downloads in 2014 an article published in 2004 still triggers a count of one use. And a librarian calculating usage and CPU may accept that usage figure as indicative of the value of the current subscription to her

community of users. In most cases, however, the situation is not that simple. Very often, the prior years of a serial title will be available to a library's patrons—because the library has perpetual access to previously subscribed content, because the journal's content becomes open access after a set period of time, or because embargoed access is available in an aggregated database. The current year's subscription really only purchases the current year's content.

We are not the first to discover this, of course. Earlier research identified this problem but required number-crunching that was beyond the capacity of most librarians to calculate improved estimates of the true cost of access to periodical content. And many libraries have dispensed with, or always lacked, efficient mechanisms for measuring print journal use. However, recent advances in data gathering and reporting have put estimates of use by publication year within the reach of many librarians. In this paper, we will discuss our observations of general trends in usage of periodical content according to the year of publication, using four tools: the JR5 COUNTER report, information from a publisher's "token" program, interlibrary loan reports, and Google Analytics applied to link resolver web pages. Further, we will explicate methods of calculating adjusted CPU figures. We will discuss how these

new data and calculations apply to four different scenarios facing librarians charged with collection development decisions: whether to adopt a token program or a similar Get-It-Now program facilitated through interlibrary loan software; whether and how to abandon a Big Deal; and whether to purchase serial backfiles.

A Case Study in the Importance of Usage Figures by Year of Publication

COUNTER reports for usage figures have traditionally prioritized the JR1 report, which counts all usage of a given title, regardless of the date of publication. Until 2012, there were few alternatives except manual tallying. Until the ready availability of JR5 COUNTER reports, access to data by publication year has required either massive web server log data analysis projects (e.g., Huntington, Nicholas, & Jamali, 2006; Bollen & van de Sompel, 2008) for insights into local use, or reliance on proprietary usage data provided by publishers or e-journal service providers (e.g., Nicholas, Huntington, & Dobrowolski, 2005; Gorraiz, Gumpenberger, & Schlögl, 2014) for generalizations about user behavior from a global perspective. The COUNTER 4 Code of Practice, drafted in 2012, described the JR5 report and required COUNTER compliant providers to provide it by 2014. JR5 reports the use of periodicals by year of publication, and includes the use of archival packages in the report.

Inattention to the implications of publication data like those now available in the JR5 reports, and making decisions solely based on JR1 report data, can lead to poor collection decisions. In 2013, Rhodes College decided to abandon one of its Big Deals and instead adopt a token program. In a token program, the library prepays for a bundle of article access instances. Users coming through the library portal can find articles from the publisher via databases or a discovery layer, and when they download an article, one token is subtracted from the total number of tokens remaining available. Bulk discounts are offered for buying large quantities of tokens, but unused tokens expire after one year, making it important for the library to correctly estimate the number of articles that its patrons will read and purchase.

Librarians at Rhodes looked at their JR1 reports for the publisher from whom they were planning to buy tokens. Based upon that report they purchased 3,200 tokens, which represented between one-half and one-third of the previous year's use. Although some at the library initially feared they would run out of tokens, it became apparent as the year progressed that their patrons would use far fewer tokens than anticipated. Scrutiny of the usage log revealed that the tokens were only required for articles published during the current year. The previous subscription to a Big Deal had entitled Rhodes College to perpetual access to content published in the years covered by the subscription. As a result, only a fraction of the purchased tokens were redeemed before expiration. Although the college still saved money by dropping their Big Deal, much greater savings would have been realized if a more accurate calculation had been made.

Methods of Observing Patron Interest in Content According to Year of Publication

This observation led us to consider ways to explore the extent to which older content constitutes a portion of all the content used by our patrons. Four different methods are available. The first two are direct measures of use. The latter two indicate patron interest in content, but not necessarily successful access of it.

Token Information

Token reports are especially valuable because they give a clear picture of what content requires paid access. For example, open access articles will not be counted and downloads of different formats will not cause a single article to be double-counted. Comparing token reports to JR1 and JR5 reports may provide a method for measuring overall inflation due to double-counting in usage reports. Although we have preliminary token reports, they are not comprehensive enough to compare directly to our other data sources, and their data are not included in this paper.

