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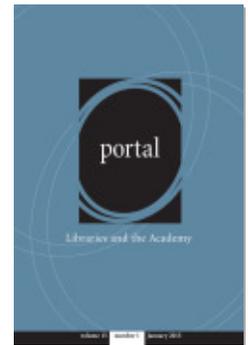
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David M. Durant and Tony Horava

abstract: The e-book is raising fundamental questions around the dynamics and habits of reading; the role of books in the academic library; and the role of librarians in addressing new realities of reading and learning. Print and digital texts foster different styles of reading and different ways of thinking and doing research. This paper examines implications of the shift from print to digital reading and how academic libraries in particular should respond. Academic libraries should treat print and electronic books as complementary, not interchangeable, and commit themselves to maintaining hybrid collections that support the full range of learning and research styles.

Introduction: Do We Still Need Books?

In September 2009, Cushing Academy, a prep school in Ashburnham, MA, announced that it was removing almost all print books from its library and replacing them with access to e-books. The Cushing Library Web site states that it "now delivers thousands of web-based electronic books and authoritative database content directly to our students' laptops, while also supporting offline reading with immediate access to hundreds of thousands of downloadable electronic books delivered to our nearly 200 e-ink eReaders."[1] A number of academic libraries, usually either specialized facilities or undergraduate libraries adopting a variant of the information commons model, have also come to rely on primarily electronic book collections.[2]

While the "digital library" as exemplified by Cushing remains an exception, a number of educators and scholars have called for it to become the norm. In a September 2010 piece for the *Chronicle of Higher Education,* Jeffrey R. Di Leo, dean of arts and sciences at the University of Houston–Victoria in Texas, argued, "Academe must transform itself from a fundamentally print culture to one that is fundamentally digital." Di Leo openly looked forward to the day when "the myth of the book will be overcome."[3] Writing in the same publication, publishing executive Diane Wachtell put things just as bluntly: "We do not need books."[4] Technology author Marc Prensky has even gone so far as to call

for college campuses to go completely "bookless," in the "sense of allowing no physical books." In his vision, students daring to own print books would have them confiscated and replaced with access to an electronic version of the same title.[5] As Christine Rosen puts it, "Digital literacy's advocates increasingly speak of replacing, rather than supplementing, print literacy."[6]

The idea of the "bookless" library, however, is voiced much more prominently than ever before, and as both libraries and publishing continue to be transformed in the digital age, the concept will likely continue to gain traction.

Many librarians, scholars, and students recoil at such proposals, and they are unlikely to be adopted on a widespread scale in the near term. The idea of the "bookless" library, however, is voiced much more prominently than ever before, and as both libraries and publishing continue to be transformed in the digital age, the concept will likely continue to gain traction. It is important, however, that before academic libraries pursue such a course, they fully understand the possible implications for their users, their institutions, and society as a whole.

Reading Trends Today

The developing trend toward digital libraries is based on a number of factors. One key advantage of electronic information resources over print is that simultaneous users can access them regardless of location or time of day. In the age of Google, many users do not expect to come to the library at all. Electronic access to information also allows libraries to save space by reducing the size of their print holdings, thus enabling them to add more computers, study space, and amenities such as coffee shops to attract students to the library as a physical space. Many academic libraries have now adopted the "Information Commons" model, designed to facilitate collaborative work among students in addition to quiet individual study. Finally, electronic information resources have enabled libraries to expand their holdings, both in monographs and especially in serials, well beyond what they owned in tangible format. "Big Deal" electronic journal packages, for all their flaws, are just one example.

One additional factor behind the growing trend among libraries to greatly reduce print holdings is changing patron preferences. While print reading remains more popular overall than e-reading, data show that the latter is rapidly gaining in popularity, apparently at the expense of the former. According to a November 2012 Pew Internet study, 23 percent of all Americans 16 or older had read an e-book in the previous twelve months, up from 16 percent in late 2011. At the same time, the percentage who had read a printed book dropped from 72 percent to 67 percent. According to the same study, 33 percent of Americans now own either a tablet or a designated e-reader (such as a Kindle or Nook), compared to 18 percent the previous year.[7]

E-book sales figures further illustrate this trend. In 2011, Amazon announced that its e-book sales now exceeded its print sales.[8] In 2012, a survey of American publishers revealed that e-books make up 20 percent of the trade market, with 457 million e-books

sold during the year, a vast increase on the 10 million sold in 2008.[9] These numbers would seem to vindicate a 2008 prediction by the British Library that, by 2017, "Electronic books . . . will finally become established as the primary format for educational textbooks and scholarly books and monographs, as well as reference formats."[10]

Underlining this shift from print to digital is the belief that format is essentially irrelevant: that text is interchangeable whether it appears on a printed page, a computer screen, or a Kindle. As Di Leo puts it:

> There is nothing intrinsically inferior about spreading knowledge on a screen rather than on a printed page, and plagiarism is an ethical issue, not a material one. Words may look better in print, and a book may feel better in your hands than a Kindle or an iPad, but the words are the same.[11]

If this is true, then widespread adoption of the bookless library model can indeed be justified, for all the reasons previously outlined. If words have value and relevance regardless of format, then surely the format that provides for the broadest, widest, most immediate access is the best option. But is text really interchangeable regardless of format? To answer this question, we must look at both the cultural and scientific background of the reading experience.

