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Convergence and Divergence Among Digital Libraries and the Publishing Industry

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1. Introduction

The Internet's dynamic impact on society, industries and individuals has been studied intensively across a broad number of academic disciplines. Digital media are spurring both creativity and dislocation in every field of study, as well as the workplace. These forces have also triggered sweeping changes in how traditional players in the creation of knowledge and scholarship operate and interact with each other. "Digital convergence," as it is widely known, invites not only creativity and enterprise, but also new and energetic competition in nearly every line of work (Yoffie, 1996).

The evolving roles of the traditional publisher and the research library in the United States are particularly illuminating as indicators of the ferment that the digital era is producing. These two groups have long enjoyed ties of mutual benefit, but now face radical forces of change, and find themselves in competition with each other—as digital publishers. Indeed, it is now possible for each agent to assume the characteristics of the other: librarians can act as digital publishers, and publishers can add new roles as preservationists and guarantors of long term access to content. Innovators in each group are already experimenting with expanded services in large and small ways. Ventures may involve wholly new services, or more basic experiments that gauge their audience's interest.

The opportunity to assume much-enlarged professional roles and offer services with good prospects for success places publishers and digital librarians in a new relationship, and is causing fundamental shifts in each field. Can digital libraries act as full-service publishers? If so, should they undertake such a path? Likewise, when the lifespan of a work of literature or scholarship is measured in its entirety, publishers can scarcely miss synergistic opportunities that add new functions and skills to their historical areas of expertise. Indeed, other "content creators" of every stripe frequently assume custodial and interpretive roles—much like library services—acting as repository managers, purveyors of social media and online conversationalists. Should publishers assume any of these roles? These questions go to the heart of both the library and the publishing professions. How each group decides to answer them will have a significant impact on the future of scholarship, education and entertainment, as well as the form and function of digital libraries themselves.

This article will explore the recent history and pivotal experiences of U.S. publishers and research libraries, and the prospects for competition or collaboration between the two groups. The crux of this analysis will lie not on industry studies, but rather on an evaluation

of the "professional cultures" of publishing and digital libraries. Although commercial publishers and digital libraries are not identical types of organizations, they share many values and their necessary skills hold many similarities. Indeed, the underpinnings of their respective skill sets are closely related. Therefore even though outright competition is a viable strategy, so also is a future based on strategic alliances of mutual benefit. Whatever course history takes, the outcome will have an important impact on both of these information-handling groups as well as the social and technological architectures of knowledge resources.

Sociology provides us with solid theories that evaluate the dynamics of competition and strategic collaboration, and such theories have grown in importance during the digital era. Andrew Abbott (1988, 1991) has argued persuasively that professions that handle related areas of expertise will take advantage of new opportunities to advance their status, whether by adding skills into existing portfolios or by forming new levels of licensure, standards, or international oversight. At the same time, there is also a growing perception that all kinds of digital production occur on a continuum of activity, involving many phases and a diversity of players, reinforcing the need for traditional players such as publishers and digital librarians to look beyond traditional spheres of authority for new opportunities. What is more, theories about competitive motives and their interplay with digital convergence are not limited to sociology; similar theories now appear in business literature, as well cultural debates about the future of scholarship (Ellison, J & Eatman, T, 2008; Tian, et al, 2009; Banks, 2006).

There is little doubt that the technological hurdles to assuming the role of digital publisher have never been lower; the remaining barriers are of an organizational nature, such as the urge to hold onto prevailing beliefs about functional roles and workflows, not to mention pre-conceived notions of how markets or services "should" operate. The present turmoil is both energizing and destabilizing for all established players in the information professions, and conditions are so dynamic that 2011 may bring a host of new challenges for both groups. With these factors in mind, the following review of the cultures and recent histories of these two crucial players in knowledge creation may provoke insights about the future strategies – and prospects – of both groups, whether they may compete or collaborate, and what impact their choices may have on the future development of digital libraries.

2. Competing professions: the new landscape

Digital technology has been rewriting professional roles for many years. This process is dynamic and stressful for the affected groups. Understanding how professions compete for dominance has gained new importance in the digital era, because each affected group must come to terms with the possibility that their own native area of expertise – whether it is publishing, distributing or archiving, for example – may be taken over by a competing group with a better idea.

The current ferment in all professional groups that manage information is one of the best examples of competition for new roles in the digital era. For a long time, publishers and libraries in particular have enjoyed stable perceptions of their roles, but those days are gone and not likely to return. Instead, these two groups (and many others, to be sure) are deeply involved not only in re-imagining what their core services are, but also what roles they may be able to "poach" from others in the overall process of knowledge creation.

Abbott's (1988) broad analysis of the U.S. system of professions sheds considerable light on the relationship between expert labor, technology and organizational design, and offers some explanations for patterns of competition between different professions. Professionals have standing in society to evaluate the important matters of our lives, ranging from medicine through law; they "diagnose" and "treat" conditions and are regulated by organized bodies of their peers. Expert status depends upon sound and irrefutable "abstract knowledge": a set of skills that is controlled by the profession and applied to practical problems. The use of specialized language is one example of how abstract knowledge retains power; engineers or doctors utilize sophisticated terminologies to retain authority over their practice areas. Also with respect to medicine, physician associations aggressively protect the meaning and definition of "practicing medicine," fending off efforts by other practitioners such as acupuncturists to gain higher levels of recognition for their treatments. Professions that lose control of their system of abstract knowledge risk the loss of prestige and status. The height of professional power is determined by licensure by state- or national-level licensing bodies, which confer the official status to practice a profession. This is the case with accountancy, law, medicine and other fields. Professions and occupations that are not universally licensed by government—such as publishing and libraries—are at greater risk of competition from others who may seek to offer their own expert solutions.