JR5 Reports

Almost all major publishers have JR5 reports for use of serials during 2014 and afterward. JR5

reports are valuable because they can give title-by-title looks at the publication dates of articles viewed by the readers. Reports from large vendors allow us to identify trends across a diverse set of titles, while still being able to identify exceptions to the broad trends. A shortcoming of these reports, however, is that they only show data for titles to which a library already has access. Users' desire for articles that fall outside of the dates for which the journal are held are not measured. JR5 reports are prone to the same flaws as JR1 reports, including incidences of double-counting when a patron opens both html and PDF versions of the same article. As Bucknell (2011) notes, the design of a publisher's platform can influence usage counts, as publishers who don't provide abstract landing pages will often drive users to open an HTML version of an article to scan for its usefulness, then download the PDF version for deeper reading. In addition, as will be explored further, COUNTER reports record all usage within a single platform, whether it comes from the library's direct subscription or open access content; this may distort calculations of CPU.

Interlibrary Loan Reports

Libraries that use ILLiad software for interlibrary loan can generate reports indicating the year of publication for requested articles. The University of Memphis Libraries uses ILLiad to facilitate interlibrary loan requests. We generated a custom report in the ILLiad client of all of the filled article requests made in 2014, discerned the year of publication of each request, and calculated the relative number of occurrences of each year of publication. Interlibrary loan reports, of course, cannot give us an indication about how current collections are being used, but they are useful for a number of reasons. First, they are not limited by a vendor or disciplinary area, giving us a wider view of users' interests. Second, they can complement the JR5 reports, showing us which articles users want but to which they don't have access. This may also indicate weaknesses in a library's collection or the relative desirability of purchasing backfiles. Third, the additional effort required to place an interlibrary loan request indicate to us that these are high value items for users.

Google Analytics Applied To Link Resolver Web Pages

The University of Memphis Libraries uses SerialsSolutions 360 Link as its link resolver and has configured Google Analytics to track every time the resolver is used. Google Analytics records the Open URLs generated by each link resolution and the date of publication is included in the OpenURL. A fuller description of this method can be found in Knowlton, Kristanciuk, and Jabaily (2015). This allows us to calculate user interest in articles by year of publication. Link resolver tracking gives a very broad view of users' interest in articles, as it is not limited by vendor, discipline, or library holdings. Unlike the token reports and JR5 reports described above, this method measures interest instead of use; the full-text of the article may not have ever been successfully accessed. One limitation of link resolver data, however, is that they miss some full-text access. Any full-text access within the database that the user initially searched goes uncounted using this method. It also misses any use that did not come through a link resolver. If a user browses current issues of a journal online, this use is not measured.

Patterns of Patron Interest in Content by Year of Publication

University of Memphis Libraries has made use of three types of use statistics that allow us to look at article downloads and requests by publication year. Our data reflect usage recorded between January 1 and December 31, 2014. Here follows a brief summary of each set of data we obtained using these three methods. The first set of use statistics consists of 64,708 link resolver landing page URLs, collected using Google Analytics, and covers a range of publication dates from 1900 to 2014. The second set is 10,649 ILL requests, 2,202 of which were cancelled, and 8,446 of which were filled. It also records requests for articles published between 1900 and 2014. The third set consists of combined statistics from JR5 Counter reports for 140,151 full-text downloads for three large "Big Deal" e-journal subscription packages: Elsevier Science Direct Freedom Collection, Sage Premier, and Wiley Online Library. They comprise 3,745 titles published between circa 1986 and

