The Nonsubscription Side of Periodicals:

Changes in Library Operations and Costs between Print and Electronic Formats

by Roger C. Schonfeld, Donald W. King,
Ann Okerson, Eileen Gifford Fenton

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RESEARCH REPORT

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Eileen Gifford Fenton
Donald W. King
Ann Okerson
Roger C. Schonfeld

About the Authors

Eileen Fenton is executive director of the Electronic-Archiving Initiative, an effort that was launched by JSTOR and incubated by Ithaka, a nonprofit organization whose purpose is to help accelerate the adoption of productive and efficient uses of information technology for the benefit of higher education. She is leading the initiative's effort to develop the organizational elements necessary to ensure the long-term preservation of and access to scholarly literature published in electronic form. Previously the director of production at JSTOR, she has also worked at the Vanderbilt and Yale University libraries.

Donald W. King is research professor at the University of Pittsburgh School of Information Sciences. His 40-year career has focused on research and description of communication services. He began exploring the potential of electronic publishing in the late 1960s through a series of National Science Foundation projects. He and colleagues have performed cost studies of more than 100 academic, special, or public libraries since the early 1980s. He has coauthored 18 books and hundreds of other publications.

Ann Okerson has served as associate university librarian at Yale University since 1995, following 15 years of academic library and library-management experience, several years of work in the commercial sector, and service as a senior program officer at the Association of Research Libraries. In 1996, she organized the Northeast Research Libraries Consortium, a group of 26 large research libraries that negotiates licenses for electronic information and engages in other forms of cooperative activity. In 1997, with funding from the Council on Library and Information Resources, she and the Yale Library staff mounted an online educational resource about library licensing of electronic content in a project called LIBLICENSE.

Roger C. Schonfeld is coordinator of research for Ithaka. His current research is focused on library economics, library history, and new developments in scholarly communication. He is the author of the recently published *JSTOR: A History* (Princeton University Press). Previously, he was a research associate at The Andrew W. Mellon Foundation.

Foreword

Campuses across the country are rapidly converting their print-based serials collections to the electronic format. Digital technology is changing the ways in which students and faculty seek information, even in traditionally print-intensive disciplines such as history and literary studies.

For almost two decades, observers of scholarly communication have predicted that the transition from print to digital format would have a major and positive impact on publishing, collecting, preserving, and reading. The time is now ripe to take stock of those predictions. It is time to determine where we are in the digital transformation and to assess, on the basis of our accumulated knowledge and experience, what effects digital technology may yet produce.

This report is part of that much-needed assessment effort. It looks into the future of electronic dissemination of scholarship through the lens of experience. Commissioned by Ithaka, the study investigated one aspect of the digital transformation: the ongoing costs of library collections and operations for journals. CLIR is pleased to make the full set of findings widely available to the public.

The study is useful not only for its findings but also for the significant questions it raises about the cost shifts now under way between libraries, publishers, academic administrations, and third-party service providers. These shifts point to the need for staff with new skills, a new array of reader services geared to digital delivery, and a willingness to negotiate new relationships with other units on campus, from academic computing to facilities management.

Although this study does not address the impact of these shifts on publishers and other extramural participants in the chain of scholarly communication, its implications are clear. These entities will be called on to absorb more costs as they assume a greater burden for the technical development of various formats, security measures, and delivery tools. Likewise, the study did not factor into the equation the greatest unknown of all—the long-term cost of digital archiving and service of journal literature. It will be important to address these issues as well to get a fuller picture of the environment in which electronic collections will grow. This study on library impacts is an important place to start.

Abby Smith
Director of Programs

Executive Summary

Many academic and research libraries are in the midst of what may ultimately be a major transition for various parts of their collections—a shift from print to electronic format. Libraries that had long subscribed only to print versions of journals are, in increasing numbers, licensing electronic versions to replace the print. What effects will this transition have on library operations and on nonsubscription expenditures? To answer this question, we collected new data on staff activities and costs from 11 U.S. academic libraries. We then performed a life-cycle analysis to study the longer-term cost implications of the transition.

Library collections and operations stand to change significantly as a result of the transition. At all but the largest academic libraries, collection sizes in the electronic format are significantly larger than they ever were for print. Notably different activities are required to manage and maintain an electronic collection. Staff-compensation profiles for the formats vary as well.

Our life-cycle analysis divided the costs for print and electronic formats as they exist today into one-time (often first-year) and annually recurring costs. For the average title in each format, we added 25 years' worth of recurring costs to the one-time costs. This yielded the average nonsubscription cost for a given title over an estimated total life span. While this time period was arbitrary, it was essential that a sufficiently long period be used to highlight the long-term implications of the format choice.

Our findings suggest that nonsubscription costs are lower, on a per-title basis, in electronic than in print format. The per-title effect is more pronounced at smaller libraries, mainly because they license relatively large collections of electronic titles in comparison to the size of their print collections. Relative to collection size, however, the cost benefits of the electronic format exist across the board.

We modeled the effects of the per-title cost differentials under a variety of assumptions in order to determine their likely implications on individual libraries. While many of the cost implications will depend on local conditions, initiatives, and management practices, the

likely outcome of the transition for many libraries will be reduced nonsubscription costs for periodicals. In the long run, some libraries may benefit significantly, although there are important short-term management challenges to be considered. The potential savings are not, however, on the scale that some enthusiasts have imagined.

Moreover, any dollar-for-dollar comparison of the two formats is complicated by several shifts in system-wide costs. Some costs that are borne by libraries or publishers for the print format may be borne by the other party in the electronic format. The cost of day-to-day storage of the information resource is one example: Publishers, rather than libraries, generally provide for the server storage of electronic periodicals. In addition, some costs that are borne by libraries for the print format, most notably the cost of archiving, have not yet been taken on by either party for the electronic format. There is as yet no archiving solution for electronic periodicals, so it is not possible to calculate the costs or determine how they will be borne. Given the complexity of the problem and unanswered questions such as these, the objective of this study was to offer a set of conclusions that will help inform the transition rather than to provide the final word on system-wide cost shifts.

Although much remains uncertain, we can state with confidence that the failure to resolve the issue of responsibility for archiving has hindered the transition to electronic journals. If archiving is to be achieved, it must be paid for. While it is unclear whether libraries alone will be able to fund archiving, the cost advantages that this study finds may constitute the most likely source of library funding for this purpose and may therefore present an opportunity for the library community to shape the archiving solutions that eventually emerge. If these cost advantages can be realized by individual libraries and used to stimulate the implementation of archiving solutions, they might expedite electronic access to appropriate resources and the accompanying advantages to scholarship—even if, net of archiving, the format transition were to be cost-neutral.

Introduction

Many academic and research libraries are in the midst of what may ultimately be a major transition for various parts of their collections—a transition from print to electronic format. One of the major challenges in providing for the long-term availability of research literature today is the lack of an acceptable archiving solution for electronic publications. Several efforts are under way to develop such a solution, including work at the British Library, the Library of Congress, JSTOR, Stanford University, and elsewhere.[1] In designing its business plan, the Electronic-Archiving Initiative (launched by JSTOR and now being incubated by Ithaka) wanted to learn more about the transition to electronic journals. The study summarized here was part of this effort to learn more about the effects of the transition from print to electronic format on the higher education community's ability to ensure the long-term availability of electronic publications.

For years, observers of library economics have noted that there may be significant cost advantages to moving away from print collections and toward electronic collections.[2] Librarians routinely express the conviction that cost savings is an important reason for shifting toward electronic resources. Should this shift become more pronounced, some have suggested that publishing and library processing costs would be lower, that faculty and student time expenditures would be reduced, and that the quality of research would increase because of more effective searching techniques. Although there have been skeptics, optimism abounds.

In the past 10 years, projections about the cost impact of a shift to the electronic format have led to hard-nosed considerations of business models and prices.[3] With the advent of journal package

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[1] For information on the four projects named here, see, respectively, http://www.bl.uk/cgi-bin/press.cgi?story=1382, http://www.digitalpreservation.gov/, http://www.ithaka.org/e-archive, and http://lockss.stanford.edu/.

[2] For papers that touch on all sides of this issue, see Ekman and Quandt 1999.

[3] See, for example, the Ingenta Institute 2002; Frazier 2001; and International Coalition of Library Consortia 2001. For additional references, see Quandt 2003.

deals, consortial negotiations, and alternative proposals such as open access, libraries' subscription and license costs, as well as collection sizes and profiles, are changing.

As significant as these changes are, they do not capture all of the important shifts in operations and costs that have taken place. For example, storage of back issues has been the responsibility of libraries for the print format, but publishers have tended to provide storage for previously published years of an electronic journal (although neither libraries nor publishers have assumed formal archival responsibility for the electronic format). Substantive changes are also taking place in the daily operations and associated costs of academic libraries. These changes are the topic of this study. We refer to the costs of these library operations as the "nonsubscription" costs associated with the periodicals collection.

In addition to staff time, nonsubscription costs include computer workstations, binding costs, and capital and maintenance expenditures for space,[4] among others. Some have believed that these costs would be lower, perhaps much lower, in the electronic format than they have been in print. As one observer has noted, "A not unsubstantial amount of our staff time is devoted to making sure print issues get to the shelf. Mail handling, issue check-in, security taping, bar coding, stamping, and shelving the issues are labor-intensive activities that absorb entire job descriptions or multiple clerk hours every day."[5] The assertion that these costs could be avoided for electronic periodicals, and that savings would be realized, was important in the early days of JSTOR as well.[6]

There has, however, been little formal consideration of how library operations and nonsubscription costs may vary with the transition to electronic format. Yet these costs are not trivial, and shifts to the new format are already under way. A better understanding of these cost issues is clearly needed. This study sought to bolster the existing data and analysis and provide a basis for a firmer understanding of the changing nonsubscription cost structure that will accompany the transition to electronic periodicals.[7]

This report is an expanded version of a previously published article.[8] It contains a more detailed description of our methodology and a complete overview of library operations as well as costs. It also includes a significantly expanded analysis. Following the literature review and an explanation of our data-collection methodology, we examine the differences in library operations between the two for-

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[4] The construction cost of space is usually borne by the institution in its capital budget, while maintenance costs are frequently included in a facilities-department budget. In both cases, space-related costs are often not included in the academic library's budget.

[5] McDonald 2003, 24.

[6] See Schonfeld 2003, 122-23.

[7] For a framework of metrics that can be used to analyze and assess library services, which puts our approach in its broader context, see King et al. 2004.

[8] Schonfeld et al. 2004.

mats, as revealed by our survey. We then apply the life-cycle analysis and present the findings of this analysis. We conclude with several sets of projections that estimate likely implications of the transition from print to electronic format on total library costs.

Literature Review

Our work is not the first to explore how costs change as periodicals are increasingly delivered in electronic format. The most important work previously undertaken on this topic was performed by Carol Hansen Montgomery, under whose leadership the Drexel University library system radically shifted its periodicals collecting from the print to the electronic form. The transition at Drexel is notable for its speed and comprehensiveness, and it has been documented in an effort to measure the impact on both costs and "value."[9] Drexel's work built in part on Donald King's many years of methodological experience in studying the cost structures of libraries.[10]

Our study built on these experiences; however, it had a somewhat different focus, used a revised methodology, and collected data from more libraries. We examined library operations, but our cost analysis focused strictly on nonsubscription costs, thereby excluding the actual costs of the subscription or license. We also set aside measures of value, such as those derived from the level of usage. We compared the existing costs for each format at each library, rather than making use of the opportunity to compare before-and-after costs that was possible at Drexel. In addition, we used a life-cycle model to analyze our findings in order to compare the costs of the format choice over time.

Using the life-cycle approach for cost analysis is not a new idea. Technology companies regularly use it to demonstrate that a higher sticker price may, over the life spans of their products, result in lower total expenditures, if service and maintenance costs are low. The first published adaptation of the life cycle by the library community took place in the 1980s at the British Library.[11] More recently, the British Library has applied this experience to work toward understanding the implications, within its operations, of accessioning items in a variety of formats and publication types.[12]

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[9] Montgomery and King 2002. Montgomery has published several other pieces on the transition, making Drexel by far the most well documented of the libraries that have shifted their periodicals collections to the electronic format so completely. See Montgomery 2000, Montgomery and Sparks 2000, and Montgomery 2002.

[10] For a helpful overview, see King et al. 2004. Another recent article has used a different approach to project the cost differentials. See Connaway and Lawrence 2003.

[11] Stephens 1988 and Stephens 1994.

[12] Shenton 2003. Our thanks to Ms. Shenton, and her colleague Stephen Morgan, for a series of valuable conversations while both our studies were under way. For another recent application of the life-cycle approach, see Lawrence et al. 2001.

The studies mentioned thus far, like our own work, focus on future publications; however, a transition to electronic periodicals might also affect existing print holdings. One exposition of the space savings made possible by access to electronic versions of already-held print journal titles estimates that 25% or more of the volumes held in a large university chemistry library could be moved off campus immediately.[13]

Our study compared the two formats both for operations and, across the life cycle, for costs. We believe that these comparisons can help libraries understand how a shift from print to electronic periodicals may affect their operations and costs. One should keep in mind—as we have tried to do in this study—that there are limitations to our data. Nevertheless, we hope that this study will help inform the choices facing libraries and academia in this time of transition.

Study Design and Data Collection

There are significant differences in the organization and operation of periodicals activities across libraries. In designing our data-collection approach, we worked closely with a number of the participating libraries to find ways to build upon commonalities and accommodate differences. In this section, we summarize our approach to data collection.

Units of Analysis

Like Montgomery and King (2002), we were interested in serial literature, not monographs or other types of publications. Within the serial literature, we decided to focus on periodicals. To harmonize data across all libraries with relative ease, we used a widely accepted definition of periodical: "a serial publication that contains separate articles, stories, other writings, etc., and is published or distributed generally more frequently than annual." This definition excludes annual reports and yearbooks; updates of databases, loose-leafs, and Web sites; monographic series; and newspapers.[14]

Libraries divide their print-periodicals operations into two categories: current issues and backfiles. Current issues are accessible individually, generally in a reading room, for the first year or two following publication. Then, at the libraries in this study, they are generally bound into volumes and stored in stacks.[15] We refer to the

[13] Chrzastowski 2003.

[14] This is the 006 code for Type of Continuing Resource, which appears in OCLC's *Bibliographic Formats and Standards*, Third Edition, available online at http://www.oclc.org/bibformats/pdf/ffe.pdf, at page 73.

[15] Less often, issues are discarded and replaced with microform editions. We did collect data on the microform category; however, the quality of this information was insufficient for analysis. Since so few of the periodicals are held in microform, we did not present these data in this study.

two divisions of the print format—current issues and bound backfiles—as *holdings categories*, and we collected data separately on each category.

Electronic periodicals are generally stored on a server computer maintained by a publisher or an aggregator, although at some libraries, certain electronic periodicals are stored locally or on a consortial basis. The distinction between current issues and backfiles is not always as clear in the electronic format as it is for print. We therefore collected data on the electronic format as a whole and included it as a third holdings category.

Within these two formats and three holdings categories, we needed to develop units of measure that would allow us to compare costs—i.e., dollars per unit. This was complicated, because the units had to be similar across the electronic and print formats.

The electronic environment has given rise to business practices among those who sell access to electronic periodicals that make it hard to count and compare practices and holdings from one institution to another. In this regard, the phenomenon of the "serials aggregator" needs some explanation.

The simplest kind of aggregator is the publisher that bundles a package of periodicals to sell at a single price. Such publishers argue that the purchaser gets a larger collection of important journals at a better price than would be possible if titles were sold individually. There are, to be sure, some economies of scale for the publisher in not having to manage individual subscriptions. Delivery of the information is easier than in buy-by-the-title models.[16]

The purchaser, on the other hand, may question whether all the journals that have been added to the package are ones she would have otherwise wanted and so may wonder whether the price is as good as it is touted to be. The purchaser's dilemma is that of the customer at a restaurant that offers an à la carte menu as well as a one-price buffet. The restaurant will insist that the buffet is a bargain, but the customer may doubt whether the vat of peanut butter and the towering stack of sliced bread add much value and may come to a different calculation of cost and benefit.

If a publisher comes to a library that currently subscribes to 100 of its titles in print and offers an electronic package of 200 titles for 120% of the original price, a reasonable library may indeed choose the new package. But is that library subscribing to 200 titles? To the 100 titles that were previously judged to be worthwhile? Or perhaps

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16 Third-party vendors also engage in aggregation. Typically, they go to publishers that produce one or a few journals—small learned societies with a single title, for example—and offer to help them reach their markets. Then they turn to the library market and offer a package of journals more easily acquired, tracked, and managed for being in a single package than would be the case if the library went from publisher to publisher each year renewing subscriptions. A variant on this model is the aggregator that selects a package in different ways designed to add value: offering access to research articles only in a basket of journals that publish a variety of kinds of information, for example, or identifying a small group of related subjects where a thematic bundle seems to make market and intellectual sense. Here again, publisher and purchaser may disagree over the value gained by the bundling.

licensing one collection, since some of these packages boast interoperability, linking, and searching and are marketed under a single brand name?

