Reading in a Digital Age
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The Death of Reading/ the Physical Book/ Libraries?

At a time when digital forms of information and entertainment are gaining in importance, there is a lot of worried talk about the death of reading and the obsolescence of the physical book. In a frequently-recalled scene from Victor Hugo's *The Hunchback of Notre Dame*, a scholar holds up an early printed book, looks toward Notre Dame Cathedral, and says, "*Ceci tuera cela*." This will kill that—which is to say, the new technology of the book will kill the institution of the church. As linguist and researcher at Xerox Palo Alto Research Centre Geoffrey Nunberg (1993) points out in "The Places of Books in the Age of Electronic Reproduction," this is an old anxiety that has been voiced repeatedly whenever a new technology appears on the scene. Once the new artifact is given a toehold, so the technological determinist argument goes, the new will take over completely and drive out the older artifact as well as the institutions and practices that have shaped its use. Now it is the computer and the e-book that are said to be killing libraries, the physical book, and reading itself, together with all the values, practices, and social relations associated with print culture.

Sounding the alarm, books like Jane Healy's *Endangered Minds* (1990) and Sven Birkerts' *Gutenberg Elegies* (1994) argue that the capacity for reading sustained text is being threatened by competition from visual media such as television and video and/ or by the fragmentary nature of the discontinuous hypertext read on screens. Healy argues that what we now call thinking itself—the ability to pursue the development of an idea, step by step in a logical chain of reasoning, through sentences and paragraphs—is an outgrowth of the linearity of print. In *The Gutenberg Elegies: The Fate of Reading in an Electronic Age*, Birkerts has made himself an advocate, *par excellence*, for print culture, literary texts, and the act of deeply engaged reading. He is at his best when he describes the pleasures of reading codex books: the experience of curling up with a work of literary fiction; the sensory engagement with the physical book, touching its binding, turning its pages, inhaling its smell; the way fiction can draw you into a world so that you take up residence in it and it inhabits you long after you close the physical pages of the book. "What is the place of reading, and of the reading sensibility, in our culture as it has become?" (p. 15). His answer is that the place is shrinking and the sensibility withering, under attack from electronic media in its myriad forms. For him, "A book is solitude, privacy; it is a way of holding the self apart from the crush of the outer world" (p. 164).

Birkerts' argument is that people—that is, younger people who have grown up with television and computers— are no longer acquiring the ability to read deeply and enter these private imagined worlds. As evidence he points to undergraduates in his course on the American Short Story who have an attention span so shortened and a sense of time so fragmented that they are unable, or unwilling, to sustain a prolonged engagement with Henry James's "Brooksmith." In contrasting "deep reading" of real books with the superficial skimming of hypertexts, Birkerts' analysis recalls a similar distinction made

by the German historian Rolf Engelsing and frequently cited (e.g., Darnton 1982, p. 79). From the Middle Ages until some time toward the end of the eighteenth century, Engelsing noted, people had just a few books such as the Bible and read them "intensively," over and over again, often aloud and in groups. Then there was a shift to "extensive" reading as the presses produced an enormously expanded range and number of publications, especially periodicals and newspapers but also novels. After this "*Leserevolution*," people in their pursuit of commodified amusement tended to read a text only once before racing on to the latest work.

In Engelsing's anxiety about the expansion of extensive reading and the desacralization of the printed word, we can see some familiar oppositional pairs: deep reading vs. superficial reading; active engagement with a central canonical text vs. passive consumption of a stream of ephemeral materials whose apparent novelty conceals the fact that they are essentially the same commodified and repeated product (e.g., newspapers, magazines, dime novels, series books, genre books such as romances or detective fiction, bestsellers). There are, it seems, many accounts of the decline of reading from some golden age of the past when reading was deep, intensive, whole, and life-affirming. The exact point when the fall is alleged to have happened, however, differs in these various accounts—the late 18th century with the expansion of printing; the 19th century when the invention of the steam-powered press made cheap fiction, magazines and newspapers available to whole classes of readers who had never before read much of anything; the late 20th century with the global reach of the Internet.