The Reading Experience: An Overview

It is no exaggeration to say that the reading experience has been profoundly affected by the shift in media. Until a generation ago, reading and print culture were virtually synonymous. It was difficult to separate the two. Learning to read and to become fluent as a literate, self-aware reader meant not only that one had mastered the language and its grammatical and semantic structure, but also that one had a grasp of different writing techniques. These techniques, such as point-of-view and exposition, established an ongoing relationship between the text and the reader: these two were in constant interplay to determine meaning. Formal education, from public school through to university, was steeped in the legacy and influence of print culture. There were few opportunities for individuals to engage with other media while being immersed in the reading process. Radio and television became ubiquitous in the course of the twentieth century, but their interrelationship with culture was distinctly different from that of print. Print had an august history dating back over 500 years; print was considered a permanent vehicle for transmission of ideas and learning; print was affordable and ubiquitous; and most importantly, it was stamped with the values associated with mass literacy, scientific and social progress, and self-improvement.

It was clear that reading involved print, and other media involved different forms of cultural engagement, often seen as entertainment rather than more "serious" forms of intellectual expression. Yes, there were microfiche and microfilm, which were tolerated as necessary evils where the print original was not available (and which were much more

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robust as preservation media, ironically). The development of CD-ROM books in the 1980s and other forms such as the laserdisc led to a broadening of possibilities, but this expansion was always within the paradigm of the print book model. Early e-books from the late 1990s, such as NetLibrary, also mirrored the print original and did not provide room for new possibilities of enriching the navigational and experiential possibilities. The PDF file provided reassurance to the reader looking for familiarity and stability, and harkened back to the fixity of the print environment. However, as new formats began to emerge (for example, HTML, then XML) and broadband capacity developed rapidly, it became clear that the traditional book would be overwhelmed by new possibilities. Video clips, audio segments, animation, and images began to crowd upon the sacred space of the long-form intellectual work. As a consequence, reading required a series of mental processes that were new to the experience. The integration of rich media led to many far-reaching consequences, such as a challenge to linearity in mental focus. The association of meaning across different media, so that the impact of images, sounds, and video would reinforce one another, created multiple perspectives on the experience and meaning of reading. The approaches to meaning would now be mediated through a variety of sensory possibilities that divided the mental focus of the brain. The impact of the visual sense on our understanding of the world, versus the verbal sense, is under-estimated because image-based culture is now ubiquitous in our lives. Our easy trust in data visualizations,[12] distinguished from our more nuanced, critical approach to text, is an example. Meaning, defined in more individualistic, personal ways, is developed at the intersection of print, audio, video, and animated information. The impact on the brain's absorption of words is now filtered through a screen of various media, and our brains have adapted by synthesizing information in new and efficient ways. Sensory media now complement or compete with written language in new ways to establish meaning, identity, and engagement with the world.

The Science of Reading

It is vitally important to note that the ability to read is not innate—that is, we are not born to read. Reading is learned. The human brain is not designed for reading; rather, reading developed as a result of a phenomenon called neuroplasticity. In the words of Maryanne Wolf, a noted neurobiologist, and Mirit Barzillai, who studies the acquisition of reading and language, "Plasticity enables the brain to form new connections among the structures underlying vision, hearing, cognition, and language."[13] In essence, reading was made possible by the brain's ability to rewire itself. The more one reads, the more deeply the neural pathways that facilitate reading take hold. The converse is true as well.

It is also important to note that all reading is not the same. As the literary and film scholar Christopher Rowe explains, there are two forms of engagement with a text: "Linear or intensive reading characterizes the way we consume narrative fiction . . . [whereas] the tabular mode of reading . . . is interrogative, seeking information about a specific subject."[14] Until the advent of the Internet, this split had been the broad phenom-enological division in the reading experience. There were two major kinds of reading: (1) sustained linear engagement that required a significant level of emotional empathy and (2) factual, ad hoc information seeking intended to accomplish a specific purpose, such as finding a movie review, baseball game recap, or community event.

At first glance, the advent of the digital age would seem to bode well for the future of reading in all its forms. After all, the Internet has unleashed a veritable deluge of text: Web pages, blogs, tweets, Facebook posts, texting, e-mail, and free e-books. In the words of information services librarian Barry W. Cull, "The Internet is a text-saturated world. It could only have succeeded in a highly literate society."[15] In addition, evidence suggests that the heaviest readers are also among the heaviest Internet users.[16] However, research on the nature of digital reading provides substantial cause for concern.

There is a growing body of research-based and anecdotal evidence that, as technology writer Nicholas Carr has argued in his book *The Shallows,* reading from a printed page is fundamentally different than reading from an electronic screen.[17] According to a 2009 study by a team of researchers at the University of California, Los Angeles (UCLA), Internet searching activates much more of the brain than did reading text from a page. The UCLA project found that reading text stimulates areas of the brain associated with language and visual ability, while Web browsing stimulates many of the same regions as well as areas controlling decision making and pattern analysis.[18] At first glance, this finding sounds like a point in favor of e-reading, but that is not necessarily the case. Instead, this increased brain activity reflects the stimulative, distraction-laden nature of screen reading. It actually impairs the ability to memorize, reflect, and absorb in the way that print texts—conducive to linear, intensive reading—enable.[19]

Numerous studies, ranging from scientific eye-tracking research to usage analysis to surveys of readers, show that people reading in digital format are far more likely to engage in a form of superficial "power browsing" or skimming than they are to read in depth. Web usability pioneer Jakob Nielsen has found that users do not read Web pages in a linear manner, but rather scan them using what he has called an "F-shaped pattern," making shorter and less intensive glances at the text the farther the user goes down the page.[20] The 2008 British Library study declared, "It is clear that users are not reading online in the traditional sense . . . It almost seems that they go online to avoid reading in the traditional sense."[21] Finally, a 2012 literature survey of more than two dozen studies of e-book use in academic libraries consistently noted that both students and faculty tend to use e-books for specific information-seeking purposes, without making any real effort to read them in depth.[22]