For the electronic format, subscription, issue, and title may no longer be meaningful descriptors—in the example above, 200 titles is not the ideal measure. Other reliable units of measure, however, have not yet come in to common use. For example, while we considered examining the total number of licenses to electronic collections as one alternative unit, even greater variability prevails in what is licensed and in the size of the collections. Moreover, licenses are not directly comparable. Given these considerations, we chose "titles" as the unit of measure for the electronic format. We defined this as all titles to which a library provides access, regardless of whether they are cataloged at the title level. This definition was intended to include titles that are licensed or accessed individually as well as those that are part of an aggregation. A title that is licensed twice—for example, through each of two aggregators—would only be counted once.

For print current issues, we also used "titles" as the unit of measure. Another choice would have been "subscriptions," since libraries sometimes have more than one subscription to a given title. But by dividing total costs by the number of titles, we were able to better compare print with electronic. One effect of this choice was to assume, in our eventual comparison of print with electronic, that the transition of a given title from print to electronic format will result in the elimination of all print subscriptions to that title.

For backfiles, we used the number of bound volumes that the library held as the unit of analysis. Some libraries were able to provide good estimates of this number; in other cases, we used standard conversion measures to calculate the number of volumes from the number of square or linear feet occupied by the collection.[17]

Participating Libraries

Our dataset included data related to the nonsubscription costs of periodicals from 11 academic libraries. Drexel University permitted its mostly pre-existing data to be used within a modified methodological approach. Coauthor King was independently organizing a somewhat similar study at the University of Pittsburgh (Pitt), which agreed to permit the use of its data in this study. In addition, we collected data directly from nine libraries: Bryn Mawr College, Cornell University, Franklin & Marshall (F&M) College, George Mason University, New York University (NYU), Suffolk University, Western Carolina University, Williams College, and Yale University.

In recruiting library participants, we sought diversity in terms of size, affiliation, and degree of commitment to electronic resources. For the purposes of comparative analysis, we have categorized these institutions, on the basis of their Carnegie Classifications, as small, medium, and large (see table 1). More information on the size of

[17] See Leighton and Weber 1986.

Table 1. Participating libraries, by size

Small	Medium	Large
Bryn Mawr College	Drexel University	Cornell University
Franklin & Marshall College	George Mason University	New York University
Suffolk University	Western Carolina University	University of Pittsburgh
Williams College		Yale University

these library collections and their operations may be found in the section entitled Periodical Operations and How They Are Changing.

A number of the participating institutions are relatively decentralized. Professional schools often administer their own libraries. All of the institutions whose libraries are classified as "large" have more than half a dozen library locations on their campuses (and three have more than a dozen). Consequently, several participants chose to collect data only for certain units, avoiding some of the school or departmental libraries. Table 2 shows the parts of each library system that participated in this study.

As noted in table 2, some large medical, science, and law collections were excluded from the study. Many of the periodicals in such collections are very lengthy, in terms of numbers of issues and pages per year. One implication of excluding these collections from the study is to reduce the average cost of binding and storage space

Table 2. Collections under examination at each participating library

Participant	Print Subscriptions in Collections under Examination as a Percentage of Institutional Total	Comments
Bryn Mawr	100%	
F&M	100%	
Suffolk	45%	Includes the Mildred F. Sawyer Library, the main facility, but excludes the law library.
Williams	95%	Excludes several departmental libraries.
Drexel	100%	
George Mason	73%	Includes all libraries except law.
Western Carolina	100%	
Cornell	66%	Includes these Ithaca libraries: Africana, Annex, engineering, fine arts, hotel, management, mathematics, music, Olin/Kroch/Uris, and physical science. Excludes law and medicine libraries, among others.
NYU	62%	Bobst Library only for print holdings categories; Bobst, Courant, Institute for Fine Arts, and Real Estate Institute for electronic. Excludes law and medicine libraries, among others.
Pitt	85%	Includes five campuses and 19 complete departmental libraries. Excludes health sciences and law libraries.
Yale	51%	Sterling Memorial Library only; includes major humanities and area studies collections. Excludes sciences, law, and medicine libraries, among others.

for the print collections. Another implication is that we may have excluded copies of print subscriptions that are duplicated at collections not included. This may also have the effect of reducing the cost of print at libraries that have significant duplication across print collections that are and are not included in our data. For both of these reasons, the omission of certain collections led us to underestimate the print costs in the life-cycle analysis for Cornell, NYU, Pitt, and especially Yale.

Science collections may have other unique features that would have implications for circulation and reference services in the print format and across the board for electronic. We have no reason to believe, however, that such differences would have any significant effect on the cost comparison.

All the library collections included in this study have open stacks. A library such as the General Humanities Center of the New York Public Library, which has closed stacks, would presumably have higher print-related costs. Similarly, any special collections that had closed stacks, even if the main library collection were open stack, would presumably have relatively higher costs.

Finally, with the exception of NYU (as noted in table 2), the collections under examination at each institution were identical for both print and electronic formats.

Data Collection

Data collection took place during the first half of 2003. Staff contacts at each library gathered institutional statistics and distributed activity logs to all library staff who spent any amount of time on periodicals-related activities. The activity logs required staff to report the amount of time they devoted within a specified time period to each of 15 periodicals-related categories, segmented by holdings category, for a total of 45 possible activities.[18] With one category excluded (explained below), the 14 categories of data included in this report were as follows:

- collections development
- negotiations and licensing
- subscription processing, routine renewal, and termination
- receipt and check-in
- routing of issues and tables of contents
- cataloging
- linking services
- physical processing
- stacks maintenance (including current issues areas)
- circulation
- reference and research

[18] In isolated cases, survey respondents did not distinguish adequately between the holdings categories for a given activity. In these cases, we allocated the time among the holdings categories via imputations based on other staff in the same department at the same library. This was only rarely necessary.

- user instruction
- preservation
- other

Some cost categories are not included, but we do not believe their absence meaningfully affected our results. Most important, we excluded from our analysis the costs of electronic infrastructure and support. We did so only after careful consideration. These costs are difficult to allocate directly to periodicals in general and to print or electronic periodicals more specifically. Although most of the libraries in this study were unable to allocate these costs directly, it was possible to develop estimates for three schools—Drexel, George Mason, and Pittsburgh. In these cases, including the electronic infrastructure costs did not affect the direction our findings, although there were varying effects on the degree of the cost effects. An analysis of the data from these three institutions, as well as the implications for our findings, may be found in Appendix A. Because we could not develop estimates for all the participating libraries, we chose to exclude the electronic infrastructure costs from all the data that we present. Likewise, we did not attempt to collect data on interlibrary lending and borrowing.[19]

We also collected, on a confidential basis, information about staff compensation, which eventually allowed us to associate dollar costs with specific activities. Appendix B shows the data-collection instruments, including the list of included activities and definitions of each, the staff activity log, and the institutional survey.

Because we needed to collect a substantial amount of data, we tried to be as flexible as possible in allowing participating libraries to provide information in ways consistent with their existing practices. This flexibility had two notable implications.

First, some libraries preferred to collect data for a recent month, while others felt it was best to provide data from the past year.[20] Because we wanted to allow each library to choose the method that it believed was most efficient and effective, we developed a mechanism to scale up monthly data to an annual form. For most activities, this mechanism relied on one of a variety of output-driven ratios.[21]

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[19] When initiating a borrowing request, a patron does not understand an item to be missing from the local print materials or from the locally provided electronic materials, but simply from the periodicals collection as a whole. Consequently, it is not possible to allocate interlibrary loans (ILLs) by format or holdings category. ILL costs do not affect the relative costs of the formats and were therefore excluded from the study.

[20] Bryn Mawr, Cornell, George Mason, NYU, Suffolk, and Williams provided data in the monthly format; the other libraries did so by the year.

[21] The activities handled in this way included negotiation and licensing, receipt and check-in, routing of issues or tables of contents, cataloging, physical processing, circulation, user instruction, and preservation. For those activities, we constructed a ratio of the number of "outputs" per month to the number of outputs per year, where outputs could be, for example, the number of volumes that were circulated. We used this ratio to determine how that activity for the given holdings category scaled to the year. These ratios, however, did not necessarily apply to all formats or to activities when the monthly data were not provided or appeared inappropriate (e.g., instances when monthly outputs exceeded previous annual outputs).

When it was more appropriate for a given activity, however, we assumed that each week's work constituted 1/52nd of the year's total work.[22] All data in this report are presented in annualized form.

Second, we preferred that staff data be provided anonymously to avoid the possibility that managerial review might skew an individual's willingness or ability to provide accurate time allocations. While most of the libraries felt comfortable with this approach, three felt it was not appropriate for them (NYU, Suffolk, and Yale). We do not believe that this difference had any meaningful impact on the data supplied. We put into place a system that allowed us to monitor the return of logs and to ensure that none went missing. We wanted to find an appropriate balance between collecting every staff survey, encouraging accuracy and honesty in responses, and respecting the participating libraries' campus culture.

Once the data had been collected, three processing steps were implemented for staff-activity information, all of which were performed both by library and by holdings category. First, we merged the time allocations of individual staff to determine the total time expended on each activity at each institution. Then, as necessary, we annualized these time allocations. Separately, we used the salary data to determine the actual cost of each activity performed by each staff member. This entailed allocating the implicit cost of nonproductive time (vacation, breaks, lunch, and so forth) for the given staff member on a proportional basis to each activity, as well as loading in benefits. We did not include library or institutional overhead; however, the direct attributable managerial costs were included in the survey and are reported in our analysis.

Once staff costs had been calculated, we added nonlabor costs. Most of these—for example, the cost of binding vendors—were fairly straightforward. But when it came to the cost of space, we departed from our usual practice of using actual costs.

It was difficult for most libraries to calculate the cost of space occupied by periodicals in their mature library buildings, since data were unavailable or the effects of inflation were difficult to determine, or both. In some cases, renovations complicated matters significantly. Also, there were substantial differences in the location and design of participants' library buildings, making individualized estimates difficult to compare. To resolve this problem, we determined a conservative standard for the cost of space and imposed it across the board, identifying one cost for current issues and another for backfiles.

Because several of the libraries had in recent years opened off-campus high-density shelving facilities (or begun to participate in consortial arrangements that provide such space), it seemed that for them (and eventually for many of the others) a new backfile volume

[22] This was the case for activities for which outputs would be inaccurate measures of work, including collection development, subscription processing, routine renewal and termination, linking services, stacks maintenance (including current issues areas), reference and research, and electronic infrastructure and support.

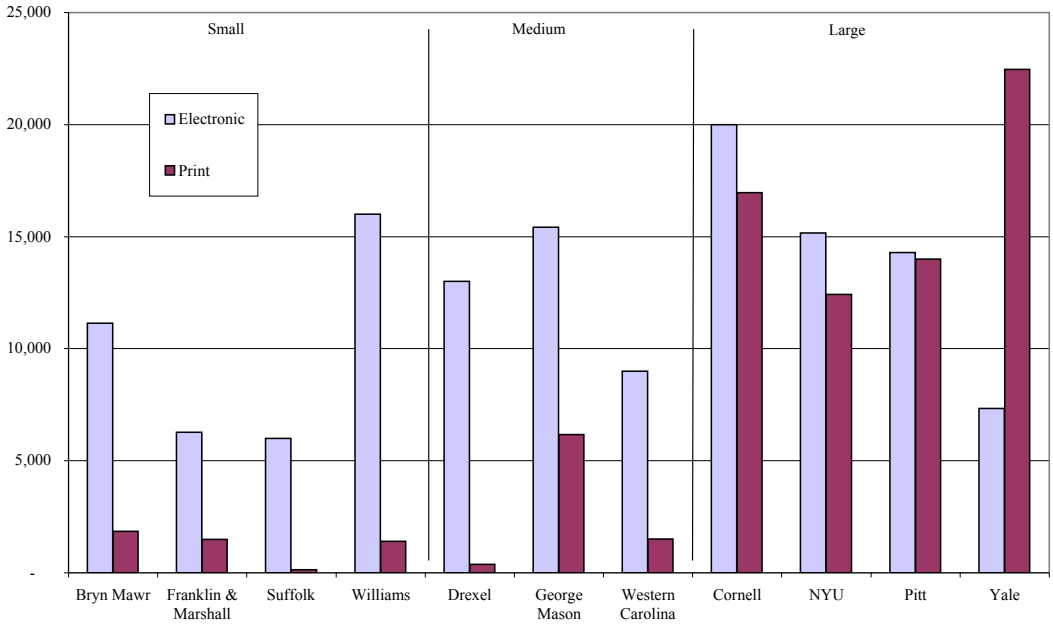
accessioned would be shelved off campus or would displace an existing item to the off-campus facility. The cost of space in such a shelving facility would therefore be a reasonable proxy for the cost of space for all backfiles. In reality, backfiles today are usually shelved on campus, so, in using the off-campus space for these calculations, we derived figures that were more conservative than the actual costs of the space generally occupied by backfiles.

To determine the cost of storage space for backfiles, we gathered data from several recently constructed off-campus high-density facilities. Some of these cost data were available publicly and some were provided confidentially.[23] We estimated the average one-time construction cost in today's dollars to be approximately $2.50 per volume.

Unlike backfiles, current issues of print versions would be expected to be shelved on campuses into the future. They are generally housed in browsable shelving areas, often in comfortable reading rooms.

For current issues, we created a cost estimate based on numbers reported by several of the participants. We believe that these figures are too low, because, among other things, they do not account for inflation. The estimate used for the construction cost of space for current issues was $100 per square foot. Estimates in the past several years for construction costs of new library space have averaged about $250 per square foot.[24]

Fig. 1. Number of current periodical titles, by format, by library



[23] One useful source in seeking data on contemporary expenditures for off-site facilities can be found as Appendices 1 (capacity figures) and 4 (construction costs) of Reilly 2003. For more information on these types of facilities, see Nitecki and Kendrick 2001.

[24] See, for example, Jay Lucker, personal communication to Sarah Levin, in Bowen 2001.

Although we believe that these conservative estimates of space costs are appropriate for the purposes of this study, we also include, at various places, estimates of the costs assuming newly constructed on-campus space at $250 per square foot. We distinguish these estimates clearly wherever they are used. We amortized all space costs over a 25-year period.

Periodicals Operations and How They Are Changing

In the past decade, as periodicals in the electronic format have increased in importance for research and teaching, academic libraries have adapted to make them available locally. In this section, we provide an overview of the 11 participating libraries and their periodicals operations. We examine collection profiles and the staff activities that make them possible, paying particular attention to tasks that contribute to long-term preservation. We consider the possible differences in staffing levels between the formats. Finally, we provide an overview of the annual nonsubscription budgets of each library and the percentage of annual expenditures on each format.

