If sex were to be invented tomorrow, the species would be extinct before the skeptics gave it a try. Seemingly by nature, humanity is slow to embrace innovation. We are disposed to resist disruption of the familiar, clinging against all odds to the comforts of sameness. As Christopher Morley once quipped, “There is no squabbling so violent as that between people who accepted an idea yesterday and those who will accept the same idea tomorrow.” Humans do not lack for innovation. Rather, they lack for uptake of innovation, which brings us to the topic at hand: e-books. The authors have no doubt that libraries and library users will gravitate to digital forms of the book. There will be no surprise endings here; no quixotic struggles against the forces of history and change. Electronic access to both journals and books will be the predominant mode of scholarly discourse in years to come. The issues addressed in this article are not about the outcome, but the factors influencing the process of adoption.

Everett Rogers (1962) studied the “diffusion of innovation” from a sociological perspective, positing five categories of respondents to innovation that conform to a normal distribution across a population: innovators representing approximately 2.5% of the population; early adopters around 13.5%; early majority adopters comprising 34% of the population and the same percentage for late majority adopters. Laggards—those inclined to resist even widely accepted changes—constitute the remaining 16% of a population. Rogers’ work has been incorporated into marketing research for product development, where Geoffrey Moore (2002) and others have studied in detail the difficulty of moving beyond “innovators” and “early adopters” to gain traction and uptake from early and late majority adopters. Rogers’ insights, including the factors affecting the pace of adoption, was also quantified by Frank Bass (1969), and applied retrospectively and prospectively to a number of innovative products and concepts. The work of these students of innovation and change—coming from disciplines including sociology, psychology, and business—suggests that understanding the sluggish uptake of e-books is not only about product development, but the development of the market that ultimately needs to accept it.

Not All Market Segments Are Slow To Adopt

While we believe most librarians and most publishers would agree that market uptake of e-books—including both end-users and librarians—has been sluggish, some segments of the market have actually outperformed expectations. Large corpus collections of older books have been widely adopted by libraries and enthusiastically greeted by humanists as “transformative” for both advanced research and classroom instruction. Projects like Early English Books Online (125,000 volumes), Eighteenth Century Collections Online (150,000 volumes) and Evans Early American Imprints (36,000 volumes) have dramatically exceeded the sales expectations of their distributors, with library sales in the hundreds. The success of these projects, in contrast to the more general difficulties of engendering support for e-book spending, can be attributed to some or all of the following factors:

- Low per-volume costs
- One-time funding commitments
Content of unquestioned and enduring value for scholarship

Added value of cross-corpus searching across an integrated body of material that is arguably comprehensive enough to support scholarship for a known audience (as opposed to single-publisher collections or highly selective representations of content from the backlists of one or several publishers)

Low thresholds of user knowledge required to access the content

Bibliographic records available to be incorporated into local catalogs

No duplication of print holdings, or different functionality and broader access than print; funding does not compete with that available for print acquisitions.

Effective marketing targeted to faculty and library subject specialists with resources and decision-making authority, or the skills and will to find and influence those with resources and decision-making authority.

Beyond the several corpus collections mentioned above, library uptake for other e-book collections like Chadwyck-Healey's English Poetry or Early American Fiction, as well as extensive series like the U.S. Congressional Serial Set or British Parliamentary Papers, have sold relatively well for many of the reasons cited above. In addition to commercially distributed e-book content, we have also seen significant library investments being made in the retrospective conversion of book collections, including Wright's American Fiction, the Making of America, the Women Writers Project, and numerous other university-led initiatives. Add to these projects the work now being led by companies like Google and Microsoft to effect large-scale digitization of library books, and it becomes apparent that under certain conditions there is enthusiastic uptake for e-books by libraries and end users alike.

Successful Front-List Models

In addition to historic corpus collections, some categories of current e-books have also shown considerable market strength. Electronically accessible reference works—encyclopedias, dictionaries, and directories—have enjoyed thoroughgoing adoption, often at prices considerably higher than what libraries spent for the same content in a print form (e.g., the Oxford English Dictionary). Another e-book success story has been the ACLS History E-Book Project, with a focus on scholarly works of history published by university and scholarly presses. The Humanities E-Book project, with about 2,000 current and backlist titles, has been adopted by approximately 600 libraries worldwide, indicating that it is indeed possible to sell e-books to libraries if the package includes a proper mix of quality, price, trust, functionality, and disciplinary interest. Unfortunately, the great majority of e-book distributors have fallen short of the mark on some or all of these factors. These expenditures for both reference resources and history monographs are continuing subscription commitments, increasingly replacing outlays for print versions of the same resource.