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Thus, it seems clear that print books and e-books facilitate two very different types of reading. The print codex facilitates what Rowe calls linear reading and what has also been described as "deep reading," the ability to read an extended linear narrative and reflect upon its meaning. Wolf and Barzillai define deep reading as "the array of sophisticated processes that propel comprehension and that include inferential and deductive reasoning, analogical skills, critical analysis, reflection, and insight. The expert reader needs milliseconds to execute these processes; the young brain needs years to develop them."[23] This form of reading depends on, and, in turn, helps foster, skills such as sustained focus and attention, deep concentration, and the ability to memorize information and integrate it into conceptualized forms of knowledge and self-awareness.[24]

In contrast, screen reading fosters what Rowe calls tabular reading, because it tends to be nonlinear in nature, develops rapid pattern recognition and quick decision making, and is interactive instead of solitary.[25] While the print codex is fixed and has defined physical boundaries, digital text is often malleable and borderless, with a floating page limited only by the edges of the screen. Whereas deep print reading tends to foster sustained attention and in-depth reflection, e-reading fosters impatience and a desire for immediate gratification. In fact, a 2008 study found that the number of journal articles cited in science periodicals actually declined as more of the scientific journal literature became available online, and those that were cited tended to be more recent ones.[26] E-reading is also much more prone to distraction, as it is often done on devices that also offer e-mail, various apps, or access to the Internet, which, in Carr's words, "seizes our attention only to scatter it."[27] Thus, screen-based reading is often much less conducive to memorization than print reading.

Finally, we must return to the concept of neuroplasticity. The more we read from screens in tabular fashion, the more our brains rewire themselves to facilitate this activity, and the harder it becomes to engage in deep print reading. In short, format does matter. Text is not interchangeable. While e-reading certainly has its advantages, it is not the same as reading from the printed page. It fosters a different set of cognitive skills and indeed a qualitatively different way of thinking.[28] In short, the rise of e-reading has fostered tabular reading at the expense of linear or deep reading. The digital environment has thus greatly increased our ability to access information at the likely expense of our ability to convert it into conceptual knowledge.

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Of special concern is the potential neurological impact on children, who may now initially learn to read using digital devices, and whose ability to develop the neural pathways conducive to deep reading may hence be severely limited if not curtailed altogether. As Wolf has pointed out, formation of those pathways is anything but certain:

> The act of going beyond the text to analyze, infer and think new thoughts is the product of years of formation . . . There is no genetic guarantee that any individual novice reader will ever form the expert reading brain circuitry that most of us form. *The reading circuit's very plasticity is also its Achilles' heel. It can be fully fashioned over time and fully implemented when we read, or it can be short-circuited—either early on in its formation period or later, after its formation, in the execution of only part of its potentially available cognitive resources*.[29] (emphasis added)

The Materiality of Reading

It is often overlooked that reading does not occur in a material vacuum. Whether we are reading a print book, a microfiche text, or an e-book on a reader, laptop, or desktop, there is an impact on how we physically interact with the work. There is a large class of

readers, many of them digital immigrants, for whom the book is a material artifact, and this tangible book strongly affects their experience of reading. Whether it is the cover art, the binding, the smell and feel of the pages, or the size of the book, these elements have a physical presence that exerts a strong influence on how we absorb, learn, and remember, as well as on our emotions. As the writer Alberto Manguel explains, "The act of reading establishes an intimate, physical relationship in which all of the senses have a part: the eyes drawing the words from the page, the ears echoing the sounds being read, the nose inhaling the familiar scent of paper, glue, ink, cardboard, or leather, the touch caressing the rough or soft page, the smooth or hard binding; even the taste, at times, when the reader's fingers are lifted to the tongue."[30] The materiality of reading is an issue that has not received enough attention in discussions on the transformation of the reading experience in the digital age. The implications of digital formats on this experience are profound, because there is no container-neutral reading. Every container or apparatus will have specific qualities and features, affecting the experience of reading.

Until about the 1980s, the unity of the intellectual and physical artifact was seen as integral to reading. Anne Mangen, an expert on literacy and reading, observes, "When reading digital texts, our haptic interaction with the text is experienced as taking place at an indeterminate distance from the actual text, whereas when reading print text we are physically and phenomenologically (and literally) in touch with the material substrate of the text itself."[31] The words on the screen have a separate existence from the device on which they are read; the words are detachable, malleable, and not inherently associated with any container. Moreover, the experience of reading from a handheld device is different, not only because of the multiple media and information sources vying for attention but also because the engagement with reading involves precise hand-eye coordination. Swiping, tapping, scrolling, and similar navigational actions have become inherent to the reading process. They have become ingrained in how we experience any text on a screen.

In a few short years, this shift has become second nature to us, but it has involved an unconscious rewiring of neural connections; this rewiring is a major reworking of the traditional pathways that translate words into conscious understanding and meaning. In print reading, the hands are relatively stationary—they hold the pages, move but slightly, and perhaps play with the corners of the pages as the eyes move down the text, line by line. In screen reading, though, the hands are intensely active players in the process of navigating, scrolling, and moving around the text and related media. The hands, therefore, play a critical role in the pace of reading, the amount being read, and the personalized navigation across different media and texts.