Periodicals Collections Profiles

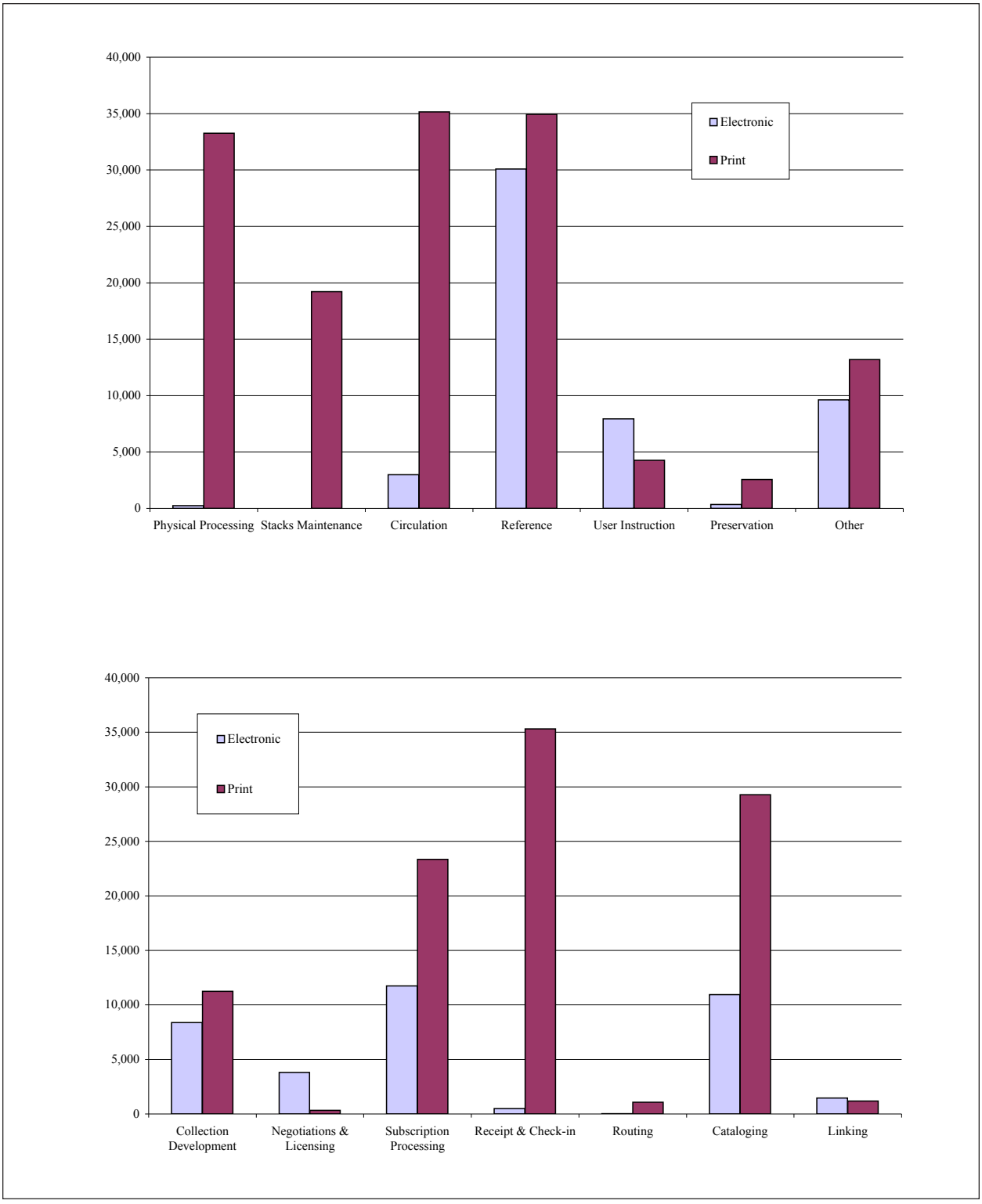
During the period under observation, most of the current periodicals collections in the participating libraries contained a mixture of items in print and electronic formats. The small- and medium-size libraries have large electronic collections relative to their print collections. Drexel and Suffolk have moved almost entirely to electronic-only collections. The large libraries have roughly similar numbers of print and electronic titles, with the exception of Yale, the participating collections of which were its principal humanities and area studies collections. Every library under examination provides access to at least 5,000 electronic periodicals titles. Nevertheless, as figure 1 illustrates, major differences exist both within and across the library size categorizations in the size and format focus of periodicals collections.

For each library, the choice to accession significant numbers of electronic titles to replace or complement an existing print collection has necessitated new processes and resources. How do processes differ between the two formats?

Time Expenditures

Our data allow us, in figure 2, to provide the aggregate number of staff hours expended at the 11 libraries on each of the 14 activities, by format. The hours for both electronic and print include both current issues and backfiles. These aggregate figures are not weighted by institution; therefore, the larger libraries account for the majority of hours. The aggregates also mask significant differences among the individual libraries. They are intended solely to provide a sense of

Fig. 2. Total periodicals-related hours expended by all libraries, by activity and by format



how processes tend to differ.[25] Overall, 73% of the total periodicals-related hours at these libraries are devoted to the print format.

These hours are distributed very differently within each format. Major print activities on which far fewer hours are expended for the electronic format than for the print include subscription processing, receipt and check-in, cataloging, physical processing, stacks maintenance, and circulation. For only two activities (negotiations and licensing and user instruction) were more hours expended on the electronic format than on the print.

The data in figure 2 include time expenditures on some activities that might not have been expected. In some cases, such as "receipt and check-in" and "circulation," our activity definitions (see Appendix B) can be understood to encompass electronic activities. And although "linking" activities are generally thought of as related exclusively to the electronic format, some libraries attempt to include information about their print collections in their linking services. Finally, in the case of physical processing, it is difficult to understand why there should be any hours for the electronic format, so the miniscule number of hours appearing there may be in error. Overall, however, we believe that these data present an accurate illustration of the annual time expenditures for library periodicals operations.

Masked behind these activities for the print format are important tasks that contribute to the long-term preservation and availability of the periodicals. Binding, which many view as an important factor in making print backfiles more secure and durable, as well as rebinding and security stripping, are managed by staff as part of physical processing. Various kinds of shifting, transferring, and shelf maintenance are integral to the continued availability of the print backfiles and are grouped under stacks maintenance. Searching for missing items is included as part of circulation, and if a replacement volume must be purchased, it will affect the library's operations under collections development, subscription processing, receipt, and cataloging. Finally, some 2,500 hours per year are devoted to professional preservation activities, including reformatting, conservation, and disaster recovery. In short, while it is impossible to segregate preservation-related hours within the print format, they are many, and they suffuse quite a number of the activities.

The same is not true for the electronic format. We were able to identify only 350 hours under "preservation," and no operational electronic-preservation programs are in place. To be sure, there is some modest related work to be found in some of the other activities. But in terms of breadth and depth, the amount of work to ensure the long-term availability of electronic periodicals does not match that of the print format. Storage and maintenance of electronic collections have become the work of the publisher and are largely paid for by licensing fees, even if long-term archival responsibility has not yet been assigned.

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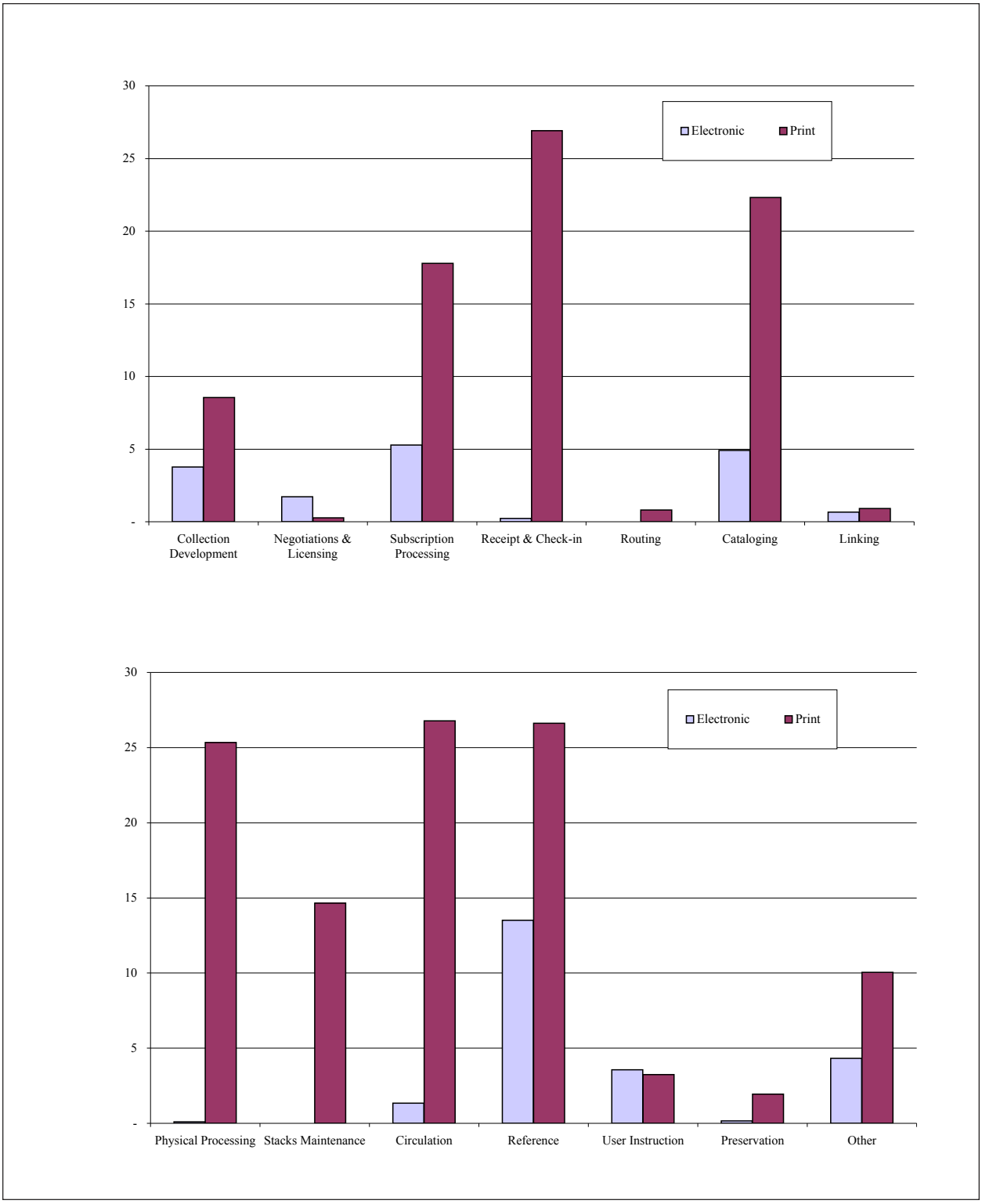
[25] It is not possible to provide breakdowns for individual libraries by activity and by format because in many cases a given figure would represent the work of an individual staff member and would conflict with the assurances of confidentiality that we offered during the data-collection process.

Fig. 3. Minutes of staff time expended per title on various periodicals-related activities, average across all participating libraries



In addition to these total hours, we calculated the time expenditure per title. This measure, illustrated in figure 3, is intended to provide some further perspective about the relative time expenditures involved with each format; again, however, this measure is an aggregate that is not weighted by institution and that masks differences among the libraries.

One important reason for differentials in per-title time expenditure among libraries could well be usage. Two libraries with identical collections, seeking to provide identical services for their readers, might experience different levels of usage of their collections, and this would have an impact on the cost of activities such as circulation, reference, and user instruction. Variances in time expenditures between the formats for these three activities may therefore be explained, at least in part, by differences in the levels of usage of the formats. In the life-cycle section, we take account of this possibility, but we did not attempt to measure usage directly or to adjust costs on this basis.

The patterns of time expenditures per title are generally consistent with expectations. The format comparison suggests a significant shift away from the print format's manual tasks, including subscription processing, receipt and check-in, physical processing, stacks maintenance, and circulation.[26] Collection development and cataloging also required far less time per title in the electronic format. But the fact that these activities took less time does not tell us anything about their cost. A significant factor in cost is the compensation of staff performing each of these activities. We therefore will now examine the average staff compensation for periodicals operations.

Average Compensation Rates

Electronic-resources staff are sometimes believed to be more highly skilled and to work in positions with higher classification levels than do print-focused staff. Although we did not collect data on classification levels per se, our cost data provide insight into and help confirm this hypothesis. Figure 4 illustrates average hourly staff compensation rates for the two formats at each library.[27] The figure indicates that hourly staff compensation for activities in the electronic format is at least marginally higher than it is for print at all 11 libraries, and at 8 of the libraries the difference exceeds 20%. This pattern holds true in virtually all activities that apply to both formats.

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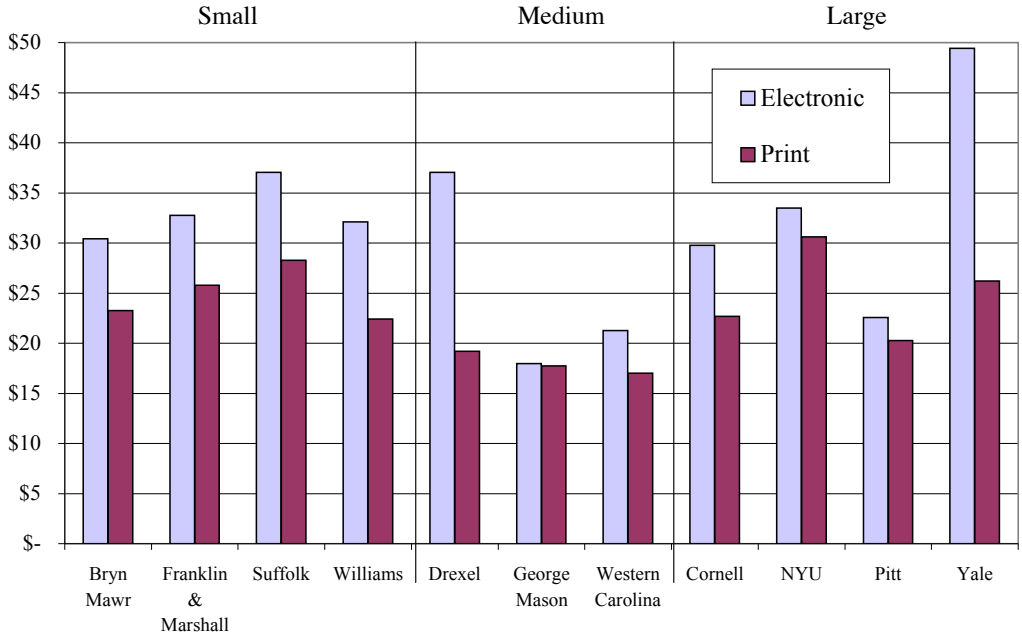
[26] It is important to recognize that there are variations in the processes adopted at each library for both formats. Recent literature, for example, suggests that some libraries have been rethinking the necessity of binding for print periodicals (see Anderson and Zink 2003 and Streatfield and King 2003). And for electronic periodicals, processes are in the relatively early stages of being developed (see Watson 2003 for one overview).

[27] Hourly rates for salaried employees were calculated by dividing compensation by a self-reported number of hours. Salaried employees who do not receive overtime compensation can thereby appear to earn a relatively low hourly rate. Compensation rates include benefits but exclude overhead.

Fig. 4. Staff costs per hour, by library by format



There are two reasons why electronic-format operations tend to rely on staff who are better paid than print operations staff. The first reason is that, as the previous section indicated, major differences exist in the types of activities performed for each of the two formats. The activities for the print format that are not necessary for the electronic format, including receipt and check-in, physical processing, stacks maintenance, and circulation, are generally performed by clerks or student workers. For several activities, one group of staff performs these activities for one format, and another group of staff performs similar activities for the other format. Within cataloging, for example, various processes have been developed to allow clerks to perform most of the work for the print format; but for the electronic format much of the cataloging has been done, at least until relatively recently, by professional librarians. This example suggests one area where new processes might yield further economies, at least for certain libraries, in the electronic format.

Capital Costs

Another key cost area related to periodicals is space to process and store collections. Secure and environmentally appropriate storage space is one of the most important components of the archiving solution for periodicals in print format, and even at high-efficiency off-campus rates, it is an important ongoing cost. The print format relies more heavily on space than does the electronic format. The cost of physical space is therefore an area that will offer savings in the electronic format relative to the print format.

The expenses associated with providing adequate storage space

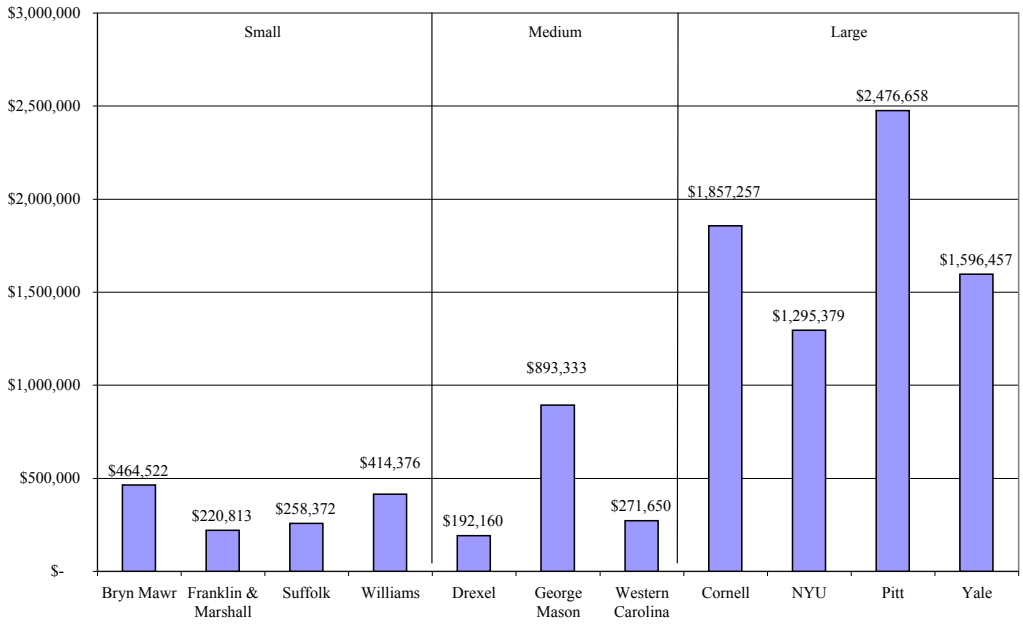
include construction, renovation, maintenance, and utilities. The costs of construction and renovation (as well as, in many cases, maintenance and utilities) generally come from outside the library budget. Capital spending for construction and renovation is generally budgeted for on an institution-wide level, and maintenance and utilities may likewise not appear on the library budget. So, although storage needs and the associated costs are lower for the electronic format than they are for print, much of the savings will accrue to the institution rather than within the library budget itself. This is an important factor in the consideration of whether any overall savings can be realized by the library and redeployed for other purposes.

