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E-books in academic libraries: Challenges for sharing and use

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Abstract

This paper reviews the recent literature on e-book sharing and use in post-secondary libraries, exploring current restrictions on viewing, printing, downloading, circulation, and interlibrary loan. It also discusses the ways in which these restrictions influence the library lending of e-book readers and other mobile devices. The most fundamental problems include restrictive license provisions, proprietary software and file formats, digital rights management (DRM), and the single-user business model adopted by many e-book vendors.

Keywords

Digital rights management, e-book, e-reader, licensing, restrictions

Introduction

The real and perceived advantages of e-books are well known. In contrast, many students and faculty are unaware of even the most common restrictions on e-book access, sharing, and use. For example, readers of single-user e-books (such as those available through Amazon) may not be familiar with the restrictive license terms that govern the use of e-books in universities and other multi-user environments. In some cases, these restrictions are not readily apparent until after the e-book contract has been signed, when library patrons discover that they have trouble downloading files or printing more than a few pages of text.

This paper discusses the barriers to access and use that are most often encountered by e-book users in academic (post-secondary) libraries and other multi-user environments. It also examines the ways in which basic library operations, such as circulation management and interlibrary loan, can become far more difficult when e-books are involved. The goal of the essay is not to discourage the use of e-books, but to increase awareness of the challenges associated with e-book licensing and management, to provide support for library staff who need to justify their decisions to senior administrators, and to show the extent to which popular conceptions of e-books are supported (or not supported) by the scholarly and professional literature of the past several years.

The paper covers four main topics:

- the academic e-book landscape: early e-books, the current e-book market, and the acceptance and use of e-books by students, faculty, and librarians;
- restrictions on the use of e-books by library patrons: restrictions on viewing, printing, downloading and transferring files; digital rights management;
- restrictions on library circulation and interlibrary loan: restrictions on the number and type of users; other restrictions on circulation; restrictions on the use of e-books for course reserve and interlibrary loan;
- lending of e-book readers (devices) in academic libraries: proprietary software and file formats; the need for continual Internet access and the potential for withdrawal of content from users' devices; other considerations in the lending of e-book readers.

It concludes with a summary of the main points and a brief discussion of the ways in which librarians can respond to restrictions on the sharing and use of e-books.

Although e-books have been defined in a number of ways (Minčić-Obradović, 2011; Rao, 2005; Slater, 2010;

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Soules, 2009; Vasileiou et al., 2009), this discussion refers to book-length monographic (non-serial) works that are presented chiefly as text and intended for online delivery. Reference works and free e-books are excluded from the discussion, since they are exempt from many of the access restrictions described here.

This study is essentially a literature review. Relevant papers were identified chiefly through searches of LISTA (Library, Information Science & Technology Abstracts), LISA (Library and Information Science Abstracts), Library Literature & Information Science, Google Scholar, and WorldCat. The searches were designed to retrieve all records with subject headings for two key concepts: *e-books* and *academic libraries*. Journal browsing and citation tracing led to the discovery of additional studies.

More than 300 potentially relevant works were read and evaluated. Nearly 90 included material relevant to the study. Although the literature search was not limited to a particular date range, subsequent evaluation revealed that two-thirds of the relevant works were published in 2010 or later; more than 90% were published in 2005 or later. The relevant works—those cited herein—include 51 peer-reviewed articles, 14 articles in professional magazines such as *Information Today* and Library Journal, 11 articles in the popular press, 5 books or chapters from publishers such as Facet and the American Library Association, 5 professional reports from organizations such as Ithaka, and 2 government documents.

The academic e-book landscape

Early e-books

Vannevar Bush described the memex, a device much like a personal computer, nearly three decades before the first PC became available (Bush, 1945). Unlike most scientists, he focused not on the computational power of computers but on the possibility that they might one day serve as highly personal tools for the organization and storage of the books, articles, notes, and correspondence that individuals use in their daily lives. As Connaway and Wicht (2007) have noted, Bush's article in *Atlantic Monthly* may be regarded as the earliest description of an e-book.