In contrast to this hand-eye cognitive dance across screen reading, there is evidence that the brain navigates the physical text as a form of topography. As the science writer Ferris Jabr describes the process:

> When we read, we construct a mental representation of the text in which meaning is anchored to structure. The exact nature of such representations remains unclear, but they are likely similar to the mental maps we create of terrain—such as mountains and trails—and of man-made physical spaces, such as apartments and offices. Both anecdotally and in published studies, people report that when trying to locate a particular piece of written information they often remember where in the text it appeared.[32]

This mental topography has a subtle but powerful impact on how humans navigate and locate textual information—the brain associates the features of the reading surface with intellectual markers that help define meaning and understanding.

The basic uniformity of screen reading has important implications for how we learn from what we read, and it impacts our relationship with the text in strongly phenomenological terms. Jeff Staiger probes this issue and its implications for reading preferences, noting: "Computers impose a relative featurelessness on the text files one reads or prints from them, whereas print books . . . have distinct, interesting physiognomies with which one can form associations that abet one's grasp of their content."[33] In his view, readers' continued preference for print reading represents "an intuition that the deeper relationship, sealed by affection, that they can have with a physical book is a vital study aid when compared to the relative uniformity of virtual texts."[34]

Bob Stein views the digital age as unlocking the social dimension of reading that has been obscured by the print medium:

> The social aspect traditionally takes place outside the pages—around the water cooler, at the dinner table and on the pages of other publications in the form of reviews or references and bibliographies. In that light, moving texts from page to screen doesn't make them social so much as it allows the social components to come forward and to multiply in value. From this perspective a book isn't ink on bound paper, but rather "a user-driven medium" where the reader is in complete control of how they access the contents.[35]

This view may be true, but the technological infrastructure of our networked world has other, disturbing implications. Search engines and their algorithms have a profound impact on what we see and discover in the online world, and hence on what we read by serendipity. The uncanny predictive power of Google and other algorithm-based systems lies in how they learn enormous amounts of information about our interests, behavior, and history to create a unique profile of who we are, and thus create a highly personalized experience. Eli Pariser, often called an "Internet activist," notes, "The new generation of Internet filters . . . are prediction engines [that] create a unique universe of information for each of us—what I've come to call a filter bubble—which fundamentally alters the way we encounter ideas and information."[36] As a consequence, our use of reading to learn, develop, question, and reassess our understanding of the world becomes much more problematic. We are more and more likely to discover ideas that are remarkably similar to our own, thus reinforcing our existing views in a feedback loop or echo chamber.

Implications of the Shift from Print to Electronic Reading

Based on what we know about the differences between print and digital reading, the shift in favor of the latter offers potentially profound implications. It is possible that not only a textual format but also an entire way of thought, rooted in the stable, linear, analytical nature of deep print reading, will be greatly reduced in importance if not disappear entirely. There are already signs, albeit early ones, that print reading is in decline. For example, the U.S. Department of Labor's *American Time Use Survey* for 2011 found that the average American teenager (ages 15 to 19) spent more than two hours a day watch-

ing television, more than one hour a day using computers or video games, and less than nine minutes a day reading for pleasure.[37] Similarly, a 2009 National Endowment for the Arts study found that the percentage of 18- to 24-year-old Americans who read a book of their own accord declined from 52 percent in 2002 to 50.7 percent in 2008.[38] A recent study of students at a university in Texas found that they spent nearly 21 hours per week reading, for both academic and recreational purposes and in all formats. However, more than 40 percent of this reading, by far the largest percentage, was devoted to social media, often in lieu of reading print textbooks.[39] These shifting use patterns promise to transform the culture of reading in fundamental ways.

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One major change is that reading has become a much more mobile activity. The impact of mobile culture on reading has been nothing short of transformative. On the one hand, it means that individuals can carry out reading—regardless of the length, format, or source—wherever they happen to be. The power of mobile devices, in terms of connectivity, storage, and interactivity, increases dramatically over time (an echo of Moore's Law—that is, that the number of integrated circuits doubles every two years).[40] The thorough integration of social media in the use of mobile devices has led to what some see as a new golden age of reading, while others see it as a deathly fragmentation of the reading experience. There is a natural momentum toward pithy, rapid-fire interaction; ubiquitous integration with other linked works and communication channels; and a need for constant stimulation that is at odds with the demands of reading any lengthy work that requires sustained attention and reflection. Mobile culture encourages a telegraphic approach to communication and by consequence to reading. As the linguist Naomi Barron puts it, "Textual snippets-on-demand threaten our need for the larger works from which they are extracted . . . Today's snippet literacy efficiently keeps us on the straight and narrow path, with little opportunity for fortuitous side trips."[41]

Reading as a formerly private act is very much in the process of becoming a shared, public experience. Rating, commenting, annotating, mashing, repurposing, tweeting, and blogging, usually on social media, are not only easy but also encouraged as a way to develop one's own community of interests with like-minded people. Information technology promotes the sharing of reading experience but also leads to a fragmentation of attention and an impatient need for constant stimulation, as has been noted earlier.

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The literary critic Sven Birkerts notes, "The print engagement is essentially private. While it does represent an act of communication, the contents pass from the privacy of

the sender to the privacy of the receiver."[42] The multimedia engagement, by contrast, is communal and thoroughly social. Learning and knowledge are developed in an iterative, collective manner. This group method of learning is witnessed by the power of social media to dominate many individuals and shape our self-identity and decision making, and it is reflected in how we think, work, love, and play.