Annual Nonsubscription Costs

To summarize the data on total annual nonsubscription costs presented in this section, we provide an overview of the total scale, across all holdings categories, of periodicals operations at each of the participating libraries. We include all cost components, including capital costs that may not appear on the library budget. Figure 5 shows that major differences of scale emerge both within and across our size categorizations. Note that these totals include only the collections referenced in table 2 and therefore are not necessarily institution-wide totals.

The most important reasons for these differences are the size and composition of the holdings of the various collections, along with patterns of usage. Differences in the processes used to perform similar activities also play a significant role, as do variations in salaries and benefits.

Fig. 5. Total annual nonsubscription periodicals cost allocation, by library



Within these libraries, the breakdown of costs by format exhibit striking differences. That is, within the total annual nonsubscription costs shown in figure 5, the allocations among the formats were vastly different. These allocations are shown in figure 6, in which the libraries are ordered by their percentage allocation to the electronic format.

The two schools with the highest electronic allocations, Drexel and Suffolk, have already moved from print to electronic format, as can be seen in figure 6. Several of the larger schools, notwithstanding the presence of significant numbers of electronic periodicals on their campuses, appear to continue to devote high proportions of their expenditures to their formidable backfile collections. Yale appears furthest to the left because its collections represented in this study are humanities and area studies alone, and periodicals in these fields are least likely to be available in electronic format.

We now break down the data presented in the previous figures in greater detail. We report the annual total nonsubscription costs by holdings category in tables 3 through 5.

In this section, we have examined some of the evidence suggesting that format differences lead to different library operations and costs. These data might be thought of as budgetary in nature, in that they provide information on the time allotments and costs for a recent year. In the next section we will use a different analytical lens. We will use the budgetary data to project the likely cost implications of the transition itself.

Fig. 6. Share of total annual nonsubscription periodicals costs by format, by library

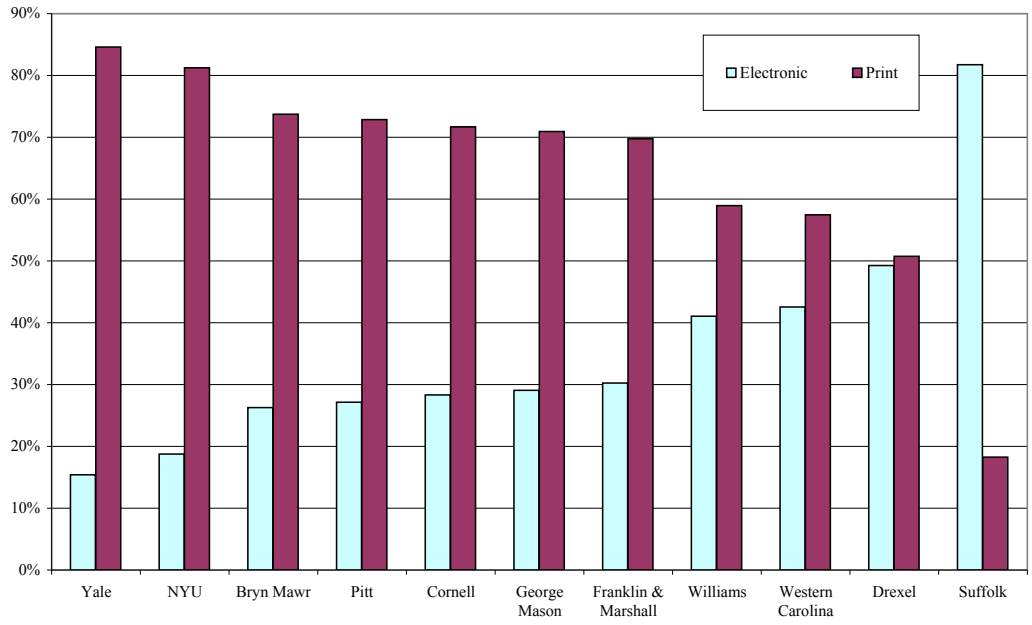


Table 3. Total annual nonsubscription cost allocated to electronic periodicals, per title

	Cost ($)	No. Titles	Cost per Title ($)
Bryn Mawr	121,981	11,140	10.95
Franklin & Marshall	66,854	6,264	10.67
Suffolk	211,145	6,000	35.19
Williams	170,020	16,000	10.63
Drexel	94,631	13,000	7.28
George Mason	259,918	15,430	16.84
Western Carolina	115,512	9,000	12.83
Cornell	525,898	20,000	26.29
NYU	242,951	15,173	16.01
Pitt	671,848	14,284	47.04
Yale	245,638	7,326	33.53

Table 4. Total annual nonsubscription cost allocated to current issues of print periodicals, per title

	Cost ($)	No. Titles	Cost per Title ($)
Bryn Mawr	195,872	1,854	105.65
Franklin & Marshall	94,831	1,487	63.77
Suffolk	40,492	129	313.89
Williams	129,700	1,404	92.38
Drexel	37,507	370	101.37
George Mason	456,557	6,165	74.06
Western Carolina	75,498	1,500	50.33
Cornell	844,664	16,956	49.82
NYU	518,944	12,424	41.77
Pitt	828,911	14,000	59.21
Yale	659,684	22,460	29.37

Table 5. Total annual nonsubscription cost allocated to backfiles of print periodicals, per volume

	Cost ($)	No. Volumes	Cost per Volume ($)
Bryn Mawr	146,669	166,100	0.88
Franklin & Marshall	59,128	53,600	1.10
Suffolk	6,735	20,900	0.32
Williams	114,656	182,500	0.63
Drexel	60,022	152,700	0.39
George Mason	176,858	98,300	1.80
Western Carolina	80,640	82,600	0.98
Cornell	486,695	2,724,000	0.18
NYU	533,484	326,900	1.63
Pitt	975,899	848,200	1.15
Yale	691,135	600,000	1.15

Data Analysis: A Life-Cycle Approach

Because we wanted to understand the long-term implications of the format choice, we adopted the life-cycle approach. In the analysis that follows, we track *the total nonsubscription costs over the course of 26 years of accessioning one year of a typical periodical*. One way to think about this analytical technique is to imagine following a single year's worth of a given periodical subscription, tracking its total nonsubscription costs over time. The costs reported therefore represent the implicit long-term financial commitment made at the point of acquisitions for a given year of a given periodical. It is by comparing these total costs over time that we can best compare the nonsubscription cost implications of the two formats.

The choice to examine 26 years was arbitrary. It was built on the assumption that a print periodical would be held for one year as a current issue and for 25 years as a backfile, and that an electronic periodical would be maintained for an equal period of time. Any other time horizon could have been selected.

We report life-cycle costs as a net present value. The net present value allows us to calculate the amount of today's money that, after interest is added, will be adequate for a future need. It allows for the easy comparison of two future cost streams, such as the life-cycle costs of the print and electronic formats. For costs in subsequent years, we used a discount rate of 5%.[28]

The purpose of this exercise was to make possible a comparison between the print and electronic formats at each library. This approach cannot be expected to predict costs for different libraries or for the same libraries operating under alternate procedures or processes. The life-cycle approach allows us to calculate the costs over the course of time for each of the participating libraries, *if* they continue to operate under the same set of processes as they do today. Moreover, we have focused on developing internally consistent measurements at each library and on allowing for comparison by format. Our data are most valuable for making this comparison, rather than for examining absolute costs or patterns across the libraries. The findings that this section yields will certainly offer direction and guidance to other libraries, but any number of variables, including different levels of service and usage, lead to variance among the costs of the participating libraries and might cause costs at other libraries to differ from the costs presented here.

Specific formulae are outlined in the sections that follow for the two formats. In general, however, our work involved decomposing the budgetary data found in the previous section into one-time expenditures and recurring expenditures. We then allocated these as they could be expected to occur in the first and subsequent years.

By presenting separately the data for the first year and for subsequent years, we make it possible for interested parties to project out

[28] Discount rates of 3% and 7% were also tested, without significant differences in the direction or scale of the results.

as many years as they see fit. For example, a library that is focused on its role as a long-term steward of its periodicals collection might combine the one-time cost with 100 years of the ongoing costs to compare the life-cycle costs of the print and electronic formats. In the subsections that follow, we present the formulae and the findings and use them to compare the two formats.

Life-Cycle Formulae

We began our analysis of print periodicals with the one-time costs, that is, those costs that can be expected to take place only once during the life cycle. For the typical print periodical, most of these costs are experienced in the first year. They include all activities associated with current issues and certain presumptively one-time costs associated with preparing the backfile volumes. We included one year of the following costs:

- all staff costs on the current issue format
- staff costs for those activities on the backfile format that are one-time in nature, namely
  - collection development
  - licensing and negotiations
  - subscription processing, routine renewal, and termination
  - receipt and check-in
  - routing of issues and/or tables of contents
  - cataloging
  - linking services
  - physical processing
- depreciation of staff workstations, allocated on the same basis as the staff costs
- total cost of binding
- total cost of subscription agents and
- cost of space occupied by the current issues reading room during the year.

For each library, we divided the sum of these costs by the number of print current issues titles to reach the *one-time cost per title*.

We then determined the ongoing costs. These are costs that will recur every year for every bound volume of every title. Our approach entailed calculating the total annual ongoing costs experienced by each library. This was determined by summing

- staff costs on the backfile format for ongoing services, calculated on a dollar-per-year basis, namely
  - stacks maintenance
  - circulation
  - reference and research
  - user instruction
  - reservation
  - other activities
- depreciation of staff workstations, allocated on the same basis as the staff costs

- depreciation of publicly available workstations, allocated at 2% to print periodicals
- annual cost of storage space in an off-campus facility, calculated on a dollar-per-year basis and
- annual cost of shelving, calculated on a dollar-per-year basis.

For each library, we divided the sum of these costs by the number of volumes held in the backfile to reach the *annual ongoing cost per volume*.

We then combined the one-time cost per title and the annual ongoing cost per volume that have just been reported to yield the life-cycle cost. Because these two figures were reported on two different unit bases (titles in one case and volumes in the other), we had to take an extra step to bring them together in the life cycle. We used the ratio of bindings to titles for this purpose. This was an important step, because not every print title will yield one bound volume per year. Some periodical titles are not bound, are not bound every year, have multiple subscriptions, or yield multiple bound volumes per subscription due to their length.

The ultimate life-cycle formula for one title is as follows:

Print Life-cycle Cost = 1*(*One-time cost per title*)
+
Net Present Value of 25 Years of
[(*Bindings per title*)*(*Annual ongoing cost per volume*)]

The life-cycle cost analysis for the electronic format is fundamentally similar, although the structure of the format necessitates some differences. There is no natural distinction between current issues and backfiles, which makes some of the distinctions between ongoing and one-time costs less intuitive. We nevertheless were able to group activities by those that are fundamentally one-time in nature and by those that are recurring in nature. This allowed us to perform an analysis that mirrored our estimates for the print format.

We began our analysis of the electronic life cycle with those activities that are expected to take place only once for a given year of a given title. We included one year of the following costs:

- staff costs for those activities on the electronic format that are effectively one-time in nature, namely
  - collections development
  - receipt and check-in
  - cataloging
  - linking services
- an allocation of staff costs for two activities that are principally (we estimate 75%) one-time in nature but have recurring components to them as well[29]

[29] While the allocation of 75% of these costs here is an approximation, we believe that most of the costs of these two activities in the electronic format are one-time in character.Although renegotiations and processing take place on a recurring basis for electronic periodicals, it is important to distinguish new years of a given periodical from previous years. These two categories of recurring costs are properly attributed in large measure to the new years of the title, not to the previously accessible years.

  - 75% of negotiations and licensing
  - 75% of subscription processing and
- the depreciation of staff workstations, allocated on the same basis as the staff costs.

For each library, we divided the sum of these costs by the total number of electronic titles to reach the *one-time cost per title*.

For activities that are recurring or ongoing, we developed a mechanism to spread costs across the multiple years of the electronic periodicals available on campus. For these, we determined the nature of the recurrence, assuming an average of five years of content for every electronic periodical currently provided on campuses. Use of electronic journals over the five years represents use of one-year-old through five-year-old titles. The recurring costs in our data are therefore assumed to be spread across five years.

Of the recurring costs, we first considered separately those that are believed not to vary by usage. These include

- staff costs for those activities on the electronic format that are effectively recurring, unrelated to usage, in nature
  - routing
  - preservation
  - other activities
- an allocation of staff costs for two activities that are principally (we estimate 25%) one-time in nature but have recurring components to them as well[30]
  - 25% of negotiations and licensing
  - 25% of subscription processing and
- depreciation of staff workstations, allocated on the same basis as the staff costs.

For each library, we divided the annual expenditure on these activities by five to achieve an average cost per title per year. We divided this annual total by the number of titles to reach the *annual ongoing cost per title*.

Finally, some costs vary based on the degree of usage. These include

- staff costs for those activities on the electronic format that are effectively recurring, related to usage, namely
  - circulation
  - reference and research
  - user instruction
- the depreciation of staff workstations, allocated on the same basis as the staff costs and
- the depreciation of publicly available workstations, allocated at 6% to electronic periodicals.

[30] For explanation, see footnote 29.

We called this sum the *use-related cost per title*.[31] We expect usage of electronic periodicals to decay over time, as is also typical with print. Our data are, however, believed to include only five years of titles. Recent surveys in three universities suggest that there is only about 21% more use beyond the five years.[32] Thus, the use-related cost per title (circulation, reference and research, and user instruction) is multiplied by 1.21 in the formula.

The ultimate life-cycle formula for one electronic title is:

Electronic Life-cycle Cost = 1*(*One-time cost per title*) + Net Present Value of 25 Years of (*Annual ongoing cost per title*) + 1.21*(*Use-related cost per title*)

The Life-Cycle Findings

The cost comparison in table 6 and figure 7 indicates that the long-term financial commitment associated with accessioning one year of a periodical is lower for the electronic format than for print at every library in our study. There is strong reason to conclude that the electronic format brings a reduction in the nonsubscription costs of periodicals across the board.

The potential savings are most pronounced at the smaller institutions. This development is consistent with our understanding of these libraries. Because the larger libraries have long benefited from

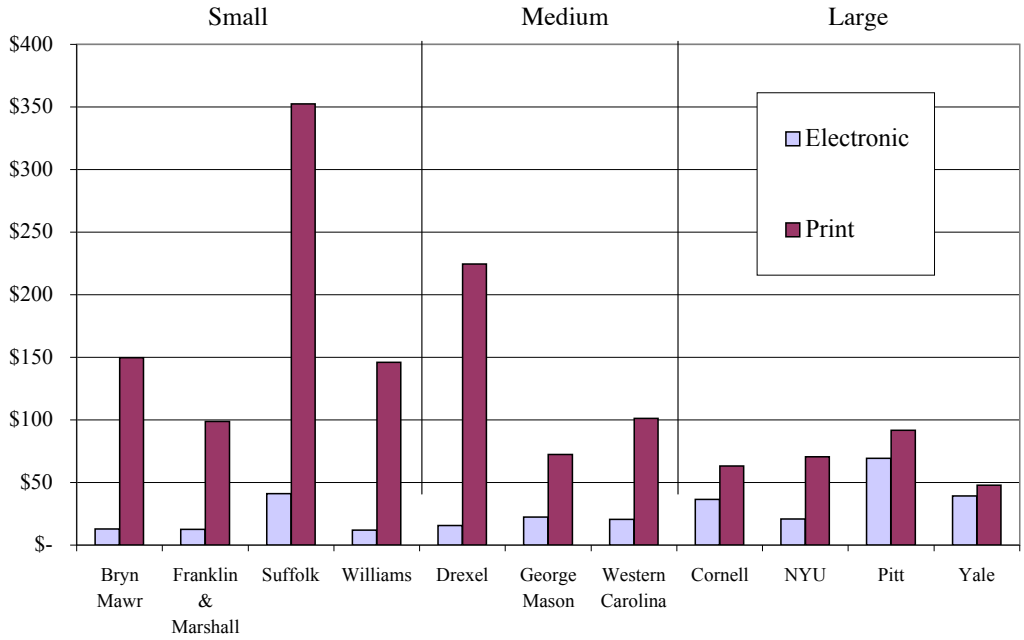
Table 6. 25-year costs allocated to print and electronic periodicals, per title

	Electronic Cost per Title ($)	Print Cost per Title ($)
Bryn Mawr	13	150
Franklin & Marshall	13	99
Suffolk	41	353
Williams	12	146
Drexel	16	225
George Mason	22	72
Western Carolina	21	101
Cornell	36	63
NYU	21	71
Pitt	69	92
Yale	39	48

[31] It is necessary to segregate the use-related costs only for the electronic format. The backfiles of the print format date back through the life span of the periodical. For this reason, the natural decay in usage is built into the use-related costs of the print format periodicals. For the electronic format, however, the frequent lack of backfiles means that the anticipated usage decay was not built into our data and therefore must be estimated.