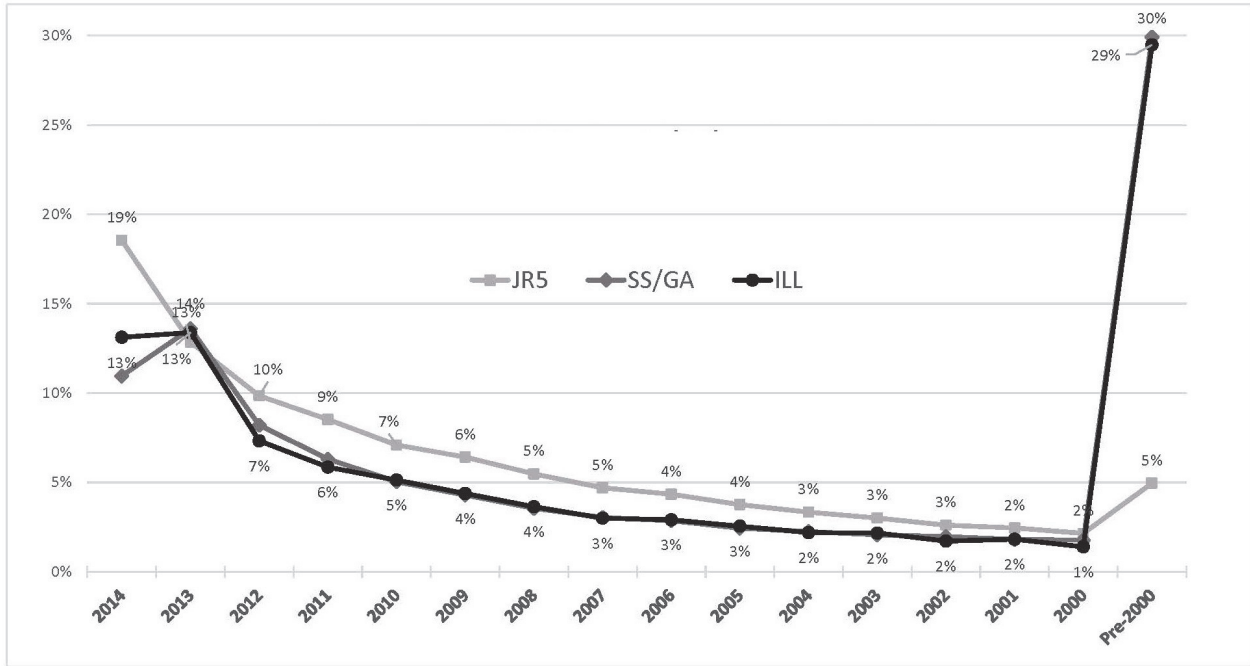


Figure 1. Percentage of use in 2014 by date of publication, according to three different measures.

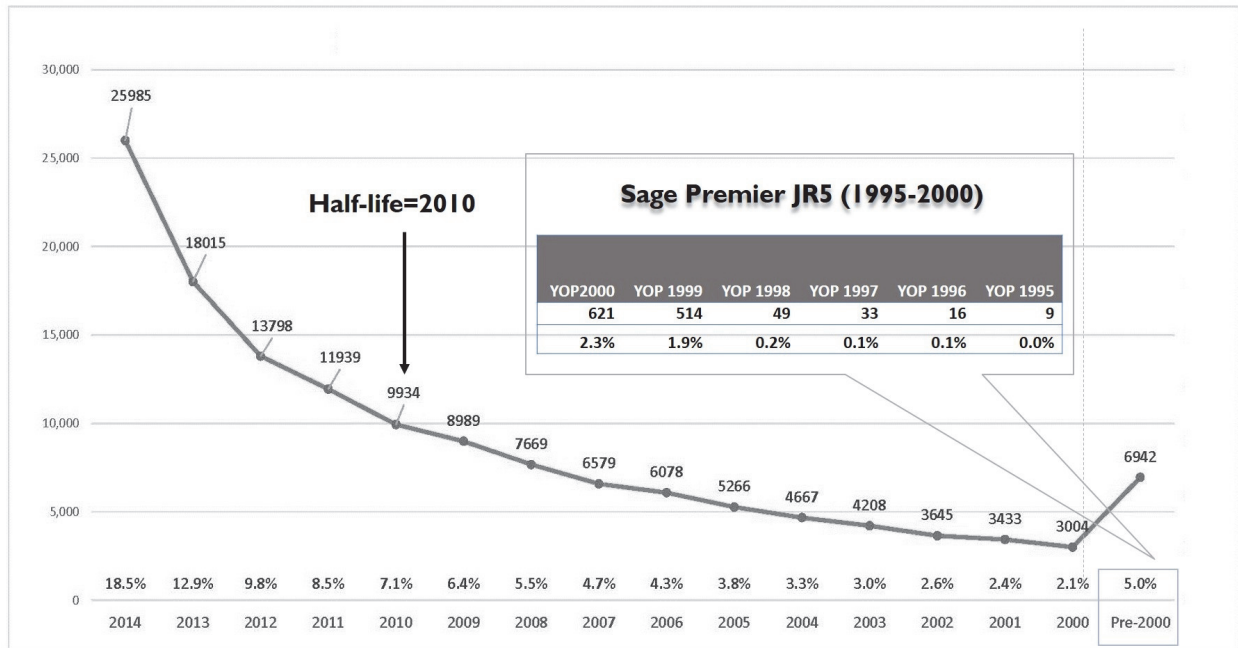


Figure 2. E-journal usage per JR5 reports with usage half-life.

2014. Between these three types of data we get a fairly complete picture of our users' interest and use. And perhaps most importantly for the purposes of this paper, they reinforce the fact that there is a clear predominance of use of the current year and an initially sharp decline and

then a gradually flattening decline in use by publication age (see Figure 1).