2.1 Treatment substitution

Digital technology has created numerous opportunities for the expansion (or reduction) of prestige. Competing groups, such as librarians, publishers or technology managers, may attempt to take over new areas of responsibility, in essence by offering a better treatment than their competitors. As technology influences working life, professional status may rise or fall depending on the vitality of abstract knowledge. New types of abstract knowledge, such as the ability to understand how people use technology and information resources, or how to structure metadata for a digital future, are potential sources of new professional power (Abbott, 1988).

Treatment substitution holds three important lessons for the information professions. First, power, or the standing to diagnose and treat, is best maintained by the strategic preservation of abstract knowledge. Second, constant self-evaluation publicly exposes weaknesses in the abstract underpinnings of professional expertise, which can invite competition. Third, digital media offer new groups the chance to expand their zones of influence, if their practitioner skills provide them with new abstract knowledge. Because of these factors, all of the information professions are using digital technology to gain political leverage and to take new roles in knowledge creation.

2.2 The knowledge creation continuum

Abbott's study of the professions was originally conducted before the most explosive years of Internet growth began rewriting the rules for scholarly activity and publishing. Subsequent research about the impact of new technologies on the creative and intellectual processes of scholarship strengthens his theories about competition among the professions. During the early days of the Internet era, the Getty Information Institute established useful models for understanding what was happening to the traditional information industries (Fink, 1999). Researchers at the Getty Information Institute identified the "knowledge creation continuum" as a means for understanding scholarly communications. Under this

model, all of the various players in the creation of knowledge operate upon this continuum, bumping into each other as they find new opportunities during the digital era. Each player dominates a "zone of progressive release" of knowledge, as creative work finds its way from author to reader. This dynamic process defines much of the action underway at the present time, as authors, publishers, media outlets and repositories such as digital libraries redefine their roles.

Organization studies researchers, university leaders, and information professionals have also found the metaphor of the continuum to be useful. Tian et al (2009) recast the continuum as a "data-information-knowledge spiral," lending the visual image of upward movement. Ellison & Eatman (2008), who wrote a major policy document about the American tenure system, identify a "continuum of scholarship" that encompasses not only the faculty but every contributor to the knowledge creation process. Fister (2001) undertook a study of trade publishing to explore the changing roles of all of the industry's contributors on a continuum of actions, seen with an information professional's perspective.

As the continuum (or spiral) evolves, zones of added value may collapse into one another. This trend is also widely studied, and is well described by Marcus Banks (2006), in his analysis of the shifting distinctions between (and potential disappearance of) "grey" and "non-grey" literature. The application of abstract knowledge governs strategic action; therefore an assessment of the comparative robustness of abstract knowledge among various groups may provide a useful indicator of future success. It may also reveal who is most likely to compete with each other, and which zones of progressive release they will move into.

2.3 Publishers and libraries face blurring boundaries

The abstract knowledge bases of publishers and digital librarians contain many similarities, but they are also distinct in how they perceive special skill. For publishers, the skills of discovering, editing, preparing and selling books for consumers or for academics is a well-understood chain of actions; as a result publishers historically have viewed themselves as indispensable players on the knowledge creation continuum. For librarians, collection, categorization, interpretation and preservation of vast repositories of literature likewise define the core expertise of the profession.

However, digital technology has blurred the distinct boundaries for just where each zone of expertise begins and ends. New technologies, beginning with desktop publishing programs and moving onward through an avalanche of electronic devices and networked information, now make it possible for other skilful groups to offer competing publishing solutions. For example, digital librarians may choose to enter the publishing zone, or publishers may launch new programs as archivists or preservationists of the knowledge they create. The "open source" movement is another example, with universities offering a full-scale publishing alternative to commercial journals. Open source journals are free of charge and compete directly with expensive and respected scholarly journals—a classic example of treatment substitution. Likewise, much of the struggle between publishers and libraries over the past 20 years has focused on price control or access to markets, with publishers advocating for greater pricing authority over knowledge resources and librarians advocating for expansive access, within the reasonable constraints of the "first sale" principle that underlies the book market (Lessig, 2003.)

If information can be managed in new and flexible ways, traditional perceptions of both publishers and digital libraries are also more fluid than they once were in the eyes of other

groups (Koenig, 1988). For example, information technologists have competed with numerous strategies to manage information, including search engines, database services, large-scale archiving and records management. These forays into the traditional role of publisher or librarian have been sustained for as long as computers have been in existence.

2.4 New media, new competition

The digital era presents many opportunities for enterprising individuals to reinvent publishing practices. As a result, most information-handling professionals are evaluating their options, using models such as the knowledge creation continuum to understand what moves to make. It is a dangerous and exciting time to be in the publishing industry, and also in the library field; virtually all of a sudden, new agents that range from software developers to authors are able to style themselves as a publisher to varying degrees, or as managers of repositories of information (Regazzi & Caliquiri, 2006). In such a tumultuous environment, success comes from possession of abstract knowledge that can make sense of the new and unknown. In this regard, the creation and evolution of digital libraries is much influenced by what goes on in the publishing sector, as well as in the library sphere.

As publishers and digital librarians confront competition from new agents on the knowledge creation continuum, their responses to the turmoil are instructive for assessing how digital libraries will grow. As conditions change, the traditional beliefs of entrenched players such as publishers and librarians can either help or hinder efforts to protect their traditional roles. With that in mind, an overview of recent history and the professional dialogues of publishing and librarianship follows below, as a preface to analyzing each group's challenges and their prospects for collaborating or competing with each other.

3. Dystopia and distress: publishing's professional dialogue

As the disruptive power of technology creates a diversity of opinion about what will come next, established players typically respond to new challenges by drawing on their known areas of expertise. For example, publishers have responded to the digital era by analyzing the shifting terrain through the lens of market analysis and the benchmarking of sales goals. This approach made good sense, as it served the industry well prior to the digital era. Indeed, as recently as 2003, the U.S. publishing industry's total revenue was in excess of 100 billion dollars, with a substantial percentage of revenue generated by book publishing. Reporting on the book industry in that same year, Datamonitor, a market analysis firm, opined that the "online publishing industry" had not yet materialized, and forecast even higher revenue in 2010 (Datamonitor, 2003). Yet by 2009, the U.S. publishing industry had revenue of slightly more than 50 billion dollars, e-books and e-readers had gained wider acceptance, and industry analysts lowered their revenue forecasts (Datamonitor, 2010).