[32] Surveys were conducted with University of Tennessee, Drexel University, and University of Pittsburgh. King et al. 2003a.

Fig. 7. Relationship between print and electronic 25-year life-cycle costs



economies of scale in their print operations,[33] the relative savings to be generated from the further economies brought by electronic periodicals are simply not as great as they are at smaller libraries. This finding should not be discouraging to the larger libraries, which nevertheless would stand to save, but seems compelling for the smaller libraries, for which there appear to be opportunities to realize roughly the same per-title cost basis as the larger libraries.

In examining the life-cycle findings, one must recall that three of the large libraries chose not to include significant parts of their science, technical, and medical (STM) and law collections in the reported data. Many STM and law titles produce quite a number of bound backfile volumes per year. These titles would have brought up the ratio of bindings per title, had they been included in our dataset. To think about them separately, we should consider that, in addition to the one-time costs, many of these titles might yield the annual costs of up to 20 volumes per year. The absence of these collections from our data clearly has the effect of reducing the reported life-cycle cost of the print format at these libraries. Including these collections would have yielded modestly higher print unit costs than those re-

[33] These economies of scale characterize large, centralized operations, and a library such as Yale, whose data in this study include only the large central collections at Sterling Memorial Library, exhibits such economies dramatically. However, the data for other large institutions, such as the University of Pittsburgh, include, in addition to an extremely efficient central library, a significant number of small libraries—24 spread across multiple campuses—thus exhibiting higher average costs per title. For more detail about the economies of scale that we observed, please see the section entitled Total Costs and the Transition Path.

ported here, for Cornell, NYU, and Yale.[34]

Moreover, because we charged space at the rate of a highly efficient high-density off-campus facility, the per-title implications for the costs associated with reduced space requirements are rather small. While we believe that this is the most appropriate representation of the likely savings (for the reasons discussed in the Study Design section), some institutions might find that a switch to electronic would relieve them from constructing some amount of costly on-campus browsable shelving.

In the previous tables and figures, we assumed that print backfile volumes are stored off-campus. This yields a construction cost of approximately $2.50 per volume. Storing volumes on campus, in a newly constructed Americans with Disabilities Act (ADA)-compliant facility, is estimated to cost an average of $250 per volume. On this basis, we have developed table 7, which includes the print life-cycle calculations exactly as they were performed above, but using the figure for newly constructed on-campus storage. For a comparison with the electronic life-cycle cost, see figure 8.

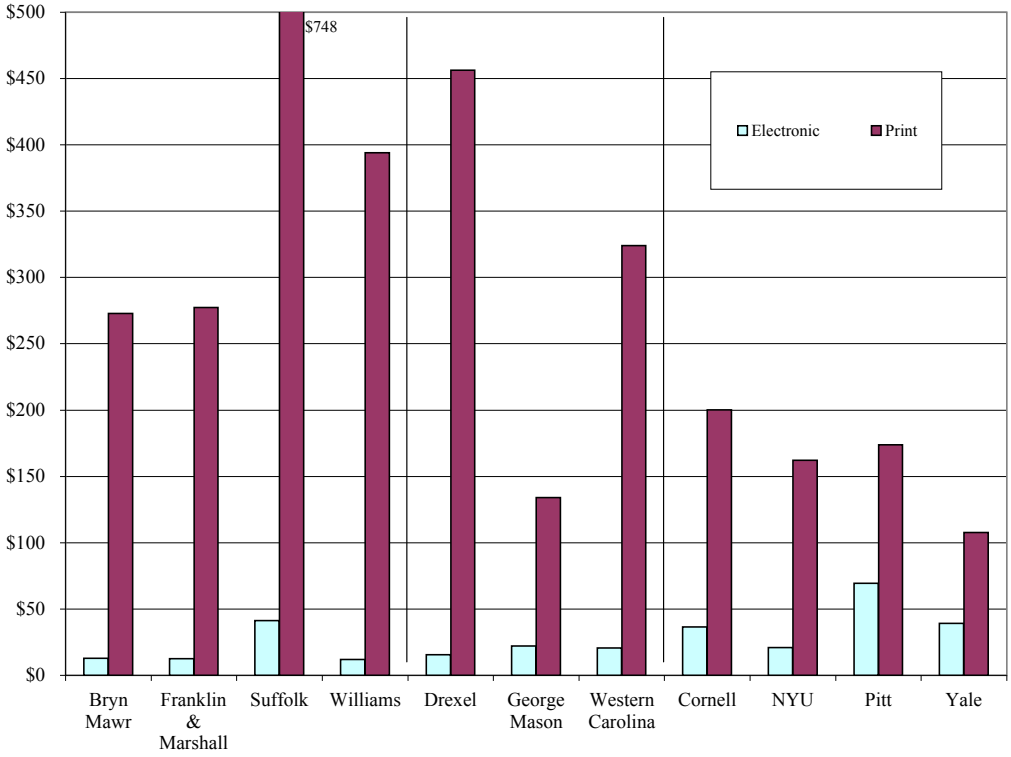
Table 7: Total annual cost allocated to backfiles of print periodicals, per title, assuming on-campus, ADA-compliant, newly constructed library facility

	25-Year Life-Cycle Cost ($)	Titles	25-Year Life-Cycle Cost per Title ($)
Bryn Mawr	506,031	1,854	272
Franklin & Marshall	412,661	1,487	277
Suffolk	96,534	129	748
Williams	553,323	1,404	394
Drexel	168,787	370	456
George Mason	825,643	6,165	133
Western Carolina	486,020	1,500	324
Cornell	3,395,152	16,956	200
NYU	2,013,518	12,424	162
Pitt	2,433,066	14,000	173
Yale	2,420,558	22,460	107

The cost comparison is far more dramatic if print backfiles are stored on campus. But regardless of whether their backfiles are stored on or off campus, electronic periodicals collections are less costly, on a unit cost life-cycle basis, than print collections. This life-cycle analysis has offered a window into the ways in which the nonsubscription costs vary on a unit basis. Before reaching any conclusions on the basis of these findings, however, it is necessary to consider—as we will in the following two sections—how these life-cycle unit costs may affect total library expenditures on nonsubscription periodicals. For the following sections, in which we model

[34] Another effect of excluding the data of certain collections from some of the libraries is to undercount the cost of titles for which duplicate subscriptions may exist in the excluded collections. Had all duplicates been included, total costs for the same number of titles would have risen. This would also have led to at least modestly higher print unit costs being reported for the affected schools.

Fig. 8. Relationship between print and electronic 25-year life-cycle costs, assuming on-campus, ADA-compliant, newly constructed library facility



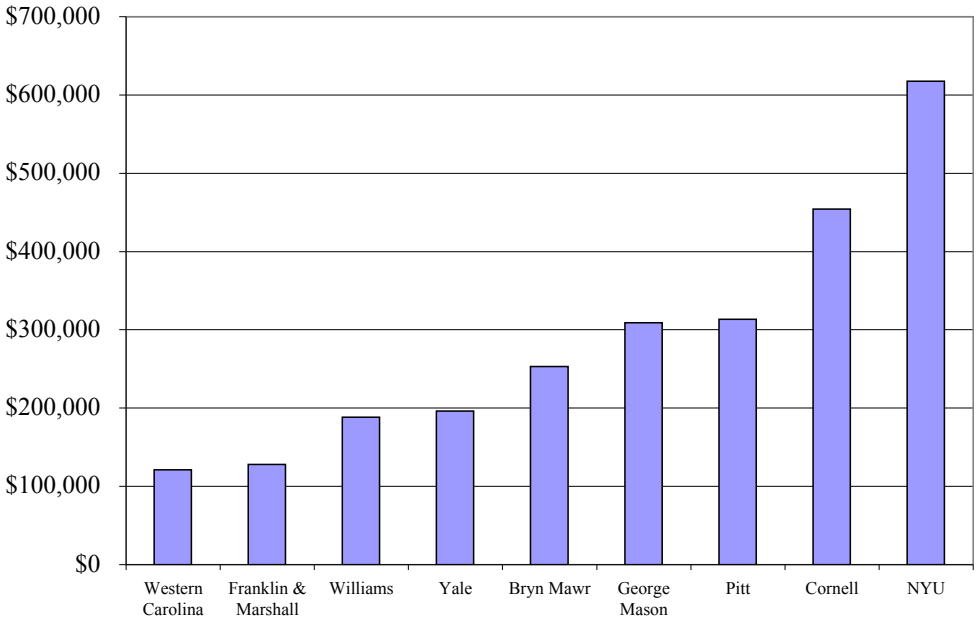
some of the possible effects of the life-cycle analysis, we hold to the assumption that storage costs for print backfiles are at the rate of a high-efficiency off-campus facility.

Total Costs and the Transition Path

As we have just seen, the electronic format's substantially lower life-cycle costs, in comparison with those of print, are striking. Measured on a unit basis, i.e., per title, these costs may be reduced by as much as 90% or more. Other things equal, our unit-cost findings imply that the *total* nonsubscription cost, on a life-cycle basis, will also be lower in the electronic format than in the print. In this section, we develop a number of models that suggest how this might be the case, while also offering a number of cautionary notes.

To measure the total potential cost effects of these differentials, we estimated the decrease in the implicit long-term financial commitment under the hypothetical case of a complete transition from print to electronic format for periodicals. To do so, we multiplied the number of current print titles by the cost differentials between the print and electronic life-cycle figures. This yielded the amount by which the total financial commitment decreases for every year's worth of acquisitions (see figure 9). These figures do not include the

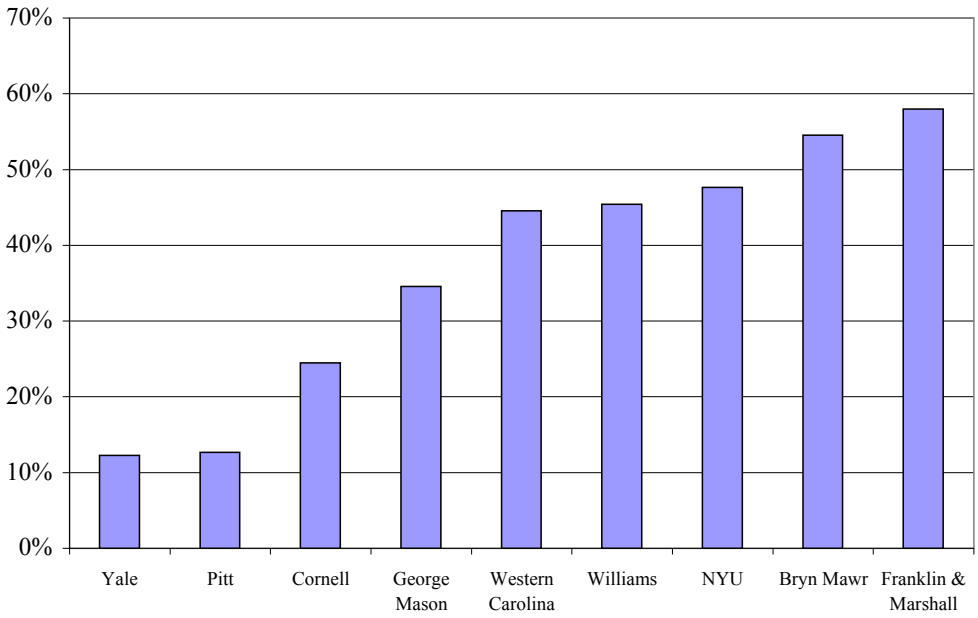
Fig. 9. One year after the transition from print to electronic (total cost differential over 25-year life cycle)



collections, including law and STM, that were excluded from a number of these libraries, and therefore omit associated cost differentials. The total differentials at Drexel and Suffolk would be at the low end of the spectrum because they have already transitioned to the electronic format and few print periodicals remain. For them, many of the cost advantages of a transition have already been realized.

We estimated in figure 10 the cost savings within each library that can potentially be realized, as a percentage of total nonsubscrip-

Fig. 10. Total 25-year life-cycle cost differentials as a percentage of annual nonsubscription periodicals expenditures



tion costs. To do so, we divided the figures presented in figure 9 into the total annual nonsubscription costs from figure 5. We thereby compared the cost effect, which is achieved at various points across the life cycle, with the actual annual expenditures. One cannot assume that these rates of cost reduction could be expected in the initial years of a transition, since the cost effects take place over the course of the life cycle.

There is significant duplication of print and electronic titles at many of these libraries (see Withers 2003, 93–4). We therefore have estimated rates of duplication and assumed that, for titles that are received in both formats, there would be a savings in the cost for print without a corresponding added cost for electronic. Our assumptions are that 16% of print titles are duplicated in electronic at Yale, 30% at Cornell, NYU, and Pitt, and 50% at the medium and small institutions. Figures 11 and 12 present the cost differentials under this set of assumptions.

Figures 11 and 12 represent our best estimate for the long-term effect of the transition on the libraries in the study. Accounting for estimated duplication, we found cost differentials exceeding 50% at four of the libraries and differentials of 20% or greater in all nine libraries that have yet to make the full transition. Although the absolute amount of the differential is larger at the large libraries, the rates of savings tend to be lower at these large libraries. Differentials on the order of $100,000 or more are expected to be generated for every year that the library has an electronic-only collection, at every library that undergoes a transition.

Fig. 11. One year after the transition from print to electronic (total cost differential over 25-year life cycle), accounting for duplication between print and electronic formats

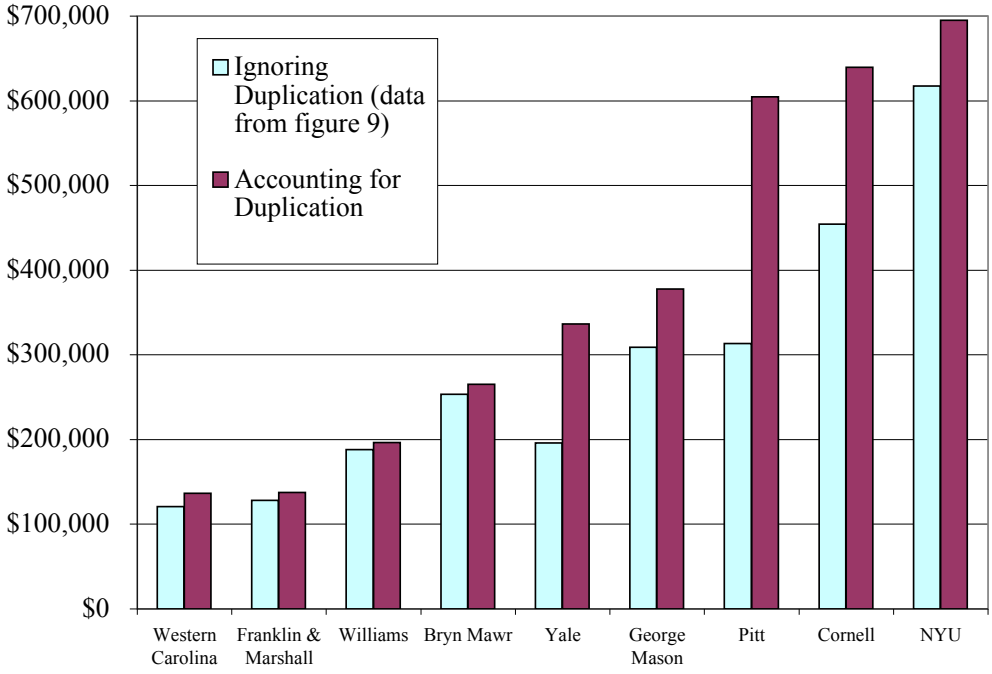
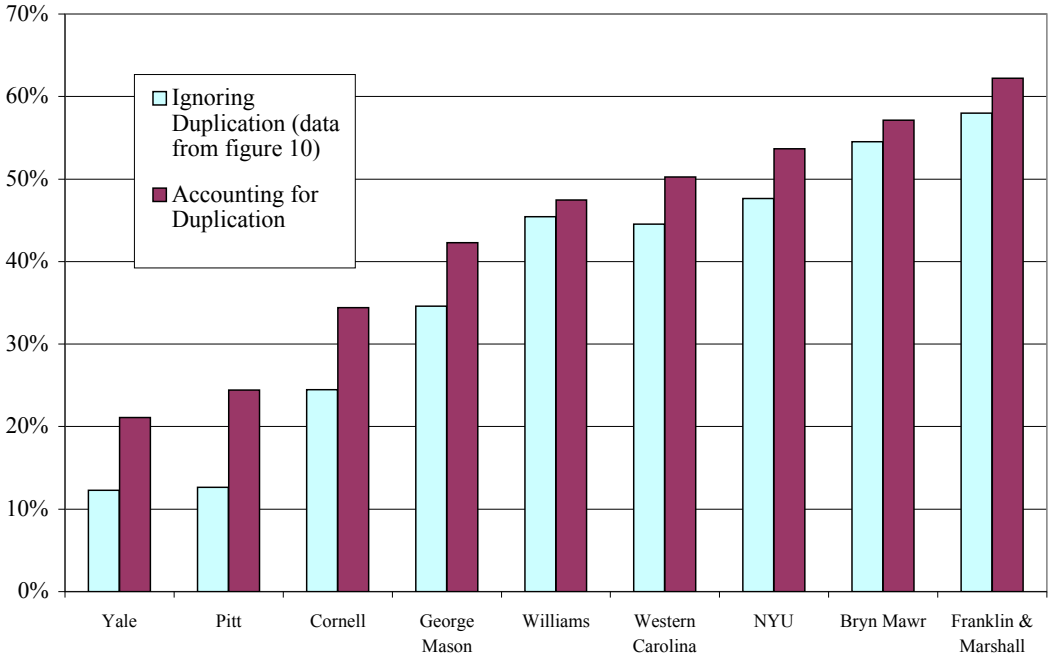


Fig. 12. Total 25-year life-cycle cost differentials as a percentage of annual nonsubscription periodicals expenditures, accounting for duplication between print and electronic formats



While this represents our best estimate of the ultimate cost effects, it is important to bear in mind the scale effects that are at work. The data reported in the two figures above assume a complete transition, and it may be years, if ever, before the majority of users at many of the libraries in this study would demand (or tolerate) such an action.[35] During a transition, if it were to be gradual, print subscriptions would decline but not be eliminated and so the associated economies of scale would decline as well, driving up print per-title costs. Therefore, having modeled the outcome of a transition, we must also consider these types of short-term effects that might accompany it, particularly scale effects.