When we speak of current year usage, we have to consider the cumulative nature of available articles, and since the rate of interest shouldn't be expected to keep pace with the rate of availability,

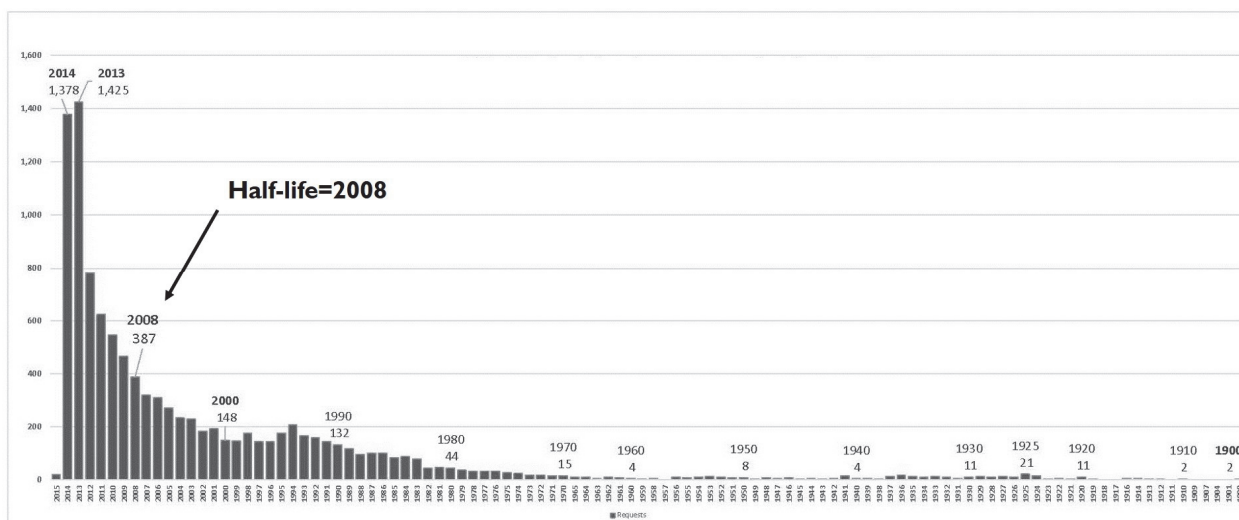


Figure 3. ILL requests by publication year with usage half-life.

one would expect there generally to be a lag before the full impact of currency is measured. That seems to be the case with ILL requests and our Google Analytics reports. Each shows that use of articles published in the most recent two years represents 13% of all use (about 25% for both years combined). However, the full-text downloads recorded in our JR5 reports seem to defy that pattern. In each of the three Big Deal packages, 2014 use exceeds that of any other year, and when adding in 2015 pre-publications and articles in press (ostensibly not available before 2014) it is as high as 20% of all uses. The flip at the end of the long tail in Figure 1 is a graphic conceit forced by one of the idiosyncrasies of the JR5 reports. Two of the three vendors reported pre-2000 use in combined groups of publication years 1995–1999, 1990–1995, and pre-1990, all shown here as pre-2000. The use by publication year before 2000 presumably follows closely to what is seen in the third Sage Premier package (see “Sage Premier JR5 1995–2000” call-out in Figure 2 below).

Our data follow patterns of usage by age of publication found in the literature. As Huntington, Nicholas, and Jamali (2006) describe patterns of use in seven months of OhioLINK weblog server data: “The general shape of the curve suggests there were, in fact, two stages to the decline. First there is a sharp decline phase. This period spans the first 8 to 9 years from publication date. Decline is most evident in the first 2 to 3 years,

with usage falling by about a third over the first year and by about 60% by the third year. After the sharp decline period there follows a relatively stable or flat period of usage” (p. 1843).

Usage half-life, as introduced by Rowlands and Nicholas (2007) is another way to see the weight of currency in the distribution of uses by publication age. Both the concept and the behavior of charted data follow that of cited half-life, which, as the authors explain, is expressed as the median age of the articles [the author community] cite in their own publications. Typically, the citation time curve shows a sharp initial increase (authors’ attention tends to focus on more recent papers) then a long tail off. Calculation of the 2007 usage half-life: the median age of all articles in journal J downloaded during 2007, regardless of their age (p. 226). To put it another way, usage half-life is the publication date before and after which there is the same number of uses.

Usage half-life for immediately available articles published between 1986 and 2014 (see Figure 2) is four years (that is, publication date of 2010). Strikingly, the usage half-life of all articles requested by our users, published between 1900 and 2014, and regardless of immediate access, as recorded by our Google Analytics data and ILL Requests (see Figure 3) is only six years (publication date of 2008).

