

The E-only Tipping Point for Journals

What's Ahead in the
Print-to-Electronic Transition Zone

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Association of Research Libraries

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FOREWORD

As academic librarians, publishers, authors of research articles, and readers of journals well know, journals began a profound and ongoing makeover with the arrival of the World Wide Web. Technological, economic, and human factors are transforming both journals and the broader process of scholarly communication. The first phase of development for the twenty-first century journal has taken two forms, the *born-electronic* journals and the *electronic editions* of print-based journals. It is the second category that provides the focus for this investigation.

Making previously print journals available electronically has already brought tremendous benefits to authors and readers because libraries and publishers have invested substantially in making this possible. With the establishment of the electronic edition, the presumed next step is that print is shed and the journal continues its development in a strictly electronic form. Yet today both libraries and publishers find themselves in a hybrid world.

There has been increasing dialog about the challenges presented by existing in this transition zone where electronic journals function as alternate editions of print counterparts. The operational costs of maintaining two systems and the opportunity costs of keeping electronic journals operating within the bounds of the print publishing process are increasingly taxing the status quo for publishers, libraries, authors, and readers. There are suggestions that this transitional phase is especially challenging to small publishers of high quality titles and places them at a disadvantage in relation to large, resource-rich publishers as they compete for subscribers, authors, and readers. The question of when dual-format journals will complete the transition to single-format (electronic) publishing is taking on increasing urgency.

This study seeks to discern how far the process of migrating to electronic-only journal publishing has come and to examine library and publisher perspectives on the dynamics that will govern the process of replacement of print editions with entirely electronic journals. Our goals are to:

- Identify the forces that have brought us to this point and are propelling or inhibiting further moves toward electronic-only journals.
- Understand key issues affecting the emergence of e-only journals and e-only journal subscriptions.
- Facilitate further communication about these issues among and between publishers and librarians so that barriers to more effective and efficient scholarly communication can be reduced.

The Association of Research Libraries (ARL) has undertaken this project in the spirit of open inquiry. While it shares the widely held assumption that we are headed to a world in which purely electronic journals are the norm, this research was not designed to advance an agenda for or against various approaches to e-only publishing of journals. Rather it seeks to better understand the dynamics of the transition process. Publishers and librarians were consulted equally in recognition that these changes pose significant issues of coordination. A synthetic analysis of the situation is sorely needed. Neither publishers nor librarians independently

control the process and the need to somehow coordinate their activities greatly increases the complexity of the transition.

By commissioning this work and disseminating its findings, we hope to better comprehend varying perspectives and to enhance broader, deeper understanding of the challenges and decisions faced by publishers and libraries as they navigate the transition that is underway. If we are successful, this work will be of value well beyond the library community, serving publishers and others active in leading these transitions.

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PREFACE

The evidence supporting this report is based in large part on interviews conducted between June and August 2007 with two-dozen academic librarians and journal publishers. Interviews were conducted with collection officers and others at 12 institutions that are members of the Association of Research Libraries (ARL), an organization of 123 qualifying libraries in the U.S. and Canada that cumulatively spend \$750 million annually on journals and other serial publications. Another 12 interviews were carried out with publishing staff of societies and university presses, publishing platform hosts, and production consultants. Un-attributed quotations in the text of this report are drawn from these two-dozen interviews.

The study is further informed by a review of relevant research (see References) and the experience of the authors.

As a practical matter, library interviews did not reach beyond the research university community; likewise, commercial publishers were not part of the interview group. Researchers, students, and other readers also were not directly consulted, so their views are reflected only through the filter of librarians and publishers. Certainly research on these stakeholders would further inform understanding of the issues, but the information presented here should help clarify many of the essential forces at work.

EXECUTIVE SUMMARY

This report examines the issues associated with moves toward electronic-only publication of journals. It is based in large part on interviews with two-dozen academic librarians and journal publishers. Interviews were conducted with collection officers and others at a dozen ARL member libraries; the rest of the interviews were with publishing staff of societies and university presses, publishing platform hosts, and publishing production consultants.

In the Transition Zone

Publishers and libraries today find themselves in an extended transition zone between print-only and e-only journals. The persistence of dual-format journals suggests that substantial obstacles will need to be surmounted if the transformation to e-only publication is to be complete. Approximately 60% of the universe of some 20,000 active peer-reviewed journals is available in electronic form. Online journals are popular with readers; online use of library-provided journals exceeds print use by a factor of at least ten, according to a University of California study. While electronic formats offer powerful attractions for users, the costs of supporting hybrid collections are straining library resources and the economies of the e-only collection are still speculative.

Just as libraries currently support hybrid collections, publishers are investing in both print and online publishing. A declining number of mostly smaller publishers still offer their journals only in print and a growing number of journals are available only in electronic form. But today's norm is dual print and electronic publication of a title. A few publishers, having adjusted their pricing to the dual-format model, are trying to hasten the day when they can discontinue print and the associated costs. But most are either navigating a gradual transition or holding onto print.

What's Driving Change?

Libraries

Interviews with librarians revealed a remarkable uniformity of views about the forces driving their institutions toward adoption of electronic-only journals. Their comments point clearly to two key imperatives for change, user expectations/demands and the reallocation of resources to support that demand. Various additional benefits of electronic journals were mentioned—such as being able to measure use better—but these are not central to the move from dual formats to e-only.

“The users have voted—and they want the convenience of electronic.” Libraries have found that they can deliver a higher level of service quality with electronic resources and they are shaping their journal subscription portfolios to address that reality. For many if not most campus users of journals, electronic access is a productivity enhancer. And for libraries, enhancing productivity is a potentially powerful means to demonstrate their return on investment.

While the imperative to satisfy demand for a digital library is driving wide adoption of online

editions of journals, the need to sustain their cost and address evolving needs for new content is forcing the discontinuation of increasing numbers of corresponding print editions. By switching from either print or dual media to e-only, a modest but immediate one-time reduction in subscription fee is captured and service is established on a new lower cost basis.

An array of existing operational costs is affected by the shift to e-only journals. These costs span the life cycle of a printed journal issue and include: receipt and processing; shelving; binding; cataloging and catalog maintenance; stack maintenance; and interlibrary loan. In the shift to online, certain costs are *eliminated* (e.g., receipt and processing, shelving, binding, circulation, stacks maintenance), certain costs are *changed* (cataloging, catalog maintenance), and other costs are *added* (licensing, SFX). Many of the potential economies of online journals are not achieved if dual formats are sustained.

Publishers

Publisher motivations, like those of libraries, emerge from financial exigencies and user expectations. Just as libraries are straining under the burden of subscribing to dual formats, publishers' financial statements also reflect the additive effect of producing dual formats. At its simplest level, the elimination of the print version of journals is an opportunity to improve the publisher's bottom line or free-up funds to invest in e-publishing by reducing printing, mailing, warehousing, claims, and other costs—provided, of course, that there is not an offsetting loss of revenue. Under the right conditions, however, this opportunity is present and sufficient to motivate action. Some society publishers have noted that they are losing money on individual/member print subscriptions. Publishers of all types would probably agree that printing and fulfillment costs are increasing sharply. Both are impetuses toward offering e-only. Whether that impetus is converted into action depends on the perceived ratio of risk to reward.

Most publishers appear to recognize the risk that, even in the scholarly world, readers will eventually stop using information that is not available online. Especially in scientific, technical, and medical fields, many publishers already have embraced technological capabilities that were not available in the pre-digital environment. These enhancements make editors more productive, peer reviewing faster and more convenient, and publication more timely and robust. By offering these capabilities, journals gain advantages in the competition for authors' articles.

While the benefits of electronic publication do not necessarily argue for discontinuing print journals, they do imply that electronic publishing increasingly offers authors a "more hospitable environment" in which to present their work. As the opportunity cost of continuing to invest in print becomes too great, online will be the growing focus of publishing processes. Except for top-tier, broad circulation titles—which sometimes are used more like magazines—surviving printed editions may become mere add-ons available via print on demand.

Bumps in the Road

Libraries

The responsibilities of the library to support users and provide long-term access can act as brakes on the transition to e-only journals. Librarians expressed a commitment to meeting their faculty's need for information and a disinclination to move forward unilaterally without taking account of resistance to discontinuing print or providing access to it only from off-site shelving. Several libraries indicated they have framed transition strategies that rely heavily on consensus building with faculty. Concerns about protecting long-term institutional interests in journal titles in a leased-access environment are an important factor for libraries, but as they move more quickly towards e-only, libraries also emphasize the importance of their service role.

While the most widely subscribed scholarly journals are available in electronic form, journals from smaller publishers and those from outside of the developed world often are published only in print. Thus the extent to which libraries can shift to e-only—or even dual format collections—depends to no small extent on publishers. Smaller publishers tend to be subject specialists and often lack the expertise to re-engineer their production systems and business models for the emerging e-only context. They are not well positioned financially to afford the technology or to take the risks inherent in the transition. As long as these smaller journals are unable to even enter the dual-format transition zone, it is difficult for libraries to move out of it.

With the publisher hosting the electronic version, responsibility for assuring preservation seems to be shifting from the library to third parties. Library concerns about preservation range from the need to assure persistent access over time, to preserving a print copy, to participating in a collaborative archive for the electronic edition with forward migration. Some libraries view the current situation as a “calculated risk,” trusting that effective preservation strategies are in place.

Publishers

A move to e-only entails substantial adjustments to a publisher's marketing and production operations as well as cultural adjustments to the online publishing environment. Anticipated savings in printing and mailing costs must be balanced against the risks of reduced readership, lost members (for societies), and lost revenue. Plus there is the matter of the time, resources, and expertise to re-engineer production processes and devise new business strategies.