In the face of such alarming figures, the publishing industry interpreted the emergence of a digital marketplace as a threat to revenue. This initial perception influenced much of the industry's professional dialogue about what would follow. Notably, a market-based system of perception and strategic thinking is based on viewing readers as consumers who purchase books; certainly this is a valid assessment, but as a paradigm, it excludes viewing readers as members of "community" who have many interests in addition to purchasing books, such as social interaction with publishers and authors. The general tendency to view readers as consumers has been a strategic "Achilles heel" for publishing and has persisted for years, but is beginning to break down (Cader, 2008).

3.1 A history of embattlement

Publishers have perceived their industry as embattled for decades, due to a series of destabilizing events that predated the emergence of the Internet. It is important to understand the impact of this long-running and alarmist professional dialogue, decades old as it is, on the current strategic thinking of publishers.

Throughout the 1970s and 1980s, the dominance of the mass-market paperback threatened the profitability of trade publishers. Thomas Whiteside (1981) describes this threat as part of the "blockbuster complex": new rules pushed ever-increasing resources to the production of high-volume bestsellers at the expense of "mid-list" books of interest and value. The mass-market crisis period was quickly followed by bookseller consolidation, as Barnes and Noble and the now-defunct Waldenbooks expanded and began exerting heavy influence through their buying patterns. (Overdorf and Barragree, 2001).

As the Internet and the World Wide Web made all-digital publishing a serious option, Web-based reading alternatives began to grow very rapidly, causing consternation and even panic for publishers. High-powered online distribution services such as Amazon seemed to gain even more influence than their predecessors of the print-only era over what readers would choose to buy. The invention of "digital ink" and the e-book seemed to pose further threats to publisher profits. With sales and market development as analytical paradigms, publishers entered the digital era without adequate strategic preparation for technological change. Consequently, they retained a sense of embattlement, as new agents who possessed innovative abstract knowledge began to emerge—once again demonstrating the process of treatment substitution (Abbott, 1988).

With much narrower margins and downward pressure on budgets, traditional publishing's internal dialogue reached new rhetorical heights of anxiety after the turn of the century. *The New Yorker* magazine launched a Weblog called "Publisher Death Watch," which kept track of downsizing businesses, including individual posts from demoralized staff (La Force, 2008). Jason Epstein, long-time Publisher at Random House and a major thinker of the publishing profession, responded to the growing anxiety with a variety of new business models, including on-demand print publishing, as well as passionate philosophical manifestos meant to renew and uplift (Epstein, 2008). Epstein has been joined by other prominent figures such as Peter Jovanovich, offering a series of roadmaps for survival, focusing on adaptation to new technology and digital rights management (Epstein, 2010; Jovanovich, 2009; Nawotka, 2008). Yet even as new ideas began to flow, publishing staff morale reached new lows. Debate at publisher association meetings often reflected the grim business environment. At the 2008 Association of American University Presses meeting in Montreal, incoming president Alex Holzman declared that "We meet under darkening clouds," referring to lightning-fast technological change, the open access publishing movement, new competitors, economic downturns and more (Howard, 2008).

At the same time, independent booksellers—key partners to the publishing industry—had also suffered severe losses in market share, complicating traditional revenue streams. Booksellers have long enjoyed close (though sometimes fractious) relationships with publishers, and therefore publishers possessed keen understanding of bookstores as their key sales outlet. However since 1985, independent booksellers have been shrinking in number, although some robust bookstores (such as Powell's in Portland, Oregon) continue to thrive. New super-stores such as Borders and Barnes and Noble entered the vacuum left by disappearing independents, bringing different business patterns for sales and returns of merchandise with them. With fewer and larger retailers, the unique process of returning

unsold books to publishers for credit has had far greater impact on sales cycles and profits. Under such conditions, reverberations of distress flowing from the bookselling industry carry heavy impact for publishers. When Barnes and Noble, which dominates U.S. bookselling, announced that it may put itself up for sale in 2010 or 2011, the announcement created fresh alarm for publishers (Bosman, 2010, 2010a).

3.2 Core competencies face new realities

The sheer drama of the publishing industry's waves of consolidation, downsizing and new ventures helped to focus the profession's attention on the meaning and value of its core skills and roles. These skills and roles are typically boiled down to four principal functions, although they can vary in name. These roles are Agents; Editors; Design and Marketing; and Sales staff (Fister, 2001). Publishing work begins with authors via agency, and proceeds to add value by editing and preparing an author's work for sale. Each of the functions along this path to market is labor-intensive, requiring large investments of time and resources, and each is also widely held to be an essential, value-added service that no other group can offer at a higher standard. Of the four roles, editing is held as the most durable service that publishers offer (Schatzkin, 2010, La Force, 2008).

The curricula of graduate programs that grant degrees or certificates in publishing reflect several of the trends underway in the marketplace. For example, the *New York Times* Knowledge Network co-hosts an ePublishing certificate program with Rosemont College, and the introductory description for the program is telling as a gauge of uncertainty. It states: "*The world of publishing is changing rapidly, due to one little letter: "e." The advent of ePublishing has launched an era of rapid change, growth and turmoil in the publishing industry. What are these new technologies and how do they work? How will they continue to develop and be used? What will the industry look like in five years, in six months, next week? And what skills are needed to survive and succeed in the publishing workplace?*" (New York Times Knowledge Network, 2010).

