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**Impact of Full Text on Print Journal Use at a Liberal Arts College**

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## **Impact of Full Text on Print Journal Use at a Liberal Arts College**

Abstract:

The availability of full text journal articles online affects patrons' use of the library's print journal collection. This case study of a liberal arts college library collection quantifies the change in print journal use from 1996 to 2003. Variables that affect print journal use are discussed, highlighting college student needs and behaviors. Validity and reliability of journal use studies is investigated, and the use of Coefficient of Variance is described as a tool to measure the reliability of journal use counts. Results show that overall use of the print collection decreased by 52 percent. Use of print journals also available in full text showed a greater decrease in use than journals not available online. Changes in use for each of the academic disciplines represented at the college are reported.

## **Impact of Full text on Print Journal Use at a Liberal Arts College**

Interactions with students at the reference desk and conversations with faculty suggest that the increased availability of journal articles online in full text causes a decrease in the use of print journals. However, that is not necessarily the case. Some libraries have experienced simultaneous increases in the use of both print and online journals. [1] Journal use may have an analogy to movie viewing. Many feared that videocassette recorders in homes would inevitably force movie theaters out of business [2], yet people still go to movie theaters. The convenience of watching movies on videocassette and now DVDs presumably increased overall interest in movies, allowing mutually reinforcing, parallel markets for videos and movie tickets. Online full text might increase overall demand for journals, leaving room in the market for both the print and online formats.

## **Literature Review**

Most evidence in the published literature supports the hypothesis that availability of online, full text journals reduces demand for print journals. De Groote and Dorsch found a significant decrease in print journal use, regardless of whether journals were available only in print, or both online and in print. [3] Morse and Clintworth compared the use of a matched set of biomedical journals available both in print and online, and found that users overwhelmingly chose journals in the online format. [4] Vaughan measured a 47.5 percent drop in chemistry print journal use from 1999 to 2002, finding that use of print editions of journals that had electronic equivalents declined more swiftly than journals available only in print. [5] Sennyey, Ellern, and Newsome tracked an accelerating decrease in the use of print journals, reporting an overall

decrease of 40.6 percent from 1998 to 2000. [6] While the above mentioned studies measured use of either specialized science journals or journal use in a large university setting, this case study measured the change in use of print journals in the disciplines represented at one liberal arts college.

The literature reviewed for this study concerns journal use in academic libraries, based on studies focusing on variables in journal collections and their use by faculty and students. These variables may be considered in four broad, interrelated categories: student demographics, student motivations, faculty expectations, user preferences, and changes in journal content and format.

Student population demographic variables include changes in number of students enrolled, age of students, and whether they live on campus. Demographic variables have been found to correlate with library use. Whitmire found that gender and race significantly correlated with students' amount of library use, but the correlation of academic activities with library use was stronger. [7] The data from Grimes and Charters' study of economics students indicated that female, black, and on-campus students spent more time in the library than their male, white, and off-campus classmates. [8] These two studies did not relate demographics specifically with journal use or with user preferences for online or print format. The degree to which changes in demographics affect print journal use remains to be determined.

Students' overall motivation to use library resources, including journals, is strongly influenced by faculty expectations and course assignments. Gammon and O'Connor's comparison of journal use in the 1970s and 1990s cited the impact of changes in curriculum and new interest in subject areas as major factors influencing journal use patterns. [9] Whitmire found that "the variables having the strongest relationship with undergraduate academic library use involved

their academic activities: student-faculty and peer interactions, active learning and engaged writing activities, and being assigned term papers”. [10]

Joswick and Stierman compared the use of journals by faculty and students, finding that faculty use different journals than students and that faculty seem not to realize that student use differs from faculty use of journals. [11] They found that students are much more likely than faculty to cite journals that the library had classified as General Fund and that students use highly specialized journals less than faculty do. Nevertheless, faculty assessment of journal titles remains a highly valuable criterion for collection development. [12] Faculty recommendations support what they would like their students to use, even if students tend to seek other materials.

Students and faculty also vary in their preference for using print or online formats of journals. Among the variables affecting choice of journal articles in print or online, the time spent to acquire articles may have the strongest correlation to preference of format. Dilevko and Gottlieb closely examined undergraduates' use of print resources, including journals. [13] The context of their study was the proper role of the library and print materials in students' academic success, in light of perceived over reliance by students on Web sites. By interviewing undergraduates, they found that while some students took the effort to find the most appropriate articles for their topic regardless of format, a quarter of the students preferred the convenience of "good enough" online journal articles.