The evolution of journal pricing from *print plus electronic* (p+e) to *electronic plus print* (e+p) paves the way for an e-only option by establishing the expectation that the electronic is the primary version of the journal. Since pricing for the electronic version is typically based on the print, it has taken time for publishers to decouple the pricing for print and electronic formats.

Although most print subscription bases are declining steadily, they are still a significant revenue stream for some and a source of security for many publishers. Print journals were typically marketed through direct mail and sold title by title through subscription agents. The transition to licensing electronic journals globally requires different skills internally and a new array of partners that can effectively reach libraries worldwide. Electronic versions are more often sold as a package with other society titles or additional years of content. To price the package

attractively for a broad range of large and small institutions may require tiered pricing or consortia discounts. Handling these electronic sales involves staff with the expertise to manage consortia negotiations and complex relationships with multiple agents globally.

Though business models may increasingly be e+p, the production process for many publishers is still p+e. The production process is built around creating a printed product with the attendant costs associated with layout and page design. The electronic version is a by-product. To thrive in an e-only environment, it is not sufficient to eliminate print. Instead, it is necessary to re-engineer operations to incorporate XML tagging early in the process so that it applies to the entire document, not just the metadata. This approach provides flexibility in utilizing or repurposing content from various formats and sources to create documents that can be output in print or online for new applications.

Like libraries, publishers are service organizations and respond to their subscribers', authors', or members' preferences for receiving print. Their perceptions of their readers' readiness for electronic-only publications reinforce their current print path. As long as enough members and subscribers express a preference for the print format, the journal is likely to be published in print.

There is a widely held belief among publishers that discontinuing print will result in some subscription loss. The effects of such losses are more than purely economic. Society publishers are concerned with broad readership and thus fear sacrificing a portion of current readers and ultimately limiting the audience for authors by discontinuing print subscriptions. While some assess readers' print preference as being generational, others note that there are tech savvy segments that cross generations and user preference appears to be influenced as much by the discipline. There are obviously competing perceptions, considerable speculation, and few indicators to suggest how many readers and subscribers are truly tied to print and when that number will decrease to a point of irrelevance for any particular journal.

Outlook

The role of the printed journal in the institutional marketplace faces a steep decline in the coming 5 to 10 years. Print journals will exist mainly to address specialized needs, users, or business opportunities. Financial imperatives will draw libraries first—and ultimately publishers also—toward a tipping point where it no longer makes sense to subscribe to or publish printed versions of most journals.

Publishers will be driven to rationalize their investments in declining print revenue streams and to finance investments in e-publishing infrastructure and emerging opportunities. Some will be faster to do so, such as those already straining from the cost burden. Others will be slower, such as those with a self-supporting base of individual subscribers or significant advertising revenue from print.

A new focus will emerge on productivity in scholarly communication. Experiments will explore

new business models and new ways of conducting and facilitating research. Along the way, vexing issues such as those surrounding assurance of long-term access to the scholarly record will continue to be sorted out and perhaps even solved.

Recommendations

Issues emerging from this study suggest the need for a fuller examination of and response to obstacles impeding the transition of journal articles fully into the digital networked environment.

- ***New business models:*** Publishers will need to explore business models that allow them to make decisions about how to serve individual subscribers or members independent of their subscription arrangements with libraries.
- ***User expectations:*** Publishers and librarians need means to more fully understand changes in information use by scholars and to predict the impact on services they provide.
- ***Publisher success stories:*** Identify and share reference points and guidelines from publishers who make the transition—their decisions and experiences with business models, production re-engineering approaches, and member management strategies would be especially valuable.
- ***Library success stories:*** Share case studies and metrics documenting productivity gains in the online environment—what to consider, how to measure, where to look for savings.
- ***Preservation:*** Ongoing discussions about a wide range of digital preservation issues and initiatives are needed to inform the community and support collaborative efforts.
- ***Version of record:*** A standard for journal version management may be needed to support archiving of both print and electronic forms, where these differ.

IN THE TRANSITION ZONE

Almost since they first went online, librarians and publishers have been predicting the eventual demise of printed journals, but the persistence of dual formats suggests that substantial obstacles will need to be surmounted. Publishers and libraries today find themselves in an extended transition zone between print-only and e-only journals. This study is not the first to ask if it is time to drop print¹— and it surely will not be the last. The intent here is to offer a snapshot from today's perspective and focus on the dynamics of the transition process.

One of the frustrations of living in a transition period is making sense of all the turbulence. Where one stands affects what one sees. Characterizing changes and trends from the perspectives of a range of stakeholders provides an important basis for looking ahead. A number of recent trends, summarized below, have brought them to this stage and paved the way for the further advances. Framing these trends is the fundamental reality that “the future will be increasingly born-digital, with the growth of e-science and network-enabled collaborative working.”²

Online journals are popular with readers

Electronic journals are abundant and widely used among researchers and students. Where both formats of a title are offered, user preferences are now clear. Electronic journal use exceeds print use by a factor of at least ten, according to a University of California study.³ Journal use becomes more efficient as faculty and students spend less time getting library-provided articles when they are available online.⁴

Features that enhance the use of online journals have become standard (e.g., reference linking, searching, usage data) and leading publishers are experimenting with Web 2.0-style community tools (e.g., social reviewing and bookmarking systems). It is not only current journal literature that interests readers; adding online backfiles stimulates further use of most titles.

In some fields—or at least among some users—acceptance of electronic resources is less widespread, but even here the situation is in flux.⁵

Business models are changing

Online formats have also changed the marketplace for journals. Approximately 60% of the universe of some 20,000 active peer-reviewed journals is available in electronic form.⁶ Commercial publishers generally offer online versions of their journals and large publishers have aggregated them to create new bundled products that libraries license.

With the move online and growth of licensing by library consortia and publisher bundling, journal institutional-pricing models are in flux and vary widely. Publishers increasingly have “flipped” their pricing so that print subscriptions are charged at a premium (often 15%) on top of a contract for electronic access instead of online being an add-on. A few publishers have adopted tiered pricing, in which differential subscription charges are based on size or another feature for categorizing the subscribing institutions (e.g., Carnegie Classification).⁷ Journal publishers generally acknowledge gradual attrition of their institutional print

subscriptions.⁸ This can be attributed to a number of factors, including low use and the redundancy of multiple print subscriptions when institution-wide online access is available. (The latter was a particular factor when online was first introduced, but is now of declining significance as duplicates have largely been eliminated.) Increasingly, however, institutional print attrition is a result of libraries' shift to e-only subscriptions.⁹

A few publishers, having adjusted their pricing to the dual-format model, are trying to hasten the day when they can discontinue print and the associated costs. But most are either navigating a gradual transition or holding onto print.

Print collections have become hybrid collections

Librarians are making a variety of journal format choices resulting in collections mixing print, fully electronic, and dual-format subscriptions. Even though relatively few publishers offer publications only in electronic form, 37% percent of research libraries' subscriptions were licensed only in electronic form in 2006. Seventy percent of journal subscriptions were licensed in electronic or electronic-plus-print forms, up from 36% just four years earlier.¹⁰ (See Figure 1.)

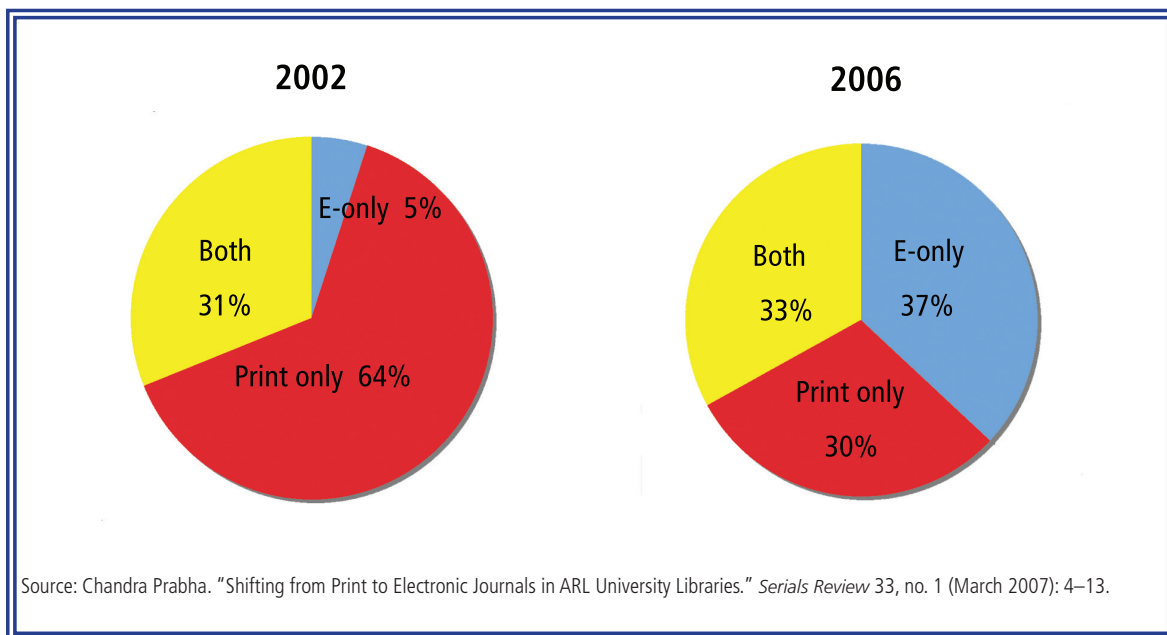


Figure 1: Formats of Journal Titles Subscribed by ARL University Libraries

Making this shift has required substantial reconfiguration of spending. The average ARL university library spent 37% of its acquisition budget on electronic resources in 2004–05 and some spent over 50%.¹¹ Smaller academic libraries may spend a greater share of their budget on electronic resources as a result of consortia licensing deals.