Just as this description articulates the widespread uncertainty, a closer review of the 36 unit master's degree at Rosemont College illustrates how transferrable the core skills of publishing have become. Over the course of study students learn the principles of editing, marketing, production and more; yet the same curriculum could easily appear as coursework for a career in Web administration, journalism or information science. The ease with which digital publishing skills may transfer to other fields accentuates how publishing expertise is much more widespread than it was just 15 years ago, and that other groups can now learn these skills and experiment with publishing strategies (Rosemont College, 2010).

3.3 Tipping toward innovation

The professional dialogue of publishers is intriguing, given the industry's continued existence despite its many challenges. The blockbuster mentality produced much alarm, but also yielded impressive revenue streams for publishers who could respond with strong bestselling lists. It has also made many authors into multi-millionaires. Mass-market books did not "kill" publishers; instead, they revolutionized marketing strategies. The success of mass market paperbacks spawned the larger-format, higher-profit "trade paperback," which was conceived as a business builder and a permanent artifact for library collections (Epstein, 2010). Big distributors during the print-only era and the print-plus-digital era (as evidenced by Amazon) have also contributed some positive impacts on sales, by creating unexpected top selling titles. E-books, while they are growing in use, still constitute just a few percentage points of total book sales—and book sales, although they have been shrinking

since 2004, nonetheless generated more than 25 billion dollars in 2009 (Datamonitor, 2003, 2010). Moreover, 2010 appears to be the year that acceptance of e-book devices and electronic text reading will accelerate in popularity. By the end of 2010, 10.3 million people are forecast to own an e-reader, and will buy as many as 100 million e-books (Richtel & Miller, 2010). With such rapid trends underway, the influential Book Industry Study Group has devoted considerable energy and resources to study the whole of the industry, with a close focus on electronic products (Healy, 2008). Publishers have also have released content in aggregated and topical "libraries" such as Wiley Custom Select, which offers a course-reader solution to professors (WileyPLUS, 2010). In short, the business environment, though fraught with challenges, continues to be functional, and publisher strategies have been evolving at a faster pace (Brown & Boulderstone, 2008).

Although new ideas are being actively studied, staff morale continues to suffer. Attention to the publisher "death watch" and a "rallying the troops" rhetorical style continue to dominate the tenor of publishing's professional dialogue. In 2010, the Book Industry Study Group conducted an important survey of publishing staff, to gauge their perspectives and sentiments regarding new media and e-books. When asked when they expected to see fundamental change in their own functional work area, 31 percent of respondents replied that it had "already happened", and 45 percent said it was "happening now" (Schatzkin, 2010). At the same time, enterprising digital publishers such as O'Reilly Media have countered with comprehensive business models that draw on the full array of social media, creating interactive user experiences that go beyond the book format (Hane, 2010). By 2008, the full force of experimentation and pursuit of innovation had gripped the publishing industry, creating a sense of making up for lost time.

4. Digital librarians: preserving the past, looking forward

Throughout the same eras of upheaval and change, librarians faced similarly daunting challenges. Clarion calls heralding the imminent demise of a proud profession crowded the professional literature of every specialized sector of librarianship for decades (White, 1989, Lowry, 2001). In response, various innovators have explored a multiplicity of strategies. Nancy Lemon (1996) argues that rethinking traditional roles enables librarians to climb organizational "value chains;" James Matarazzo and Toby Pearlstein (2010) review the plight of news media libraries and see a history of cyclical renewal, in which existing jobs give way to new opportunities in new locations. Among corporate libraries, a wide variety of bare-knuckle strategies have been put forward, urging librarians to find a competitive edge by offering services that can be demonstrated to boost profits (Chandler & Carroll, 2002). In the public library sphere, despite straitened civic budgets and the shock of new media, libraries have achieved a degree of success in staying relevant. Circulation, library card membership and on-site use of services are at an all-time high, countering the idea that community libraries are outdated during the digital era. On the contrary, they are more popular than ever (Nolte, 2010). Therefore even as pessimism about the future became a standard feature in the professional literature, a parallel stream of daring and innovative thinking has run concurrently among a wide spectrum of library specialists.

The resulting intellectual ferment has produced new paradigms and new energy for rethinking library goals in light of the emergence of digital technology. Rather than wait to see what would happen, librarians repeatedly took initiative with new media. They staked an early claim on the crucial issue of intellectual property and copyright, working both with

and against publishers as needed to preserve the library's public service mission. As part of this process, librarians became more deeply aware of the publishing industry's travails with digital media. This awareness led to greater strategic knowledge about the marketplace. (Fister, 2001; Katz, 2010; Hane, 2010; Howard, 2008).

4.1 Spanning "online" eras

Librarians were shaken by the rapid emergence of Web-based information resources, because they had been important players in the previous "online" economy that was dominated by firms like LEXIS/NEXIS and Dialog Information Services. This first "online" era gave librarians the opportunity to cast themselves as experts who conducted mediated searches on behalf of users such as attorneys, scientists and business leaders. As the initial "online" era faded and the Internet exploded into growth, librarians joined the first wave of Internet e-mail "conversationalists", Web content users, Web site producers, and aggregators of high quality information. They also grasped the importance of creating stable and robust Web portals, which organized and "branded" library-hosted aggregations of databases; such activist strategies stretched scarce budgets while formalizing a Web-based library presence (Howard, 2009). Similarly, the economic upheaval caused by the skyrocketing price of scholarly journals generated energetic responses on the part of research libraries, including formation of the Scholarly Publishing and Academic Resources Coalition (SPARC), as well as active congressional lobbying to protect copyright and "fair use" principles from a runaway marketplace. The same upheaval also sparked a sustained outreach to faculty, in search of much stronger partnerships with the academy's principle content creators. In general, digital librarians have been agents for innovation over the past 15 years, and have participated in the sweeping process of rethinking scholarly communications (SPARC, 2010; Berkeley Research Impact Initiative, 2009).