There are those who view this transformation as an unequivocally positive development. Clay Shirky, a writer on new media, has expressed the view that the print codex and the style of reading and thought it fosters are merely by-products of the technology of the printing press. He predicts that new cultural forms produced by digital media will inevitably supplant the codex.[43] In a 2013 online exchange with Carr, Shirky predicted, "The experience of reading books will be displaced by other experiences," and pronounced himself "quite cheerful about the ongoing destruction of pre-digital patterns of life, because I think something better will come from it."[44]

Digital skeptics such as Carr are much less sanguine. In a 2010 post to the *Encyclopædia Britannica Blog,* he pointed out that, among other effects, such a major transformation in how we read will lead to a similar transformation in how we write. In Carr's view, this process will ultimately result in a superficial, purely functional form of literacy:

> What we've learned about digital media is that, even as they promote the transmission of writing, they shatter writing into little, utilitarian fragments. They turn stories into snippets. They transform prose and poetry into quick, scattered bursts of text. Writing will survive, but it will survive in a debased form. It will lose its richness. We will no longer read and write words. We will merely process them, the way our computers do.[45]

Carr's concerns are not without foundation. Reading and writing enjoy a symbiotic relationship. As people increasingly read text in relatively small snippets, there will be momentum to adapt by writing in shorter ways. On a daily basis, students consume a wide spectrum of texts of many lengths and forms. This means that students will need to think in counterintuitive ways when writing traditional long-form assignments, such as term papers, that go against the grain of this cultural trend.

Wolf and Barzillai have also expressed concerns about the impact of the replacement of print reading by digital. They say:

> The digital culture's reinforcement of rapid attentional shifts and multiple sources of distraction can short-circuit the development of the slower, more cognitively demanding comprehension processes that go into the formation of deep reading and deep thinking. If such a truncated development occurs, we may be spawning a culture so inured to sound bites and thought bites that it fosters neither critical analysis nor contemplative processes in its members.[46]

One possible solution to such concerns is the rise of the dedicated e-reading device, such as the Kindle or the Nook. Unlike most digital devices, e-readers are designed to mimic the experience of print reading as closely as possible. In the opinion of some, dedicated e-readers offer the best of both worlds: a digital reading technology that preserves the key features of deep print reading. Alan Jacobs, a professor of English, has written how he too—like Nicholas Carr—found himself losing the ability to read lengthy linear narratives. However, Jacobs regained the power to engage in deep linear

reading once he purchased a Kindle. He found his "ability to concentrate . . . restored almost instantly." In Jacobs's view, "E-readers are by any measure *far* less distracting than an iPad or a laptop. It's at least possible for new technologies to be part of the solution instead of part of the problem."[47] (emphasis original)

There have been only a handful of scientific studies comparing reading the printed page to reading using an e-reader, and the results are mixed.[48] However, even if we assume that dedicated e-readers succeed in preserving the experience of deep reading in a digital container, there is still the question of how popular such devices will prove over the long term. The natural tendency in the digital era has been for single-purpose devices to be relegated to boutique status, supplanted by general multipurpose devices, such as digital cameras being superseded by smartphones. There is reason to believe that this replacement is now also happening in the digital reading environment. While some survey data show continued growth in dedicated e-reader ownership,[49] recent sales trends indicate that such devices are losing out to multipurpose tablets. Global e-reader sales are estimated to have fallen 36 percent from 2011 to 2012, going from 23 million units sold to fewer than 15 million. IHS (Information Handling Services), a market research firm, estimates that e-reader sales will fall to 7 million by 2016. In their view, "Single-task devices like the ebook are being replaced without remorse in the lives of consumers by their multifunction equivalents, in this case by media tablets."[50]

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If tablets do become the primary device for digital reading, with all their attendant possibilities of distraction and multitasking, it does not bode well for those who, like Jacobs, hope that deep reading can be preserved in the digital environment. The *New York Times* summarized the danger in March 2012: "People who read e-books on tablets like the iPad are realizing that while a book in print or on a black-and-white Kindle is straightforward and immersive, a tablet offers a menu of distractions that can fragment the reading experience, or stop it in its tracks."[51] Even if it is possible to engage in deep reading on a tablet, how many readers will choose to do so when Facebook or YouTube are just a click away, especially if their neural pathways have rewired themselves to seek the latter at the expense of the former? Today's attention economy drives readers inevitably away from lengthy texts to pithier, bite-sized information that can be rapidly consumed without much effort.

The digital era has also led to the development of the networked book, where fluidity, deep and rapid dissemination, and open-endedness are key qualities of the reinvention of the traditional book. This possibility has led some to question whether what we think of as "the book" is truly compatible with the digital information environment. Carr, for example, has written about the importance of the book as a discrete, coherent physical entity, in contrast to the amorphous, indistinct nature of electronic information on the Internet. In his view, "An electronic book is therefore a contradiction in terms. To move the words of a book onto the screen of a networked computer is to engineer a collision between two contradictory technological, and aesthetic, forces."[52] Staiger has expressed similar concerns, writing, "It may be that by dematerializing the book and

making its wholeness invisible and intangible, the e-book weakens the very boundaries and concept of the book, making it that much easier to think of the book as a mere fount of textual bits."[53]

Supporters of the shift from print to digital, such as Clay Shirky and Kevin Kelly, a founder of *Wired* magazine, share this belief that the book as a discrete, linear entity will eventually dissolve in the digital ether. Kelly, in a famous 2006 essay, noted, "Once digitized, books can be unraveled into single pages or be reduced further, into snippets of a page."[54] Similarly, the Internet pioneer Bob Stein asserts, "Unlike the printed book, the networked book is not bound by time or space. It is an evolving entity within an ecology of readers, authors and texts. Unlike the printed book, the networked book is never finished: it is always a work in progress."[55] In this context, reading takes its new value from the network effect of cumulative sharing, meaning, and learning.