Much of the shift to date has been accomplished via the licensing of large publishers' journal bundles. Often these are three-to-five-year deals, with longer contracts offering pricing incentives but cancellation restrictions.¹²

While electronic formats offer powerful attractions for users, the costs of supporting hybrid collections are straining library resources and the economies of the e-only collection are still speculative. What is known is that, for any particular title or bundle, shifting from dual media to e-only generally nets a *subscription* cost savings of 10% or less off the print subscription price.¹³ Beyond this, it has been suggested that the library's long-term *non-subscription* cost of maintaining a periodical in electronic format will be lower on a per-title basis than in print, though the differential is less pronounced in research libraries than in smaller libraries.¹⁴

However, these savings may largely be recovered in cost avoidance, particularly by reductions in future space construction. Licensing of journal backfiles is enabling a few libraries to send legacy collections of bound back-year volumes to less-expensive off-site shelving facilities. The savings accrue to the institution not the library budget and generally cannot be converted into direct savings of fungible resources.

Despite the broad take-up of electronic subscriptions, two-thirds of journals are still being received in print form (either print-only or print-plus-electronic subscriptions) by research libraries.¹⁵ Most libraries say that, because they are now supporting print *and* electronic journals, staffing costs have not declined and may increase. While print serials processing operations are often somewhat smaller than before and binding costs have been pared, electronic resources management and other technical services costs have been added.

Hybrid publication predominates

Just as libraries currently support hybrid collections, publishers are investing in both print and online publishing. A declining number of mostly smaller publishers still offer their journals only in print and a growing number of journals are available only in electronic form. But today's norm is dual print and electronic publication of a title.

This is because most publishers, unlike libraries, are faced with the desire to sustain revenue from their printed editions as well as manage costs and serve users. This need has left them firmly in the transition zone, becoming increasingly online oriented but holding onto print. The print offers continuing revenue and a sense of security that the journal is visible to potential authors. But with print subscription bases generally on a slow downward trajectory, many face the question of how long to continue investing in dual formats. Typically, their answer is, as long as there is sufficient demand.

This leaves publishers with the cost of sustaining their print journal while adding e-publication with its costs and revenue potential. Often electronic publication capability is simply added to the end of the established print publication process, for example posting PDFs of printed pages on a Web site that presents tables of contents for each issue. However, many publishers are investing in re-engineering their production systems to include XML tagging, digital art and typesetting, electronic production tracking, and automated copyediting.¹⁶ Online submission is rapidly being adopted with the automation of article submission and peer-review processes.¹⁷

Some investments have more to do with user needs than with streamlining production processes. For example, article metadata is being widely exported to CrossRef for linking and to abstracting and indexing services so users can easily connect to online content.

Digitization of backfiles is becoming widespread. For hundreds of leading journals, the JSTOR or National Library of Medicine archiving programs have enabled journals to be digitized without their publisher incurring costs. But many journals have managed the cost of backfile conversion themselves to further integrate access with their current service or to develop a new revenue stream. Commercial publishers are more likely to charge libraries for back volumes than are non-profit publishers.¹⁸

Preservation and access in the digital environment

A number of multi-library systems or consortia are collaboratively licensing online journals and retaining a single print subscription as an archival back-up. But as the focus has shifted from print to electronic publication, online editions are increasingly being accepted as the *de facto* “journals of record.” As a consequence, librarians and publishers are searching for ways to protect their long-term interests in the online editions. There is growing interest in preserving electronic journals and, among librarians, in insuring their access persists over the long term.

While publishers generally recognize the value of assuring that digital files will be available and usable over the life of their enterprise, libraries have a longer preservation horizon, reflecting their traditional mission and the need to maintain the backfile access rights they had in the print environment. They have been reluctant to accept publishers as credible stewards of preservation because of threats to publisher continuity or solvency in changing markets. Yet, because libraries are licensing online journals as a service rather than acquiring ownership of a physical artifact, preservation and long-term access solutions require collaboration by the publisher.

Beyond the issue of how electronic files will be migrated or otherwise preserved over time (and how this will be financed), is the issue of whether subscribing libraries will have access to subscribed content if they no longer are paying an annual license fee. Although some publishers have viewed persistent access commitments as a liability or a forgone opportunity, there are a number of examples of agreements to address preservation needs:

- Some libraries are moving to e-only once journals have established digital preservation arrangements with Portico, an electronic archiving service supported by libraries and publishers.
- Library consortia (such as OhioLink and the Ontario Council of University Libraries) sometimes mount licensed journals on their own systems with publisher agreement.
- Via agreements with publishers, a few national libraries are taking on roles in digital preservation of journal articles (e.g., National Library of Medicine in the U.S. and Koninklijke Bibliotheek in The Netherlands).
- Many libraries rely on provisions of license agreements with publishers as their main assurance that a journal will be preserved over time.¹⁹

As reflected in these examples, the anticipated technical complexity and expense of digital preservation have motivated libraries to pursue collective rather than unilateral approaches to the challenge.

While research librarians believe that preservation of electronic journals is very important,²⁰ uncertainties about exactly how this will be accomplished have, to some extent, slowed libraries' passage through the transition zone. Yet any qualms have not been sufficient to block the expansion of libraries' e-only subscriptions.

Scholarly societies face difficult challenges

Scholarly societies present a special class of journal publisher, one that disproportionately accounts for the highest quality content in scholarly journals. They are more than journal publishers because, as communities of scholars, they perform important functions within disciplines or fields that contribute to the work of the academy. Consequently, the challenges to societies presented by the hybrid environment are of special interest to many research libraries.

Along with the attrition of institutional print subscriptions noted earlier, many scientific and scholarly societies report a gradual decline in members. The perceived value of membership in the society can be weakened when faculty have desktop access to their journals through an institutional subscription. However, since library subscriptions are "the engine that pulled the train" for many societies' balance sheets, increasingly they are addressing library demand for online versions.

Despite overall progress in bringing society journals online, many self-publishing societies, particularly in the humanities and social sciences, still offer their journals only in print. These organizations probably account for the majority of the estimated 8,000 remaining print-only journals. Most societies publish a single journal, suggesting that lack of scale may be a barrier to e-publication.²¹ (See figure 2.)

Although they may serve more print-oriented users today, they face the prospect of declining impact and deteriorating financial stability as a new generation of scholars takes over and print-only journals become increasingly marginalized without the interconnectivity of the network.

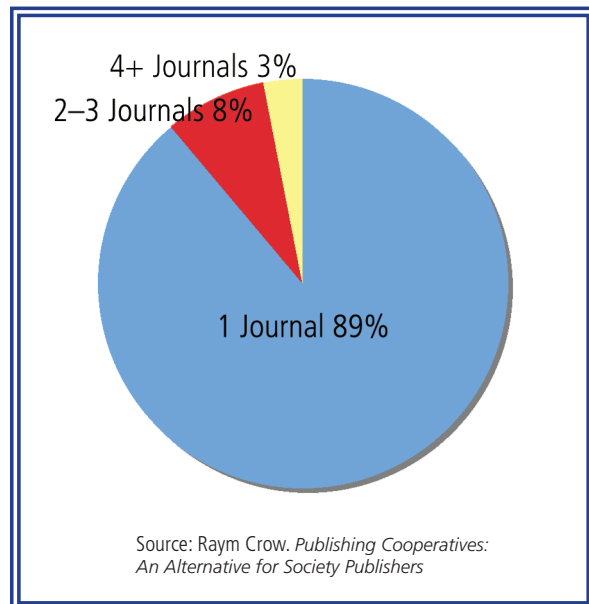


Figure 2. Average Number of Journals per Society

WHAT'S DRIVING CHANGE?

To understand the changes underway, it is important to separate the forces that are driving action by publishers and libraries from other less dynamic factors in the environment.

To discern the drivers, interviews were conducted with research librarians and journal publishers—actors whose core missions and operating contexts are shaping the transition to a large extent. Presented here are observations and anecdotal evidence derived from those interviews.

Libraries

Interviews with librarians revealed a remarkable uniformity of views about the forces driving their institutions toward adoption of electronic-only journals. The speed and breadth of the move varies, but their comments point clearly to two key imperatives for change, described below. Various additional benefits of electronic journals were mentioned—such as being able to measure use better—but these are not central to the move from dual formats to e-only.

User expectations/demands

“The users have voted—and they want the convenience of electronic.” That is how one collection development head expressed the sentiment that inspired her institution’s approach to journals and most other resources. The attitude was echoed at every library interviewed. Clearly, university research libraries have recognized broad and expanding campus demand for integrated, instantaneous desktop access to library resources as a fundamental aspect of their existence in the networked digital environment.

It is pretty simple at a high level of strategic abstraction. Libraries have found that they can deliver a higher level of service quality with electronic resources and they are shaping their journal subscription portfolios to address that reality. With electronic journals, users need not walk to the library. They can readily search, forward links, cut and paste text, and utilize citation software. For many if not most campus users of journals, electronic access is a productivity enhancer. And for libraries, enhancing productivity is a potentially powerful means to demonstrate their return on investment.