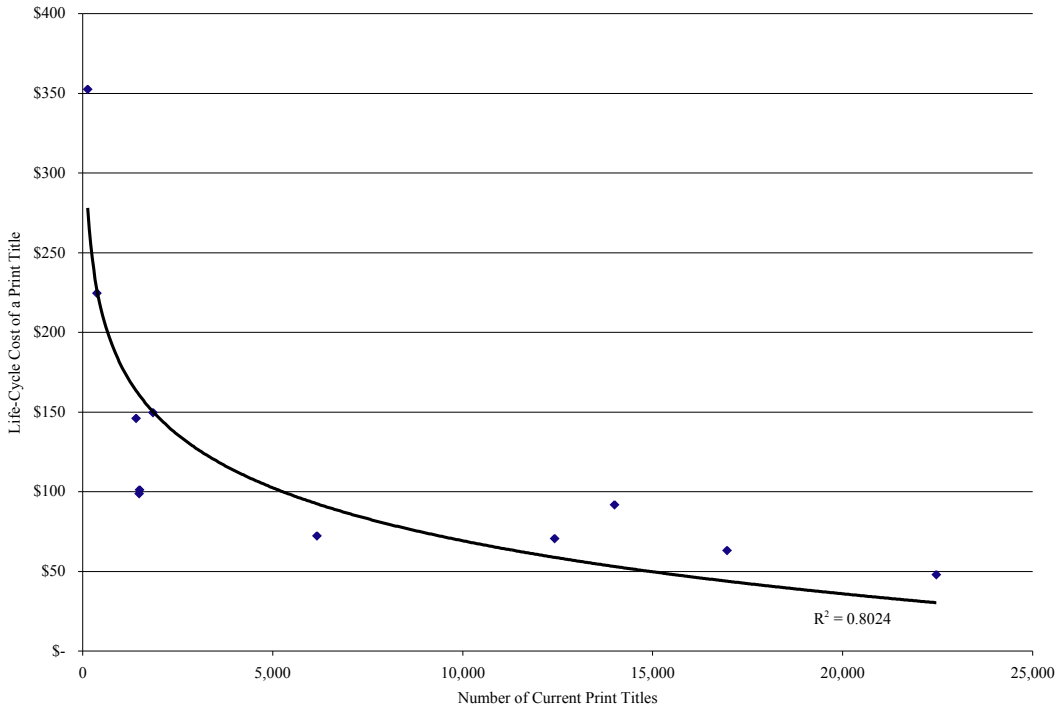
Scale Effects

The presence of scale effects on the print format explains why the large libraries have a smaller cost differential than the smaller libraries.[36] The evidence for economies of scale for the print format is clear (see figure 13). A larger operation requires less time per title than does a smaller operation, perhaps because processes can contain

[35] For some survey-based findings on faculty tolerance of electronic periodicals, see Dillon and Hahn 2002; Guthrie 2001; Friedlander 2002; and Guthrie and Schonfeld 2004.

[36] The consideration of scale effects in examining costs of libraries has a notable history, as outlined in Lin 2003. Our work is less complicated than many of the precedents discussed there, because we focused on a discrete portion of the academic library, rather than developing a library-wide cost function.

Fig. 13. Relationship between the size and the life-cycle cost of the print collection



more specialization and routine. This is driven by manual tasks that vary principally by the number of subscriptions.[37]

Equally striking is the absence of economies of scale in the electronic format (see figure 14). Several hypotheses for the lack of such a relationship may be advanced. First, the relative novelty of the electronic format suggests that the most efficient processes may not yet have been fully deployed. Further process improvements may yield scale effects. Another possibility is that the nonsubscription costs of electronic titles accessed as part of an aggregation may be far lower than those of titles accessed individually or as a small group from a publisher. (This finding was reported by Montgomery and King 2002.) The distribution of a library's titles (i.e., a comparison of titles received from publishers versus large aggregators), might be a more revealing source of cost differential than scale effects themselves. The present study's design did not call for the collection of data that might permit us to address this uncertainty, and it might constitute an area for further research by others.

Recognizing the different economies of scale allows us to project the potential cost effects for a library that would make an immediate transition of, say, 50% of its collection, but not the entire collection. To make such a projection, we assume that each title transitioned achieves the same life-cycle cost as other electronic titles at that library do (since there are at present no scale effects on the electronic

[37] The scale effects attain a high level of statistical significance for the print format if measured on a per-subscription, rather than a per-title, basis, since certain activities (such as cataloging) are presumably more cost-effective when performed locally for multiple copies of a given title.

format), but that the cost per remaining print title will rise as a result of scale effects, as predicted by the curve in figure 13.[38] We also assume the rates of print-electronic duplication that were discussed at figure 11. The outcome of this calculation, shown in figure 15, demonstrates starkly that a partial transition would, for many of the librar-

Fig. 14. Relationship between the size and the life-cycle cost of the electronic collection

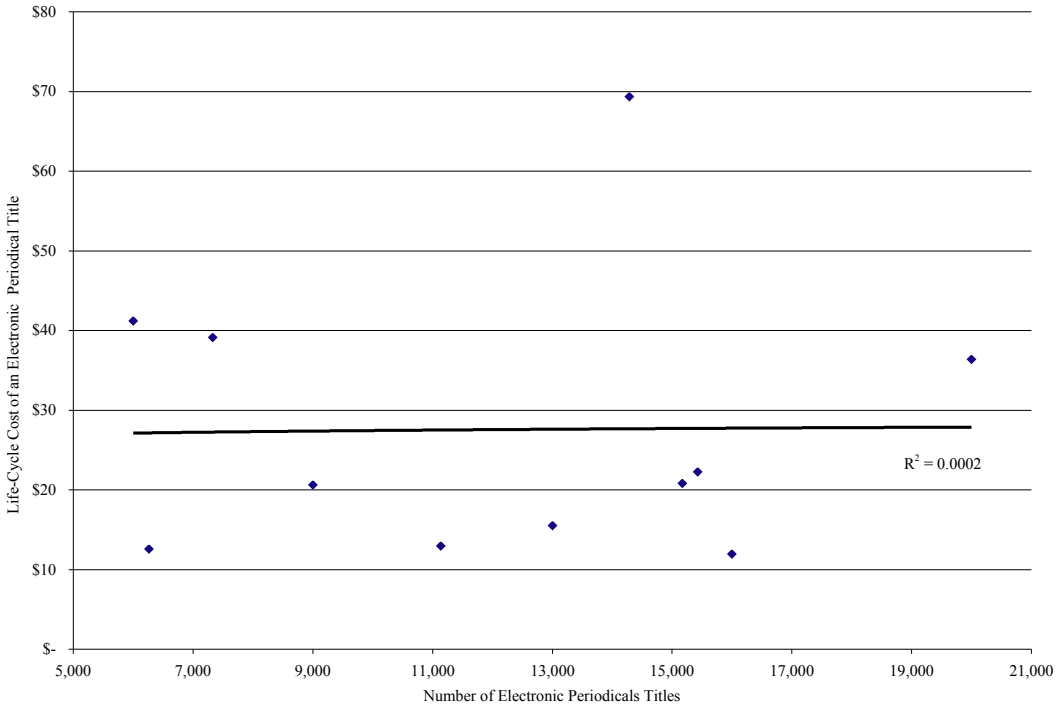
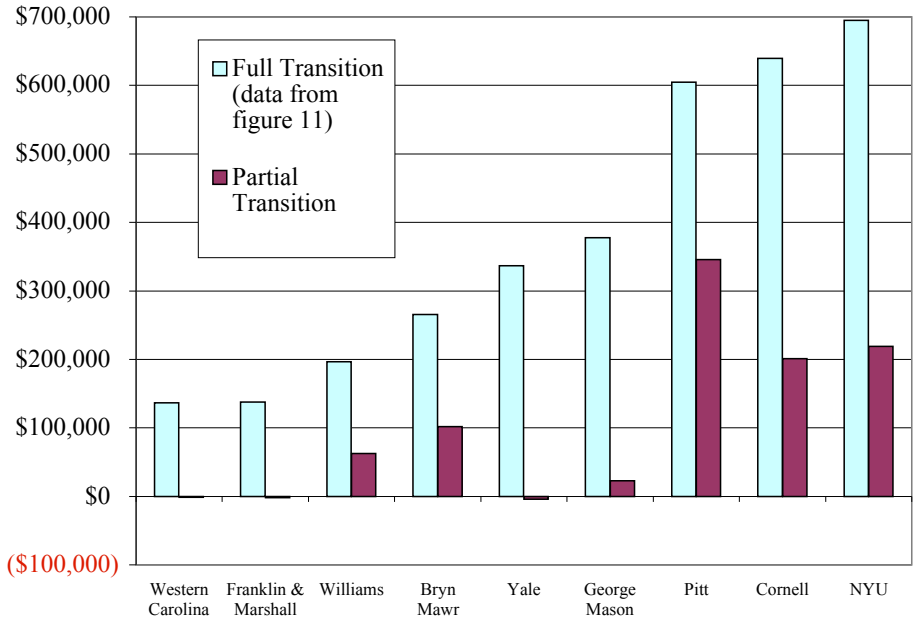


Fig. 15. One year after a 50% transition from print to electronic (total cost differential over 25-year life cycle)



[38] The equation for the curve is y = -48.005Ln(x) + 511.33.

ies, have notably different cost effects than would a full transition.

Many of the libraries might still achieve savings, although all would see their savings eroded and some might even experience a net cost. The cost effects we have found to be associated with a partial transition, which are driven by the positive scale effects of the print format, deserve careful consideration by any library that is planning a strategy for the transition from print to electronic format. If a full transition is eventually to be achieved, the near-term transitional effects may of course be of only short-term importance. But it cannot be ignored that the transitional period, especially if it is a long one, will result in increased unit costs for print periodicals as the number of print titles is reduced. Many libraries are already along the path of such a partial transition. But the slow ripping of the bandage is always more painful. From this perspective, a faster transition would, other things equal, be preferable.[39]

Management Challenges

There are a number of other reasons why it might not be possible to recapture the total annual cost differentials discussed above. A significant amount of the cost differential that this study has documented is attributable to lower staff-time expenditures. Unlike savings that result from unbuilt space, which are difficult to reallocate,[40] staff and student-worker time may be redirected or their positions reassigned. Because of the varying skill sets of individuals and the difficulty of reallocating relatively small amounts of employees' time expenditures, it would probably be impossible to reallocate all the staff time expenditures in perfectly efficient ways. For example, it might be difficult to reassign 2% of a librarian's time expenditures, especially if that person is a skilled cataloger who will not necessarily take on public-service tasks during the freed-up period of time. Realizing the full potential cost decreases would pose a significant management challenge.

Before we could conclude with any certainty that cost differentials on this scale could be expected, we would need to know whether the collection size of a given library will grow significantly during the transition from print to electronic and, if so, how. The evidence from several of the libraries in this study—in particular, the small and medium-size libraries—suggests that far more electronic titles are being received than was ever the case with print (see figure 1). If this phenomenon holds true, then some might be led to conclude that the lower unit costs may be offset, at least partially, by a higher total number of units. On the other hand, some say that many of these additional titles are not really wanted by the subscribing li-

[39] Connaway and Lawrence (2003) reported librarians' concerns about the burden that a transition period would place on their resources.

[40] Reallocating the cost of unbuilt space is, economically, a sound concept. It is, however, a complex argument to make, except in cases where shelves are bursting at their seams and expansion is imminent. See Schonfeld 2003, 367-72.

brary, and some libraries are beginning to move back to access models that afford greater control over the specific titles that they license. If this trend continues, the vast increases in available titles might become far less of a factor than they now appear to be.

While our data clearly indicate that unit costs will decline, this section has suggested a number of reasons why local practices will determine the budgetary impact of any cost decreases. Where collection sizes do not increase significantly, and where efficient procedures and time reassignments can be implemented, a transition could be expected to have a salutary effect. We believe, on balance, that decreases in total nonsubscription costs present the most likely scenario for the future. Questions of implementation, however, remain to be addressed.

Conclusion

The transition to the electronic format is bringing with it changes in library operations that will afford reductions in libraries' long-term financial commitments to nonsubscription costs. This is good news for the many libraries that are well along into this transition and would find it difficult to step back. This finding may also be useful to libraries that have been more reluctant to move toward this new format. Each year, a library that has transitioned to the electronic format for periodicals may have the opportunity to avoid immediate costs and long-term financial commitments as high as several hundred thousand dollars.

We have documented the likelihood that nonsubscription costs as they currently exist will decline for libraries as a result of the transition to electronic periodicals. The process differences make electronic costs lower than those of print. Certain efficiencies for electronic processes have probably not yet been developed, and electronic nonsubscription costs might therefore be expected to decline in certain ways. On the other hand, our data do not fully account for a number of effects of the transition. Numbers of periodical titles may increase dramatically at libraries. Cost shifts between libraries and publishers may continue. And, as noted in the section on Periodicals Operations and How They Are Changing, there is an absence of work associated with the long-term archiving of the electronic periodical content. Cost provisions for archiving will eventually be necessary.

For the print format, several characteristics have combined to help ensure the long-term archiving of periodicals at many, if not all, of the libraries participating in this study. First, once a bound volume is accessioned to the collection, it is rarely intentionally deaccessioned. Second, adequate storage space with satisfactory environmental conditions is provided to house the collection, including the periodic expansions of that space. Finally, at several of the libraries in this study, some amount of preservation-program costs are devoted

to periodicals collections, including conservation, reformatting, and rebinding. Costs associated with these policies present themselves throughout the data on the print format.

For the electronic format, no appropriation of staff time or institutional expenditures has yet been made for the equivalent costs. Today, no archiving solution is in place for electronic materials, although efforts are being devoted toward developing possible solutions.[41] While opportunities for tackling this problem may be difficult to identify, this study's focus on the relative costs of the two formats may offer a point of entry. We have documented the extensive and costly efforts undertaken by libraries to ensure the long-term preservation of and access to their print periodicals collections. If the library community is to continue to ensure the long-term availability of the resources that it provides, some provision must be made.[42] Just as all manner of nonsubscription expenses have been (or will be) reallocated from the print format to the electronic format, so the cost of long-term preservation and access must also be reallocated, and our findings suggest that a source exists for such reallocations.

Because every library has traditionally incurred certain costs associated with the long-term preservation of and access to print periodicals, each will have funds that can potentially be reallocated. For example, even a relatively small academic library will not, for the electronic format, need to construct expanded space for periodicals, bind current issues, reshelve materials after use, or maintain items on shelves. Each library that benefits from electronic periodicals could therefore contribute to the cost of long-term preservation and access. If an archiving solution is preventing a given library from making the format transition more fully, it would appear to make sense for that library to be willing to reallocate funds toward the costs of the solution. If all libraries that benefit make contributions in this key area of work, the costs for any given institution would thereby be lowered.

While the archiving solution is yet to be put into place, some ob-

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41 Libraries have only recently begun to request licensing terms that provide for long-term access to electronic resources after the subscription period ends. Long-term access is often guaranteed by the terms of the license, but through an indeterminate mechanism and for an unknown price. Most frequently, this licensing term is expressed as the opportunity to receive tapes, CDs, or other media on which data have been copied. However, subscribing libraries rarely make provision for the installation and servicing of these data or, more generally, for the preservation practices and safeguards this new medium requires. The location and custody of electronic periodicals today almost always remain with the publisher.

