

DIGITIZING

Education

A Primer on

BOOKS

By Michael A. Looney and Mark Sheehan

A student makes the traditional pilgrimage to the campus bookstore with a new class schedule in hand. In previous semesters, she would have snaked through long, winding lines to buy used, highlighted, dog-eared textbooks. This time, however, she logs on at one of a dozen computer kiosks, enters her authorization number, slides a debit card through a machine, and leaves the bookstore with a very different set of readings. Besides one traditional textbook (price, \$65), she also leaves with two customized printed books. One consists of a few chapters from several standard textbooks (the book smells “fresh” because it was printed the night before). It cost only \$27. The other customized book comprises a chapter from a traditional textbook, two case studies from various professors, and a white paper written by the professor teaching the course. This book cost about \$20. In addition to these paper documents, she also picked up at the bookstore a customized CD simply

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marked “English Literature of the 18th Century” and two 3x5 index cards on which are printed URLs for campus Web sites—one suggesting materials stored in the digital library on campus, and the other directing her to supplementary materials available only on the campus bookstore Web site.

Back in her dorm room, the student connects to the Internet and finds an e-mail from the bookstore waiting for her. Following links within the e-mail, she downloads the electronic version of the physical textbook that she just bought for \$65. She sees that electronic versions of her two new customized books are available for just \$2.50 and \$10 respectively; she downloads these to her laptop as well. She visits the Web addresses listed on her 3x5 index cards and selects some of the additional materials available there. Most of these ancillary materials are free but “protected” (though she notes that for students at other institutions, there is a \$3.50 charge). Finally, while she is organizing her new digital textbooks using software on her laptop, the student receives another e-mail. This time, the message contains an attachment from her chemistry professor, who, with one mouse click, has sent a sixty-five-page digital course pack and supplemental reading materials to a class of 150 students. The total cost of all these paper and electronic materials is roughly 30 percent less than what she would have paid for the same course materials just a semester before, almost all are accessible both electronically and in print, and most impressively, she now has room in her backpack for something besides books and study guides.

In the near future, this student may carry a single handheld device containing all the materials she needs for all her classes, not to mention a full complement of relevant reference materials. She will download and interact with these materials by using software that allows her to bookmark and annotate content, conduct quick searches, and look up words in an integrated dictionary that can read words and phrases back to her in synthetic speech. She will connect wirelessly to the Internet from links within her electronic materials. Of course, she will be able to print portions of her digital course books (if authored and published by campus

faculty members) anytime she likes. New electronic reading material for her sequence courses will contain links back to the electronic content from previous semesters, still stored on her reading device, for quick review and reference. She will also experience a richer learning experience made possible by embedded audio, video, three-dimensional animation, and tools for collaborative learning.

This is not a new vision. Educators and visionaries have been imagining the ultimate learning hardware and software for some time, presenting even more futuristic scenarios (notable examples being Vannevar Bush’s 1945 “Memex”¹ and Alan Kay’s “Dynabook” from thirty years ago). But neither is this a scene from a futuristic novel. Electronic reading materials—“eBooks”—are real today, and many other elements of the vision are only months away. Digital learning content is about to overtake the education marketplace and change the way we distribute and interact with information and, ultimately, the way we learn.

Pieces of the eBook Puzzle: Gadgets, Software, Digital Content, and Security

What exactly is an “eBook”? Depending on whom you ask, an eBook either is a device specialized for displaying electronic reading material or is software designed to display such material. We’ve been reading digital content on “glass” for years, of course. The recent surge in attention to eBooks relates to the fact that digital rights management (DRM) software tied to electronic commerce is now available. By enabling the protection of intellectual property in electronic formats, DRM software is revolutionizing the availability of digital content. In turn, software and hardware companies have begun exploring specialized reading technologies to take advantage of content previously unavailable in digital form.