By most accounts, distributed access has meant lower use of journals housed in the library. Yet overall usage of journals has increased dramatically. “No one is using print; there’s virtually no pressure to keep it,” said one librarian. Online journals, on the other hand, are being used—even titles that were previously sitting idle on shelves.

One librarian received more positive feedback from users on the value of licensed e-resources than on anything else done during his library career. Ninety percent of the usage of their e-resources is on remote access terminals outside the library and they have not encountered any meaningful faculty resistance to eliminating print subscriptions in favor of electronic. Despite the purported affinity of mathematicians for print, at one school it took the math department two years to notice when the library discontinued their printed journals after obtaining electronic access.

“There’s a general perception among faculty that moving toward electronic delivery is the right thing to do,” said one interviewee. But it is not just that online is better serving users. The corollary is the extravagance—at least as viewed in some quarters—of supporting idle print. “In computer science there’s a perception that the library is wasting money on print.” Strong use patterns for electronic resources licensed by the library point to the need to continue moving in this direction, he said.

A financially challenged state university library reported that 60% of its journal subscriptions are electronic-only today. They do not buy in multiple formats unless there is an explicit reason to do so. The cost of a “hybrid library” is too high, so at every opportunity they are making a shift to electronic. When doing their periodic serials cancellation reviews, there is a preference for journals that are available electronically. Some print gets cancelled because it is not available in electronic form. The collections head said their philosophy is that “print is the legacy part of the library. Electronic is the customers’ preference.”

Of course, the nuances are abundant as one digs deeper. For example, most would agree that not all users place the same high value on electronic resources. But perspectives differ within libraries and from library to library on whether resistance to online journals is isolated to specific fields or specific individuals. Moreover, embracing online does not necessarily imply users’ acceptance of discontinuing print. Yet as a practical matter for many institutions, the move to electronic can only be accomplished if print journals and their attendant costs are sacrificed. This sets up a clash of library objectives—longstanding concerns about persistent access and digital preservation vs. the goal of offering desktop access to journals as quickly as possible.

The collection development librarian at a state university suggested, “Faculty understand that it’s not practical to support both formats and that it makes sense to move to e-only. But at the same time they look to the library for a print repository. So it’s a bit confusing.”

Though all the libraries contacted are moving to some extent toward e-only journals, none indicated an expectation that they will be 100% e-only in the foreseeable future. The barriers they identified are discussed later in this paper. However, one librarian pointed to the overall trajectory of unfolding changes in research libraries: “There are some ways that print works better, but over time it may not work better than the electronic. The quality, stability, and convenience of electronic resources are changing how the faculty does research.”

Reallocation of resources to support demand

While the imperative to satisfy demand for a digital library is driving wide adoption of online editions of journals, the need to sustain their cost and address evolving needs for new content is forcing the discontinuation of increasing numbers of corresponding print editions.

There are varying degrees of trepidation about abandoning printed journals but, as one librarian put it, “There is substantial opportunity cost to continue supporting print. It is wasteful to continue investing in the library’s infrastructure for acquiring, processing, and maintaining print when there is an opportunity to improve access, redeploy staff, and better use space.”

Librarians interviewed for this paper all indicated that their libraries could not afford to sustain indefinitely both print and online formats of all journals. They also indicated a strong desire to add online access to journal backfiles and to keep their libraries responsive to changing needs and growing expectations of users by adding new services and new e-resources beyond journals.

Although the pace and likely ultimate extent of the transition differs from institution to institution, all are moving along a continuum from print-only to dual-media to e-only journals. The process began with licensing of bundles of journals—typically publisher online bundles such as those offered by Elsevier, Springer, or Wiley. Most research libraries appear now either to be moving beyond this by canceling print journals or are poised to do so. As discussed later, the extent to which libraries move to e-only journal environments and the velocity of the transition is uncertain. But in most scientific, technical, and medical fields, where there is strong faculty support, the shift is likely to be sweeping.

In discontinuing their subscriptions to the print editions of journals, the libraries' aim is to a) free up funds within their acquisition budgets and b) trim the associated operational costs of the library, and c) reduce the amount of space devoted to journal stacks.

Acquisition budgets

By switching from either print or dual media to e-only, a modest but immediate one-time reduction in subscription fee of 5% to 10% is captured and service is established on a new lower cost basis (though the annual increase rate will be unchanged). The amount of this saving differs from library to library and publisher to publisher based on negotiated contract terms.

In many cases, this saving is converted into added content. "It's far more compelling to cancel print and buy new content," said one librarian. Another pointed to the desire to direct the saving at licensing new databases and tools that enhance faculty productivity. The most commonly cited use of savings was securing access to digital backfiles of current online journals. This not only offers users continuity of searching and access, but also enables libraries to transfer bound volumes to offsite shelving and redeploy stack space.

At one library, they used \$100,000 saved from print cancellations with a particular publisher to participate in Portico, buy backfiles in several of the publisher's subject areas, and acquire digital backfiles of other high-impact individual titles. A statewide university system reports that canceling print at individual campuses has allowed them to reallocate resources for system-wide access.

At a state university that is moving aggressively toward e-only journals they are attempting to identify for cancellation print titles with apparent low demand and no available online edition. If faculty members resist cancellation of a title, the library will go along, but the situation will be re-evaluated in three years. Their experience has shown that in 40% of such cases, the title does not subsequently get used. Another library offers faculty the opportunity to pick the top 10 journals they want in print. At a third library, if faculty insist on print, it is charged against their allotment within the book budget.

Most of those interviewed mentioned their library's investment in collaborative digital preservation solutions such as Portico or LOCKSS, but they generally acknowledged the absence of a policy of directly shifting savings on print cancellation to support preservation costs.

Operational savings

An array of existing operational costs is affected by the shift to e-only journals. As analyzed by Schonfeld, et al., these costs span the life cycle of a printed journal issue and include: receipt and processing; shelving; binding; cataloging and catalog maintenance; stack maintenance; and interlibrary loan. (Space, another key operational cost, is treated separately, below.)

In the shift to online, certain costs are *eliminated* (e.g., receipt and processing, shelving, binding, circulation, stacks maintenance), certain costs are *changed* (cataloging, catalog maintenance), and other costs are *added* (licensing, SFX). Many of the potential economies of online journals are not achieved if dual formats are sustained. Furthermore, as the volume of print titles dwindles, unit costs of processing may increase. As a result, the magnitude of the savings opportunity or potential offsetting costs of staffing is not well understood.

Here are situations described by several libraries that hint at the complexity of the transition:

- ***Reaching critical mass:*** At a private university, 2007 was the first year they have been without print for over 400 titles from a particular publisher. At the time of the interview (summer 2007) it was too soon to shift staff — “to date only bits and pieces of people’s time, not wholesale change.” But after 2008, when they cancel another 500 print subscriptions, they may begin to see more impact. Management of finances, licensing, and contracts are key concerns. They are looking for ways to “piggyback” electronic and print investments, for example via acquisition of a commercial electronic resource management system. Currently, they have various in-house databases, but these are inefficient and expensive to maintain. In the central unit, where people’s jobs are more specialized, they are trying to shift technical services staff gradually to more hybrid jobs. It is harder to deal with the change in their subject libraries.
- ***New requirements:*** Another private institution that is further along in e-only licensing has started shifting its staffing, for example eliminating binding positions and creating a new marketing and assessment position. Expanded assessment aims to identify low use titles that can be eliminated in the next publisher negotiation. They need to scale up backroom operations that manage license agreements, implement an electronic resource management system, and get more productivity applications onto the library’s public workstations.
- ***Reengineering the organization:*** Supporting dual media is an organizational concern at a state university library. “There’s a lot going through the electronic resources librarian. It’s overwhelming. With the changes in title lists, there’s also been a bottleneck in the technical services department, which is geared to print. We need to move them to other areas.” Ultimately, they may save on the serials budget by making the move to e-only journals, but that alone is not enough to drive their strategy. Their interest is in redirecting overall resources to effectively address user expectations in the digital environment.

As one interviewee stated, “There probably are cost savings, but it’s hard to pin them down.” Indeed some librarians suggest that new costs associated with online journals will more than offset any operational saving from the discontinuation of print.

Space

With use of printed journals declining and electronic access achieving popular approval on campus, the opportunity to reduce stack space devoted to journals is an enticing benefit of moving to e-only subscriptions. However, the extent to which space is driving decisions seems to vary based on local factors.

Several libraries indicated that space is a key motivation for their move to e-only because their stacks are at capacity or they are eager to clear “prime real estate” in the library building so the space can be used more effectively—such as by offering workstations or space for student collaboration.

However, most of the libraries interviewed did not explicitly identify space saving as a driver to discontinue print subscriptions. In some cases, this appears to be because a new library building or shelving facility is available or planned—and so the need is less immediate. In other cases this may be because the space issue is simply embedded in their larger goal of redeploying resources in a shifting environment.

Publishers

As with libraries, journals are at varying stages along a continuum from traditional print publication to dual print and electronic publication to electronic-only publication. A 2005 estimate put the number of e-only journals at under 1000,²² but this appears to be low²³ and anecdotal evidence suggests this number is climbing. How fast it grows and how high it eventually reaches depends on unique factors affecting each journal and publisher. Publisher motivations, like those of libraries, emerge from financial exigencies and user expectations. As a journal technology provider observed, “E-only is inevitable for some journals and for others it may be 20 years.”

Shifts in the economics of publishing

In recent years, many publishers have spoken of the added costs of publishing for online. But of course most of them are now publishing in two media instead of one. Just as libraries are straining under the burden of subscribing to dual formats, publishers’ financial statements also may reflect the additive effect.