Thus, as the digital age unfolds, it is likely to transform both the nature of reading and the nature of the book itself, as deep, immersive reading fades in importance and functional, tabular reading becomes more widespread. This transformation will, in turn, alter the way people write and even the way they think, leading to a decline of deep analytical thought for the purpose of forming broad conceptual frameworks in favor of a more immediate, purely functional form of decision-oriented thinking based on rapidly acquired snippets of information.

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Of course, immersive print reading is unlikely to disappear altogether. Instead, as the sociologist Wendy Griswold has prophesied, it will become the exclusive property of "a self-perpetuating minority that I have called the reading class."[56] In Griswold's view, the age of mass reading, which spanned the mid-nineteenth to the mid-twentieth centuries, was the anomalous period, and the new era of the reading class is, in many ways, simply a reversion to the historical norm.[57] While the divide between the elite and the rest of society during the age of mass reading was largely determined by what a person read, it will now be determined by *whether* a person reads, and subsequently how a person thinks. This development promises to have enormous implications for Western societies in the twenty-first century. Most of our social, cultural, and political institutions, including North American libraries and universities, were decisively shaped by the age of mass print literacy. How will those institutions be impacted if the culture of immersive print literacy is greatly reduced in importance, becomes the province of a relatively small elite, or both?

Academic Libraries: The Need for Hybrid Collections

Libraries are, of course, already adapting to the various intellectual and technological trends driving the shift from print to digital reading. Print journal collections have been substantially reduced in favor of aggregator databases, publisher e-journal packages, and electronic archival packages, such as JSTOR. E-books have been adopted at a much

slower rate, but here too electronic is beginning to supplant print. Libraries are selecting digital monographs instead of print; making e-readers such as Kindles, Nooks, and iPads available to users; and allowing patrons to purchase e-books through the implementation of demand-driven acquisition programs. In fiscal year 2010, American academic libraries actually added more e-books (over 32,000,000) than print items (27,000,000) to their collections.[58]

Part of the process of adapting to the new, however, involves knowing what to preserve of the old. This custodianship is especially important in light of what we know about the key differences between print reading and e-reading. Print literacy and digital literacy seem to represent not only distinct forms of reading but also distinct forms of writing and even of thinking. North American academic libraries and the universities they serve are products of the age of mass reading and the culture of print literacy. We as academic librarians need to find ways to preserve access to deep reading even as we adapt to the values and needs of the digital age.

Instead of pursuing the creation of digital or bookless libraries, academic librarians should focus on maintaining hybrid collections, containing both print and digital materials. Such holdings should be rooted firmly in the realization that print and digital are distinct yet complementary formats, each serving a different type of user need. To best serve the needs of our institutions, we must support the full spectrum of reading and research. Obviously, the precise balance between electronic and tangible holdings should be a reflection of each library's unique mission and the needs of the institution it supports. However, in each case it should include a commitment to maintain some level of open-stack access to print monographs to provide users with access to the benefits of print reading and research, including serendipitous shelf browsing.

These hybrid collections need not be as large as they are now, nor does this approach preclude keeping some or even most of a library's print collection in closed stacks, remote storage facilities, or both. David Lewis's view of print books as solely "legacy collections"[59] to be wholly moved off-site needs to be more nuanced. More fitting is a hybrid library offering multiple formats for a diverse community of learners. This plan is appropriate for most academic libraries.

Hybrid Collections: Learning and Teaching Outcomes

There are a number of important reasons why academic libraries need to preserve collections of print monographs. Of immediate importance are the many practical problems involving e-book implementation in libraries, such as pricing, limits on simultaneous usage, and digital rights management (DRM) and licensing concerns.[60] However, there are also deeper, longer-term reasons for maintaining print books along with e-resources.

As librarians, we have an important role to play in the learning and teaching environment of our institutions. A commitment to literacy and learning is one of the core values of librarianship.[61] Therefore, librarians are obligated to assess the impact of new technologies on reading styles, communication preferences, and learning outcomes. This obligation implies that we have a key role in partnering with faculty in understanding the impact of new forms of reading on scholarship, learning styles, and communication of ideas. As reading is being transformed, it is incumbent on librarians to ask how this

transformation affects the ways in which teaching is delivered and learning occurs. The multiple forms and tools for reading raise the question of how learning and teaching processes are altered by the new uses and representations of language. Anne Burke and Jennifer Rowsell discuss the need for critical teaching of texts in different media:

> **As reading is being transformed, it is incumbent on librarians to ask how this transformation affects the ways in which teaching is delivered and learning occurs.**

> Students think in terms of visuals, and the notion of redesign for greater comprehension of personal expression is a highly valued literacy practice within their worlds. As educators we realize that we must endeavour to have a greater understanding of how their reading desires are connected to the capacity for designing reading and comprehension experiences on the Internet . . . Critical teaching of both traditional texts and digital texts would help students to understand how the representation of language offers many interpretations depending on its use.[62]