The eBook phenomenon has been hyped by the press as being about popular trade paperback books, such as Stephen King’s eBook experiments with *Riding the Bullet*. In reality, eBooks can span a vast range of types of content. Short stories, plays, research reports, manuals, textbooks, speeches, white papers, course packs, and distance learning

materials all make great eBooks. All these materials can now be encrypted, acquired free or for a fee, and displayed with specialized readers (either software or hardware) that make reading electronically more viable than ever. Admittedly, we’re a long way from replacing the aesthetic feel of a printed book; however, for readers who read for information and who are mobile, the benefits so outweigh the disadvantages as to ensure that the era of the eBook has begun.²

Dedicated eBook devices—including the Franklin eBookMan, Gemstar eBook, goReader, and others—are gadgets that you hold in your hand while reading digital content. These devices cost between \$125 and \$600 and include dictionaries, backlit screens, and friendly user interfaces that make for a near-paper reading experience. They are limited in certain ways—for example, the user may be unable to print parts of the eBook conveniently or to share or lend the digital files even if the eBook publisher agrees to it. In addition to these dedicated reading devices, multifunctional “tablet PCs” and other light-weight, high-resolution devices are being made or designed. With these devices, electronic reading will be at least a secondary feature by virtue of exceptional screen resolution, handy navigational features, and specialized reading software.³

In the meantime, tens of millions of PCs, but especially Windows and Macintosh laptops, make excellent eBook devices through the use of free, downloadable software featuring tools for individualizing text-resolution preferences. The current eBook readers for PCs provide a means for literally every faculty member and student with a PC to explore this new way of accessing both protected and nonprotected electronic content. Adobe Systems Inc. (<http://www.adobe.com/epaper/ebooks/main.html>) and Microsoft (<http://www.microsoft.com/reader/default.asp>) have both introduced software for reading eBooks on desktop computers and laptops. Another version of the Microsoft Reader product runs on handheld pocket PC devices manufactured by Hewlett-Packard, Casio, and Compaq. Likewise, Adobe (<http://www.adobe.com/products/acrobat/readerforpalm.html>),

Palm Computing (<http://www.palm.com/>), and Handspring (<http://www.handspring.com/>) offer software for reading eBooks on handheld devices that use the Palm operating system.

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Effective eBook software enables the digital eBook to mirror the printed book, with graphics, equations, photos, charts, and illustrations vividly displayed amid the text in the same format and layout as the eBook's printed counterpart. This is especially important in edu-



“Napsterizing” of textual material has, until recently, been a major barrier to entry into the electronic marketplace by many publishers.

cation, where graphics are invaluable tools for conveying dynamic, abstract concepts such as molecular bonding or the subtleties of tone and shading in a work of art. Also important is the ability to print portions of the eBook. Many people prefer hard-copy formats; printed eBooks can satisfy that sensual craving for the feel and smell of paper. On a broader scale, the process of creating an eBook can also result in a Print-On-Demand (POD) book, which can have the same look and feel as the hard copy but can be customized by content. POD books can be printed in small batches, virtually overnight. The appearance, including the cover, is almost indistinguishable from the original printed hard copy.

One potential concern about eBooks involves intellectual property rights. What measures are in place to prevent eBooks from being reproduced and shared in ways that violate copyright protections? This potential “Napsterizing” of textual material has, until recently, been a major barrier to entry into the electronic marketplace by many publishers, including university presses. In addition, faculty authors of supplemental or customized materials need to

protect their own intellectual property. eBook encryption technology has begun to ease authors' and publishers' fears. Publishers and authors need only to add a security layer and assign permissions to a work to market it as an eBook. Typical security software locks the eBook to the purchaser's computer so that it cannot be printed, copied, or forwarded to other computers without payment or “permission” (unlocking content without a fee). Rights-protection software is also becoming increasingly sophisticated; now, while maintaining very high levels of security, the author or publisher can allow the reader (buyer) to lend the eBook for selected periods of time (though with eBooks you never need to worry about whether you'll get the book back, because you select the period of lending!). The new protected digital content can also be set to “self-destruct” after the end of a semester. This alone allows the development of completely new business models for texts and supplemental materials. Electronic distribution schemes can allow an entire book or only a certain number of pages to be printed over a specified period of time (e.g., ten pages every week). The eBook encryption methodologies may even be set to give the book away to a specified number of users. As rights protection software increases in sophistication, more and more options will become available to faculty authors, publishers, and readers.