This lengthy process of trial and error has transformed digital librarians' self-perception. Rather than viewing digital media as a force of dislocation that would bring ruin to the profession, digital librarians have instead embraced it. Likewise, constant downward pressure on budgets forced innovative survival plans to the forefront, emphasizing new technologies (Howard, 2009, McKenzie, 2009).

4.2 Metadata as enhanced competency

Perhaps the most significant advance on the part of digital librarians has been the profession's embrace of structured metadata and taxonomy as a reinvigorated core competency. Even as they faced the twin challenges of integrating new technologies and shrinking budgets, digital librarians participated in the formation of international metadata standards such as the Dublin Core (Dublin Core Metadata Initiative, 2010). Libraries became key institutional members of new groups such as the Coalition for Networked Information and the National Digital Library Federation. Academic librarians experimented with diverse forms of preservation, including digital repositories, e-journals, and increasingly, full-scale publishing initiatives that originate within the library (Furlough, 2009).

Many metadata platforms and languages have been explored, but Extensible Markup Language (XML) has become a dominant tool for managing digital assets (OASIS, 2010). XML is a "meta-language of languages," enabling developers to create taxonomies and metadata schema that are customizable, portable and attached to the "digital objects" they describe. The emergence of national and international standards for metadata, the ascendance of digital

objects which are transferrable among collections, and a strong focus on systems interoperability have elevated the library profession to a technical status considerably higher than it enjoyed before the advent of the digital era (Johnson, 2010). Although digital librarians are not the only XML developers—many computing firms and other academics are heavily involved—they have left an imprint on the development stream of XML.

XML-based systems have become accepted across many industries beyond the academy, and now play a crucial role in information management and data warehousing by large corporate firms. XML-based information architectures are essential tools for managing text, images and other artifacts, creating new workflows that are based on the principle of "one text, multiple outputs". This kind of workflow would transfer very effectively to the publishing world, yet the publishing industry has been slower to adopt XML workflows at a universal level. The opportunity to manage digital assets using XML is an important leap forward that publishers have not yet fully embraced, and forward-looking commentators have recognized this shortfall (Ganesan, 2010; Young & Madans, 2009).

4.3 From online repository to publishing platform

The turmoil of the Internet's early years also produced solid initiatives to understand the digital library as a publisher in its own right. Thomas (2006) provides an early and comprehensive road map that offers large research libraries a template for launching high quality publishing services. She also describes the early emergence of online repositories as a new form of curated information resources. Online repositories grew quickly throughout the early years of the twenty-first century, taking much inspiration from the digital archiving efforts of the computer science and engineering fields (Furlough, 2010). Library-managed repositories also grew up with a strong bias for interoperability, which has led to more dialogue about the need for large-scale "federations" of digital libraries, even at the international level (Van de Sompel, 2006, et al).

As these repositories became more accepted, use skyrocketed. The University of California's eScholarship repository experienced more than one million downloads in its first two years of operation. "Post prints" and research reports are now also collected in online repositories, and are frequently overseen by digital librarians, or at least coordinated by them. In late 2009, eScholarship recast itself as a full-scale "publishing platform," which drew strength from the reputation of its source—the University of California system. Although this is not the only example of a library-sponsored publishing service with university imprimatur, it is certainly one of the most high profile experiments (SPARC, 2006).

The evolution of library-based online repositories and their current transformation into full-scale publishing platforms is a prime example of how contributors can expand their role and move into new "zones of progressive release" (Abbott, 1988, 1991). Digital librarians' publishing solutions are guided by two objectives: first, to empower authors, and second, to create robust, collaborative blocs of institutions that share expertise and improve access. These are new "treatments" that address the changing needs of academic publishing (Van de Sompel, et al, 2006). Publishers are rushing to reinvigorate their relationships with authors, but to some degree they are playing a game of catch-up.

5. Convergence and divergence: strategies and examples

Recent events in these two fields reveal several interesting trends, not only in strategic planning but also in the underlying thinking of leading commentators. Although there is

considerable ferment and thus many trends underway, there are four areas where publishers and digital librarians face similar challenges. The strategic decisions that each group makes in the coming years will have significant impact on their long-term futures.

First, the hurdles to publishing a well-packaged text artifact are dropping rapidly. The result has been that authors, both in the academic and popular literature spheres, now have the option of creating their own digital artifacts without publishers' assistance. Many already manage online presences and engage in dialogue with readers. In response publishers and digital librarians are testing strategies that reinforce their own roles.

Second, the disruptive nature of digital media has forced publishers and digital librarians to evaluate their own native skill sets in a new light. The library profession's core competencies—collection development, information counselling, interpretation and preservation—involve in-depth analysis of information resources. Yet librarians already format, revise, copy-edit and even print bibliographies, scholarly e-journals, festschrift, and full-scale books in many cases. As these content-intensive roles become more important, research libraries have responded by creating senior management positions with titles such as director of digital scholarly publishing, director of digital publishing, or director of built content. These positions carry responsibility for assessing new opportunities to publish, as well as assisting research faculty in doing so themselves.

Publishers also have the opportunity to review what they do well, re-evaluating existing functions to include new services such content aggregation, developing much-enlarged Web presences, taking on custodial roles and offering services for long-term preservation of their own built content. The technological hurdles to adding new services of this nature are just as low for publishers as they are for librarians who are involved in digital publishing. Both groups are limited chiefly by imagination, by perceived commitments to doing "business as usual," and by the high cost of retraining their already-well-trained work forces to take on new tasks in addition to their existing workflows.

Third, both publishers and digital librarians are looking beyond the boundaries of their own fields of expertise for new ideas and strategies. For example, new social media have carried a heavy impact on the news industry, and both librarians and publishers have studied newspapers as a cautionary tale. News media were one of the first zones where readers began "talking back" to the press and contributing substantive new content (as well as trivial or satirical interactions). The Blogosphere has also attracted interest, although it increasingly produces voluminous and cyclical "blooms" of creative work that are followed by inactivity and the formation of "dead zones." This pattern suggests that new media are only as vibrant as the minds that are driving them forward (The Economist, 2010). However, over time the Blogosphere has become firmly established as an effective platform for commentary, news, cultural critique and debate. The Blogosphere's experience implies that longer-term value takes time to emerge as a new technology matures.