Motivations and personality characteristics that lead people to take what is acceptable rather than seek the best available, dubbed “satisficing,” are described by Schwartz. [14] The most common reasons given by Dilevko and Gottlieb for satisficing were "time pressures, efficiency, ease of access, and around-the-clock availability from any geographic location.” [15] Many users of journals seek more than merely satisfactory articles. Dilevko and Gottlieb also

found that one third of the surveyed students preferred print journals, and that the use of print characterized high quality academic work. [16]

The degree to which scholars still use print journals varies by academic discipline. Talja and Maula identify and define factors that may account for disciplinary differences in the frequency of use of journal articles available online. [17] The factors are based on the amount of information available, and how scattered among sources the information is found. Their study is based on the Bates hypothesis, which suggests that topic areas with a high number of relevant materials are best searched by browsing, areas of middling numbers of relevant materials are best searched using databases, and “needle in a haystack” searches are best done by following citations. [18] However, Bates notes that undergraduates tend not to know when and how to best browse, search databases, or track citations. [19] Students' experiences with professors, collections, and librarians influence their methods of seeking information, which then affects the mix of print and online sources they encounter in their research processes.

The journals in collections and databases that scholars have to choose from vary in many ways. The type of content, numbering, quality of printing, and so forth have always varied among journals. Availability of journal articles online has added to the variability of journals. Differences may exist, for example, between online journals and journal articles available online in a full text database. Some journals are online as complete entities. For example, in JSTOR, titles have been scanned and archived cover to cover, from volume one through a moving wall of three to five years before the present. Full text databases contain articles from journals, but do not necessarily contain the complete content of the covered journals.

Journal articles online in full text databases are not fully equivalent to print, for reasons explored by Sprague and Chambers. [20] Their systematic appraisal of full text journal articles in

databases was built around four criteria: currency, coverage, graphics, and stability. They found that 45 percent of full text articles were not as current as print, 17 percent of major articles in print were missing in the databases, many graphics were missing from the articles, and 140 of 3,393 titles were dropped from the full text databases over a six month period. [21]

Volatility in database content is widely recognized, as is the danger in canceling print subscriptions in favor of aggregated databases containing the full text of journal articles. Brooks states "it has always been EBSCO's position that full text databases should be viewed as a complement (not a replacement) to the core print and electronic journal collections in libraries." [22]

Subscribing to individual online titles avoids some of the problems with full text databases, but other access problems can occur. Articles may not be available because of service outages or network problems and the online format may not be adequate for some students' purposes. For instance, color is sometimes absent from illustrations and low resolution scans can make printouts difficult to read. A full treatment of variability in full text journals and online databases lies beyond the scope of this study, but recognizing that online journals are not perfect substitutes is vital.

### **Problem statement**

The purpose of this case study was to measure the change in print journal use from the year before full text journal articles became available until 2003, both overall and by academic discipline. The study began with the hypothesis that availability of full text correlates with an overall decrease in the use of print journals, that use of print journals available online decreases

more than use of those not available online, and that changes in print use vary among academic disciplines. The research questions to be addressed in this case were: 1) What has the overall change in print journal use been since the introduction of full text? 2) Was the change in use different for print journals that are also available online? 3) What were the differences, if any, among academic disciplines in change of journal use?

## **Methodology**

Details of this case are presented for purposes of comparison to other libraries. In 1996, a journal use study was conducted at the Neil Hellman Library of the College of Saint Rose in Albany, NY. The College is a Carnegie classification Master's I institution, with approximately 175 full time faculty, 2,900 undergraduate students, and 1,800 graduate students. The library holds 240,000 volumes and supports a broad range of course work in the liberal arts. We analyzed the results of the 1996 study to quantify the cost effectiveness of our journal collection, taking into account the number of students enrolled in each department. [23] At the time, full text databases delivered over the Web were still new, and our library was not providing journal content via CD-ROMs or the Web. Since the library had no journals in full text in 1996, that study provided a baseline of print journal use before full text journal articles became available to our patrons.

The College of Saint Rose began offering journal articles in full text in 1998, beginning with EBSCOhost Academic Search and Lexis-Nexis Academic Universe. In 2000, we added more full text databases, including Project MUSE, PsycARTICLES, and Science Direct. JSTOR and other full text online content was added from then until the end of 2003. Off-campus access

to some databases by password began in 1998 and we implemented a proxy server to enable off-campus access to all our databases in 2003. As of January 2004, the library had access to approximately 14,000 periodicals (including newspapers and newsletters) offered through fourteen databases, as well as a small but growing number of full text journals linked directly from our online catalog to publishers' sites. The library subscribes to the Serials Solutions service to provide our patrons links to the titles of journals covered in whole or part in the full text databases available to them.