The eBook revolution has spawned several new support businesses: companies that provide DRM technology; content conversion houses, which aid publishers in converting existing print and electronic content to eBook formats; and system integrators and clearinghouses—such as Lightning Source (<http://www.lightningsource.com/>), Reciprocal (<http://www.reciprocal.com/>), iUniverse.com (<http://www.iuniverse.com/>), and OverDrive (<http://www.overdrive.com/>)—which provide encryption, hosting, and e-commerce integration services to authors, publishers, and resellers. Before long, specialized rich-media authoring services, copyright clearinghouses, and digital object vending services will also be established. Besides these service providers, online resellers such as Amazon.com and Barnes &



Noble have begun vigorously marketing eBook content, and online college bookstores will start to do the same fairly soon. Finally, specialized system integrator companies will soon be assisting libraries with integrating eBooks into their lending systems.

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As previously mentioned, eBooks can be enriched with a broad range of

media types to help with the learning process. For example, MIT's Sloan School of Management is already preparing "Knowledge Updates," brief research updates from MIT faculty. Complete with video, audio, and potentially animated materials, these updates are current research snapshots intended as much for alumni, corporate customers, and friends of Sloan as for current students.

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eBooks can also improve on qualities of traditional printed books. Like a paper book, the eBook will become marked with highlighting, with page corners turned down for quick reference, and with notes made in the margins of the pages. The difference with the eBook is that all of these aids will be the user's own amendments rather than the vestiges of the learning habits of previous owners. In addition, the digital medium is often simply more convenient or appropriate as either a replacement for or an adjunct to the potentially heavier, environmentally unfriendly paper medium.

Finally, another factor that may influence the adoption of eBooks and other digital courseware is the financial model used by traditional textbook publishers and the financial burden this model imposes on students. The average price of a new textbook in 1998 was almost \$62,⁵ and this price is anticipated to increase 4–6 percent per year. This represents a nearly 500 percent increase since 1965. Contributing factors to this worsening economic scenario include the fact that 24 percent of all academic books are returned to publishers from college bookstores⁶ and the fact that each purchased book is turned over six times or more on average before it is out of circulation. As a result, one-third of students buy used books,⁷ and one-third do not even purchase the book required for the course. Only 10 percent of textbook sales are to international markets,⁸ due increasingly

to hard-copy piracy as the costs of books increase. All of these factors, coupled with bookstores' and publishers' profit margins, lead to textbook prices that in some cases are higher than the tuition for the course. Through the utilization of an eBook "workflow" process that can leverage not only eBooks but also POD books and modular content, eBooks are an opportunity for academic textbook publishers to provide students with content that is of higher value and is potentially less expensive.

What Will Make eBooks Successful in Education?

Three major factors will be required to make eBooks successful generally and also in higher education: content, accessibility, and readability.

Content

Without electronic content, there is no eBook. Quality and quantity of content will together form the most critical factor in the success of the eBook phenomenon. In the education space,

content comes from two main sources: (1) author-educator-publisher teams and (2) educators themselves, publishing independently. Textbook publishers are moving rapidly to provide previously published content in digital formats. At the same time, faculty are exploring authoring their own materials for electronic distribution as eBooks (encrypted to protect the author's intellectual property and made ready for transactional e-commerce). Beginning this fall, a number of major academic publishers—including Addison Wesley, Harcourt, McGraw Hill, and Houghton Mifflin—will offer leading textbooks in an optional digital format, along with a variety of study guides, solution manuals, and other supplemental material. Publishers' experimentation will provide instructors with greater modularity and individualization of content selection while simultaneously offering higher-value content to students.