While uptake of general reference content (or monographs in certain disciplines) has demonstrated some strength, we recognize that STM reference resources and monographs in STM fields have struggled to attract the needed support for library acquisition, even though we have seen a ubiquitous acceptance of electronic journals in the sciences. Some of the reasons for sluggish uptake of STM e-books will be considered later in the article.

Some Impediments to the Acquisition of Current E-books

Most onlookers in the 1990s would likely have predicted that by 2007 library adoption of e-books would be commonplace, if not predominant. In 1999, netLibrary was launched with $120 million in investment capital, much of which was directed to a marketing campaign unparalleled in the world of library products. To suggest at that time that e-books would struggle to gain traction in libraries would have seemed the height of folly. It was impossible in those years to attend a conference, read a journal, or correspond with colleagues without sensing that the Age of Gutenberg was receding to make room for an ascending Electronic Age. In a 2001 article in *The Electronic Library*, S.S. Rao concludes that e-books “may result in the real birth of that paperless society which was predicted in the 1960s.”

But, the heady predictions of the 1990s would not be borne out by the events of the first decade of the new millennium. Today, while netLibrary—now a division of OCLC— is still a going concern, the fallout from netLibrary’s failure to meet or exceed expectations has tarnished the shiny predictions for the company’s future, and with it the confidence so many had felt for the future of e-books themselves. Not only has
netLibrary struggled, but so too has Questia, Baker & Taylor's "ED," books 24X7, and others with a sole focus in this space. The frustration of many librarians with the content and models put forth by these companies has been a significant barrier to widespread acceptance of the e-book itself.

If librarians learned anything from that first wave of e-book enthusiasm in the late 1990s, it was that there was no penalty for waiting to adopt them. User interest in e-books—even awareness of e-books—was limited. Use of print books might be in decline, but print had a constituency and a cultural place on campus as well as in the larger society, while e-books did not. E-Book acquisition seemed situational; appropriate for reference books, medieval texts, or serial government publications, but more generally than that, it was so much easier and far less risky to continue supplying the status quo. In short, e-book uptake has been fettered by supply-side problems with how they have been presented as well as by demand-side problems with how they have been received.

Supply-Side Problems

Among the supply-side problems with early e-book models was spotty content, lacking in both critical mass and a baseline standard of quality and appropriateness for a given audience. In large measure, this problem can't be laid solely at the doorstep of the e-book distributors, since they could only include the content for which publishers would convey rights, and the publishers were very tentative about offering those titles for which they anticipated continued print sales. Apart from issues of content, the publishers and distributors also share culpability for a pastiche of convoluted marketing and pricing models that were not well aligned with how libraries actually purchase books and resources. Some of these models called for direct sales to end users while others offered free library access but attempted to charge users for printing or downloading. These and other e-book systems required special software downloads, burdensome and intrusive authentication schemes, 'check-out" protocols so two readers couldn't access a book at the same time, and other efforts to protect publisher and distributor revenues at the expense of satisfying the legitimate needs of libraries and users. While some—but by no means all—of these problems have been addressed with time, they created a deep-seated mistrust of e-books' costs, functionality and sustainability that continues to this day as a drag on the market.

While there have been no shortage of missteps by publishers and distributors, these players have been attempting to navigate this space against the challenges of numerous undercurrents and crosswinds. If e-book distributors have floundered or failed, it's not necessarily because of individual flaws such as stupidity, indifference, or greed. Rather, these pioneers faced pressure and resistance—push and pull—from a variety of sources, most being in the category of "partners" rather than "competitors." Publishers—especially scholarly and university presses—are staffed to produce high-quality print books, regardless of the anticipated sales revenues. University presses have surprisingly large commitments to print composition, book and cover design, and traditional marketing costs such as distribution of glossy print catalogs. As was said of e-book distributors, these publishers aren't stupid, indifferent, or greedy. Nor are they deaf to the demands of a changing market. Nonetheless, they have to stay attuned to the expectations of the authors they publish—and those they aspire to publish. Whether for reasons of ego, status, or professional recognition, most authors—including academics—equate "publication" with a print manifestation of their work, and shelf appeal adds credibility to their scholarship, even when royalties add little or nothing to their bank accounts. Scholarly publishers may have been hearing the distant rumbles of change in the marketplace, but more clear and present voices of authors and staff were undoubtedly cautioning against change.