A publishing consultant has observed that, “The right time to drop print is when your customers no longer want it enough to pay an economic price”²⁴ and comments of a university press electronic publishing director mirrored the view. While there is truth in this, it ignores the opportunity cost of continuing to support a declining print base at the expense of a growing online opportunity. Getting clarity on those costs and choosing the right time to abandon print is the challenge facing many publishers.

At its simplest level, the elimination of the print version of journals is an opportunity to improve the publisher's bottom line or free-up funds to invest in e-publishing by reducing printing, mailing, warehousing, claims, and other costs—provided, of course, that there is not an offsetting loss of revenue. Under the right conditions, however, this opportunity is present and sufficient to motivate action. Some society publishers have noted that they are losing money on individual/member print subscriptions. Publishers of all types would probably agree that printing and fulfillment costs are increasing sharply. Both are impetuses toward offering e-only. Whether that impetus is converted into action depends on the perceived ratio of risk to reward.

Given the possibility of large-scale cancellations of institutional print subscriptions and the corresponding rise of printing unit costs as quantities dwindle, the issue is of more than academic interest, particularly to publishers that mainly serve institutional subscribers or that rely on institutional print subscriptions to subsidize member subscriptions. At present, however, most publishers seem to be experiencing gradual erosion of their institutional print base. One publisher reported a 6% annual decline in her society's library subscriptions and another spoke of a "steady decline." Eventually the chickens will come home to roost. Publishers who monitor subscription revenues without evaluating the number of institutional subscribers may be less aware of the rate of change and its cumulative effect.

Prudent publishing managers would do well to begin modeling the impact of various change scenarios and planning accordingly. One publishing technology vendor observed, "If there's a precipitous drop [in institutional print subscriptions], they're not ready. If it's slow, they will make a series of micro-adjustments" such as developing online infrastructure, restructuring their pricing, expanding sales efforts, pricing adjustments, adding pay-per-view sales, etc.

Even without looming changes in volume, market factors also may argue for e-only publication in certain circumstances. Printing in color is expensive but is often highly valued by authors and readers. Shifting to e-only enables publishers to accommodate this demand for color without incurring the significant costs. For example, the American Society for Cell Biology (ASCB) recently decided to discontinue the print edition of *Molecular Biology of the Cell* (MBC) so that they could eliminate the cost of color printing and thus reduce color figure charges to their authors.²⁵ Only a relative handful of MBC's authors were resistant to e-only. One of their editors reportedly asked, "What print journal?"

For another society, the issue was more difficult. When they analyzed their subscribers, they realized that half of them were large institutions that offered degree programs in their discipline and they were starting to drop the print. The other 50% of their subscribers were smaller institutions without degree programs that the society feared might not transition to an electronic subscription if the society discontinued print. The society's interest in e-only would allow them to save the higher cost of color, which was about the same amount of savings as the potential loss of the print subscribers. The question confronting the publisher was if the society should retain print to accommodate subscribers who most likely were not their core market and whether it was fair to their authors who wanted to include more color images in each issue, which e-only publication would enable.

Desire to enhance publication

Today, the importance of offering electronic editions of journals differs from field to field. However, most publishers appear to recognize the risk that, even in the scholarly world, readers will eventually stop using information that is not available online. Especially in scientific, technical, and medical fields, many publishers already have embraced technological capabilities that were not available in the pre-digital environment. These enhancements make editors more productive, peer reviewing faster and more convenient, and publication more timely and robust. By offering these capabilities, journals gain advantages in the competition for authors' articles.

While the benefits of electronic publication do not necessarily argue for discontinuing print journals, they do imply that electronic publishing increasingly offers authors a "more hospitable environment" in which to present their work. As the opportunity cost of continuing to invest in print becomes too great, online will be the growing focus of publishing processes. Except for top-tier, broad circulation titles—which sometimes are used more like magazines—or other exceptional circumstances, surviving printed editions may become mere add-ons available via print on demand.

A society publications director noted his editors' concern that there should be no differences between the print and electronic editions of their journal. But such uniformity will become increasingly difficult to maintain as new online capabilities present themselves, with the possible result either that print and online editions will become entirely distinct (a publishing technology vendor reports there is only a 20% overlap in readership of print and online medical journals) or that print publication is ceased.

In either event, the electronic edition is a rich environment in which to present and conduct scholarship. It can be readily discovered online, accessed at the desktop, and linked to related information. It can present content that is not suitable for print—data, sound, or video, for example. As experience demonstrates, use of research is expanded and accelerated online. Citation becomes easier and more accurate. Images that once were superior in printed form can now be of sufficient resolution online to offer advantages over print. Except where their licensing costs are a barrier, it is possible to offer images online without regard to the substantial cost of color printing. New kinds of computational analysis techniques are potentially opened up online, as is interactivity between users and content and collaboration among researchers.

A university press electronic publishing director suggested that movement toward the primacy of online may be hastened by introduction of increasingly robust Web-based communities, social networking, and other Web 2.0 functionality. She wonders "if the potential for personal interaction with content will more clearly delineate the advantages of electronic over print," and is eager to understand how these features might bear upon the migration to e-only subscriptions.

Even putting aside many of the as-yet-unrealized possibilities of digital scholarship and the varying relevance of new capabilities in different fields, publishers interviewed pointed to the likelihood that generational changes will transform the publishing landscape. This shift will expand the importance of online publication—and perhaps even diminish the role of journals as we currently conceive them, regardless of medium.²⁶

BUMPS IN THE ROAD

As with any change brought by technology, the corresponding social and economic models must be well developed for a complete transition. The motivations pushing some publishers and librarians to drop print are counterbalanced by a high degree of uncertainty regarding suitable business models for publishers and reliable long-term access for libraries.

Libraries

The responsibilities of the library to support users and provide long-term access can act as brakes on the transition to e-only journals. Nonetheless, those reluctant to relinquish print presented concerns which, if addressed, would remove the obstacles to an e-only future.

Socio-cultural shift

Librarians expressed a commitment to meeting their faculty's needs for information and a disinclination to move forward unilaterally without taking account of resistance to discontinuing print or providing access to it only from off-site shelving. A librarian in a technology-oriented environment noted that "People's concerns are not always concrete, but they are accustomed to being able to lay their hands on the printed journal. This is true across all disciplines, not just humanities." However, while anecdotes about faculty resistance abound, the sense among many of those interviewed is that, "largely the resistance is from individuals rather than entire fields."

Faculty are not alone in their attachment to print. A librarian opined, "It is common to blame faculty for not making the full transition to e-only. But actually it may be the librarians who are holding things back." Some librarians expressed "concerns about control of the content—not just ownership—that weren't there with print. Collections don't reside with libraries in the e-environment." What, for example, will happen to their access when journals transfer to a different publisher? One librarian stated that "the library will be more vulnerable in the e-only environment," which reflects a sense of caution in embracing the elimination of print.

Several libraries indicated they have framed transition strategies that rely heavily on consensus building with faculty. Concerns about protecting long-term institutional interests in journal titles in a leased-access environment are an important factor for libraries, but as they move more quickly towards e-only, libraries also emphasize the importance of their service role. "In our community user preference is most important and the least important factor is cost," said the associate director at a private university.

The collections head at an institution that is cultivating support for a new library building said, "We don't want to be penny wise and pound foolish. Yes, we can save a little money, but the savings are not sufficient to risk losing critical faculty support of the library." He said librarians and administrators are sensitive to the risk-reward ratio as they contemplate further shifts — it's not worth it to lose faculty support in exchange for a small discount. The library has gone to some effort to "identify who will yell and avoid them for now." They've engaged faculty "strategically," focusing on the disciplines where loss of print is not an issue. The approach

Figure 3. When do libraries retain print?

Following are examples of criteria for retaining subscriptions to the print versions of journals that were cited by a number of research libraries:

Demand

- Strong faculty demand for retention of print.
- Print is being used.
- Print is needed to support local curriculum or research.

Price

- The cost/benefit of print is superior.
- The subscription model is still based on print.

Function

- Print offers better features (e.g., browsing or current awareness)
- Poor interface design in the electronic version.
- Quality of images or graphics is demonstrably poorer in the electronic journal.
- Print has significant artifactual or aesthetic value.
- Electronic does not meet needs of users.
- Electronic access has unacceptable limits on use (e.g., simultaneous users, physical location).

Long-term Electronic Availability

- There is no credible contractual guarantee of continued access to the subscribed electronic volumes in case of future cancellation or in the event the publisher fails.
- There is no evidence of the publisher's commitment to long-term digital preservation of

the journal (e.g., journal is not in a trusted digital repository).

- Electronic is only available in aggregator packages and library cannot control if a title drops out (considered unstable).

Print Retention Responsibility

- Library has a consortial or other responsibility to retain a print archive of the journal title or the subject area to which it belongs.
- Resource sharing requirements indicate the need for print.
- Library has a "premier collection" in the field.

Timeliness and Reliability

- There is a delay between publication of the print and availability of online content.
- The provider of the electronic journal is unreliable.

Content

- The content of the print version differs from that of the electronic (e.g., the print contains significantly more material than the electronic; mastheads, letters, conference announcements, etc. are not maintained historically).
- The electronic is not the primary publication venue (e.g., it does not provide at least as much or more content than the print).

they've adopted is "like flood insurance;" the risk may indeed be low, but if disaster strikes it will be ruinous.

The shift taking place is very much a cultural one for both librarians and faculty. An associate director at a private institution noted, "It's not our role to lobby faculty. They will go when it's of benefit for them to go. Our role is to let the publishers know what the faculty wants. It's important that the community not get so excited that they forget their users."