Telling a completely different story about reading and literacy, cyber-theorists such as George Landow (1992), Richard Lanham (1993), James O'Donnell (1998), and Janet Murray (1997) agree that the digital media have introduced a transformative shift in reading and in the ways in which cultural products are produced, disseminated and received. However they see exciting new potentials for cultural expression and for education, as the electronic environment opens up new spaces for reading and for writing. Murray's book *Hamlet on the Holodeck* sketches out the aesthetics of a new type of narrative that has not yet been invented but can be seen in embryo in the work of videogame designers, computer programmers, and Web page designers. She looks forward to cyber storytellers' discovering new modes of representation by taking full advantage of the technology's strengths: its interactivity; non-linearity; ability to create immersive three-dimensional landscapes and machine-based fictional characters such as chatterbots; and its convergence of text and images, audio and video. As her title suggests, Murray sees in the immersive electronic environment a powerful technology of sensory illusion that is "continuous with the larger human traditions of storytelling, stretching from the heroic bards through the nineteenth-century novelists" (Murray 1997, p. 26).

It may be helpful to place these anxieties about the death of the printed codex book and of deep reading within the context of other gloomy prognostications—the alphabet and inscription will kill human memory; the book will kill the Cathedral; the photograph will kill painting; the telephone will kill the art of letter writing; film will kill live theatre; television will kill film, radio and/or books; interactive computer-based environments

such as the videogame and the Internet will kill broadcast media such as television. These predictions were only partially right. The threatened artifact or technology in most cases has turned out to have its uses and has prevailed in a niche where its utility or pleasure could not be matched by the newer, competing technology. Admittedly there are some e-book enthusiasts who predict a new age of reading right around the corner when printed books will displaced almost entirely by e-books—just as soon as some little problems are ironed out and a few technological improvements achieved such as screen displays of 300 dpi; portable and inexpensive e-book reading devices that can match such valued features of printed books as allowing for writing marginal notes; and the universal acceptance of a common e-book standard. It is more likely that digital books will take their place alongside printed codex books, and that readers will read both, at any given time choosing the format that suits their purposes, just as people now get news from various media such as radio, television, newspapers, and newsmagazines (for helpful discussions of this question, see Epstein 2001; Jenkins 1998; Pang 1998). An area of research that needs more attention is the study of how readers actually engage with these different formats of digital text vs. printed text, their reasons for choosing one format over another, and the different values and satisfactions they assign to reading each.

Fostering reading

Since the ability to read extended complex texts, including texts on screens, is a requirement for full participation as a citizen and worker in a modern economy, understandably there is considerable concern about literacy and the conditions that foster it. Research on reading and literacy is converging on the conclusion that the "literacy crisis" is not that people can't read—in westernized societies, a higher percentage of people *can* read than ever before. The problem is that too small a proportion of readers read well enough to cope with the complex literacy demands of modern society. Many children, especially boys, choose not to read. Forty percent of the poor fourth-grade readers in a Texas school claimed they would rather clean their rooms than read. One child was even more emphatic, "I'd rather clean the mold around the bathtub than read" (Adams 1990, p. 20).

In *The Power of Reading,* Stephen Krashen (1993) draws together the results of a large number of American research studies on the question of what factors bring about success in reading and writing and he suggests a remedy. He recommends fostering a certain kind of reading that he calls "free voluntary reading." Free voluntary reading "means putting down a book you don't like and choosing another one instead. It is the kind of reading that highly literate people do obsessively all the time" (pp. ix-x). The connection between voluntary reading and powerful literacy is that people learn to read by reading. What keeps children reading for the countless thousands of hours necessary to produce the bulk of reading practice that creates confident readers? The answer seems to be the pleasure in the reading experience itself. It appears that a reader learns to read, not by drills and exercises, but by reading a lot of text that is meaningful and personally rewarding. Avid readers often describe themselves as coming from households where they were surrounded by books. They claim that as children they had been voracious readers, that they "read everything" and "read indiscriminately." Unlike non-readers who say they

lack the time to read and find reading hard, avid readers say that they can read "any time" and that they build opportunities for reading into their daily routines. Reading is interwoven into the texture of their lives, not separate from it.

In a study that I conducted based on more than 200 open-ended interviews with pleasure-readers, interviewees were chosen because they said that reading formed a very important part of their lives. These readers turned out to be adept at choosing books that suited their needs and purposes at any given time, depending on the satisfaction that they were looking for (Ross 2001). They talked about the way that books—often fiction books but sometimes non-fiction books such as biography or travel books—gave them a pleasure that they could not find in any other way. And beyond providing pleasure, the books helped them in important and diverse ways, but not in a way that an outsider could have predicted from the titles of the books themselves.