When total uses for all 3,745 titles are aggregated the sharp decline and long tail chart very clearly. As you might expect, there is much greater variation when we look at titles grouped by subject, and of course even more so at the title level. By aggregating our JR5 data into subject categories, we get a sense of the different patterns of use by publication age in different disciplines or subject areas. The combined list of 3,745 titles was aggregated into 14 subject groups, based on a collation of subject assignments provided by each vendor, summarized in Table 1.

Subject	No. of Titles	Usage Half-Life
Agriculture, Aquaculture & Food Science	215	2011, 3 Years
Business, Economics, Finance & Accounting	349	2010, 4 Years
Chemistry	115	2011, 3 Years
Computer Science & Information Technology	156	2011, 3 Years
Earth, Space & Environmental Sciences	162	2011, 3 Years
Humanities	152	2012, 2 Years
Law & Criminology	51	2010, 4 Years
Life Sciences	449	2010, 4 Years
Mathematics & Statistics	72	2011, 3 Years
Medicine	846	2010, 4 Years
Nursing, Dentistry & Healthcare	179	2011, 3 Years
Physical Sciences & Engineering	362	2011, 3 Years
Psychology	182	2010, 4 Years
Social & Behavioral Sciences	454	2011, 3 Years

Table 1. Subject groupings of journals reported in three aggregated publisher package JR5 reports.

How total uses, use per title, and CPU correlate within subject areas warrants further exploration. Nonetheless, we can see in Figure 2 that use of material published in the current year ranges from 15% to 35% and does not necessarily correlate to the number of titles in that discipline. (Note that both the maximum and minimum current year use values are represented by the two subjects—law and criminology, and mathematics—with the smallest title representation in the combined packages.)

One can see significant differences in the shapes our charts take when comparing use by

publication year for four different subject groupings (see Figure 5).

It is unclear to what extent preference for currency or other patterns in use by publication year can be observed on a global level when it comes to subject areas or disciplines. Certainly, some disciplines value currency to a greater degree than others, and there will be greater interest in older, seminal articles in some disciplines while that is not the case in others. And the makeup of a local population of users—with their particular habits and research interests—surely has a strong influence on the patterns of use by publication year in different disciplines.

According to our JR5 data, a good rule of thumb is that the most current year accounts for about 18–20% of use. This means that if a library cancels a title but retains perpetual access, it can expect to retain access to about four-fifths of its previous usage in the next year and would need to provide another means of access to meet about one-fifth of the demand. It is useful to note that the number of published current year articles grows over the course of the year. So, if a library cancels a title and is planning to rely on full-text from a source with a one-year embargo, the percentage of usage for which it will lose access is higher than it would be for an accumulating year. To approximate the number of articles accessed or desired “in the past year” requires adding a portion of the 2013 results to the 2014/2015/In Press numbers. So a library would retain access to between two-thirds and three-quarters of its use and need alternate access for the rest. Another consideration is that the JR5 reports we have from our publishers may overemphasize the demand for current articles because access to backfiles is limited in our collections. For collections with larger full-text backfiles, the percentages of use from the current year of publication may be smaller. The measurements of patron demand (ILL and link resolver analytics) show the same high demand for articles published in the current year and a steady decline in demand for articles published in each previous year, but the