Fourth, both groups have come to realize that as digital convergence has accelerated, bold action is required. As a consequence, the pace of intellectual thought that is devoted to innovation has also accelerated. There is also greater acceptance that bold actions may succeed or fail, yet they must be attempted to gain new knowledge and expertise. Both groups show evidence of complex responses to the necessity of taking bold action, because both groups believe that they must protect legacy print programs, whether as book sales or print collections, even as they step into new digital futures. This is a difficult balancing act, because reader and user community loyalty may be challenged as risks are taken.

These four trends illustrate the turmoil, and indeed, the excitement of the times for both publishers and librarians. They also illustrate how each group is operating on the knowledge creation continuum, and how they might choose convergent or divergent strategies when compared to each other.

5.1 Convergent strategies

With respect to convergent strategies, publishers and digital librarians are aware that their core competencies must now include a robust and dynamic "conversation" with their readers, collaborators and user communities. Although this may seem obvious during the Internet era, it nonetheless symbolizes a major challenge for established players on the knowledge creation continuum. New ideas and new technologies, commonly known as "Web 2.0", currently emphasize ubiquitous interaction in a wide variety of locations and via a long list of tools, ranging from desktop computers to "smartphones."

Among publishers, this interactive paradigm and the tools it has spawned have caused a seismic shift in thinking. A book's usefulness is no longer limited to the experience of reading it; it now has a lifespan that can take many forms, involve communities in addition to solo readers, and last for years (Norrington, 2010). In response publishers have launched serious attempts to enter the Web 2.0 sphere. Likewise, digital librarians have seen their print-based mission expand exponentially to include not only the finished works of scholarship and literature, but also the artifacts created by the overall process of creating scholarship, from start to finish. Library responses also include innovative combinations of digital collections and community-building features, such as allowing commentary, running newsfeeds, and adding Wikis to facilitate dialogue.

Publishers continue to focus on sales and profits, and they are experimenting with social media to increase revenue. Two strategies dominate the landscape: narrowcasting and community-subscriber services (Kist, 2008). Narrowcasting refers to the strategy of discovering discrete markets or user communities who share strong interest in very specific literature, and then offering them targeted products that are based on market analysis (Shaver and Shaver, 2009). This approach is greatly assisted by "viral marketing," a common term in the Internet era, which describes how news of events or products can travel very quickly, even circumnavigating the globe in a matter of hours in some instances. Narrowcasting would be paired with general marketing strategies, just as print sales would be complemented by e-book sales, still a small (but growing) revenue stream.

Community-subscriber based strategies also make explicit publishers' new role as their own distribution outlets, joining bookstores, libraries and online firms such as Amazon in direct consumer outreach. Direct outreach is another example of treatment substitution, as it establishes a new zone of service on the knowledge creation continuum for publishers, shifting them further into the zone of distribution and perhaps even preservation.

Recent developments in textbook publishing provide evidence of innovative approaches by publishers and digital librarians, who are exploring classroom teaching aids. It is now possible to print textbooks or sections of them on demand, use e-readers to read them, or purchase printed readers, and the entire idea of how textbooks support teaching is rapidly evolving. Publishers are now perfecting "portal" style learning zones on the Web, which are based on textbooks but include many added features, including unbundled chapters, added teaching aids and accompanying training modules. Interestingly, 55 percent of students still prefer to buy the textbook in print as part of their study plan (Vance, 2010; WileyPLUS,

2010). Meanwhile, digital librarians are also involved in teaching portals, and they have been perfecting e-reserve systems and new formats for class e-readers (bSpace, 2010). Finally, publishers are beginning to show interest in managing their backlists more along the lines of a repository or collection of resources. However, whether publishers will take up archiving and preserving content remains uncertain. Once again, networked information technologies have lowered the hurdles to creating online archives. But in practical terms, taking on an archival role would require publishing staff to learn new skills, or recruit new talent to join the firm. Early evidence suggests that publishers have not fully embraced the link between the process of acquiring, editing and selling books and the long-term value of archiving the material (Schatzkin, 2010). This further suggests that publishers continue to regard themselves as facilitators of the early stages of a book's lifespan, but not as the custodians of its entire lifespan.

5.2 Divergent strategies

There is a large common ground of shared strategies among publishers and digital librarians, derived primarily from the interactive nature of social media, and how it may be adapted for research or to enhance popular literature. However, the points of divergence between the two groups are pronounced. Divergent strategies flow directly from the history of each group.

Digital librarians are working very hard to preserve and advance the role of managed knowledge resources, branded by the library, as part of the teaching process. In addition to experimentation with e-reserves and e-readers, they are now staking a large claim on the full-service teaching Web "portals." Open-source instructional portals now include a variety of added functions, including the ability to attach related files, images and simulations (bSpace, 2010). They also operate as eportfolios for students that follow them throughout their academic careers, and as information management tools for the faculty. Academic librarians perceive important new roles for information services in these learning spaces.

Academic librarians are also brainstorming about ways to enhance "built" content that is created by the faculty—a key zone of knowledge creation where libraries may assume the role of digital publishers. The opportunities are vast, as pre-publication content creation encompasses the supporting information, texts and data sets that lead to finished work. Strategies to preserve this knowledge base are rapidly taking shape, and they are evidence of innovative thinking about librarian core competencies (Abels et al, 2003).

What is more, the library profession's original core competencies—particularly collection development and classification—gain new relevance and importance as digital publishing moves to the forefront. Metadata schemes are vital tools for managing vast amounts of digital assets. The prevailing scheme, the Metadata Enhanced Technical Standard (METS), has seen heavy involvement by digital librarians; it ensures that metadata are portable and stay attached to a digital artifact, allowing the metadata and the object they describe to migrate over time (Library of Congress, 2010). In contrast, publishers are in the early stages of harnessing XML to manage content more flexibly (Ganesan, 2010).