One factor to keep in mind is the way reading and learning strategies vary between academic disciplines. Certain fields in the humanities and social sciences, such as English, philosophy, and history, are firmly rooted in the culture of deep, immersive reading and dependent upon the extended linear narrative as a means for absorbing and producing research, as well as for providing the broader intellectual frameworks that shape their scholarship. A 2010 user survey conducted by the University of California (UC) Libraries found that only 17 percent of respondents in the arts and humanities preferred e-books to print, compared to 31 percent of social scientists and 54 percent of respondents in business and law.[63]

Beyond differences based on discipline, there is substantial evidence that at least a plurality of academic users simply like using print books rather than electronic. Overall, 44 percent of all respondents to the UC survey who had used e-books still preferred print, while 35 percent favored digital texts.[64] This preference is just as true for students as for faculty. Despite all the data showing the decline in reading among the young, and the broader shift from print to e-reading, a number of studies of university students have found that the majority still prefers print books to digital. For example, 53 percent of undergraduate respondents to the California survey said that they preferred print books to electronic (27 percent favored e-books).[65] As the survey report put it, "Many undergraduate respondents commented on the difficulty they have learning, retaining, and concentrating while in front of a computer."[66] A 2012 survey conducted at a college in Pennsylvania found that half the students 22 or younger preferred print to e-books. Among the reasons given for liking print better were that it was "Easier to focus on content/task at hand"; "Easier to absorb/comprehend information on paper rather than from a monitor"; and "Easier to remember content" in print than in digital format.[67] Finally, Staiger, in a literature review analyzing two dozen studies of e-book use in academic libraries, reported a "salient preference across all of the studies for physical books for extended or immersive reading."[68]

While it might be tempting to dismiss such user attitudes toward e-books as a temporary blip that will disappear as digital reading takes deeper hold in society, it seems

just as likely that they reflect an instinctive understanding of the differences between print reading and e-reading. Staiger, for example, believes that the research he describes "indicates that print books are preferred for what we typically think of as the kind of reading on which sustained intellectual inquiry depends, let alone the life of the mind."[69] By preserving print collections in concert with providing access to digital materials, libraries would be protecting not just a format, but also an entire way of thinking and doing research that is complementary to online uses of scholarly information.

> **By preserving print collections in concert with providing access to digital materials, libraries would be protecting not just a format, but also an entire way of thinking and doing research.**

Another factor concerning why libraries should maintain print books is the trend Griswold has noted: the idea that reading is reverting to the property of "a self-perpetuating minority." The present system of North American libraries exists for the purpose of making reading and print culture available to anyone who is interested; it lies at the heart of our mission. As digital reading becomes the norm and print reading becomes marginalized relative to most of society, it will be up to libraries to retain a gateway to multiple forms of reading. With brick and mortar bookstores in the process of disappearing, if libraries do not perform this vital task, who will? The Online Computer Library Center (OCLC) report *Print Management at "Mega-Scale": A Regional Perspective on Print Book Collections in North America* notes the importance of developing new organizational structures "to ensure that the remarkable breadth and diversity of the North American print book collection is preserved for future citizens and scholars."[70] Here is recognition that libraries exist in a hybrid world where the value and availability of print books needs to be carefully planned and managed for the benefit of our communities.

Libraries are faced with an information flood that deluges patrons and staff alike, every minute of every day. In this context, the challenge of incorporating reading practices into a culture of attention scarcity is a pivotal issue. Barry Cull asserts that the effectiveness of reading is closely linked to the ability to have time to absorb and learn, regardless of the media: "The power of reading, whether of print or online text, continues to lie in this power of time—time to digest words, time to read between the lines, time to reflect on ideas, and time to think beyond one's self, one's place, and one's time in the pursuit of knowledge."[71] This power of reading, of course, cuts against the infinite profusion of digital media and its alluring distractions for the challenged human brain. The brain seeks across digital texts and other media for cues determining meaning, scanning rapidly for keywords, phrases, or images that connect with a learning or information-seeking need.

This is a self-evident truth that is easy to overlook. As Carr has written, "What was so remarkable about book reading was that the deep concentration was combined with the highly active and efficient deciphering of text and interpretation of meaning."[72] It is a challenge for everyone involved in the learning enterprise to hold on to the best of print culture while recognizing that our practices need to be adapted to new digital technologies of communication, reading, and sharing.

Assessing Public Services

One of the approaches libraries need to consider is how we can influence the development of new reading experiences. Librarians can incorporate questions around reading research and best practices in our conversations with publishers and vendors. To what degree are the latter aware of this growing body of research, and to what extent does this awareness influence the development of their platforms or functionality? It is not an issue that is typically raised in negotiations between library and vendor; these discussions normally center upon issues of pricing, content, licensing models, and discoverability. Reading research is a rapidly evolving area of interdisciplinary study, involving sociology, psychology, communication studies, neurobiology, education, and linguistics. Reading in all its forms is central to the activities of an academic library, whether we are considering collection development, information literacy, or public services in general. Without an emphasis on reading, the raison d'être of libraries would be hugely diminished, hence the importance of raising awareness of this issue among publishers and other vendors with whom libraries deal. It is also important to keep in mind that reading and writing are intimately connected and develop together. Writing leads to knowledge creation and dissemination, which is the lifeblood of the university.