Studies of the use of the print journal collection were repeated in 2000 and 2003, with the same data collection method used in the 1996 study. [25] Shelf labels were printed that extended out of the label holders. Any staff reshelving journals put a dot on the label with a black felt-tip pen for each bound volume or loose issue returned to the shelf. Labels were replaced if they became overly crowded with dots. The labels were pulled and dots counted at the end of the calendar year and entered into an Excel spreadsheet. Counts of currently subscribed journals retrieved from our basement storage area were also included. This version of the "sweep" method was simple and cost effective and did not interfere with patrons' use of the journal collection. Nisonger presents an overview of various journal use study methods, along with an extensive bibliography. [26]

The spreadsheet used to analyze the change in use of print journals contained use data for each title for 1996, 2000, and 2003. Prices paid for each title (including any increases between annual invoices) were entered into the spreadsheet. Each title row in the spreadsheet also had the academic discipline fund to which the journal was allocated and the beginning dates of full text coverage. These six data elements (fund, title, three years of use counts, and full text start date) were used to calculate the variations in use and the effects of full text availability on use reported

in Tables 2, 3, and 4. Other librarians with data on title-level use counts, department allocations, and dates of full text coverage could replicate this method and compare the results reported here with trends in their library.

## **Validity and Reliability**

All journal use studies face challenges with the validity and reliability of the use data. The validity of the sweep method for counting uses is based on the assumption that volumes or issues found on carts and tables have been used and that volumes and issues still on the shelves have not been used. Since an unknown number of patrons with unknown frequency pull items but do not read them and reshelve items they have read, the sweep method is not a perfectly valid way to count use. Trying to measure the variability of use counts from actual use suffers from the so-called reference problem. That is, no omniscient observer exists to indicate the true level of use, against which measured use can be compared. A reported attempt to measure patrons' pulling of volumes from shelves with paid observers only yielded data at the call number classification level; it did not report title level data. [27] With no reference point, the validity of the use counts cannot be accurately measured. This inability to test the internal validity of use counts is true of any use study relying on the sweep method.

External validity concerns the degree to which the results of the study support a hypothesis that can be generalized to other libraries. This test of hypotheses that the availability of full text correlates with an overall decrease in print journal use and that the decrease varies among disciplines would have to be replicated in comparable settings to establish external validity. Variability of student demographics, academic programs, and journal collections (print

and online) among academic institutions has not been studied. Therefore this case study does not claim that the reported changes in use, overall or by academic discipline, will be the same as those found in other institutions.

Reliability, in this case the degree to which use counts consistently measure real journal use, is also difficult to measure. Problems with reliability come from three basic sources: variability in counting (researcher behavior), variability in use (patron behavior), and variability in what is being counted (magazines and journals). Variability in counting is not amenable to measurement. As with internal validity, no true reference points exist against which counts can be compared, since no omniscient observer is present. The reliability of this study is strengthened by the fact that the personnel directly responsible for managing the use study and the method of recording use remained constant over the eight years of the study. Reliability is weakened by the fact that some recording of use was done by student workers (in equal proportion each year), and we cannot know if or how often they forgot to mark labels. However, we have is no reason to believe that rates of student worker compliance with marking labels as instructed were different in 1996, 2000, and 2003.

A fundamental concern with journal use study reliability is the variation in use of titles from one year to the next. Print serials vary in content, frequency, and title. In an endless stream of variability, they cease, split, arrive late, grow, shrink, change names, and otherwise taunt serials librarians and confuse patrons. In addition, libraries add and cancel titles. To control for the variables of title changes, and added, canceled, and ceased titles, this study measured only those titles that were subscribed to throughout the scope of this study (1996 through 2003). Variability in number of articles published and delays in publication may also impact use, but those variables were not measured.

Unlike the other variables, changes in rates of use are subject to measurement. One could use a *t*-test to determine if the average number of uses of one title is statistically significantly different from the average number of uses of all titles, or of titles within the discipline, but those results would have very little practical meaning. A ranking of titles by use would convey essentially the same information, but in a more useable format.