Project Gutenberg, a collection of free online texts, was established in 1971. The Oxford Text Archive, the first large-scale digital repository of scholarly works, was developed five years later, and the first prototype e-book reader, Dynabook, was introduced at about the same time. Commercial publishers were late to enter the game, however; they did not begin to sell e-books until the late 1990s (Connaway and Wicht, 2007). NetLibrary, the first library e-book vendor, was founded in 1999. The company nearly went bankrupt in 2001 but was acquired by OCLC in 2002, then by EBSCO in 2010. Ebrary, established in 2001, originally sold e-books directly to end users but now operates solely as a library vendor.

Those who marvel at the predicted growth of the e-book market should recall that earlier predictions, equally marvelous, did not come to pass. In 2000, a well-known market research firm predicted average annual growth rates of 260% for the next several years (Hawkins, 2002). Two years later, the e-book market had collapsed. The makers of the Rocket eBook reader stopped production in 2003, shortly after claiming that 10,000 devices would be sold within the next six months (Tedd, 2005). As Hawkins (2002: 44) has noted, 'The e-book market is littered with the wreckage of failed ventures'.

The current e-book market

None of the early e-book suppliers has maintained a significant presence in the current consumer e-book market. Instead, the market is dominated by three distributors that did not even offer e-books until a few years ago—Amazon, Barnes & Noble, and Apple. Those three companies account for 58%, 27%, and 9% of consumer e-book sales, respectively (McCracken et al., 2011). By any measure, a new stage of consumer e-book marketing and acceptance has begun. E-books accounted for 2.7% of all US book sales in 2009 and for 5% in 2010 (Darnton, 2011; Holt, 2010; Kaser, 2010; Slater, 2010). Estimates of the annual rate of increase in sales are typically near 20% (Buczynski, 2010; Dillon, 2011; Just, 2007; Vasileiou et al., 2009).

Although Amazon and Barnes & Noble are the main companies selling e-books directly to consumers, neither has a strong presence in the library market. For e-books other than reference titles, the primary US library vendors are EBSCO (formerly NetLibrary) and ebrary (Library Journal, 2010; Primary Research Group, 2010). E-books, including reference titles, make up about 9% of the market for academic books (Sharp and Thompson, 2010).

Acceptance of e-books by students, faculty, and librarians

The major selling points of e-books are readily apparent to anyone who watches television commercials or reads popular magazines. The disadvantages of e-books are less well known, although a number of problems have been acknowledged. Table 1 shows the primary advantages and disadvantages of e-books from the perspective of the individual consumer. The points mentioned in Table 1 have been widely discussed in the professional and popular literature.

The advantages and disadvantages shown in Table 1 are those that might be experienced by an individual who has downloaded e-books for his or her personal use. Academic libraries face the same advantages and disadvantages, along with others that are specific to the multi-user environment. The tasks of identifying, selecting, and acquiring high-quality e-books, then making them available to entire communities—all while maintaining both security and

Table 1. Advantages and disadvantages of e-books, from the perspective of the individual user.