When comparing the recent research reviewed during this study with the comments of those interviewed, it is apparent that shifts are occurring rapidly. Within two years, librarians serving on a publisher advisory panel changed from warning that the publisher "had better not drop print" to conceding "it would be a shame to see it go" and noting that two colleagues had already dropped print. One interviewee observed that, "Both librarians and faculty are increasingly coming to the realization that their usage behaviors have changed."

Print-only journals

While the most widely subscribed scholarly journals are available in electronic form, journals from smaller publishers and those from outside of the developed world often are published only in print. Crow estimates that 40% (~8,000) of the approximately 20,000 peer-reviewed journals are not available online and many of these are from single-title publishers.²⁷ According to librarians, many arts, humanities, and area studies titles in particular are only available in print.

Thus the extent to which libraries can shift to e-only—or even dual-format collections—depends to no small extent on publishers. (See, for example, the extent of publisher dependencies in library selection criteria summarized in Figure 3. "When do libraries retain print?") Smaller publishers tend to be subject specialists and often lack the expertise to re-engineer their production systems and business models for the emerging e-only context. They may not be well positioned financially to afford the technology or to take the risks inherent in the transition. As long as these smaller journals are unable to even enter the dual-format transition zone, it is difficult for libraries to move out of it.

In addition, the process of determining which journals are available electronically and whether an e-only option is offered continue to challenge libraries throughout the period of transition. To some extent subscription agents attend to this need, but many titles still need to be researched and questions about licensing addressed as the heretofore relatively stable legacy print collection is converted to online access.

Preservation and long-term access

With the publisher hosting the electronic version, responsibility for assuring preservation seems to be shifting from research libraries to third parties. Library concerns about preservation range from the need to assure persistent access over time, to preserving a print copy, to participating in a collaborative archive for the electronic edition with forward migration. There was a wide variation in the responses and concerns of those interviewed.

Although preservation is a central concern for several of the librarians interviewed, under economic pressures many are relinquishing permanent local archiving of print or electronic. Many research libraries that are canceling print are choosing to participate in programs such as Portico and LOCKSS to assure long-term access and to fulfill their role in preserving content. These libraries have not abandoned their preservation function but, of necessity, have shifted how they support it. They see themselves as undertaking the costs associated with these efforts and are encouraging publishers to participate. ARL issued a statement in August 2007 affirming the importance of preservation for research libraries.²⁸

Although the importance of preservation is widely acknowledged, license agreements do not always make it clear what responsibilities publishers are agreeing to take on. A collections officer observed, “Lack of clarity within licenses concerning ongoing access rights or archiving arrangements is a problem. To summarize that for our selectors often requires that we go carefully through the licenses and puzzle over what we may find there, or not find!”

Some libraries view the current situation as a “calculated risk,” trusting that effective preservation strategies are in place. One librarian whose institution has fully embraced the notion of e-only for several years stated: “I don’t worry about archival responsibility. As long as there is one copy, one will find a way to make it available.”

In some cases, libraries are subscribing to dual formats so that they can archive the print either for themselves or on behalf of a group of libraries, for example in a shelving facility serving various libraries in a state/province or consortium. The University of California system maintains a shared print archive for major licensed packages. Individual UC libraries convert their license to e-only and as a system they obtain a single print copy for storage in regional facilities. University of Toronto staff report they have been “conservative” in keeping print because UT is viewed as the *de facto* print archive in Ontario (and perhaps nationally) and that other libraries are comfortable discontinuing their print because UT has a copy. However, there is no formal multi-institution agreement in place with respect to UT’s archiving of print. Going forward, print archives will not be part of the solution if the publisher discontinues the print edition.

As libraries implement e-only policies some are concluding that access to an aggregator’s collection is adequate for non-core titles and they are canceling the print even though permanent access is not guaranteed—a potentially risky strategy. For others the stewardship role is a priority and they assume responsibility for insuring access to the content in either print or electronic form. They see the need to demonstrate that electronic archives can meet expectations when the need arises, and thus to “put the trust in trusted archive.”

Additional concerns

Given the complexity of the evolving environment, it is not surprising that a number of concerns emerged during the interviews that were not as widely shared but nevertheless warrant recognition.

- **Content differences.** Although many librarians and publishers believe that the electronic version effectively replicates the print, this is often not the case. The lack of standards for

identifying what constitutes the version of record allows for confusion. Because the volume of pages is a relatively insignificant cost factor online, it is not uncommon for extra content to be available in the online journal. For example, some publishers have begun to include supplementary data in the online version that is not feasible to include in the print. Yet a print issues' front matter, letters to the editor, editorial board list, or other shorter pieces may be omitted from the online version. Ads are problematic as they are a potential source of revenue and therefore print ads sometimes are excluded by publishers from the online edition (and vice versa). To manage costs, some publishers print images in black and white while online the same images appear in color. The electronic version is mutable after publication in ways that print versions are not. When errors are discovered, erroneous or retracted content can be deleted, permanently affecting the scholarly record.

- *Future of scholarly societies.* Many librarians are interested in the respected journals published by societies and are supportive of the organizations whose members are also on their faculty. Librarians recognize that societies are under pressure but there is some ambiguity about the extent to which library acquisition decisions should or can take this into account.
- *Pricing models.* Publisher pricing models can discourage movement to e-only if they charge more for the library to drop the print or if the electronic version is aggressively priced. Government Value Added Tax (VAT) requirements for tax on e-only journals but not on print or print plus electronic journals can also tip the scales toward print retention.
- *Collection counts.* There are complications in determining what to count when several institutions share access to an electronic resource. Shared print repositories raise similar questions regarding who owns which resources. Participation in group licensing adds complexity to an area already challenged by electronic resources. Concern that reducing dual formats would reduce apparent collection size has been addressed by recent changes in the definitions used for counting serials by the Association of Research Libraries (ARL). Future serial counts are now defined as title counts and adding or reducing the number of formats does not affect collection size. Titles in shared collections can also be included in ARL title counts.²⁹

Publishers

A move to e-only entails substantial adjustments to a publisher's marketing and production operations as well as cultural adjustments to the online publishing environment. Anticipated savings in printing and mailing costs must be balanced against the risks of reduced readership, lost members (for societies), and lost revenue. Plus there is the matter of the time, resources, and expertise to re-engineer production processes and devise new business strategies.

Publishers vary dramatically in their readiness to take on such challenges. The large commercial houses are relatively well prepared for an e-only publishing scenario; societies run the gamut from being ready to adopt e-only to being far from ready to consider it. Since publishers are just beginning to make this transition, there are not yet a clear path and proven guidelines to follow.

Business models and marketing

As journal pricing evolved from *print plus electronic* (p+e) to *electronic plus print* (e+p) it paved the way for an e-only option by establishing the expectation that the electronic is the primary version of the journal. Since pricing for the electronic version has typically been based on the print, it has taken time for publishers to decouple the pricing for print and electronic formats. For example, although the American Chemical Society has offered their journals in electronic form for several years, they just introduced a new pricing model in 2007 that replaces the historical print price with usage data as a factor in determining the price.

The "long tail"³⁰ of scholarly publishing is comprised of smaller publishers and societies that publish only print and those who only have an electronic version available through an aggregator. The many publishers whose titles are in aggregator databases but who do not publish their own journals in electronic form are likely to be most resistant to an e-only approach as they lose the subscription revenue when libraries cancel the print version. Aggregator payments that were attractive as an additional source of revenue do not replace the lost subscription revenue.

In two cases, interviewees remarked on their concern that large numbers of library subscribers (approximately 20% in one case and 40% in the other) that receive online access with their print subscription had not activated the online. It is unclear if these libraries were unaware that their subscription included online access, if they preferred to use print, or if they were relying on electronic access through aggregators and might cancel their subscription if the publisher discontinued print.

For societies the business model is further complicated when the print journal is provided to members either at a discount or as a benefit of membership, as is often the case. Publications along with membership dues and meetings are the three main forms of revenue for many scholarly societies. When libraries provide desktop access to journals, it can diminish the need for an individual's subscription and thus jeopardize membership. The impending retirement of the boomer generation over the next 5 to 10 years is challenging many societies and is likely to exacerbate current declines in membership.

According to one publisher, "a society may save 20% of their publication cost by discontinuing print but there are offsetting risks." Early reports on a few societies that have switched their member benefit from print to an electronic subscription are mixed and reveal the need for careful planning. In one dramatic case, a society lost 25% of its members after print was abruptly dropped at the instigation of a board that was impressed with the potential for enhancements and presumed the electronic format was inherently superior. Another society lost members and ad revenue before deciding to reinstate a print option. In both these cases, decisions were made somewhat arbitrarily and suddenly without adequate communication with members. These examples reinforce the fears of smaller societies, especially in the humanities, that declare they would lose members if they went e-only.

One life sciences society acknowledged that they subsidize their members' print subscriptions via surpluses from institutional subscriptions, saying they "lose money with every member print subscription." A business society chose to ease the transition by offering its members

online access as a free member benefit and print for an added fee, while a science society is planning to allow the additional fee for print to rise over time to reflect the real costs. “Eventually, there won’t be a choice for most journals,” suggests one publishing technology vendor. “The longer that society journals delay, the less efficient they will become relative to the for-profits and the costs for society journals will rise as they try to subsidize print from online.”