Demand-Side Problems

Librarians who cut their teeth on the pricing and terms governing access to electronic journals have developed high standards for how they want to acquire, deliver, and preserve electronic content. To the extent that they bring these high standards to e-book licensing decisions, it's no wonder that they are reluctant to move forward with something less than the accustomed norm. It seems there is a homesteading aspect to the e-book marketplace where price and rights are yet to be sorted out or to have any uniformity across publishers. The current array of models by which e-books are sold or leased is a return to the bad old days when electronic journals were first introduced with a wide array of idiosyncratic
Just as librarians are seeking e-book systems that reflect how journals are now marketed, users, too, have become accustomed to the robust discovery tools and functionality of the electronic journal. They enjoy the benefits of federated searching, link resolvers, citation software, and CrossRef, in order to navigate through an aggregation of journal content without regard to platform or publisher. The ability to use the e-journal content without significant barriers, and often employing Fair Use rights (won through many arduous negotiations), simply meets any reasonable user’s idea of how a library would provide content online for research and learning. Those expectations are now being applied to e-book content as well, but for the most part e-books have failed to deliver.

While librarians and users may have legitimate concerns about the costs, terms, and functionality of e-books, it’s worth noting that these potential buyers and users have facilely overlooked even more glaring flaws of other library formats—notably microfilm, and its micro-cousins: fiche, card, and print. Why has the bar been set so high for e-books? Just as publishers are staffed to produce print books, libraries are staffed to buy them. In large research libraries, budgets and staff are committed to the acquisition of a thousand or more print books a month. To restructure the internal library operations to accommodate a format that is still unfolding and unstable is not only complex and expensive, but counter to the culture of most library organizations.

A Confusing Market

In contrast to their experiences with successful e-book models described earlier, libraries are too often faced with idiosyncratic and complex approaches to e-book offerings from multiple sellers. Publishers such as Wiley and Springer, who are able to manage the digitization process and who have a delivery platform, are selling directly to libraries either with bundled or individual titles. Smaller-scale publishers work through aggregators to provide digitization and hosting services, and to assist in digital rights management for their titles.

YBP and Blackwell are examples of book jobbers who offer selected e-book titles to assist libraries in the integration of electronic and print book selection and acquisition. Aggregators such as MyiLibrary or Ebrary offer e-books in pre-packaged database-like bundles that can be bought or leased and individually. And lastly, some aggregators, Safari and Credo Reference (previously Xrefer) included, even allow libraries to swap titles in and out of their packages based on use and user demand.

The standardization of the marketplace is still unfolding. Early guidance documents, like the “Statement of Current Perspective and Preferred Practices for the Selection and Purchase of Electronic Information,” issued first in 1998 by the International Coalition of Library Consortia and updated in 2004, and the COUNTER Code of Practice for Books and Reference Works (2006) have been effective tools for framing conversations between libraries, publishers, and content providers. But experience will also drive more standardization as library users demonstrate to publishers that accessible and usable content available in the networked environment does not inherently take revenue from front-list sales.

Library Politics

For libraries, the “serialization” of paying for e-books means that the previously stable economics of book buying is eroding. The annually recurring costs of leasing e-books must be budgeted and justified to administrators in the same way that databases and journal subscriptions are. Even e-book titles that are purchased and owned are subject to annual hosting fees. These persistent and recurring costs raise the questions that the library community asked about journals, now more than 10 years ago. When should a book be leased instead of purchased? Is there a need to acquire both print and electronic forms of a book? What long-term rights do libraries have to the content?

The selection process for e-books often parallels the chaotic organization of the marketplace. E-resources librarians, selection committees, and selectors, either individually or in groups, all have opinions and preferences for the process of selection and acquisition of e-books. Business relationships already established between librarians and publishers, book and serial vendors, and other content aggregators
influence the ways in which e-books are purchased—or not purchased, as has often been the case. Perhaps most unfortunately in the current climate, several competing distributors all handle the same small subset of e-titles, or the most desired e-books duplicate titles already acquired in print.

The following vignette, an actual e-mail from a librarian to a vendor, illustrates a few library cross-currents:

The reason I asked was to find some sort of justification to keep the ebooks from being either sent directly to the publisher or to [the serials vendor]. Arguing to staff and Administrators that reducing our order volume with [the book vendor] would mean a reduction in discount sounds compelling even if not exactly true. My argument would go out the window with a vend to [an eBook aggregator]. Right now selectors are somewhat leery of ebooks anyway. They are still not eagerly embracing them here, other than for the occasional selected title or series ... This is not to be repeated, but it is my belief that [serials staff] will vend either to serial vendors or to publishers and [collections staff] will likely vend to publishers.