Of greater usefulness is a measure of the degree of variability in use of titles from one year to the next. An appropriate tool to measure that is the Coefficient of Variation, which is the standard deviation divided by the mean. It measures the spread (variation) in use counts, taking into account the number of uses. To illustrate how the Coefficient of Variation works, consider this example of the local use counts for the *Journal of Educational Psychology* and *Science News*.

Table 1: Example of Coefficient of Variation

Title	2003 uses	2000 uses	1996 uses	Standard deviation	Average uses	Coefficient of variation
Journal of Educational Psychology	283	348	324	26.8	318	8%
Science News	10	51	154	60.6	72	85%

Use counts for the *Journal of Educational Psychology* indicate that use remained fairly stable in the three years of the study. The coefficient of variation of eight percent quantifies the relatively little variation in use from year to year. (The eight percent is calculated by dividing the standard deviation (26.8) by the average uses (318), and multiplying by 100 percent). In contrast, *Science News* experienced large changes in use from one year to the next, as indicated by the coefficient of variation of eighty-five percent.

Table 2 displays the distribution of titles among ranges of coefficients of variation. The variability of use from year to year is broadly distributed. A general tendency for the highest rates of variability to be found in titles with lower use counts is evident. In this case, titles averaging more than fifty uses per year have an average coefficient of variation of 40 percent. Titles averaging less than ten uses per year have an average coefficient of variation of 66 percent. The full spreadsheet of title-level data shows that some individual high-use titles have high coefficients of variation and some low-use titles have low coefficients of variation. [28]

General trends do not predict variation of individual titles.

**Table 2**  
**Variability in Use of Titles**

Coefficient of Variation	Number of titles (n=642*)	Average use count
≤10%	21*	63
11-20%	56	33
21-30%	67	37
31-40%	87	56
41-50%	101	51
51-60%	75	38
61-70%	60	25
71-80%	65	17
81-90%	36	20
>91%	65	10

\*excludes titles with zero uses in all three years

## **Results**

All data are for journals to which the library had a subscription throughout the scope of the study, 1996-2003. Journals that ceased, were cancelled, were added, or changed titles between 1996 and 2003 are not included in these statistics. For print journals held in the Neil

Hellman Library of The College of Saint Rose, 1996-2003 (n=649), total print journal use counts (i.e., times reshelved) were:

1996: 29,309

2000: 24,535

2003: 14,024

During these years, the library subscribed to more than 649 journals. The library had 681 paid print subscriptions in 2003, but only 649 were subscribed to continually since 1996 under the same title. This was down from 1050 print subscriptions in 1996. The library cancelled 290 periodicals and added forty-three periodical print subscriptions in the period 1996 through 2003. The balance of the reduction was from ceased and merged titles.

The change in print use factoring in full text availability appears in Table 3. Since many titles have only the most recent issues available in full text, the change in use was calculated separately for titles with more than three years of issues available online. As Table 3 shows, the use of print titles available in full text decreased more than the use of titles available only in print. The data reported in Table 3 support the hypothesis that the availability of full text correlates with an overall decrease in print journal use.

Table 3  
Change in print journal use from 1996 to 2003

All titles (n=649)	-52 %
Titles available in full text (n=367)	-59 %
Titles with full text content from at least 1999 (n=324)	-61%
Titles not available in full text (n=282)	-34 %

Table 4 reports the measured differences in print journal use by the academic disciplines at The College of Saint Rose. The disciplines shown in the table are based on the library's direct budget support for library materials. Since the number of titles for each discipline includes only those subscriptions published under one title from 1996 through 2003, the "Titles *n*=" column in Table 4 undercounts the total titles available in the library. "Titles available in full text" is the percentage of the print titles subscribed to by the library from 1996 through 2003 that were available in full text in 2003, based on the listing of titles in our Serials Solutions list. No distinction was made between journals in full text databases and online journal subscriptions. The data reported in Table 4 support the hypothesis that changes in print use occurring with the availability of full text varies among disciplines.