Using a variety of relatively inexpensive authoring and desktop publishing software, instructors are now able to com-

pile digital course packs, supplemental reading materials, and syllabi and to save these materials as secure files that they deliver to their classes via e-mail. Also, many colleges and universities already have collections of instructor-written content, which may be converted to secure, interactive course books by university presses using DRM software.

To supplement the authoring of eBooks with existing tools, eBook-specific authoring software is emerging that will leverage the desire for rich media, embedded digital objects, and rights management options. For digitization of legacy print material, screen-capture software and text distillers can create eBooks from their paper form. Most books published within the last seven years have been created digitally and translated to Postscript for printing. These files are the most readily available for conversion to eBooks. The other major format being proposed for eBooks is the Open eBook Forum (<http://www.openebook.org/>) XML-based format. Microsoft's .lit format is a proprie-

tary variation of OEBF. Many OEBF-based books should be scrutinized by academics in particular to ensure proper formatting and true pagination (e.g., for accurate references).

Accessibility

The acceptance of eBooks by the higher education community will be directly proportional to ease of access. The burden here falls on back-end fulfillment. Textbooks, course books, and other digital learning materials need to be as easy to find, buy, obtain, and use as books bought at a conventional college bookstore or found in the campus library. Encryption security needs to be effective but invisible. With a seamless, one-click eBook purchasing or lending experience, students will be excited to switch to digital. If the process is slow or complicated, eBooks will not catch fire on campus. Acquiring eBooks needs to be as simple and as attractive as acquiring and managing MP3 files.

Campus and public libraries will play a major role in the distribution of digital

content, especially as specialized lending services become available through the DRM schemes.⁹ Many library consortia, such as the Perseus Project (<http://www.perseus.tufts.edu/>), have been working for years to digitize a wide range of content. Also, a number of new academic information service businesses have emerged, such as eBrary (<http://www.ebrary.com/>) and netLibrary (<http://www.netlibrary.com/>).

The Adobe and Microsoft eBook readers both provide direct access to online digital content via "bookstore" navigational buttons. These buttons can be easily altered by users to link to their desired sources of content. Students and faculty can access content from their libraries, from their online college bookstores (even if fulfilled by a distributor like Follett or the National Association of College Stores), from an academic department and/or academic computing, from publishers, or from traditional online bookstores and specialty digital content vendors such as eBooks.com (<http://www.ebooks.com/>).

Readability

A great reading experience is the last key to the success of eBooks on campus. The burden here lies with the technology used to read the eBook, be it the device or the software. Simple but crucial issues like the weight, size, and general look and feel of an eBook device can make or break its success. Both Adobe and Microsoft have adopted font-rendering technology for use on color LCD displays (CoolType from Adobe and ClearType™ from Microsoft), allowing users to customize the sharpness of the font to their particular preferences. Other factors, like higher screen resolution on PCs and forthcoming reading devices, will accelerate the adoption of eBooks.

eBook reading on the desktop PC or laptop will also be affected by Internet access, compatibility with operating systems, ease of use, and look and feel. By its nature, eBook reading software needs to interact well with the computer on which it is installed, with no crashes or compatibility issues. The overarching question will be, does the eBook experience



enhance or detract from the students' experience and education? If it detracts, it will be a short-lived experiment. If it lives up to its massive potential, learning will change forever.

Moving Forward

At this point, some final issues still have no real resolution, including copyright, implementation, and demand. Regarding copyright, when an instructor creates a course pack using existing paper materials, he or she could be in violation of copyright law if the selections go beyond fair use. In migrating to the digital world, similar rights issues will need to be addressed through the publisher and evolving copyright law. Specialty digital object identifier clearinghouses are emerging to address this need.

The question about implementation is, who within an academic institution is responsible for bringing an eBook program to life? So far, no pattern has emerged. A librarian, a progressive instructor, an MIS department, or even a student-run coalition could gather the necessary momentum to get an eBook program off the ground.