Avid readers talked about books that "opened my eyes" to a new perspective or "opened a door" on a new reality. They said that a particularly significant book was a model for living—that the narrative representation of human experience within a novel offered examples to follow, rules to live by, and sometimes inspiration. In some cases, reading changed the readers' beliefs, attitudes, or pictures of the world, which change in turn altered the way readers chose to live their lives after the book was closed. Other books reinforced the familiar or confirmed what was already believed. Often the reader talked about the way an experience in a book seemed resonant with their own experience, claiming that the book "sounded a chord" or "struck a key." Another large group of readers said that the significant book provided reassurance, confirmation of the self, or inner strength. For books that offered comfort, especially childhood favorites that were constantly reread, readers used the metaphor of the book as a "friend" or as "comfort food." One reader said, "Books have different values depending on the stage of your life you're at when you read them. Sometimes your life intersects with a book and you can really benefit from it. . . . . I think that when I approach books I look for how they address my life" (Ross 1999). It was evident from their description of how books helped them that readers themselves play a crucial role in enlarging the meaning of the text by reading it within the context of their own lives. Through their act of making sense of texts and applying them to their lives, readers creatively rewrite texts.

From their experiences with many kinds of reading materials—from reference works meant to be mined for a particular piece of information to fictions that invite immersion in a world— practised readers discover that there are many kinds of reading and many literacies. They learn that there are many different kinds of texts to be read for different purposes. They know that they need to adapt their reading strategy to the text and the task at hand, sometimes skimming quickly over long expanses of text, using chapter headings, introductions, summaries and captions to help them get the gist and at other times reading slowly, intensely, and closely and perhaps rereading. In the electronic world of hypertext and Web pages, readers are developing new strategies of reading, and researchers are only at the very beginning stages of discovering what those strategies are. In *Cyberliteracy* (2001, p. 13), Laura Gurak argues that what is needed is a "critical technological literacy, one that includes performance but also relies heavily on people's

ability to understand, criticize, and make judgments about a technology's interactions with, and effects on, culture."

Reading as a social act

It may seem counterintuitive to claim that reading is a profoundly social activity. Once the technologies of the electric light and cheap books made it possible for ordinary people to have access to private space and plentiful reading material, the predominant image of the reader has been of the solitary individual engaged in an essentially private and unshared activity, somehow removed from the concerns of the public sphere. As Elizabeth Long (1992) points out in a paper in Jonathan Boyarin's edited collection, *The Ethnography of Reading*, the solitary female reader is a familiar iconographic image.

There is a tension in our view of reading because time spent reading is time taken away from socializing. Readers like to retreat to what Virginia Woolf has called a "room of one's own" to have a quiet space for reading (and writing). Unlike reluctant readers who find reading hard work, avid readers who read for pleasure can read anywhere. They carry books with them so that they can read for five or ten minutes while waiting in line-ups or at the doctor's office. But reading in snatches is second best, in comparison with uninterrupted reading. Lynne Sharon Schwartz in *Ruined by Reading* (1996, p. 30) mentions the voluptuousness of reading late at night, when reading can be prolonged and uninterrupted. "Sometimes at the peak of intoxicating pleasures, I am visited by a panic: the phone or doorbell will ring, someone will need me or demand that I do something." Italo Calvino (1981) begins his splendid novel about reading by advising the reader, "You are about to begin reading Italo Calvino's new novel, *If on a winter's night a traveller*. Relax. Concentrate. Dispel every other thought. Let the world around you fade. Best to close the door; the TV is always on in the next room. Tell the others right away . . . 'I'm reading! I don't want to be disturbed.'"

On the other hand, reading is nourished and sustained in community with others. Reading is learned in the social context of family and school; supported by book exchanges and reading materials given as gifts at ritual times such as birthdays; valued in particular ways by cultural authorities, including book reviewers and curriculum committees that draw up university reading lists; and directed toward particular books and authors by practices that determine what reading materials are available to read, including the activities of publishers, booksellers, and collections librarians. Long (1992, p. 193) claims that "the ideology of the solitary reader . . . suppresses recognition of the infrastructure of literacy and the social or institutional determinants of what's available to read, what is 'worth reading,' and how to read it." Boyarin (1992, p. 4) reflecting on the papers in his collection, including Long's, says that most of the essays "share the task of dissolving the stereotype of the isolated individual reader, showing that not only is all reading socially embedded, but indeed a great deal of reading is done in social groups."