Table 4  
Change in Print Journal Use by Department\*

Dept.	Titles <i>n</i> =	Print titles also available in full text	2003 uses	2000 uses	1996 uses	Change in use: all titles	Change in use: titles available in full text	Change in use: titles not available in full text
Art	29	41%	903	878	1330	-32%	-44%	-24%
Biology	32	38%	299	608	1021	-71%	-75%	-52%
Business	31	78%	213	358	927	-77%	-78%	-68%
Communications	38	59%	244	246	723	-42%	-71%	+6%
Education	105	63%	3671	6972	7325	-50%	-55%	-31%
English	89	60%	1514	1781	1742	-13%	-17%	-9%
General	36	70%	1025	1360	3193	-68%	-67%	-73%

History & Political Science	47	71%	412	437	801	-49%	-52%	-39%
Math	8	63%	45	348	284	-84%	-83%	-90%
Music	30	30%	427	695	535	-20%	-22%	-17%
Philosophy and Religious Studies	24	54%	113	179	480	-76%	-76%	-77%
Psychology	32	50%	865	1559	1671	-52%	-45%	-58%
Special Education	53	64%	3264	7967	7852	-58%	-62%	-44%
Sociology	20	45%	266	304	630	-58%	-63%	-47%
Social Work	5	40%	104	112	368	-72	-73%	-68%

\*Titles are categorized by the department whose acquisitions budget supports the subscription.

Since overall enrollment at The College of Saint Rose increased approximately 20 percent from 1996 to 2003, lower enrollment is not the cause of decreased print journal use. The College has been successful in its strategy to recruit more freshmen and accept fewer transfer students. An increase in the proportion of students fresh out of high school may cause a decrease in print use, if those patrons have a stronger preference for full text over print journal articles. The College has more students living on campus now than in 1996, but many still commute, some from quite long distances. The affects on journal use of these student demographic variables was not investigated here.

Among variables impacting students' choice to use journals online or in print, an economic motivation stands out in this case. During the entire course of this study, photocopies in the library cost 7¢ (with copycard) or 10¢, while printouts from online databases in the library and campus computer labs were free. Students in the library thus had an economic incentive to

favor printing from full text over photocopying from print. Libraries with different printing policies may have different patterns of print and online use.

To summarize the results of this case study, the overall change in print use since the introduction of full text is a drop of 52 percent. Overall, the decrease in print use is greater for those titles available online in full text. Titles available in full text dropped 59 percent (61 percent if full text coverage is for at least three years), while use of print journals not available in full text dropped 34 percent. Variation of the impact of full text availability on print use among disciplines is high. The lowest impact was found in English and music. The highest impact was found in biology, business, mathematics, and philosophy & religious studies.

## **Implications**

Individual students may vary widely in their personal motivations to use journals, but the distribution within the student body of individuals' motivation was not investigated. Librarians' experience working with students at the reference desk and conducting library instruction sessions suggests that a significant cause of variance in students' motivation to use journals is instructors' assignments and expectations. The hiring or retirement of a single faculty member can significantly change journal use patterns, especially in disciplines where overall use is relatively light. Individual faculty can insist that students use only print, direct them to a specific full text database, or design new assignments requiring a new use of journals. Since faculty come and go, past use patterns may not predict future use.

The impact on journal use of faculty expectations was not measured in this study, but some of the relationship of assignments to journal use is revealed in interactions with students at

the reference desk and librarians' discussions with faculty. For example, the relatively small decline in print use in English reported in Table 4 came as no surprise, as the librarians knew the English faculty emphasize the use of print journals. Senior faculty in philosophy & religious studies and biology have been leaders in the use of online courseware and have been proponents of using journals in the online format; the relatively larger drops in print use in those disciplines were also not a surprise. The print journals for business were among the first to be substantially cut and faculty and students in that discipline have given consistent feedback in support of journal articles being available online. The 77 percent drop in print use of those titles still held thus was not unexpected.

The data here may not reflect the environment at other institutions, nor may it reflect the environment at The College of Saint Rose in the future as new faculty are hired and senior faculty retire. Whether the rates of decrease in print use reported in Table 4 reflect experience at other colleges cannot be determined without replicating the study at other institutions. This study strongly suggests that acceptance varies by discipline, but the findings here may not be generalized to other libraries.

Since the impact of full text availability affects disciplines quite differently, decisions on shifting from print subscriptions to online full text should also vary by discipline. Discipline-specific factors to consider during the shift to journal content offered in the online format include availability from publishers, quality of online versions, and patron acceptance. The journals reported in Table 4 show a wide range of full text availability, from a high of 78 percent in business to a low of 30 percent in music. Although some journals are available as online subscriptions or in full text databases to which the library does not subscribe, many are not.

As discussed above, significant differences exist between journals available online and journal articles included in aggregated full text databases. An online subscription to an individual title may be a fine substitute for a print subscription, but full text articles for that title in a database may not be acceptable. Volatility of content in aggregated full text databases can make them unreliable substitutes for print subscriptions. The quality of online content can vary and the importance of that quality can vary by discipline. The resolution of a scanned article in PDF may not be significant for a text-only history journal, but may be critical for a medical or art journal.