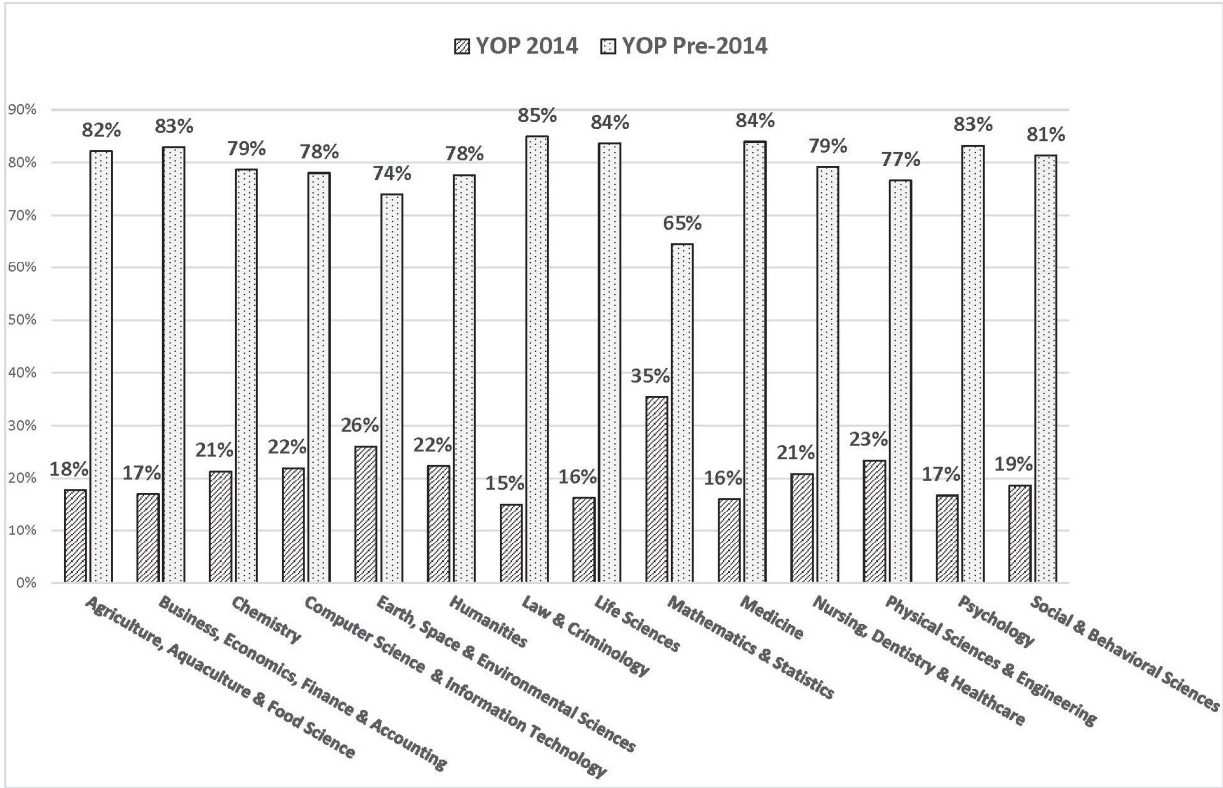


Figure 4. Current versus pre-2014 article downloads by subject.

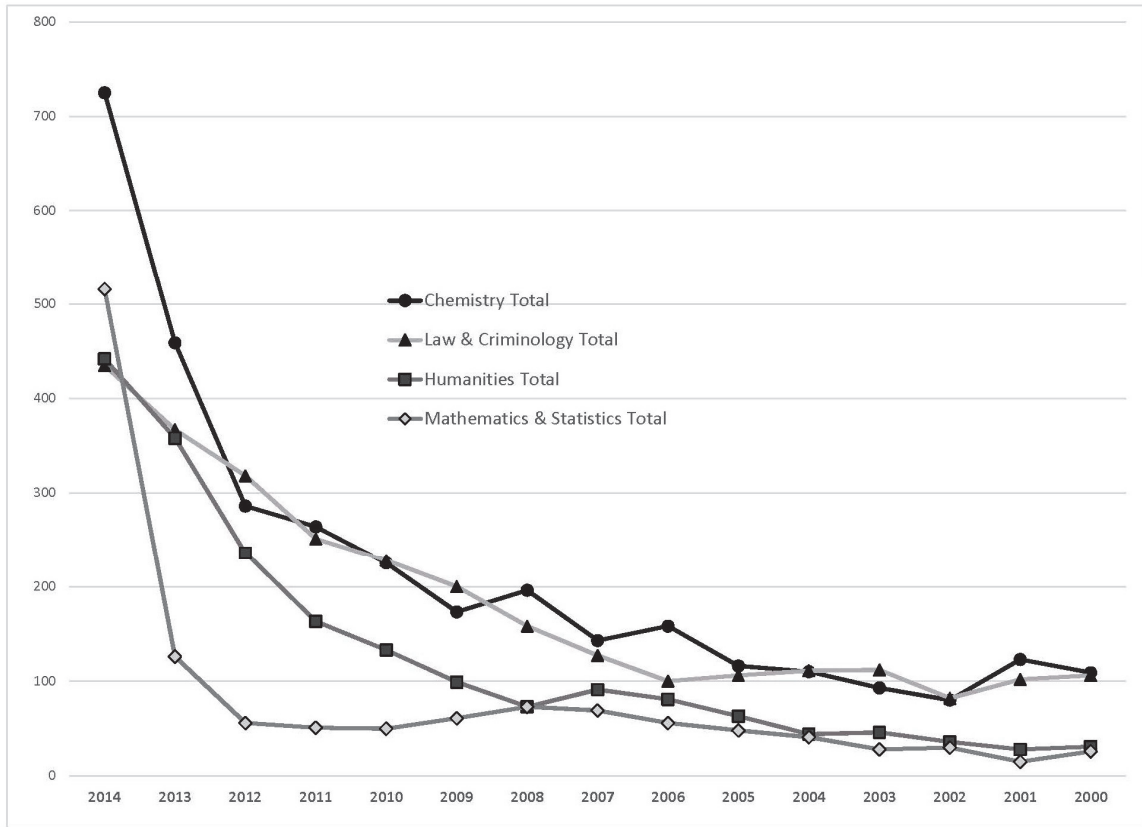


Figure 5. Comparing use by publication year for four subjects.