For many societies where the journal brand has played a key role in attracting members, there is the risk that their identity online will be diluted. Electronic journals are typically aggregated in a database of articles that is known by the name of the database. Since users often link directly to articles without searching by journal name, publishers are discovering the importance of having the name of their society and/or journal on each page of every article, including backfiles as they are put online.

Although most print subscriptions are declining steadily, they are still a significant revenue stream for some and a source of security for many publishers. Print journals were typically marketed through direct mail and sold title by title through subscription agents. The transition to licensing electronic journals globally requires different skills internally and a new array of partners that can effectively reach libraries worldwide. Electronic versions are more often sold as a package with other society titles or additional years of content. To price the package attractively for a broad range of large and small institutions may involve tiered pricing or consortia discounts. Handling these electronic sales requires staff with the expertise to manage consortia negotiations and complex relationships with multiple agents globally.

Some journals, especially those in clinical medicine, rely on ads in the print publication; in one instance the ads represented 50% of the journal’s income. In such cases, discontinuing print can put ad revenues at risk unless the publisher develops a plan for ads in the electronic environment or, as one publisher reports doing, creating a new printed news publication and migrating the ads to it.

Production and distribution

Since most users still expect to be able to download and print articles, the requirement for publishers to create a printable version remains. Rather than eliminate printing altogether, the e-only business model has shifted this task to the user’s desktop in a “print local” mode.

When an article is available either to be read on screen in HTML or downloaded and printed in PDF, evidence shows high use of PDFs, according to those hosting journals. One publisher reported that the percent of articles downloaded in PDF form is 50%. The length of the average scholarly article prompts many readers to print a copy rather than read on screen. A science publisher who observed younger scientists scrolling a PDF online in order to read the two-column layout, which did not fit easily on the screen, concluded that they had a preference for the appearance of the journal despite the awkwardness of viewing it that way. Images can also encourage printing since screen resolution of less than 100 dpi lacks the clarity of printed images that are 300 dpi for a laser printer.

Though business models may increasingly be e+p, the production process for many publishers is still p+e. Production is still built around creating a printed product—with the costs of layout,

typesetting, and page design—while the electronic version is a by-product. A publishing technology vendor noted that currently half of their publishers derive the online version *after* they have created the print version. He observed that, “There are a lot of publishers whose primary production stream is print and they have not thought out the implications for online.”

To thrive in an e-only environment, it is not sufficient to eliminate print; it is necessary to optimize the electronic. This means re-engineering operations to incorporate XML tagging earlier in the process so that it applies to the entire document, not just the metadata. Use of XML can provide flexibility in utilizing or repurposing content from various formats and sources to create documents that can be far more efficiently output in print or online for new applications. For example, if case studies appearing in each issue of a journal were XML tagged, it would be easy to collect them in a single document for classroom use. XML tagging of text also facilitates searching and discovery by humans and machines.

Moving into this environment is challenging for many smaller publishers that lack the technical expertise and economies of scale of larger operations. “Societies with sufficient staff dedicated to business-related issues are the exception rather than the norm. This lack of in-house publication management resources becomes especially critical as the transition to electronic dissemination accelerates...”³¹

As publishers consider how to manage declining demand for print, their printers have responded in a variety of ways. Some have invested in digital technologies that can produce high-quality and cost-effective small print runs (from 1–500 copies) or print-on-demand. Of particular significance to some disciplines are new processes adopted by printers that drive down the cost and improve the quality of color images.

In a recent review and commentary on the costs of journal publishing, Donald King writes, “It is clear that the total costs of electronic-only journals are likely to be appreciably less than those

Figure 4. When online becomes the journal of record

Here are several areas that publishers should pay special attention to when they decide to designate the online edition as their journal of record:

1. Communicate the change to individual members and library subscribers.
2. Create an online service that is no less valuable than the print edition.
3. Carry over features that users appreciate in the print edition.
4. Coordinate closely with the compositor, printer, and online host.
5. Brand the journal and the organization on each page.
6. Allow a transition period that accounts for planning of new pricing models and changes in subscription management.
7. Ensure that online ads work well.

of print journals“ because the variable costs associated with print reproduction and distribution can represent a significant proportion of overall costs. However, he cautions that calculations of cost savings should take into consideration first copy production costs to correctly assess production efficiencies.³²

Readers, authors, and markets

Like libraries, publishers are service organizations and respond to their subscribers’, authors’, or members’ preferences for receiving print. Publishers’ perceptions of readers’ readiness for electronic-only publications reinforce their current support of print. A manager of social science journals noted that there are no obvious benefits for the publisher to discontinue print as “print is still the center of our universe.” One society publisher that is considering e-only observed that they would “alienate” approximately 100 of their members if print were no longer available.

As long as enough members and subscribers express a preference for the print format, the journal is likely to be published in print. Another society found that 25% of their members were willing to pay extra for the electronic version when it was offered in addition to their print member benefit. When they flipped their model to an electronic benefit with print for an additional fee, 33% of their members were willing to pay extra for the print.

Though library subscription revenue is significant to most society publishers, the number of member subscriptions far exceeds the number of library subscriptions. For example, when one society switched their member benefit from print to electronic, the proportion of print attributable to library subscriptions increased from 16% to 31% of total print. The percent increase might have been higher except that a third of their members chose to pay extra to retain their print subscription. Until members choose to relinquish print, library preference alone may be insufficient to prompt a switch to e-only. (See Figure 5.)

Some publishers stated that print and electronic formats are used by readers in different ways. According to one society publisher, the print edition is useful as an alerting service, is portable, and is convenient to read and browse while the online version is used as an archive to find articles that have been read or to search topics across multiple years.

Author perceptions also weigh heavily with publishers. Some publishers believe that print copies of a journal can be effective in competing for authors who want wide readership. The director of a platform host noted that publishers “fear they will not compete as effectively for authors without

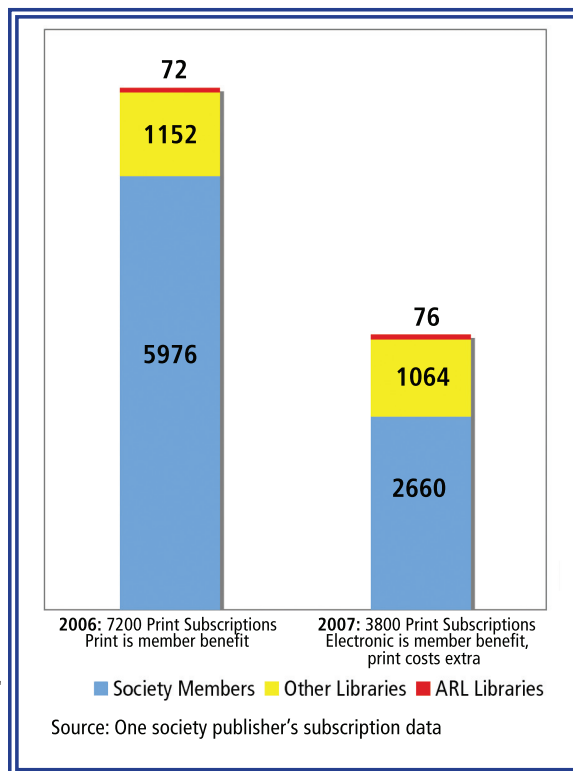


Figure 5: Changes in a Society's Print Subscriptions

a print edition.” To the extent that dual-format publishing extends readership, actions that eliminate print may also constrict readership. The effects of such losses are more than purely economic. Society publishers emphasize a broad readership and thus fear sacrificing a portion of current readers and ultimately limiting the audience for authors by discontinuing print subscriptions.

While some assess readers’ print preference as being generational, others note that there are tech savvy segments that cross generations and user preference appears to be influenced as much by the discipline. There are obviously competing perceptions, considerable speculation, and few indicators to suggest how many readers and subscribers are truly tied to print and when that number will decrease to a point of irrelevance for any particular journal.

Reader preference is not the only factor threatening to encourage the retention of print formats. Some commercial publishers have indicated that print is still required in some international markets for a variety of reasons. For instance, a major disincentive to e-only sales in Europe is the Value Added Tax (VAT) tax that applies to services such as e-journals but not always to print products.

OUTLOOK

While reports of the death of the printed journal are premature, its role in the institutional marketplace faces a steep decline in the coming 5 to 10 years. As use and norms evolve, print journals will exist mainly to address specialized needs or business opportunities. Financial imperatives will draw libraries first—and ultimately most publishers also—toward a tipping point where it no longer makes sense to subscribe to or publish printed versions of most journals. For libraries a 100% electronic journals environment is remote, but 95% could be on the horizon. A more mixed picture is likely for publishers, especially societies and advertising-driven journals.

For research libraries, making the change is “like putting the brakes on a truck.” The process likely will be more drawn out and less complete for research libraries than for academic libraries with less of a stewardship role. But financial disincentives to keeping print ultimately will outweigh dwindling demand and squeeze out all but the most popular or tactile of titles. As generational change leaves its mark and a critical mass of electronic resources (including books and primary documents) reach the desktops of users and bring productivity gains in the arts, humanities, and social sciences, resistance will dwindle.

At the same time, as the aggregate number of print subscriptions drops, the relative cost of supporting each of them will increase and raise the threshold for justifying their continuance. The change may be more rapid in state institutions than in better-funded private institutions, but ultimately all academic libraries will follow suit to a greater or lesser extent.

As libraries move toward e-only, publishers will see print subscriptions increasingly limited to individuals—the least lucrative element of the base. They will be driven to rationalize their investments in declining print revenue streams and to finance investments in e-publishing infrastructure and emerging opportunities. Some will be faster to do so, such as those already straining from the cost burden. Others will be slower, such as those with a self-supporting base of individual subscribers or significant advertising revenue from print.