A number of important projects are under way. The LOCKSS (Lots of Copies Keep Stuff Safe) project at Stanford University, the partnership between the National Library of the Netherlands and Elsevier, and the initiatives at the Library of Congress are particularly noteworthy.

42 We are assuming that costs of archiving will be borne at least in part by libraries, because that appears to be the emerging model (witness, for example, LOCKSS and the National Library of the Netherlands/Elsevier). But the principles discussed in this section would also hold true in a "publisher pays" model, under which publishers would presumably pay the costs by increasing their prices at least commensurately and libraries would be expected to allocate monies in that direction.

servers have expressed the belief that the format yields "savings" to which they might like to lay claim. Some publishers are making the case that savings resulting from the transition should somehow be returned to them in the form of rising prices. They have undoubtedly assumed new costs associated with electronic publishing, including the possibility of cost shifts within the system from libraries. Should publishers ultimately contribute toward the cost of developing an archiving solution, this would be another cost shift. Similarly, some provosts might argue that savings should be returned to the general fund rather than be redirected within the library. However, these perceptions of savings ignore the absent archiving solution coupled with the historic responsibility of the academic library to ensure the long-term preservation of and access to scholarly resources. Libraries should carefully consider the implications of reappropriations deriving from the format transition.

As the format transition continues and reappropriations take place, long-term preservation and access must not become lost in the mix. Moreover, the format transition itself has been hindered at least somewhat by the lack of broadly accepted archiving solutions for the electronic format. While the perfect system of archiving solutions is not yet in hand, a number of initiatives are under way—in the university, governmental, and not-for-profit spheres—any of which will require supporting resources. Many libraries are waiting for an opportunity to participate in an appropriate archiving solution. But perceived library "savings" in the short term must not crowd out the library community's ability to ensure the availability of such archiving solutions in the coming months and years. If appropriate solutions are developed and funds made available to support them, the transition to the new format will be much smoother, and the long-term preservation of and access to these resources can be ensured.

APPENDIX A:

Electronic Infrastructure Costs

We were unable to collect accurate data regarding electronic infrastructure costs (including both staff time and equipment costs) from most of the libraries in the study, because it was so difficult for them to apportion these expenses reliably to periodicals or to the various periodical formats. We therefore excluded the electronic infrastructure costs from the findings and analysis presented in the body of this report. Fortunately, we were able to collect electronic infrastructure costs from three libraries—Drexel University, George Mason University, and the University of Pittsburgh. This appendix reports on those costs.

The data in this appendix include all the costs included in the body of the text, with the addition of staff time expenditures devoted to electronic infrastructure at Drexel, George Mason, and Pitt, as well as the equipment costs for electronic infrastructure at Drexel and Pitt. Although we were able to determine a total cost for equipment devoted to electronic infrastructure for periodicals at George Mason, we were unable to estimate a breakdown by format. Its equipment costs therefore cannot be included in our model. Equipment cost allocations at the other two universities are only estimates, since allocating these costs properly is not a science.

In developing the life-cycle model for the electronic infrastructure costs for both the print and electronic formats, we elected to handle the equipment costs differently from the staff time. Equipment was assumed to depreciate on a five-year basis. Taking this depreciation into account, we considered equipment to constitute an annually recurring cost. Staff time was distributed as 20% recurring and 80% one-time, since we assume that staff time varies much more by the number of periodicals titles than by the number of title-years in the collection. This assumption, while we believe it to be appropriate, is a further source of possible error in the numbers presented in this appendix.

Using the assumptions as they have been outlined, we calculated the per-title life-cycle costs including electronic infrastructure, in comparison with the costs excluding infrastructure. Figure A1 illustrates the differentials for the electronic format, while figure A2 shows them for the print format. With the exception of Drexel, which has already completed its format transition, the cost differentials are not large for either format.

Fig. A1. Electronic life-cycle findings, both with and without electronic infrastructure

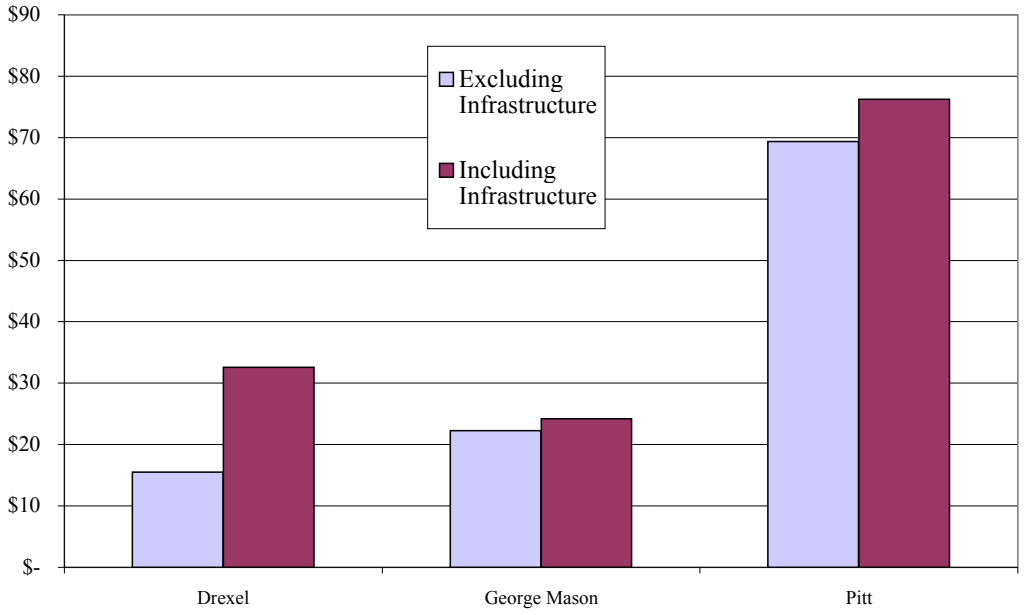


Fig. A2. Print life-cycle findings, with and without electronic infrastructure

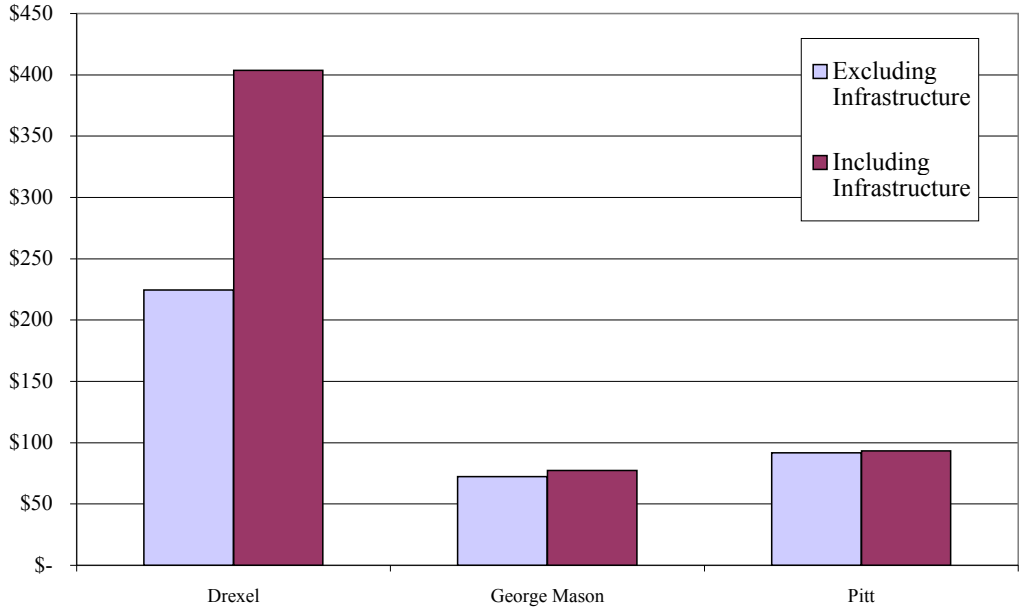
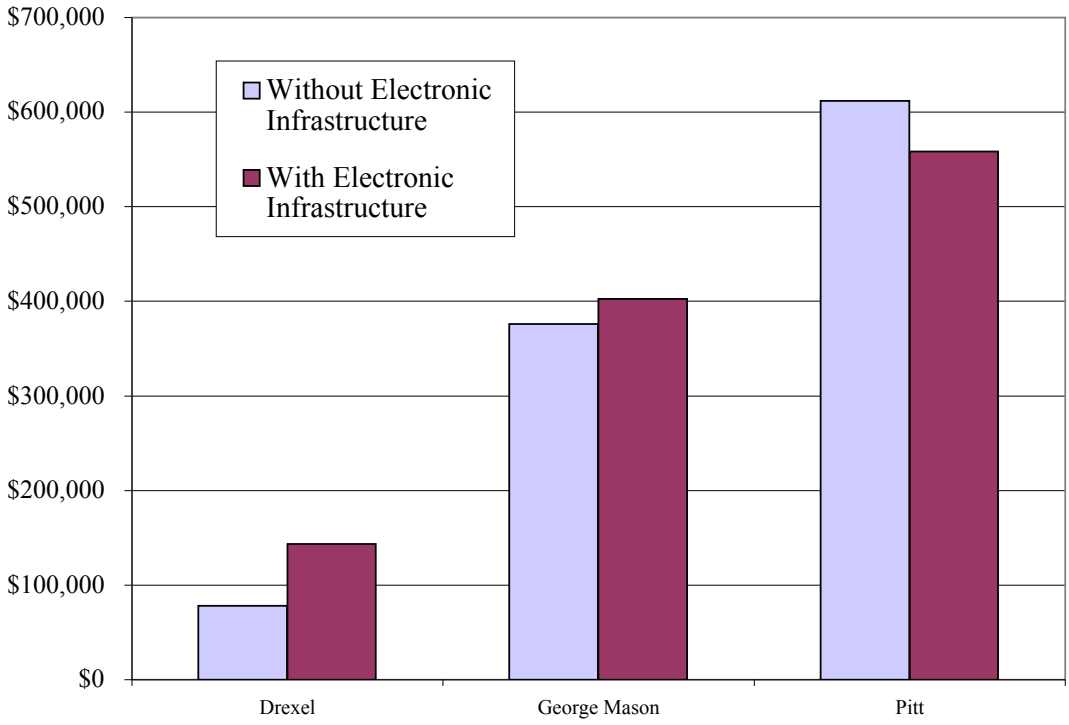


Figure A3 presents the total savings that might be expected after a complete transition to electronic format. Our approach here is identical to the approach we took in figure 11. There is a modest decline in the expected cost advantage at Pitt, although at the medium-size schools the expected cost advantage *increases*. We made no attempt to speculate on whether these results might be representative for the other schools in our study. Moreover, given the many assumptions necessary to report our findings and analysis, including electronic infrastructure costs, no claim of validity for the three libraries included in this appendix can be offered. Nevertheless, it is notable that the addition of electronic infrastructure costs does not change the direction of the results at any of these three schools: Savings continue to be anticipated. This analysis calls into question the widely held belief that electronic infrastructure costs are a principal driver of the cost differences between the formats. This area clearly calls for further inquiry.

Fig. A3. One year after a complete transition from print to electronic (total cost differential over 25-year life cycle)



APPENDIX B:

Data-Collection Instruments

ACTIVITY LIST

1. Collections development
    - Review and identify materials for selection, including gift and exchange and aggregations
    - Review and identify materials or formats for cancellation
    - Collection analysis and work with collection reports (including vendors, in-house)
    - Maintain relevant collections development statistics
    - Usage statistics gathering and analysis
2. Negotiations and licensing
    - Work with consortia, vendors, publishers, etc.
    - Discuss and attempt to alter pricing and other terms
3. Subscription processing, routine renewal, and termination
    - Order new subscriptions, not including collection development (see #1 above). Includes downloading bibliographic record, verifying title information, and creating the purchase order.
    - Register and activate electronic subscriptions
    - Renew existing subscriptions and licenses, including receiving, verifying, accepting vendor quotes. Does not include negotiating (see #2 above).
    - Order periodical back-orders, microfilm backfiles
    - Maintain access to electronic subscriptions, including claiming missing or incomplete items and communicating with vendors and publishers regarding access problems
    - Cancel subscriptions or licenses, not including collection development decisions (see #1 above).
    - Notify vendors of IP range changes for electronic subscriptions
    - Claiming missing items
    - Identify and place orders for missing/lost items
    - Set up vendor information in payment system, post invoices there
    - Verify and approve payments and transfer information to accounts payable
    - Investigate invoice payments for vendors and publishers
4. Receipt and check-in
    - Periodicals delivery to campus (preparing bins, boxes, etc)
    - Periodicals check-in (for the currently received issues)
    - Identify and make changes to current issue display (includes addition of notes and setting up or changing check-in patterns)
5. Routing of issues and/or tables of contents
    - Create and maintain periodical route lists
    - Perform actual routing for periodicals and related follow-up
6. Cataloging
    - Copy, original, and enhanced cataloging for new periodicals and for title changes, cessations, etc
    - Catalog maintenance, including updating URLs
    - Create or maintain a list of journals, Web-based or otherwise, other than the OPAC itself
    - Perform authority control functions on records
    - Create and update volume holdings
    - Correct holdings and check in errors

- Withdrawal activities (location information and last copy withdrawal)
- Union listing activities with OCLC, RLG, etc

7. Linking services
   - Maintain and enhance linking services such as SFX
8. Physical processing
   - Spine labeling
   - Bar coding
   - Inserting and applying bookplates
   - Tattle-taping
   - Stamping and marking
   - Binding, rebinding, and related activities
   - Initial shelving of item upon receipt
9. Stacks maintenance (including microform and current issues areas)
   - Shelf-reading of current periodicals and bound volumes
   - Shelf maintenance; i.e., labeling shelves/ranges
   - Collection shifting
   - Collection weeding, including transfer of journals to remote storage
   - Cleaning of stacks and materials
10. Circulation
    - Checkout
    - Paging
    - Searching for missing items
    - Recalling overdue materials
    - Check-in
    - Reserves activities
    - Reshelving as a result of circulation or other use
11. Reference and research
    - Directional/access questions
    - Reference assistance, including over the phone, Internet, and in person
    - Assistance that requires going "off the desk" (such as to the stacks)
    - Creation of resources/guides
12. User instruction
    - Prepare for and conduct tours, briefings, sessions, demonstrations
    - Other user instruction
13. Preservation
    - Conservation and repair
    - Preservation microfilming
    - All preservation/archiving associated with electronic periodicals
    - Disaster recovery planning and activities
    - Binding is not included in this category: see item #8 above
14. Electronic infrastructure and support
    - This category is intended to capture those activities, for any format, that require electronic infrastructure and associated support, including:
      Maintaining hardware and software for OPAC, Library Management System, and other relevant servers
      LAN support
      Workstation support
      Other relevant systems office activities
15. Other
    - Please explain in detail on the activity log

ACTIVITY LOG

Study of the Operating Costs of
Periodicals Collections in Various Formats

Staff Activity Log – Representative Month

The materials that you now have in hand are part of a study that is being conducted in order to learn about library operating costs for different kinds of periodical collections. The data that this study will gather are important to us because they will help to shape JSTOR's new Electronic-Archiving Initiative, which has as its goal the long-term preservation of electronic versions of scholarly materials. Insuring the longevity of these materials is a challenging task, and this study is a most important early step in the effort. Your personal help with this important effort is sincerely appreciated. Your library is one of a small number of academic libraries partnering with us in this research effort. Through this study, we are hoping in particular to understand the economic effects of the transition from print toward electronic journals, which will in turn help us to understand how an archive of electronic journals will relate to existing library costs.

There are two components to this study. The most important component is the one that you are now reading, the Staff Activity Log. We hope that you will help us by carefully completing this document, which will allow us to understand how you and the other staff of your library contribute to the periodicals operation. Be assured that this study has been carefully designed to ensure your personal anonymity. The second component to this study is an Institutional Survey, which is being completed by your library to document other components of periodicals work. Together, these two components should provide JSTOR, and the broader scholarly community, with unprecedented data on the internal operating costs of the various periodicals formats. This in turn will help to inform all manner of decisions about periodicals collecting and storage.

Thank you very much in advance for your assistance in this effort. We appreciate the time and attention that you are giving to this project.

-Eileen Gifford Fenton and Roger Schonfeld

Instructions

We ask you to complete the Staff Activity Log on the attached sheet to help determine what activities related to periodicals you have performed in a recent representative month and to indicate how much time you spent on these activities. This will be easiest to do if you begin by identifying your work-related activities and locate them on the Activity List (which is provided separately). Then, specify the format related to each activity. Finally, estimate the percentage of the representative month that you devoted to each activity. Please be sure to read the definition of periodicals carefully and consult the more detailed directions below.