The most significant divergent characteristic between publishers and digital librarians has been librarians' willingness to enter into collaborative alliances, launching aggressive outreach to faculty authors, building political lobbying groups, and forming consortia that negotiate for better prices. They also have become software developers at their host universities, emphasizing open-source computing (Van de Sompel, 2006). Ming-xing Huang (2010) envisions even more broad alliances, called "Digital Library Alliances"—which would enable academic libraries and their partners to enhance digitization initiatives and search

capabilities in ways that mimic large commercial firms such as Google. Digital librarians have also sought explicit partnerships with publishers themselves, when a shared goal could be seen. For example, the California Digital Library (CDL) entered into an early agreement with the Berkeley Electronic Press (BePress)—a full service journal publishing solution (BePress, 2010, eScholarship, 2010).

Conversely, publishers' efforts to form large-scale collaborations have taken more measured steps. With respect to libraries, collaborative efforts most often take the shape of advisory committees, which meet with editors and publishers once or twice per year. This has been a useful process, contributing to several significant joint efforts, such as the Wiley Online Library (Wiley Online Library, 2010). Wiley's new "learning space" includes extensive links to library services for training and other assistance in using the aggregation of content.

Digital librarians could afford to choose a collaborative stance, because they have been able to draw on strong relationships with their user communities. Historically, library patrons would visit a library in person, creating opportunities for a direct, personal relationship with well-trained professional staff. Armed with very good metrics on what library patrons actually need and how they prefer to gain access to resources, digital librarians are exploring how to create "user experiences" that reinforce a bond between the library and the user.

Just as important, the library profession conceptualized the digital library as a matrix of content, services and human interactions from the earliest planning process. In essence they have argued that a digital library is far more than a content platform; it is an entire community (Lyman, 1996). For example, facilitating and teaching how to use of information services, whether print or online, is a measurable core competency for librarians. They have argued that technology should enhance human connectivity, rather than replace it, and they have backed up this claim with solid e-metrics showing how people are using libraries.

This assertion of the digital library as community is not nearly as evident in the professional literature of publishing. However, publishers are beginning to reach similar realizations about digital media, and are examining different approaches. As online publishing creates new synergies between print and electronic artifacts, the book gains a broader venue for discovery: the Web itself. Publishers continue to evaluate reader responses to books and related Web sites; and while print books will continue to exist, new zones are opening up for books to grow via Web sites, as e-books, and as subjects of reader forums. If indeed these trends follow their current course, the digital or Web version of a given book may eventually become the "master copy of record." (Kist, 2008).

6. Collaborate, compete, or both?

Digital librarians possess all of the tools and expertise needed to compete directly with publishers. As universities accelerate their plans to create open-source journals and lend their imprimatur to them, digital librarians may take key leadership roles in managing the new archives and repositories, perhaps even the most central role of content owner. If so, they will be building upon existing relationships with the faculty; the two groups work in close proximity and in many cases share research interests.

Digital libraries also share the advantage of their host institution's imprimatur. This prestige enables them to expand their initiatives and to gain institutional support in doing so. This trend is already underway; if it accelerates, the trend would carry multiple benefits for digital librarians (Hahn, 2008, 2008a). First, it would cement and formalize their new role as a digital publisher within the academy. Second, the new status conferred by the role of

digital publisher will provide digital librarians with a fresh opportunity to argue the value points of their longstanding core competencies. Third, recognition of editorial work as a library skill will advance the professional status of digital librarians in the eyes of the research faculty and within the university administration.

All of these enhancements to the status of digital librarians within the academy are excellent examples of "treatment substitution" as described by Abbott (1988). Not only is the publisher role being offered by a competing group—digital librarians—it is also being used as a springboard to advance the status of the library profession as a whole.

6.1 Impetus for collaboration

Even though digital libraries' enhanced imprimatur strengthens their chances of becoming effective digital publishers, evidence indicates that they remain quite receptive to collaboration, often proposing complimentary services in dialogue with publishers (Hahn, 2008, 2008a). This suggests that digital librarians could become partners in more ambitious alliances with publishers, structuring them to preserve revenue streams while advancing user access. Such a strategy would serve as a means for using digital media to find solutions to the longstanding problems of the former print-only era, with advantages for both parties.

At present, digital librarians are exploring strategies to manage the entire lifespan of knowledge creation and the materials that lead to a finished work. These include data sets, simulations, and non-text artifacts of every sort. It is also increasingly common for research libraries to manage their own data functions and image collections, and work closely with other campus organizations that are involved in similar work (Whalley, 2010). The role of data manager is being assumed by many innovators, not only at colleges and universities but also at the Library of Congress and other national-level collections.

The digital librarian-as-data manager could be a very powerful ally for publishers who seek to transform their books into extended "dialogues" with readers, including related data resources and coherent and portable metadata management tools.

6.2 Collaboration as revenue protection

Much is made of the "scholarly journals crisis" and the imbroglios, both legal and rhetorical, that it has engendered; yet the crisis has also revealed how the best minds in both the publishing world and library profession view the economics associated with their mission. As the difficult issues of pricing academic journals have been addressed, publishers have also learned more about how digital librarians view the future, and digital librarians have gained a much deeper understanding of the travails of publishing. This could lead to shared understandings and strategic alliances that bring both groups together, as they confront changing markets for academic and consumer-oriented publishing.

Publisher-librarian collaborations will stimulate fresh perspectives about where value is being generated for both partners. Revenue protection is vital for publishers, and need not come at the cost of fair use and related user benefits, which digital librarians seek to protect. Pricing models for electronic publishing vary dramatically, and have been the site of much tinkering over the years. It is unclear at this time which pricing models are going to be the most effective for publishers, as scholarly communications evolve, and consumer behavior changes (Kist, 2008). A digital library perspective on value and pricing could be crucial for publishers as they attempt to create new markets and new revenue streams.