Interested in making visible the reading practices of groups of readers, Long conducted an ethnographic study of reading groups in the 1980s in Houston, Texas. She found that readers, in the very act of joining one particular reading group rather than another, were

defining themselves with respect to social and political values. Women who joined reading groups at a time in their lives when they were isolated in the suburbs with young children talked of their reading group experience as providing "a 'lifeline' out of their housebound existence into a world of adult sociability and intellectual conversation" (Long 1992, p. 198). Big box bookstores are taking advantage of the social nature of reading by creating spaces for people to hang out, drink latte, read, attend author readings, and buy books. More recently the Internet has become a space that connects readers through virtual book discussion groups, listservs, Web sites, and real-time chat. Perhaps the most celebrated example of the power of electronic connectivity to amplify book group activity has been the Oprah Book Club. Mary K. Chelton's article (2001), "When Oprah Meets E-mail: Virtual Book Clubs," provides an excellent overview of Web sites for online book clubs as well as the numerous resources on book discussion groups, how to start and maintain them, and suggestions for books to read.

Reading (electronic) text

On March 14 2000, Stephen King published a novella called "Riding the Bullet," making it available in electronic format only. Readers had to read it using either their computer, handheld devices, or a dedicated electronic book reader. Over 500,000 people tried to download it within the first week, paying US $2.00 for the privilege. The Barnes and Noble Web site described the event as "one of the biggest events in eBook history" and reported that King's publisher Simon & Schuster "is also excited about this new revolution in publishing": "What's exciting is that we are able to go from Stephen King's computer to the reader in a fraction of the print-publishing arc." We don't know much yet about the readers' experience with reading e-fiction, although there is anecdotal evidence accumulating that people still tend to print out units of text that are any longer than a few screens (Lynch 2001); that some e-book readers have been frustrated at the way that a 230 page book has to be read as 2300 separate screens on a Palm Reader; but that others find it handy to have a novel on their Personal Digital Assistant (PDA), just in case they get stuck in a lineup and need something to read.

Electronic text read from a screen will prevail in cases where the reader needs ready and quick access to relatively short pieces of text, especially where currency is an issue. Not surprisingly, the migration to the electronic world has worked best with textual forms that are not intended to be read in a linear way but instead are consulted, dipped into, and read in small chunks—e.g., reference works of all kinds, operating manuals, newspaper articles, Web sites, and the like. In successful translations to digital formats such as has happened with the electronic encyclopedia, the genre has been redesigned to exploit the strengths of the digital environment, becoming more like a database that can be searched to deliver up materials relevant to a reader's interest. And if the reference database is the model, par excellence, for the new digital text, it appears that in the electronic environment whole books are being absorbed as elements in a huge data base that is to be consulted but not read. Reviewing recent enterprises such as NetLibrary, Questia Media, and Ebrary.com that are racing to put full texts of hundreds of thousands of copyrighted books, old and new, on the Web, Lisa Guernsey claims that "the new effort to build an

electronic library is not about reading at all. It is about the power of electronic searching. With digital scanning, texts of works that may be decades old can be mined for those few morsels of insights that may enhance a research paper or help prove an argument" (Guernsey 2000). Some academic libraries, initially concerned that a twenty-four-hour borrowing time limit for e-books might be too short, have discovered that the average time that users are spending with a NetLibrary e-book is about ten minutes. However, to make sense out of this number, we would need to know average time spent by academic library users with printed books, a statistic that is not available.

Clifford Lynch (2001) singles out the scholarly Web site as an example of a new genre designed to engage readers in new ways. He points out that it "links and organizes many small chunks of text with multimedia content and provides the ability to search and navigate among them. It may also include interactive software components such as simulations, and use the communications capabilities of the Internet to build and interactive community around the work and its subject matter." Theorists such as George Landow (1992) and Ilana Snyder (n.d.) see the new genres of hypertext, hypermedia, and hyperfiction as providing a concrete illustration of concepts of reading that were first explored by post-modern critical theory. According to hypertext theorists, hypertext challenges our print-based notions of authors, readers, and the integrity of the text in the following ways:

- with printed books the author determines a fixed order in which ideas are presented and read, whereas with hypertext the author presents options but the reader chooses which links to pursue. The reader becomes effectively a co-author of the text, constructing the text collaboratively from a kit supplied by the author;

- the text printed in a codex book is fixed, whereas in hypertext the text changes every time it is read, depending on which link is activated. Therefore the meaning and experience of the hypertext varies with each reading;

- in the hypertextual environment, readers can make new connections that the original author did not anticipate;

- readers are not passive recipients of meaning but are active meaning-makers interactively engaged—arguing, agreeing, reading against the text, and sometimes posting their own texts in response;

- readers are not solitary and silent but are participants in a virtual community of other readers, linked by e-mail, newsgroups, electronic conferences, and real-time chat.