So, are e-books books at all? Or, are they a serial? Or a database? The answer isn't clear. Neither are the decision-making and budgeting structures that libraries will need to acquire them. The tried-and-true legacy structures developed for print may be no more serviceable for electronic books than the labeling operation would be. e-books cross boundaries, that much is clear. Even if there is a growing consensus about the utility of e-books, there may be no consensus at all on how to acquire them.

User Acceptance

Even as librarians work to acquire and provide e-book content to build on the success and the scale at which they can deliver e-journal content 24 x 7, three recent studies suggest that users have not fully embraced the e-book as a replacement for the print.

In 2006, Ithaka conducted a faculty survey to determine their attitudes and perceptions about the electronic environment and online resources. Ithaka is “an independent not-for-profit organization with a mission to accelerate the productive uses of information technologies for the benefit of higher education worldwide.” Ithaka’s faculty survey generated 4,100 responses. When asked about the importance of e-books now and in the future, 16% reported often or occasional use of e-books and 36% reported rare use of e-books. Faculty also expect the importance of e-books to grow only slightly in the next five years, and do not anticipate e-books being a substitute for print books.

Ebrary, a for-profit company that delivers electronic content via their hosted platform, conducted a librarian survey in 2007 to identify the “digital needs of the library community.” However, a large percentage of their questions were devoted specifically to e-books. The questions were grouped by: usage, integration with other content, purchase decisions, and local digitization activities.

Ebrary surveyed 583 librarians. They responded that e-book usage is “not what it should be,” citing lack of understanding of the strength of the research nature of e-books, and difficulties with the interface to the collections, as barriers. A whopping 80% of the librarians also confess to finding the new purchasing models associated with e-books confusing.

The article “E-book Use by Students: Undergraduates in Economics, Literature, and Nursing,” published in the Journal of Academic Librarianship in January 2007, reported similar findings to the faculty and librarian studies. Undergraduates report using e-books when a print copy is not available, and because e-books are portable, convenient, and efficient. However, the students also explained that they did not want to read an e-book. Rather, they used a table of contents or a quick search to identify relevant content to print or to go back to a print copy to consult. Screen layout and functionality were cited as two of the biggest barriers to acceptance and adoption of e-books as replacements for print.

These studies, looking at e-book usage from the faculty, librarian, and undergraduate perspectives, provide some insight into the directions that publishers, aggregators, and libraries need to take to shape wider acceptance and use of e-books. Reading technologies need to improve so that the content does not have
to be converted to a print format to be usable. Stronger scholarly collections will influence disciplinary migration to the format. And the purchase models need to be simpler and more uniform to assist librarians in content selection.

Still Dangling on the Brink of Success

Although uptake of e-books has been long delayed, they will ultimately succeed because a number of key constituencies, as noted below, will benefit from their widespread adoption:

Users- Students and faculty have a growing expectation to find their information online and will discover that e-books prove to be a good fit for teaching and research. Through mass digitization efforts, both commercial and non-commercial, users will discover citations, chapters, and references to book content that they will want to link to, capture, and reorganize electronically, with little tolerance for being directed to a print volume on a shelf. Scholars will use technology to make connections between content and to discover new areas of inquiry not available to them by consulting individual print items, especially the items held in a single institution.

Since most academic book use is not cover-to-cover, not linear, the convenience and availability of e-books for teaching and learning will outweigh the availability of perhaps deeper or more comprehensive print collections. New delivery models for content, including print on demand delivered directly to the user, and content delivered to the iPod, Palm, or mobile phone, will diminish the need for a print placeholder in the library. Ultimately, it is the user’s behavior that will shape the role and future of e-books.

Libraries- Using the E-journal experience as a guide, libraries will find that duplication of formats—what Ross Atkinson called “hybridity”—is economically unsustainable, both from an acquisitions and ongoing management perspective. Print book acquisitions will be restricted to meet specific disciplinary needs of a subset of campus users such as literary scholars, philosophers, some historians, and art historians. Archiving solutions for e-books should evolve through trusted publishers or organizations such as happened with LOCKSS and Portico for journals. As the “serialization” of the book continues and the container breaks down, systems such as OPACs and federated search tools must adapt to handle and integrate chapter-level abstracts with other electronic content such as e-journals, locally mounted content, audio, and video. Space concerns and the repurposing of space will drive libraries to acquire as much electronic content as possible, and new generations of librarians will view e-books as a preferred format.