Access
+ Access at any time
+ Access from any place where there's an Internet connection
– Need for a display device
– Need for infrastructure (Internet connection, power) to support the display device
– Need for passwords or access codes specific to each platform or vendor
– Recurring expenses (platform charges, device-related expenses, etc.)
Portability
+ Capacity for multiple books on a single device
+ Light weight and small size, if an appropriate device is used
– Fragility of most display devices
– Need to recharge the display device, if a mobile device is used
Content
+ Updating of content
+ Inclusion of audio and video content
– Inability to show content produced in non-compatible file formats
– Instability of content due to frequent updating
Display
+ Availability of spoken-word output
+ Customization of display characteristics (fonts, etc.)
– Limited color range and intensity
– Lower contrast and resolution than print
– Need for multiple devices to support reading and comparison of multiple texts
– Page size limited by device size
– Poor resolution for compatible but non-native file formats (PDF, in particular)
Navigation
+ Hyperlinking, internally and from one document to another
+ Searchable full text
– Inability to flip through pages quickly
Annotations
+ Ability to share notes with other e-book users
– Limited annotation mechanisms (no drawings, diagrams, etc.)
Content-transfer capabilities
+ Ability to copy and paste text
– Difficulty saving entire documents
– Inability to transfer files from one device to another
– Limited or restricted ability to print
Environmental considerations
+ Reduced consumption of paper and binding materials
+ Reduction in environmental costs associated with shipping
– Increase in environmental costs associated with battery use
– Increased consumption of energy and of rare earth minerals

privacy—pose difficulties beyond those encountered by individual users.

Institutional data suggest that many students are reluctant to use library e-books (Dewan, 2012; Nyirenda, 2012). Of the 552 university librarians who responded to a 2007 survey, only 6% described their patrons' e-book use as *excellent*. In contrast, 22% described it as *poor* (Albanese, 2007). Two years after the introduction of e-books at University College Dublin, only 26% of students had used any title from the UCD collection of nearly 170,000 e-books (Pan et al., 2009). Likewise, 49% of students in the US, Italy, Hong Kong, and Canada have never used a library e-book (ebrary, 2008). Exploring the opinions of graduate students in the social sciences, Hoseth and McLure (2012) found a clear preference for print despite general awareness of the advantages offered by e-books.

Moreover, the effective use of e-books requires more than acceptance by students. E-books cannot be considered a success in the academic context until they have been integrated into the system of scholarly communication and information delivery—that is, until they have been accepted by authors, publishers, and librarians. However, a recent survey of more than 3000 American professors revealed that e-books are not central to the work of most faculty (Schonfeld and Housewright, 2010). Asked to rate the importance of 11 types of information resources for use in teaching and research, respondents ranked e-books last, after free web sites and the library catalogs of institutions other than their own. Only 12% of respondents reported that e-books were very important to their teaching and research. In contrast, free web sites were very important to 18%, and other libraries' catalogs were very important to 38%. Likewise, recent surveys suggest that most business faculty prefer print editions rather than e-books (Camacho and Spackman, 2011).

In 2007, 88% of university libraries owned or subscribed to e-books, and current estimates range from 94% to 97% (Albanese, 2007; Library Journal, 2010; Wilkie and Harris, 2010). At the same time, most libraries have been tentative in their acquisition of e-books, confining their purchases to textbooks, reference works, or particular subject areas (Vasileiou et al., 2012). In 2006, e-books represented just 5% of the titles held by US academic libraries, and e-books still account for only a tiny fraction of the new books acquired each year (Blummer, 2006; Dillon, 2011; Söderbäck, 2011). Among university libraries 60% spend less than 6% of the acquisitions budget on e-books, and only 5% spend 25% or more (Library Journal, 2010). Overall, librarians seem eager to acquire *some* e-books but reluctant to divert resources from their print acquisition programs.

Maxim van Gisbergen, product manager for e-books at Swets, has acknowledged that several factors hinder the acceptance of e-books by faculty and librarians: restrictive license terms, limitations on the use of e-books for interlibrary loan, and the absence of standardized access mechanisms (Wilkie and Harris, 2010). Librarians' own complaints are similar to those of van Gisbergen. Respondents at 364 US academic libraries highlighted several difficulties with e-books, including license

restrictions that limit usability (Library Journal, 2010). Other studies conducted in the United States, the United Kingdom, and Ireland have revealed similar problems (Albanese, 2007; Cox, 2004; Slater, 2010; Woodward, 2007).