Large commercial publishers, being both financially attuned and generally less encumbered by membership needs (except to the extent that they publish journals for societies), could change the game by moving large numbers of journals to e-only. If their reported concerns about slower take-up of e-only by libraries outside North America are overcome, change could soon follow. This would alter the norms and embolden other publishers to follow.

On campus and in the market, the move “from ownership to access” will approach completion in the coming decade. A new focus will emerge on productivity rather than custom in scholarly communication. Experiments will explore new business models and new ways of conducting and facilitating research. Along the way, vexing issues such as those surrounding assurance of long-term access to the scholarly record will continue to be sorted out and perhaps even solved.

RECOMMENDATIONS

The interdependency of libraries and publishers is in sharp contrast to the differences that frame their separate motivations, perspectives, and decision-making processes. Yet the impact of their actions on the work of scholars and the progress of scholarship suggests the urgency of finding an appropriate means of “social coordination” to reduce some of the risks associated with the large-scale changes in journals that lie ahead. Issues emerging from this study suggest the need for a fuller examination of and response to obstacles impeding the transition of journal articles fully into the digital networked environment.

- ***New business models:*** As libraries continue to adapt their operations and spending priorities to satisfying demand for online access to journals, they will expect publishers to offer them subscription options that do not burden them with unwanted print. Recognizing the waning prospects for institutional print subscriptions, society publishers in particular will need to explore business models that allow them to make decisions about how to serve individual subscribers or members independent of their subscription arrangements with libraries.
- ***User expectations:*** A key challenge for both publishers and librarians is to better understand and anticipate the evolving expectations of their users. Change is occurring very quickly in some sectors and more slowly in others. But in all areas, publishers and librarians need means to more fully understand changes in information use by scholars and to predict the impact on services they provide.
- ***Publisher success stories:*** Given the challenges facing publishers to identify sustainable models in a changing environment, it would be helpful to identify and share reference points and guidelines from examples that work. Successful models describing steps along the path from print-only to electronic-only would provide a framework for those at different points along the way. Awareness is needed of publishers who make the transition—their decisions and experiences with business models, production re-engineering approaches, and member management strategies would be especially valuable.
- ***Library success stories:*** In a similar vein, libraries would benefit from case studies and metrics documenting productivity gains in the online environment—what to consider, how to measure, where to look for savings. Growing collections of electronic resources will tip the balance towards a virtual environment with new requirements and new opportunities to pursue. Sharing ideas can extend the value gained among multiple institutions.
- ***Preservation:*** Digital preservation approaches must continue to gather experience, expand their reach, and establish sustainable models. The increasing prevalence of interactive content and data sets will further increase the challenge. Ongoing discussions about a wide range of issues and initiatives are needed to inform the community and support collaborative efforts.
- ***Version of record:*** A standard for journal version management may be needed to support archiving of both print and electronic forms, where these differ.

Further work centering on these areas by librarians, publishers, or both could help accelerate the ongoing migration from dual-format publishing to a new environment of single format (electronic) publishing. The goal of focusing on these areas must be to equip publishers and librarians with sufficient information and insight to successfully navigate through today's transition zone.

ENDNOTES

- ¹ See for example: Mark Ware. "E-Only Journals: Is It Time to Drop Print?" *Learned Publishing* 18, no. 3 (July 2005) and Ross Atkinson. "Six Key Challenges For The Future of Collection Development." *Library Resources & Technical Services* 50, no. 4 (October 2006): 244–51, particularly Atkinson's discussion of hybridity, p. 249.
- ² Ware, p. 199.
- ³ Brian E. C. Schottlaender, et al. *Collection Management Strategies in a Digital Environment: A Project of the Collection Management Initiative of the University of California Libraries*. University of California, January 2004, p. 25. <http://www.ucop.edu/cmi/finalreport/>
- ⁴ Donald W. King and Carol Hansen Montgomery. "After Migration to an Electronic Journal Collection: Impact on Faculty and Doctoral Students." *D-Lib Magazine* 8, no. 12 (December 2002). <http://www.dlib.org/dlib/december02/king/12king.html> This study also notes that, while doctoral students depend largely on library-provided articles, faculty rely heavily on personal printed subscriptions.
- ⁵ For example, between 2000 and 2006, economists have "moved decisively to the electronic environment," according to surveys by Ithaka. Roger C. Schonfeld and Kevin Guthrie, "The Changing Information-Services Needs of Faculty." *Educause Review* 42, no. 4 (July / August 2007): 8–9. <http://www.educause.edu/ir/library/pdf/erm0746.pdf>
- ⁶ Raym Crow. *Publishing Cooperatives: An Alternative for Society Publishers*. Scholarly Publishing and Academic Resources Coalition, February 2006, p. 5. http://www.arl.org/sparc/bm%7Edoc/Cooperatives_v1.pdf
- ⁷ Examples include American Chemical Society, American Geophysical Union, American Institute of Physics, American Physical Society, American Society for Cell Biology, and several societies working with Highwire Press. For an examination of tiered pricing of journals, see: Karla Hahn. "Tiered Pricing: Implications for Library Collections." *portal: Libraries and the Academy* 5, no. 2 (April 2005): 151–63. (Manuscript available at <http://hdl.handle.net/1903/7080>.)
- ⁸ There is little publicly available data on this, mainly because publishers have no reason or incentive to release it. However, the trend is confirmed in interviews with publishers and discussions at industry meetings.
- ⁹ Publishers Communication Group. *Trends in Journal Subscription Renewal and Cancellation: A Look Back Over the Last Four Years, 2003–2007*. Cambridge, MA, 2007, Addendum A. http://www.publishingtechnology.com/news/pcg_renewals_report_sep07.pdf
- ¹⁰ Chandra Prabha, "Shifting from Print to Electronic Journals in ARL University Libraries." *Serials Review* 33, no. 1 (March 2007): 4–13.
- ¹¹ Martha Kyrillidou and Mark Young. *ARL Statistics 2004–2005*. Washington, DC: Association of Research Libraries, 2006, p. 20. <http://www.arl.org/bm~doc/arlstat05.pdf>

- ¹² Karla Hahn, "The State of the Large Publisher Bundle: Findings from an ARL Member Survey." *ARL: A Bimonthly Report on Research Library Issues and Actions from ARL, CNI, and SPARC*, no. 245, April 2006. <http://www.arl.org/bm~doc/arlbr245bundle.pdf>
- ¹³ Hahn. p. 5.
- ¹⁴ Roger C. Schonfeld, et al. *The Nonsubscription Side of Periodicals: Changes in Library Operations and Costs between Print and Electronic Formats*. Washington, DC: Council on Library and Information Resources, June 2004. <http://www.clir.org/PUBS/reports/pub127/pub127.pdf>
- ¹⁵ Prabha. Table 6.
- ¹⁶ Priscilla Markwood. "Paperless Workflows in Journal Production: A Management Perspective." *Learned Publishing* 19, no. 2 (April 2006): 115–24.
- ¹⁷ John Cox. "Scholarly Publishing Practices: A Case of plus ca change, plus c'est la meme chose?" *Learned Publishing* 19, no. 4 (October 2006): 273–76.
- ¹⁸ Cox. p. 275
- ¹⁹ Despite this reliance, a 2006 survey showed that when research libraries investigated publishers' archiving plans they were dissatisfied with the arrangements 40% of the time. (Hahn. p. 5.)
- ²⁰ Schonfeld and Guthrie. p. 9
- ²¹ Crow. p. 5.
- ²² Ware. p. 194.
- ²³ It seems likely that most of the nearly 3000 journals listed in the *Directory of Open Access Journals* (<http://www.doaj.org>) are e-only.
- ²⁴ Ware. p. 193.
- ²⁵ An illuminating review of ASCB's situation as they contemplated a move to e-only is available in: Sandra L. Schmid, et al. "MBC and the Economics of Scientific Publishing." *ASCB Newsletter* (April 2007): 4–6. http://www.ascb.org/files/mbc_cost_printing.pdf
- ²⁶ It has been argued that the traditional functions of a journal can now be distributed via the Internet among various service providers, rather than being tightly bound together in a journal. For example, it is no longer obligatory for the certification of research quality (e.g., the peer review process overseen by a particular editorial board) to be bundled with dissemination; they can be independent. This disaggregation implies the expanded significance of the article and the reduced importance or even disappearance of the journal as currently conceived. Discussed in Richard K. Johnson. "Will Research Sharing Keep Pace with the Internet?" *The Journal of Neuroscience* 26 (37) 9349–51. http://eprints.rclis.org/archive/00007226/01/Will_Research_Sharing_Keep_Pace.pdf and <http://www.jneurosci.org/cgi/content/full/26/37/9349>
- ²⁷ Crow. p. 5.

- ²⁸ "ARL Affirms Importance of Preservation for Research Libraries." news release dated August 22, 2007. http://www.arl.org/news/pr/ARL_affirms_preserv07.shtml
- ²⁹ "ARL Statistics Questionnaire 2006–2007, Instructions for Completing the Questionnaire." <http://www.arl.org/bm~doc/07instruct.pdf>
- ³⁰ Chris Anderson. "The Long Tail." *Wired* 12, no. 10 (October 2004) http://www.wired.com/wired/archive/12.10/tail_pr.html
- ³¹ Crow. p. 8
- ³² Donald W. King. "The Cost of Journal Publishing: A Literature Review and Commentary." *Learned Publishing* 20, no. 2 (April 2007): 85–106(22).

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