distribution is somewhat more even as the “tail” of the data is longer. Starr and Williams (2008) report that a similar pattern is seen in use of print journals.

Applications for Use-by-Year-of-Publication Data

The implications of this analysis are clear: the traditional way of measuring CPU fails to capture the real costs of each download. Except in those cases where a current subscription is required to access backfiles, the current year’s subscription only obtains for a library the current year’s content. Prior years’ content has already been paid for. Therefore, a more precise measurement should be made. We propose measuring the cost-per-use-paid-for-this-year, or to be less awkward, an “adjusted cost per use” (ACPU). As mentioned earlier, another problem of traditional CPU is that it disregards duplication of content in aggregated databases. While many titles are embargoed for a year or more in aggregators, we have seen that current content makes up only a small part of total use.

Table 2 shows the difference between traditional CPU and ACPU for selected titles. We examined 32 of the most expensive titles in our portfolio and

calculated the CPU. Then, by excluding the uses of content that was already paid for in prior years, we arrived at a much different ACPU.

These ACPU figures can reshape the decisions librarians make about serials expenditures. An obvious example is the token purchases discussed earlier. If the publisher offered perpetual access to their backfiles with the original subscriptions, then the library needs only to budget for the number of articles expected to be read from the years not covered by the backfiles. According to our results, this will likely be around 20% of total use. In the first year after cancelling direct subscriptions, this will often be a significant savings over the cost of the subscriptions—particularly if a Big Deal were subscribed. But in future years, more and more of the content that will be read will require tokens, as the owned backfile content moves farther backward from the current year. Strategic planning must take such changes into account.

Evaluating the Cost of Token Programs

To elaborate on the difference that is made by isolating journal usage by year of publication, let us offer an example from the University of Memphis. We looked into using a token program

TITLE	Paid in 2014	All Uses	Uses Unavailable Elsewhere	CPU	ACPU
Plant and soil	\$10,390.83	3	0	\$3,463.61	\$10,390.83
Planta	\$7,917.61	7	1	\$1,131.09	\$7,917.61
Addiction	\$3,436.44	227	0	\$15.14	\$3,436.44
Journal of Optimization Theory and Applications	\$3,343.23	13	1	\$257.17	\$3,343.23
Psychology & Marketing	\$2,288.96	70	19	\$32.70	\$2,288.96
Machine Learning	\$2,376.28	17	1	\$139.78	\$2,376.28
Journal of Financial Services Research	\$1,669.06	12	2	\$139.09	\$834.53
Climatic Change	\$5,252.93	49	11	\$107.20	\$477.54
Medical & Biological Engineering & Computing	\$2,188.75	47	6	\$46.57	\$364.79
Journal of Applied Ecology	\$1,772.64	22	5	\$80.57	\$354.53
Mean of 32 Journals	\$3,460.22	69.2	32.2	\$764.74	\$1,628.44
Median of 32 Journals	\$2,974.89	17	7	\$139.09	\$500.16

Table 2. Traditional cost-per-use compared to adjusted cost-per-use for selected titles.

from Wiley. Based on our JR1 usage data, we concluded that the cost of the tokens would be approximately four times greater than our subscription price. But by using JR5 data, we see that tokens needed for current year content would cost less than about two-thirds as much as we are paying in subscriptions. We will look into that as soon as our Wiley contract is due for renewal. (There may be some additional savings due to the fact that the JR1 and JR5 reports may be double-counting articles retrieved in both HTML and PDF format.)

Along with tokens from a publisher, libraries may also opt to participate in the Get It Now program from Copyright Clearance Center. With Get It Now, patrons who encounter an indexed article without full-text are given the option to click on a button in the link resolver that triggers an immediate purchase of the article. Prices vary by publisher, but librarians armed with the knowledge of their backfile and aggregator coverage can make much better estimates of the token or Get It Now purchases expected to occur. See Suhr (2013) for a more thorough discussion of Get It Now.