Definition of periodicals. Please note that periodicals are defined as serial publications that contain separate articles, stories, other writings, etc., and are published or distributed generally more frequently than annual. Newspapers and monographic serials are NOT periodicals.[43]

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[43] This definition is substantively identical to, and was adapted from, the 006 code for Type of Continuing Resource, which appears in the Online Computer Library Center's *Bibliographic Formats and Standards*, Third Edition, available at http://www.oclc.org/bibformats/ .

Identify your activities. Please look through the Activity List and select the activities that best describe your work related to periodicals. Make a note of any periodicals-related activity that you performed in the month in any capacity of your library job. If you did not hold your present position for the entire month, please estimate the work that would have been if completed if you had worked the entire month. Don't worry about listing the activities in any particular order. Find the activity number on the Activity List and record it on the Staff Activity Log along with a brief description.

If you only work with periodicals as part of your job (say, half the day in serials cataloging, the other half in general reference), you can lump together all the non-periodical activities without breaking them down further.

Vacation, sick leave, and holidays should be indicated as a separate activity. Breaks, not including lunch, should also be indicated as a separate activity.

In past studies, it has been useful for the participants to first think about your occasional or irregular activities. Then think about your daily activities, such as lunch, coffee breaks, checking and responding to email, and so forth. Next, identify your regular periodicals-related activities. Finally, be sure to complete the Staff Activity Log's last line, indicating any non-periodicals work that you perform.

Note the periodical format. It is vitally important for this study that you note as accurately as possible how your activities are distributed among the four formats, Hardcopy Current Issues (C), Hardcopy Backfiles (H), Microform (M), or Electronic (E). Please record the format on the appropriate column of the Staff Activity Log. *If a given activity involves more than one format, please split it into separate activities, one for each format*.

Estimate the time spent. You can provide this information using either hours or percentages, whichever will be easier and more accurate for you. Record the amount or proportion of time you spent in the month performing each activity you have listed.

As a guide, if you work 9 to 5, i.e. a 40-hour week, each day is about 5% of your month. Therefore, if you took one week of vacation, it would account for 25% of your month. Two 15-minute coffee breaks taken each day account for about 6% of your monthly time. On the reverse of this page is a guide for converting actual time spent to a percentage of total time. Be sure the percentage column totals 100%.
Send your completed Staff Activity log in the stamped, addressed envelope provided.

Guide for converting "Actual Time" to "Percentage of Time" for a 40-hour Work Week

Actual Time	**Percentage (Rounded) of the Month**
Two hours	1%
One day, assuming 6 hours worked	4%
One full day, 8 hours total	5%
One full week, or 40 hours total	25%
Two coffee breaks at 15 minutes each day	6%
One hour per day, every day	13%

Formula. Often, it will be easier to convert the amount of time you worked on an activity into a percentage based on this formula:

% = (# of hours spent on one activity) ÷ (# of hours you work in a given month)

SAMPLE COMPLETED ACTIVITY LOG

Activity Number (1-15) **See Activity List**	**Activity** **Please take language from the Activity List or jot a more detailed activity description.**	**Format** **Hardcopy Current Issues (C)** **Hardcopy Backfiles (B)** **Microform (M)** **Electronic (E)**	**Time Spent in the Representative Month** **Express as a Number of Hours or as a Percentage**
3	Maintain access to e-subscriptions	E	20%
5	Route electronic TOCs to faculty	E	10%
11	Provide reference services	E	10%
11	Provide reference services	B	10%
11	Provide reference services	C	5%
1	Select periodicals for the collection	E	10%
N/A	Breaks (not including lunch)	N/A	20%
N/A	Vacation, holidays, and sick leave	N/A	5%
N/A	Non-Periodicals Work	N/A	10%
	Total		100%

Staff Activity Log

Activity Number (1-15) **See Activity List**	**Activity** **Please take language from the Activity List or jot a more detailed activity description.**	**Format** **Hardcopy Current Issues (C)** **Hardcopy Backfiles (B)** **Microform (M)** **Electronic (E)**	**Time Spent in the Representative Month** **Express as a Number of Hours or as a Percentage**
			%
			%
			%
			%
			%
			%
			%
			%
			%
			%
			%
			%
			%
			%
N/A	Breaks (not including lunch)	N/A	%
N/A	Vacation, holidays, and sick leave	N/A	%
N/A	Non-Periodicals Work	N/A	%
	Total		In this box, please write 100% or a total number of hours.

YOUR NAME WILL NOT BE REPORTED TO US IN CONNECTION WITH THIS SURVEY, NOR WILL YOUR LIBRARY KNOW HOW YOU RESPONDED. THANK YOU AGAIN FOR TAKING THE TIME TO HELP US WITH THIS STUDY.

INSTITUTIONAL SURVEY

Study of the Operating Costs of
Periodicals Collections in Various Formats

Institutional Survey

A. Instructions

This survey is the institution-level piece of a study on the economics of periodicals in both print and electronic formats. Our goal is to understand how the increasing availability of electronic periodicals will affect the cost of libraries' internal operations.

We ask you to limit, when appropriate, your responses to our specific definition of periodicals. **Periodicals** are defined as serial publications that contain separate articles, stories, other writings, etc., and are published or distributed generally more frequently than annual. Newspapers and monographic serials are not periodicals. Please do your best to limit your responses, when requested, to this definition of periodicals.[44]

Please be certain that whenever data is asked for the "**year**" that the same definition – calendar, fiscal, academic, etc – is used consistently through this survey form, as well as on the Staff Activity Logs.

Sometimes it may be impossible to locate precise figures in answer to certain questions. In that case, we ask that you offer an **estimate** for your response. Please write "estimate" so that we know.

Some of our participating institutions have more than one library on their campus. In that case, please submit data covering **all libraries**. Campus-specific administrative arrangements may make it undesirable or impossible to offer data for all libraries. In that case, please identify the libraries that constitute the basis for this survey and restrict all answers, as well as the Activity Log participation, to that set of libraries. Be sure to identify exactly which libraries are part of this survey in your response to Question B1.

Please be certain to **photocopy** the completed survey and keep a copy for your own records.

Thank you in advance for your participation.

-Eileen Gifford Fenton and Roger Schonfeld

B. Libraries Included in This Study

1. What library or libraries at your institution are being included in this study?

2. What percentage of total institution-wide holdings (i.e., physical volumes or items) are held by the library or libraries included in Question a above?
   _____% of holdings

3. What percentage of total institution-wide periodicals subscriptions are received by the library of libraries included in Question a above? If it is possible to limit electronic subscriptions to these libraries, include both print and electronic. Otherwise, include print only.
   _____% of periodical subscriptions

4. When you provide data for "last year" in this survey, do you mean last fiscal year, calendar year, academic year, or something else? Please define it specifically:

44 This definition is substantively identical to, and was adapted from, the 006 code for Type of Continuing Resource, which appears in the Online Computer Library Center's *Bibliographic Formats and Standards*, Third Edition, available online at http://www.oclc.org/bibformats/.

C. Periodical Operations

1. How many periodicals did you receive (including by purchase, gift, or exchange) last year for:
   a. Print only?
      _____ titles (count each title once, even if you have multiple subscriptions)
      _____ subscriptions (including multiple copies of a title)
      _____ total issues received (if available)
   b. Electronic only?
      _____ unique titles
      _____ total titles, including titles duplicated across aggregations
   c. Print and Electronic combined?
      _____ unique titles, if known
      _____ multiple titles from all sources
   d. Microform periodicals? (A title-year is one year of one title, so fifteen years of one title is fifteen title-years, and five years each of three titles is also fifteen title-years.)
      _____ title-years or items (circle one)
   e. If you licensed any electronic back-files of periodicals (such as a new JSTOR collection) in the last year, about how many title-years were included in these new licenses? (A title-year is one year of one title, so fifteen years of one title is fifteen title-years, and five years each of three titles is also fifteen title-years)
      _____ title-years

2. What was the total number of periodical titles that were routed to faculty, students, and others, in the last year? Routings include issues themselves or tables of contents, including by photocopy or email.
   _____ titles were routed

3. What are your check-in processes for print periodicals? (Please check all that apply)
   ❑ We check in using our Library Management System
   ❑ We check in using another system (please describe _____)
   ❑ We are able to scan a barcode that appears on many of the periodicals that we receive

4. What are your cataloging processes for print and electronic periodicals? (Please check all that apply)
   ❑ Our catalog includes print periodicals
   ❑ Our catalog does not include print periodicals
   ❑ Our catalog includes electronic periodicals
   ❑ Our catalog does not include electronic periodicals
   ❑ Our catalog includes only minimal-level records for electronic periodicals
   ❑ Our catalog does not include detailed holdings statements for electronic periodicals
   ❑ We catalog the components of all aggregations, i.e. all the titles from Lexis-Nexis, etc.
   ❑ We use a service to assist us in cataloging or providing holdings information for certain electronic periodicals (please describe _____)
   ❑ We maintain a publicly accessible list (for example, a Web page) of electronic periodicals separate from our catalog
   ❑ We maintain a publicly accessible list (for example, a Web page) of print periodicals separate from our catalog

5. For cataloging, please provide whatever units of output you track (i.e. items that were copy-cataloged, number of items that required catalog maintenance, etc) for the last year.

6. In the last year, how many licenses were signed, including renewals, covering:
   a. 1-25 periodicals titles: _____ licenses
   b. 26-100 periodicals titles: _____ licenses
   c. 100 or more periodicals titles: _____ licenses

7. How many *new periodical titles* were added to your collections, through your collection development processes, in the last year?
   a. Electronic titles? _____ titles
   b. Print titles? _____ titles
   c. Print-electronic combined titles? _____ titles

8. How many existing periodical titles were cancelled, through your collection development process, in the last year?
   a. Electronic titles? _____ titles
   b. Print titles? _____ titles
   c. Print-electronic combined titles? _____ titles
   d. What factors contributed to the cancellation of these titles?
      - ❏ Budgetary: our budget was reduced, or did not keep pace with title price increases
      - ❏ Usage: our local usage was insufficient to justify purchase
      - ❏ Out of scope: our current collecting profile led us to cancel some previously purchased titles
      - ❏ Format: we have cancelled the format but have replaced it with another format
      - ❏ Change in pricing model or package
      - ❏ Other: please explain: _____

9. How many periodical volumes (or linear feet) were shifted within the same library in the last year?
   _____ volumes or linear feet (circle one)

10. How many periodical volumes (or linear feet) were transferred to remote storage or among libraries within your institution in the last year?
    _____ volumes or linear feet (circle one)

11. How many periodical volumes (or linear feet) were withdrawn from your collection (i.e. de-accessioned, transferred to a different institution, etc) in the last year?
    _____ volumes or linear feet (circle one)

12. Please provide circulation data, or your best estimates, for periodicals only within the following formats in the last year:
    a. Individual current issues? _____ issues
    b. Backfile volumes or items? _____ items or volumes (circle one)
    c. Microform items? _____ items or volumes (circle one)

13. Please provide reshelving figures, or your best estimates, for periodicals only within the following formats in the last year:
    a. Individual current issues? _____ issues
    b. Backfile volumes or items? _____ items or volumes (circle one)
    c. Microform items? _____ items or volumes (circle one)

14. Many libraries provide bibliographic instruction sessions for students, faculty, or staff. How many individuals participated in such sessions related to periodicals in the last year?
    _____ participants

15. How many periodical items were treated by your preservation department in the last year, not including binding/rebinding?
    _____ periodical items

16. What is the scale of your binding activities?
    a. How many volumes of periodicals were bound last year?
       _____ bound volumes
    b. What was the total periodicals binding cost, exclusive of staff time, last year?
       $_____

D. Computing / Systems

1. This section seeks to understand your total ANNUAL systems costs, exclusive of staff time and workstations, related to your periodical operations. This should include your integrated system, relevant servers, etc. If you can provide this cost broken down by current issues, hardcopy backfiles, microform, and electronic, please do so. If you cannot, please estimate your total annual periodicals-related systems costs (other than staff time).

2. How many library staff who have received the Activity Log have their own computer workstations?
   _____ staff

3. What is the approximate annual cost of a staff member computer workstation?
   $_____ per computer workstation

4. How many computer workstations that can access full-text of electronic periodicals are accessible to users in the library?
   _____ computer workstations

E. Miscellaneous Costs

What is the approximate annual cost of other resources used for periodical processing and storage?

Couriers $_____
Subscription agents $_____

F. Space Allocation

This part of the survey deals with allocation of space to periodicals-related shelving and reading. There are five basic types of shelving and storage used by university libraries that we would like you to report: current periodicals room, traditional stacks of bound copies in the library, compact shelving in the library, off-site storage, and microform storage. For each of these five shelving categories, we ask questions that are designed to determine the associated cost.

Many of these questions are fairly straightforward, involving square or linear footage and annual costs of shelving, but one type of question is somewhat more complex. We ask you to provide the "current cost"

of the space itself. This is an annualized figure that is related to the construction cost of the building. If the "current cost" of the space is not a figure that you know, please be aware that institutional budget offices will often be able to provide it.

Some institutions will have multiple shelving facilities of each type—more than one current periodical room, more than one remote storage location, or periodicals shelving in more than one library. If so, please attach additional sheets containing all the relevant information for each.

1. Current Periodicals Room(s)
   a. Do you have a current periodicals room?
      ❑ Yes
      ❑ No - Go to Question F2 below
   b. How long do you normally maintain issues of periodicals on these shelves?
      _____ months or years (circle one)
   c. About how much space is occupied by current periodicals? For square feet, include aisles and immediate surrounding space.
      _____ square feet or linear feet (circle one)
   d. Excluding shelving, about how much space is allocated to the reading room(s)?
      _____ square feet
   e. What is the "current cost" of this space?
      $_____ per square foot
   f. What is the approximate annual amount expended on new or replacement shelves for current periodicals?
      $_____ per year
      Is this a depreciated amount?
      ❑ Yes
      ❑ No

2. Traditional Stacks in the Library
   a. About how much space do periodicals occupy in traditional stacks in the library? For square feet, include aisles and immediate surrounding space.
      _____ square feet or linear feet (circle one)
   b. What is the "current cost" of this space?
      $_____ per square foot
   c. What is the approximate annual amount expended on new or replacement shelves for periodicals in traditional stack area?
      $_____ per year
      Is this a depreciated amount?
      ❑ Yes
      ❑ No

3. Compact Shelving in the Library
   a. Does your library shelve any periodicals in compact shelving?
      ❑ Yes
      ❑ No - Go to Question F4 below
   b. About how much space do periodicals occupy in the compact storage area? For square feet, include aisles and immediate surrounding space.
      _____ square feet or linear feet (circle one)
   c. What is the "current cost" of this space?
      $_____ per square foot

d. What is the approximate annual amount expended on new or replacement compact shelving for periodicals?

$_____ per year

Is this a depreciated amount?

❑ Yes

❑ No

4. Remote Storage

a. Does your library shelve periodicals in remote locations?

❑ Yes

❑ No - Go to Question F5 below

b. About how much space do periodicals occupy in remote storage? For square feet, include aisles and immediate surrounding space.

_____ square feet or linear feet (circle one)

c. What is the "current cost" of this space?

$_____ per square foot

d. What is the approximate annual amount expended on new or replacement shelving for periodicals in your remote facility?

$_____ per year

Is this a depreciated amount?

❑ Yes

❑ No

5. Microform

a. Does your library maintain periodicals in the microform format?

❑ Yes

❑ No - Go to Question G below.

b. What is the size of your periodical microform collection? For square feet, include aisles and immediate surrounding space.

_____ items or square feet or linear feet (circle one)

c. What is the "current cost" of the space occupied by your periodical microform collection?

$_____ per square foot

d. What is the approximate annual amount expended on new or replacement cabinets to house your microform periodical items?

$_____ per year

Is this a depreciated amount?

❑ Yes

❑ No

G. Institutional Policies

1. Does your university have a standard fringe benefit rate for exempt and non-exempt staff? By fringe benefits we include FICA, Medicare, Pension, Insurance, etc.

❑ Yes

❑ No

If yes, what is that rate for:

Exempt staff _____%

Non-exempt staff _____%

If no, a copy of the university fringe benefit description would be helpful to determine full compensation to staff.

2. Does your library have a set overhead rate for central administration services?
   - ❑ Yes
   - ❑ No

   If yes, what is that rate?

   _____% of direct costs

3. Does your library or university apply a standard depreciation formula (e.g., linear, double declining, etc.) for various expenditures?
   - ❑ Yes
   - ❑ No

   If yes, what is that formula, including the length of time, for:

   Computer Equipment _____
   Shelving _____
   Other _____

4. Generally, what is your policy concerning user photocopying and electronic print (e.g., free to some users, coin-operated machines, card access, etc.)? Also, specify whether the service is contracted out or operated entirely by the library.

You have reached the end of the institutional survey. Thank you again for your participation.

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