This theorizing about the role of the reader of hypertext sounds compelling, so long as we acknowledge that most of it holds true as well for readers of printed text. Now that we can observe readers doing things in the electronic environment, it seems to be easier to identify the variety of readerly activities performed and to recognize that they have been happening all along. In fact, in the case of those genres that have migrated into a digital format without being redesigned—notably novels and monographs—readers are

becoming aware, sometimes for the first time, of strategies that they have been using all along to negotiate codex books but are prevented from using at this "horseless carriage" phase of digital books. Experienced readers of printed books say, for example, that when they pick up a non-fiction book that is unfamiliar to them they perform one or more of the following tests: they take into account the status of the publisher; look at the back cover to see if the book is praised by people they respect (not possible, however, with library books, whose covers are routinely stripped); examine the table of contents; look at the bibliography to discover which discourse community this new book belongs to; check the index to see which names and concepts are included; and finally sample and skim some passages of text to check out writing style and quality of analysis. Once they decide to read the book, they may choose not to start with the first chapter but to begin somewhere else, even with novels. Quite often they read with a pencil at hand and make marginal notes and cross-references, sometimes carrying on a running dialogue with the author.

It's not just scholars whose relation to printed books is interactive. Researchers who have studied how children learn to read have found that literacy is deeply embedded in the social processes of family life and depends on a range of interactive activities from writing notes to sharing stories aloud. To develop a sense of themselves as confident readers and writers, children need to have the expectation that reading and writing are routine parts of everyday life. In her longitudinal case study of six families of young children entitled *Family Literacy*, Denny Taylor (1983) emphasized the role of environmental print in engaging children in literacy practices from reading street signs, labels on food and clothes, advertising logos, price tags, and menus to writing telephone messages, postcards, birthday cards, and grocery lists.

Everyone accepts that sharing stories with children is a crucial element in the making of readers, but ethnographic studies make it plain that "reading to a child" consists of a lot more than an adult reading and a child listening. The child emerges as a very active partner indeed, often choosing the book to be read, initiating the reading event, asking questions, making comments on the text or pictures, and eventually becoming a reader herself in a process that educators call "chiming in," where the child begins to memorize parts of the story and can fill in gaps. Parents help scaffold the process of meaning-making by encouraging beginning readers to draw on prior knowledge as a strategy for making sense of new texts. Taylor (1983, p. 70) says that parents "spent much of their story-reading time relating events in the stories to the everyday lives of their children," and gives the example of Andrew (three years, eight months) and his mother sharing a story in which a small boy and an elephant are lost. Andrew's mother said, "See how people can get lost like the little elephant when they don't stay near their mommies. Right?" "Like I did," said Andrew, on cue. "Right," said his mother.

How do we know about reading?

Now that it is perceived as under siege in the digital age, the process of reading, once taken for granted, has increasingly been the object of empirical and theoretical

investigation. Thus studied, reading has turned out to a remarkably complex and variable behaviour. It is not one single activity, but many, with different kinds of purposes, satisfactions and required skills. Two very useful and comprehensive reviews of the research literature on reading have been written especially for a LIS audience: Janice Radway (1994) and Wayne Wiegand (1998) each provide maps of the research terrain, including literacy studies, reader-response theory, ethnographies of reading, and the study of print culture. Reading has been studied from every possible angle from a variety of disciplinary backgrounds including psychology, education, sociology, literary studies, and library and information science. Each discipline has its own idea of what counts as a worthwhile research question to ask about reading and each has its own privileged methods of investigation.