Finally, will students or instructors be the main force behind the move to

Faculty dictate the content of their courses; will they also now insist on selecting the media for consuming that content?

eBooks? Who will make up the demand? Students were clearly the driving force behind PCs in schools. In a recent survey at the University of California–Berkeley, 81 percent of students said they were willing to use an online order system as a means to purchase their course readers, because they appreciated the convenience and were already accustomed to making online purchases.¹⁰ Will they now adopt eBooks as a digital medium for these same course readers, or will the movement be led by the administration and faculty? Faculty dictate the content of their courses; will they also insist on selecting the media (digital, POD, print) for consuming that content? If eBooks are the medium of choice, who on campus will actually do the authoring, publishing, and distributing? The faculty? Media centers in concert with the faculty member? Will the economics of providing content for the classroom and for the distance learner begin to fundamentally change our notions of instructional media so that in twenty years, we will remember the \$65 hardbound textbook in the way that some of us remember mainframe punchcards?

In a model familiar from other initiatives on campus, a cross-interest committee can quickly investigate the eBook options available and assess the most effective way to meet the approaching eBook revolution. The process that is used to begin personal or institutional experimentation is relatively inexpensive because the software eBook readers for PCs and Macs are free for personal use and for posting on campus Web sites

for student and faculty downloading. Content of all kinds is already available both for free and for fee. Distribution and integration into e-commerce, library, and authentication systems are more complex issues.

Several study groups and organizations have already done significant investigative work, notably the University of Virginia Library's Electronic Text Center (<http://etext.lib.virginia.edu/>) and Brown University's Scholarly Technology Group (<http://www.stg.brown.edu/>). A committee from the California Digital Library has also released a study on eBooks.¹¹ In general, college and university librarians and academic computing personnel are likely resources to explore the topic further. At this early stage, a few passionate, resourceful groups or individuals are likely to start the movement on a grass-roots level. But before we know it, the student mentioned at the start of this article will be the norm, not the exception. *e*

Notes

1. Vannevar Bush, "As We May Think," *Atlantic Monthly*, July 1945. See <<http://www.isg.sfu.ca/~duchier/misc/vbush/>> and <<http://www.cs.brown.edu/memex/>>.
2. Daniel P. O'Brien, "Books Unbound," *Forrester Report*, December 2000.
3. Steven Levy, "Bill Gates Prescribes a Tablet," *Newsweek*, April 10, 2001.
4. All of these elements, from an entire book or online learning module to a simple audio file, can be identified with a DOI[®] (Digital Object Identifier, <<http://www.doi.org/>>) and/or a SCORM[™] (Sharable Content Object Reference Model, <<http://www.adlnet.org/>>). These emerging standards provide for a vast range of access and linking options within and among documents. The notion of a "digital vending machine" (asset management with optional e-commerce) is inevitable.
5. *Campus Marketplace*, the newsletter of the National Association of College Stores, as quoted in Robert S. Lazich, ed., *Publishing by the Numbers* (Detroit: Gale Group, 1998), 133.
6. Statistical Service Center, *Book Industry Trends, 1999: Covering the Years 1993-2003* (New York: Book Industry Study Group, 1999).
7. Albert N. Greco, *The Book Publishing Industry* (Boston: Allyn & Bacon, 1997), 182.
8. Standard & Poors, "Industry Surveys: Publishing," May 25, 2000, 22.
9. See <<http://skyways.lib.ks.us/central/ebooks/libraries.html>> (accessed May 21, 2001) for a summary of library-based eBook activities.
10. Chan Jean Lee and Rosa Ren, "User Survey Results," Course Reader Purchase Preference Survey, School of Information Management and Systems, University of California–Berkeley, 2001.
11. California Digital Library, Joint Steering Committee for Shared Collections, "Ebook Task Force Report," March 2001, <<http://www.cdlib.org/about/publications/>> (accessed May 21, 2001).