Assessing the Value of a Big Deal

JR5 data can also be helpful in evaluating the effectiveness of spending on a Big Deal. This year, the University of Memphis determined it could no longer sustain its ScienceDirect package. Although we were forced to opt out of the Big Deal by budget constraints, we found a way to use JR5 reports to maximize the access to Elsevier titles through judicious selection of direct subscriptions and reliance upon backfiles.

From 2005 to 2015, University of Memphis participated in the “Freedom Collection” Big Deal from Elsevier. In exchange for our retaining all our

Elsevier subscriptions, we were entitled to full access to most other Elsevier titles. While we experience high usage and a low CPU for the package as a whole, its cost has grown to more than one-third of our entire materials budget. When we decided to get out of the Big Deal, we initially were looking simply at the JR1 usage data to determine which titles to retain. But when we looked at the JR5 data, we realized that a very different mix of titles could be subscribed to and still retain a lot of access.

There are two types of journals in our Freedom Collection package. Titles to which we had direct subscriptions, and additional titles included as part of the Big Deal. The direct subscriptions included perpetual access back to 1997. Additional titles do not have perpetual access. When we break the Big Deal, we will retain perpetual access to our direct subscriptions. With this in mind, we can calculate an ACPU that takes into account perpetual access rights. For titles with perpetual access, the ACPU is the cost of the current subscription divided by the number of uses for just the current year—because the previous years are already available whether we pay for the current subscription or not. For those titles that do not have perpetual access, the ACPU takes into account usage of all years back to 1997 because the current subscription will give us access to those older years of publication.

An example of calculating ACPU is shown in Table 3. Because Journal A does not have perpetual access, we can calculate that the year’s subscription cost will cover all of the anticipated usage. Journal B does have perpetual access, so only that portion of usage that is anticipated to come from the current year will be underwritten by the subscription cost. As the table demonstrates, Journal A is more expensive and

TITLE	Perpetual Access?	Average Yearly Usage	Subscription Price for 2016	Traditional CPU	Expected Percentage of Uses to Pay for in 2016	Estimated Paid Uses in 2016	Adjusted CPU
Journal A	NO	154	\$899.40	\$5.84	100%	154	\$5.84
Journal B	YES	208	\$587.69	\$2.82	19%	38.48	\$15.27

Table 3. Example of ACPU calculation for titles with and without perpetual access.

receives fewer total uses but still has a lower ACPU because of Journal B's retained perpetual access.

By performing this calculation for all titles in our Freedom Collection package, we identified those titles with the lowest ACPU. We realized that we can cancel direct subscriptions to 255 titles while keeping 29, and take up 136 new direct subscriptions. We anticipate that we will continue to experience about 88% of the usage we saw this year, while cutting our expenditure by more than 50%. Next year, of course, will be very different, as those titles with perpetual access that we cancelled will lose another year's worth of content—and our ACPU will have to take that into account.

Experiences will vary with different packages. In some cases, the additional content provided by a Big Deal may make the ACPU calculations favor retaining a package. But the math is easily done and can provide clarity into the true value of a Big Deal.

Complicating matters is the fact that a subscription, if it includes perpetual access, "has also secured access to the current year's content for all *future* years" (Bucknell, 2012, p. 198). A subscription that has 100 uses of current content this year will have 67 uses of the same content next year, 51 uses the year after, and so on. Forgoing a subscription this year means losing all the future usage that would be included with perpetual access.

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Purchasing Backfiles

One other use librarians may make of the data about use of older content is to assess the value of backfile packages. Many publishers offer one-time purchases of older journal content, typically with perpetual access. Torbert (2009) outlines several models of such offerings. Assigning a CPU to such titles has been difficult in the past. But with the estimates of usage by year of publication now available, it is much easier to make such calculations. If the library subscribes to the current year of a title, a librarian can extrapolate the usage of the older years according to the known progression. That extrapolation can be extended for a number of years to estimate the ACPU for a given title or for the whole package.

Conclusion

Librarians have been at a disadvantage compared to publishers for many years, as our tools to analyze the value of journal content were quite crude. With the advent of new tools including JR5 reports, interlibrary loan request reports, token usage reports, and Google Analytics applied to link resolvers, librarians can now see the usage patterns of journal content with much more granularity. While such tools do not answer all the questions a librarian may have—they certainly underreport the value of unique titles to specialized researchers—they do provide greater power in making the most cost-effective decisions regarding various options offered by publishers, whether they be tokens, Big Deals, individual subscriptions, or backfile packages.

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