Probably the most radical issue dividing researchers is this: what model of reading do they believe in? Or to put it another way, what stories do they tell about reading? Do they see readers as essentially passive objects controlled by active texts or do they see readers as actively involved with constructing the meaning of texts? In the so-called "text-active" model, the text *does* something to its readers. There is something "in" the text itself that determines the reader's response. The text is comprised of fixed and determinate textual features that are undeniably *there* and have predictable effects on readers. The text is stuffed with specific messages, beauties, or effects and reader's job is to extract them— the Little Jack Horner approach to reading, as Northrop Frye once put it. Research on propaganda and pornography is often undertaken from within this model, as is research on mass media audiences that charts ratings and uses content analysis to figure out which messages audiences are supposed to be receiving from popular programs (see Mosco and Kaye 2000). Titles for this type of research often include terms like "impacts" or "effects," and the impacts are often thought to be bad.

Another story of reading gives a lot more power to the reader/ viewer and puts emphasis on the ways in which communities of readers make sense of what they read or view. In reader-response criticism and new audience research, reading/viewing is seen as a transaction between a text and an active reader/ viewer. The meaning is not so much there in the words or on the screen as it is constructed by the reader on the basis of his or her past experiences with reading texts and with living in the world (Fish 1980). Meaning is thought to be constituted by the reader's activity in bringing certain horizons of expectations to the text, in selecting which features of the text to attend to, and in responding to these features. The balance shifts: meaning, once thought of as what the text gives, becomes something that the reader takes. If you ask different readers to read the same text, you have to take into account the fact that each reader is creating from the words on the page a different meaning. Furthermore the same reader may read the text differently on different occasions and at different stages in her life. Typically research conducted within this second model views reading as empowering, with the reader in charge, deriving benefits that range from local problem-solving to the construction of an identity. In *The Story Species: Our Life-Literature Connection*, literary critic and family therapist Joseph Gold claims that every human being is engaged in making and remaking a life story or identity out of bits and pieces derived from experience and filtered through narrative structures. He views reading fiction as "the best tool we have for helping

ourselves develop a fully functional "I" (Gold 2002, p. 19).

Selected research findings about reading

- Studies conducted in Canada and the United States have consistently found over periods of decades that "heavy readers" are more likely to be female than male; to be younger rather than older; and to have achieved a higher educational level than the population at large. (Book Industry Study Group 1984; Cole & Gold 1979; Gallup Organization 1978; Watson, *et al.* 1980)

- The single most striking characteristic of skillful readers is that they speed through stretches of text with apparent effortlessness. (Adams 1990, p. 17)

- Boys take longer to learn to read than girls do. Once they are able to read, boys spend less time reading than girls do and are less likely to value reading for pleasure. On the other hand, boys do better than girls at information retrieval and work-related literacy tasks and are far more likely than girls are to read for utilitarian purposes. Significantly more boys than girls describe themselves as "nonreaders." (Smith and Jeffrey 2002, p. 10)

- Access to books and other interesting reading materials is a critical factor in becoming a good reader. J. McQuillan concludes, "There is now considerable evidence that the amount and quality of students' access to reading materials is substantively related to the amount of reading they engage in, which in turn is the most important determinant of reading achievement" (McQuillan 1998, p. 86). Libraries have an important role to play because low-income families especially are likely to have very few books in their home.

- On Web sites, text attracts attention before graphics. A study using eyetracking equipment found that readers of online news sites first looked, not at photos or graphics, but at headlines, article summaries and captions. Readers spent 22% of the time looking at images other than banner advertising, and 78% of the time on text. (Poynter Institute 2000)

- On the web, users do a lot of brief scanning, foraging quickly through many article summaries, but when their interest is caught they will dive into a particular topic or article in depth. Users engage in interlaced browsing, frequently switching among alternate sites. (Poynter Institute 2000)

- Significantly large numbers of Americans say that they use information found on the Web when making important decisions related to education and job training, investments, big ticket purchases, and health care for themselves or those close to them. Based on a survey of 1415 Internet users in January 2002, the Pew Internet and American Life study concludes that 14 million American Internet users say that the Internet was crucial or important in upgrading their job skills; 11 million say they used information found on the Internet to help cope with the illness of a loved one.

(Pew Research Center 2002)

- A study by JSTOR indicates that university students use online versions of journals twenty times as much as they use the corresponding paper articles bound in periodical volumes in library stacks. JSTOR <www.jstor.org> is a project that has digitized dozens of runs of scholarly journals, some having issues that go back more than 100 years. (cited in Guernsey 2000)

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