Restrictions on the use of e-books by library patrons

E-book licenses are changing all the time, and many are negotiated confidentially by particular libraries or consortia. It is therefore not possible to provide an up-to-date enumeration of the terms offered by each e-book supplier. Nonetheless, the published literature does allow us to identify the most prevalent license restrictions.

Eschenfelder (2008) makes a distinction between restrictions on use (which prevent printing, downloading, and other functions) and restrictions on extent of use (which limit, for example, the duration of viewing, the number of pages that can be printed, or the number of machines on which the file can be stored). She also distinguishes between *hard restrictions*, which strictly prevent unauthorized use, and *soft restrictions*, which discourage the use of a particular function or eliminate the advantages that it would ordinarily provide. 'Soft restrictions are configurations of hardware or software that make certain uses … difficult—but not impossible—to achieve' (Eschenfelder, 2008: 208). The soft restrictions mentioned by Eschenfelder include:

- restriction by frustration: allowing users to print, save, or copy only a small amount of content in any one instance;
- obfuscation: hiding the icons, menus, or links that patrons must use to print or save content, or presenting those controls only when specific actions have been performed first;
- interface omission: omitting the controls that would normally be used to perform a function but allowing that function through other means—omitting the Print button and the Print menu option but allowing the use of Ctrl-P, for instance;
- restriction by decomposition: allowing users to save a document only as a collection of related files—not as a single file;
- restriction by warning: presenting messages that threaten administrative or legal action when certain functions are attempted, sometimes even when the function is not actually prohibited by the license agreement.

Restrictions on viewing

Many e-book licenses place limits on the amount of content that can be viewed by users, either during a single session or during the term of the contract (Price, 2011). For example, some McGraw-Hill e-books have a lifetime limit on the number of page views, generally equal to four times the number of pages in the book—'so in a 100-page book, a reader can look at one page 400 times, say, or all the pages four times' (Carlson, 2005). Nabe et al. (2011) note that even multi-user e-book licenses sometimes limit the amount of content that can be viewed by any particular user. Other common restrictions include limits on the number of pages that can be viewed during a single session.

Restrictions on printing

Restrictions on printing most often limit the number of pages that can be printed in a single print job, during a single session of use, during a particular month, or during the term of the e-book license. Under the original NetLibrary model, printing was limited to just one page at a time (Hodges et al., 2010). That policy persisted from 1999 through 2004, even after several other publishers and aggregators began to allow the printing of one chapter at a time (Coleman, 2004). Current e-book licenses from EBL (Ebook Library) allow patrons to print no more than 20% of any one book (Macicak and Schell, 2009). Users of Adobe eBook titles from Cambridge University Press face even more restrictive limits—20 pages within any 30-day period (Vasileiou et al., 2009).

Price (2011) describes some of the ways in which library patrons have tried to circumvent these limits on printing. For instance, some users will print one chapter, then log out of the session, clear the browser cache, or move to a different computer in order to print the next chapter. Likewise, patrons viewing e-books on hand-held devices can 'print' multiple pages by placing the device on a photocopier as if it were a sheet of paper (Neujahr, 2011). This process, while cumbersome, is sometimes the only way to generate hardcopy pages from mobile devices.

Restrictions on downloading and transferring

Many e-books reside only on the distributor's server and are loaded onto the user's machine in sections as he or she views successive pages through a proprietary web interface. These e-books cannot be downloaded at all, in the usual sense. That is, there is no way to save a file that contains any substantial portion of the e-book (Price, 2011). This type of no-download policy applies to many e-book licenses. (See, for example, Macicak and Schell, 2009.) In other cases, users can download only a few pages at a time (Eschenfelder, 2008; Wu and Chen, 2011). Download limits are often expressed in pages per file, pages per session, pages per user, or pages per e-book. There is wide variation in publishers' attitudes toward the downloading of e-book files. Overall, titles purchased directly from publishers tend to have the fewest restrictions, perhaps because publishers are more confident than other distributors in

their ability to detect acts of piracy (Morris and Sibert, 2011; Stern, 2010).