E-book Sellers- Publisher and aggregators will develop more favorable usage models that mirror e-journal functionality. This will be influenced by pressure from the library community to deliver to its users a more integrated and uniform e-environment. Publishers will discover new revenue sources for online content that includes advertising, pay per use, and short-term licensing permissions that will substitute for counting on print sales and restricting more widespread access to e-pubs. Publishers and book vendors will develop pricing models that reflect preference for electronic content with mechanisms built in for add-on print purchases. Perhaps most important of all, more content from a broader array of publishers will become available as aggregators assist them with digitization, hosting, licensing, and rights management.

Conclusion

Social change is always characterized by uneven, lurching acceleration. As the tides of history roll in, they inevitably create their own counter-forces—eddies and undertows, pulling back against the current. “Progress” is a loaded term, of course, because “progress” for a particular person, group, or class is likely a setback for others. Change engenders both enthusiasm and resistance; and as the sides fight for advantage, their arguments are most frequently pitched as high-minded appeals to advance or protect the social good, rather than arguments rooted in base self-interest. Michael Gorman, as president of the American Library Association, and many publishers raised the specter that e-books are the instruments of a new dark ages—anti-reading, anti-intellectual, and anti-culture. We can only leave it to the readers to determine whether such naysayers have been motivated by protecting the broader well-being of society, or the narrower short-term interests of particular classes and workers in industries that have traditionally benefited from the production and distribution of print books.
The evident flaws in the early rollout of e-books made it easy enough to attack the concept on its current merits—or the lack thereof. While, some saw e-book access as pregnant with opportunity, many others zeroed in on readily apparent system flaws or low user uptake as evidence that the concept had—and has—no future. The ups and downs of the e-book were well characterized in a December 18, 2001 posting in Wired by author M.J. Rose titled, “E-books live on after a mighty fall.” They do live on, and live on in search of an economic model that works for authors, publishers, and distributors (Internet providers, retailers and libraries). They also continue to live on in search of a platform—or several platforms—that can address the varied purposes for which books are written and read.

True enough that reading War and Peace online at a library, or on a PDA, would not be a rich and convenient experience. On the other hand, a home owner with a leaky faucet does not need to start on page 1 and read all 608 pages of the Ultimate Guide to Home Repair and Improvement, and a student needing to know what happened—or didn’t happen—at Bunker Hill does not need to wade through all 3,000 articles of the American Heritage Encyclopedia of American History. E-books offer compelling efficiencies for discovery at all levels. As such, there are adequate incentives to form markets that will advance and fine-tune this technology.

In the academic space, the incentives are particularly strong, but market readiness for e-books will necessarily require a shift of resources from print textbooks, print acquisitions in libraries, print editions by university presses, and print authorship by scholars. Economic investment and user preference has already tipped in favor of digital access to journals, newspapers, and reference resources. It is difficult to pinpoint the exact moment or year when that occurred, and harder still to say if user demand for e-formats drove economic commitments or the increased investments drove user demand and acceptance. Nonetheless, we can see it has occurred and that the transition to electronic formats is continuing to become ever more thoroughgoing, in many cases obviating the need for any print manifestation of the content.

In the words of Geoffrey Moore again, e-journals have “crossed the chasm” from support by a few early visionaries to uptake by “a majority of pragmatists.” As readers, publishers and librarians—i.e., information professionals—increasingly gain experience buying, selling, and working with e-resources for other formats such as journals and newspapers, it will inevitably smooth the path to finding acceptable implementing strategies for e-books as well. While many companies and libraries have teetered at the edge of that chasm for the past eight years or so, the framework for a bridge is now in place and the crossing will soon be routine for those prepared to pay the toll.

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References


Diffusion is a physical process that refers to the net movement of molecules from a region of high concentration to one of lower concentration. The material that diffuses could be a solid, liquid or gas. Diffusion Definition. Diffusion is a physical process that refers to the net movement of molecules from a region of high concentration to one of lower concentration. The material that diffuses could be a solid, liquid or gas. Similarly, the medium in which diffusion occurs could also be in one of the three physical states. One of the main characteristics of diffusion is the movement of molecules along the concentration gradient. While this could be facilitated by other molecules, it does not directly involve high-energy molecules such as adenosine triphosphate (ATP) or guanosine triphosphate (GTP). In cryptography, confusion and diffusion are two properties of the operation of a secure cipher identified by Claude Shannon in his 1945 classified report A Mathematical Theory of Cryptography. These properties, when present, work to thwart the application of statistics and other methods of cryptanalysis. These concepts are also important in the design of robust hash functions and pseudorandom number generators where decorrelation of the generated values is of paramount importance.