Finally, evolving perceptions of how markets work in the digital era may encourage knowledge creators and providers to work together. Longstanding beliefs about how to sell

any type of consumer product are in flux, creating new opportunities to reframe markets for particular advantage to particular players. As a result, many thinkers who study organizations and markets are now exploring new models for understanding business practices. The metaphor of the "supply chain"—which guides how goods or services move forward, from creation to the market—has limited ability to explain how business can operate in a networked and digital environment (Yoffie, 1996). In response, researchers are re-imagining the supply chain as a "web" of relationships, which spreads in many directions, and can create new revenue streams even as established revenue streams fade (Shaver & Shaver, 2009; Yoffie, 1996; Institute for the Future, 1996). The print publishing process is quite linear and so publishers continue to find the supply chain paradigm useful, but at the same time, the web of relationships is a useful means for studying the impact of new media. These competing paradigms may influence how each group forms strategies and views collaboration as opposed to competition.

6.3 Competition and its consequences

There are compelling arguments for publishers and digital librarians to join forces in response to the digital era. But at the same time, modern society thrives on competition and the evolution of the Internet has been heavily influenced by innovation, as well as anticipation for the "next big thing." On one side, a long-term, deeply rooted publisher-library coalition could save both parties considerable time and resources; yet on the other side, if either group devises a matrix of strategies for fully assuming the other's role while preserving its own, that group would gain a whole new level of prestige. The shape and makeup of digital libraries would be heavily affected by such an outcome, no matter which group were to prevail.

Library education provides an example of how core competencies can be repurposed to gain strategic advantage. A career in libraries requires an accredited master's degree, often accompanied by a second subject-area degree. This level of education is comparable to that of most editorial staff. Publishing practices are widely known, further easing the assumption of a publishing role. Digital librarians who work in large institutions already edit newsletters, bibliographies and even book series. Moreover, digital librarians can partner with academics and administrators who have resources to underwrite publishing programs at research universities; as discussed above, this trend is well underway (Hahn, 2008).

Publishers also may see advantage in taking on roles currently found in the sphere of libraries, for many of the same reasons. The rigors of publishing require outreach, interpretation of markets, and management of large backlists. With low barriers to the creation of repositories and value-added "collections" of knowledge, it is reasonable to argue that digital librarians' role in collection development could shift to publishers, along with enhanced public service functions via the Internet. Since publishers understand market dynamics and sales strategies, the arsenal of strategy at their disposal is significant.

7. Conclusions

Publishers and libraries have enjoyed strong links over the years, marked by moments of collaboration as well as competition. The urge to compete has accelerated due to the impact of digital media, and the increased ease of launching digital publishing initiatives. Moreover, both groups have skills within each other's core functions. Publishers are exploring how to manage content over time, and to find new value in their backlists. Digital librarians have overseen well-established publishing programs, often linked to special

collections, and this provides them with skills for launching digital publishing programs. Against this backdrop, both groups are evaluating whether their core skills should expand to include roles that encompass the full lifespan of creative and scholarly works.

This process has been driven by technological evolution, and the forces of digital convergence. The processes that govern competition, collaboration or a combination of both have been well-studied by sociologists such as Andrew Abbott (1988, 1991), whose theories suggest that ongoing competition between these two knowledge-creating groups is quite likely. Even though the process of publishing is distinct from the practice of librarianship, the workflows and intellectual activities of both of groups are closely connected. Taken together, they encompass a large zone of influence on the knowledge creation continuum.

Digital media make explicit the linkages between the processes of publishing, and the library-centric processes of information counselling, interpretation and preservation. These linkages are increasingly apparent to both groups, inviting serious study of their future options, as commercial, educational and entertainment markets continue to evolve. The rewards for success in creating expanded information management roles are also apparent, both from profit perspectives and as a means of increasing prestige. The forum of competition has increased beyond the well-known debate about journal-pricing and open source publishing programs, and now includes opportunities for attracting user and reader "attention" with Web 2.0 technologies. All of these factors suggest that publishers—both trade and professional—will find themselves looking at the library field for fresh ideas, and that the reverse will occur among librarians.

With the reduction of the technological barriers, the remaining obstacles are fundamentally organizational or cultural. The temptation to perpetuate known ways of managing workflows may obscure new opportunities for either group to make bold moves and take on new roles. Likewise the personnel expense of adding new functions—such as repository management for publishers, or greatly-increased editorial roles for digital librarians—is another hurdle. If organizational or cultural factors hinder strategic thinking, it is possible that collaboration between the two groups may increase as they struggle to innovate.

Even though Abbott's theory of treatment substitution augurs long-term competition in many forms, the outcomes are far from certain. Strategic planning among both publishers and digital librarians is crucial for creating advantage and reformulating their professional visions for the future. There are three areas to monitor as early indicators of how competition will play out. These include the direction of digital textbook and e-book design and function, since technical innovations may originate from either group; the advance of interactive repositories that increase the value of original creative works; and the formation of new workflow strategies to repurpose existing skills and add new functions. The strategic choices of each group will carry wide impact on the design of digital libraries, and therefore the processes of convergence and divergence among the two groups are worthy indicators for study by all stakeholders in digital library development.

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Digital library is commonly seen as a type of information retrieval system which stores and accesses digital content remotely via computer networks. However, the vision of digital libraries is not limited to technology or management, but user experience. This book is an attempt to share the practical experiences of solutions to the operation of digital libraries. To indicate interdisciplinary routes towards successful applications, the chapters in this book explore the implication of digital libraries from the perspectives of design, operation, and promotion. Without common agreement on a broadly accepted model of digital libraries, authors from diverse fields seek to develop theories and empirical investigations that to advance our understanding of digital libraries.

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