Of course the point of downloading files is often to transfer them from one machine to another. Unfortunately, many e-book licenses expressly prohibit the transfer of files. For instance:

> a downloadable electronic book published by McGraw-Hill 'locks' itself to the computer on which it is installed. So a student who downloads a textbook to a dorm-room computer will not be able to read the book on computers at the library or at his or her parents' house. (Carlson, 2005: 35)

This situation is especially likely to prevail when the e-book requires a proprietary e-reader device. In other cases, files can be transferred between machines but not between user accounts.

In perhaps the most far-reaching example of a transfer restriction, several major trade publishers have agreed to license e-books for use only on the physical premises of the subscribing library (Dillon, 2011). Of course this defeats the purpose of library lending, since patrons are prohibited from checking out e-books to read in their homes or elsewhere. As Dillon (2011: 10) has stated, this policy

> causes more problems than it solves and is the latest example of an uncertain publishing industry trying to hold off the effects of changing technology through policy or legislation rather than through adapting to circumstances, recognizing opportunities, and pursuing solutions that grow the market.

In some cases, the restrictions imposed by e-book distributors are not even communicated to users. In 2009, Amazon allowed customers to download each e-book only a limited number of times (i.e. to a limited number of devices) before a new purchase was required. However, they did not systematically inform users of the download limit (Drinkwater, 2010). Consequently, users were unaware of the restriction until their limit was exceeded and they could no longer download the book.

Copying, pasting, and emailing—alternative ways of downloading content—are also disallowed by many e-book licenses. Users of EBL e-books may copy and paste no more than 5% of the text from any one title (Macicak and Schell, 2009). Likewise, users of Adobe eBooks may copy just 20 pages within any 30-day period (Vasileiou et al., 2009). A common restriction prevents users from copying too many rows of data from a table, and some suppliers altogether prohibit the copying of tables and figures (Eschenfelder, 2008; Price, 2011).

Digital rights management

Arguably, the technological advantages of e-books are likely to be realized only to the extent that publishers and distributors can profit from them. Publishers are ultimately interested not in disseminating information, but in limiting access in ways that generate revenue. Consequently, most e-book providers have adopted technological methods of restricting e-book use. As Slater (2010: 305) has noted, 'Many of the unexpected limitations [patrons] encounter when using e-books are not inherent to the format. Most often, they are purposefully imposed limitations tied to digital rights management techniques'.

Digital rights management (DRM) refers to the technological restrictions that prevent users from carrying out activities that publishers or distributors want to prohibit (Delquié and Polanka, 2011). DRM restrictions are not always made clear to users (Drinkwater, 2010). Moreover, most licenses allow vendors to respond unilaterally to perceived breaches of the license terms. 'The trigger event could be something as simple as a class of students browsing an e-book faster than is permitted' (Nabe et al., 2011: 196).

In one sense, DRM is simply a more effective means of upholding license provisions and preventing copyright infringement (Zimerman, 2011). The fundamental difference between DRM and other enforcement mechanisms, however, is that DRM provides no recourse for users who disagree with the vendor's interpretation of the license terms. In the print environment, publishers carry the burden of demonstrating that their rights have been infringed. In the digital environment, users carry the burden of demonstrating that publishers' restrictions on use are contrary to the license terms. In practice, this means that DRM gives publishers the initial ability to limit use however they choose. The software may not allow printing, for example, even if the license agreement places no restrictions on printing. In that situation, the user has the legal and practical burden of convincing the publisher (or the courts) that printing is allowed by the license agreement. Even widespread DRM restrictions are sometimes contrary to the law. For instance, the *Copyright, Designs and Patents Act* allows for preservation-related copying as well as the reformatting of texts for use by individuals with disabilities (Clay, 2011). However, both these tasks are nearly always prevented by DRM restrictions. 'Security measures such as DRM can thus be seen as curtailing some important library functions that are legally permissible in the U.K.' (Clay, 2011: 190).