> **It is a challenge for everyone involved in the learning enterprise to hold on to the best of print culture while recognizing that our practices need to be adapted to new digital technologies of communication, reading, and sharing.**

One conceptual framework that libraries can employ in implementing such a vision has been described by Dana Sally, dean of library services at Western Carolina University in Cullowhee, NC. In a 2011 speech to the North Carolina Library Association, Sally expressed his view that the library is becoming what he calls a "thought emporium," a place where the user:

- discovers ideas from the past and present
- reflects on ideas in quiet solitude
- shares ideas with colleagues and peers
- creates ideas and composes with them—that is, the library is a place where one relates and uses ideas, new and old, bringing them into imaginative new orders and creative new forms and combinations. It is a place where one becomes an idea architect, or an idea designer.[73]

Conceiving of the library as a place where ideas are formulated and disseminated requires the library to provide access to both print and digital forms of reading, because each format leads to a different way of thinking and doing research and thus produces different types of ideas. Only through supporting the full spectrum of reading cultures and styles of research can the library truly fulfill this vision of creating, combining, and sharing ideas old and new. This image echoes the futurist Thomas Frey's view of the library of the future: "where great ideas happen, and people have the tools and facilities to act on their ideas."[74]

Two related points are worth making here. The library collection, whatever formats, genres, or subjects it includes, is founded on the notion of equity of access. Students who lacked exposure to a wide range of books in their childhood can experience the pleasure of encountering new intellectual vistas and challenges through reading. The democratic mission of libraries is well ingrained in our professional ethos. Without books and reading, how will we "perceive and make sense of the world,"[75] in the author and journalist Maggie Jackson's words? Similarly, a student's or professor's personal library of books,

> **Only through supporting the full spectrum of reading cultures and styles of research can the library truly fulfill this vision of creating, combining, and sharing ideas old and new.**

regardless of format, reflects the value of reading as an extended voyage of self-discovery and engagement with the community and the world. There is a continuum of reading between personal libraries and academic libraries that invokes a deep and abiding form of sense-making at the emotional and intellectual levels. As the writer and editor Anna Holmes puts it, "Who or what we choose to read can be as telling as the clothes we wear, and an e-book feels like a detail withheld, even a secret kept."[76]

While it is true that libraries are not teaching reading skills in information literacy or research liaison work, libraries can play a significant role in advocating for our users' expectations vis-à-vis e-books and reading technologies. Librarians can become more attuned to student learning styles and to faculty attitudes toward reading technologies and tools. Teaching objectives and learning outcomes are important to understand as well. These goals are changing rapidly as higher education is struggling to remain relevant and viable in a world where new technologies create new opportunities for learning (such as the explosion of interest in massive open online courses or MOOCs). Libraries can recognize the ability of networked technologies to promote new forms of interaction, across different media, which foster meaningful exchanges among students and across texts. Kathleen Fitzpatrick, who specializes in digital media, argues, "These forms of interaction exist even in what seems like the static, discrete textual forms made possible by print, but the affordance of network-based communication present the potential for heightening and highlighting them in ways that could prove extremely powerful for the future of scholarship."[77] Librarians' knowledge and professional experience provide an important perspective that can lead to valuable conversations with faculty and administrators on these questions, to understand how different forms of communication afford possibilities for learning and engagement, while not rushing to discard a print technology that still attracts many people. It is reasonable to concur with reference librarian Pauline Dewan, who writes, "Our role is to also promote literacy in our institutions . . . By facilitating the use of e-books in our institution but also not losing sight of the importance of print for many of our patrons, we can help our students and increase our value."[78]

Conclusion: Academic Libraries and the Future of Reading

There is no turning back: the digital age is here. Academic libraries must continue to alter our collections, physical spaces, selection practices, and internal procedures to accommodate it and the evolving needs of our patrons. The point is not to try to turn back the clock, nor to undo this transition to digital, but rather to ensure that libraries retain a place for print reading and the culture of thought and research that it sustains even as they move forward with the informational riches of the digital age. This dual mission can best be achieved through maintaining hybrid collections containing both print and digital formats, thus offering users access to both linear/immersive and tabular/browsing forms of reading. Print and digital should be seen as complementary media, serving different reading and research needs, and not simply as interchangeable. Just as we reject the idea of returning to all-print collections, librarians must be careful not to allow utopian visions of the digital or bookless library to lead us to abandon print. The danger, as Staiger puts it, is that "as librarians en masse adopt the view that digital versions of books are destined to replace physical ones, the phasing out of print books will indeed be inevitable because it will be self-fulfilling."[79]

> **Print and digital should be seen as complementary media, serving different reading and research needs, and not simply as interchangeable.**

In conclusion, there is an important role for print books in the twenty-first century academic library in supporting scholarship, teaching, and learning. As libraries develop deeper and broader digital collections, tools, and services, care must be taken to ensure that the ideal of the "thought emporium," as a rich interplay of ideas and connections, is an inclusive concept that allows for the reading experience to flourish in various formats, including the print codex form. Digital technologies are profoundly shaping the reading experience and the use of libraries. Screen reading and print reading are infusing each other in complex ways that change how we organize, recognize, and assimilate texts into our lives. These two reading cultures are becoming more and more integrated. The consequences are far-reaching, as this paper has attempted to demonstrate. The literary scholar Walter Ong wrote in a previous generation, "Technologies are not mere exterior aids but also interior transformations of consciousness, and never more than when they affect the word."[80] Here is one approach for staking the value that libraries contribute to the academic community—that is, to remain sensitive to the varieties of reading experience, in light of this transformation. This approach does not stem from any misplaced nostalgia about the role and structure of libraries but rather from a close understanding of the issues involving patron preferences, format differences, and cultural trends. These are large and complex issues on which there will certainly be ongoing dialogue in the library community.

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