At The College of Saint Rose, the combination of rising subscription rates and falling use of print journals caused the average cost per use to rise from \$2.17 in 1996 to \$8.82 in 2003. [29] Given the drop in print use, the popularity of online journals, and limits on growth in our acquisitions budget, we plan to not renew some journal subscriptions for 2005. The data summarized here will be studied on a title by title level. Within each discipline, titles with relatively greater drops in use and rises in subscription rates will be targeted for possible non-renewal.

The process of selecting titles to not renew for 2005 will take into account change in use, increase in price, faculty input, publisher reputation, and variability in use of individual titles as measured by the Coefficient of Variation. Wide variations in use of a title from year to year complicate data based decision making. Our experience with previous rounds of cancellations suggests that too many factors are involved to apply a strict decision formula to identify journals for cancellation, but use, price data, and cost per use trends are very helpful for clarifying choices and making fair, defensible decisions.

Online full text availability is also a factor to consider, but with caution. Many titles are currently available online through aggregated full text databases. Cancellation of print titles will

be grounded on the assumption that aggregated database coverage of individual titles may not continue indefinitely. Therefore, print journals considered to be core to the educational mission of the college will not be cancelled, even if they are currently online in a subscribed database.

The changes in print journals use reported here probably vary from changes in use at other institutions, but the broad trend toward greater online full text use, less print use, and rising cost per use of print journals is probably not unique to The College of Saint Rose. If the trend is occurring at other libraries, it is logical for librarians at other institutions to also consider cuts in their print subscriptions. Librarians facing print journal cuts may consider quantitative and qualitative factors in addition to those already mentioned. Enssle and Wilde included criteria of impact factor, document delivery requests and faculty rankings in a cancellation project. [30] Galbraith lists several criteria that require intimate knowledge of the user population, including "Have faculty left and not been replaced?" and "Has research and teaching emphasis changed?" [31] Whichever criteria are chosen, they need to be deliberately selected and consistently applied. Metz describes how the process of selecting, applying, and communicating criteria facilitates a successful cancellation project. [32]

### **Suggestions for Further Research**

No attempt was made in this case study to measure variation in student demographics, student motivations, faculty expectations, or journal content. Further research beyond that cited in the literature review is needed to study how those variables impact journal use. This case study reported the percentage of titles subscribed to by the library in each discipline that are available online, without distinguishing articles in full text packages from subscriptions to online

journals. Research into the availability of the two types of online content by discipline, not tied to one collection, would clarify the extent of online availability. Knowing the percentage of titles available online in each discipline could help librarians find the right balance of print and online journals.

The rates of use of journal articles available online are also not reported here. Careful study of the relationship between print use and online use at the title level could expand understanding of the interaction of print and online use patterns. Does heavy use of a title online always correlate with a drop in print use of that title? If not, are there certain characteristics of the print or online format that influence the correlation of online and print use (e.g. illustrations, HTML or PDF, currency, embargo periods)?

Much more analysis could be done on the reliability of journal use counts on the title level. A study of the Coefficient of Variation for titles with annual use counts over several years might lead to a hypothesis of when use counts are valid for title-level decision making. An investigation into the causes of high variability of use from year to year would also be helpful. No analysis of variability of use of titles in full text databases was included in this report. Such an analysis could show whether variation in title use in full text databases is similar to print. Comparisons of print and online use are very fertile ground for further research.

## **Conclusion**

As of 2004, finding the most appropriate balance of print and online journals remains a challenge. Online journals may offer greater value than print journals. [33] If problems with stability and format can be resolved, the time-saving convenience of full text journals accessible

from remote locations argues strongly for the online format. However, if print cancellations by all libraries accelerate, publishers will be forced to make up the revenue and the prices of aggregated full text packages will inevitably rise. [34] The benefits of ownership of print over access to full text may then become even more important.

The case reported here indicates a general trend in decreased print use as full text journal articles become available online. However, the changes in print use vary considerably among disciplines, as does the online availability of titles. Use counts for titles from year to year can vary greatly and unpredictably, complicating the application of use data in collection development decision making. This study demonstrates that the availability of journal articles online correlates with an overall decrease in print journal use, but further study is needed to elucidate the details of the relationship of patrons' use of print and online formats.

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