Moreover, attempts to bypass the limitations of the software through technological means are specifically prohibited by the anti-circumvention clauses of the EU Copyright Directive (European Parliament, 2001) and the *Digital Millennium Copyright Act* (US Congress, 1998). These directives make it illegal to attempt to avoid, bypass, remove, deactivate, or impair the security features designed to restrict the use and sharing of digital content.

Restrictions on library circulation and interlibrary loan

As noted earlier, libraries and other multi-user information agencies face restrictions in addition to those that govern

the use of e-books by individual consumers. These restrictions on sharing and use often impinge on the fundamental mechanisms by which libraries make information available to patrons.

Restrictions on the number and type of users

Perhaps the most common institutional use restriction is a limit on the number of users who can view a single e-book at any one time (Nabe et al., 2011; Price, 2011; Tedd and Carin, 2012). The original NetLibrary business model established a 'one user' policy that has since been adopted by many, but not all, e-book distributors (Hodges et al., 2010). For instance, MyiLibrary restricts the number of simultaneous users while ebrary does not (Zhao and Zhao, 2010). Limits on the number of users often reflect the desire to sell multiple copies of each e-book. As Coffman (2012: 21) has pointed out, publishers fear that library circulation of e-books—'giving away free copies'—'could cannibalize potential sales of those same titles'. However, at least one publisher has stated that their one-user restriction was instituted to avoid overtaxing their computer system (Nabe et al., 2011).

On the surface, the one-user rule appears no more restrictive than the single-user limitation inherent in the borrowing of a printed book. However, most e-book licenses require users to give up copying rights that would otherwise be theirs under English or American law (Clay, 2011; Rao, 2005). For instance, the Educational Use provision of US copyright law gives faculty a limited right to make multiple copies for in-class use. Most e-book licenses include no such provision.

Likewise, many e-book licenses allow for use only by currently enrolled students, faculty, and staff, thereby excluding community (walk-in) patrons (Ball, 2005; Connaway and Wicht, 2007). This can be a significant problem, especially at state universities and other institutions that have a duty to serve the community at large. This license provision may also require libraries to purchase, implement, and maintain technological methods of access restriction that would otherwise be unnecessary.

Other restrictions on circulation

Some e-book licenses limit the total number of times any title can be viewed. Vendors may require additional payments or even cut off access completely when that limit is reached (Hadro and Kelley, 2011; Macicak and Schell, 2009; Nabe et al., 2011). The most notable example is that of HarperCollins. In February 2011, HarperCollins announced that new institutional e-book licenses would allow no more than 26 circulations per book. That limitation reflects the publisher's wariness about e-book licenses that provide unlimited access for an indefinite period of time (Goldberg, 2011). Essentially, HarperCollins was dissatisfied with the terms that have governed the sale and use of printed books in the United States since 1908 (*Wikipedia*, 2012b). As their representative stated:

> We have serious concerns that our previous e-book policy, selling e-books to libraries in perpetuity, if left unchanged, would undermine the emerging e-book ecosystem, hurt the growing e-book channel, place additional pressures on physical bookstores, and in the end lead to a decrease in book sales and royalties paid to authors. (Bosman, 2011: A1)

By April 2011, the 26-circulation limit had led at least three library consortia, representing 193 libraries, to stop purchasing HarperCollins e-books (Hadro and Kelley, 2011). Perhaps in response to the HarperCollins situation, Random House announced in February 2012 that they would not place any limits on e-book circulation. However, that announcement was accompanied by a price increase for library e-books (Eberhart and Harris, 2012).

E-book circulation is also constrained by the fact that many patrons have difficulty checking in e-books (releasing them for use by other patrons) when they have finished using them. With many e-book platforms, the procedure for returning an e-book is convoluted and non-intuitive (Hodges et al., 2010). As a result, an e-book needed by one patron may be inaccessible because the item is still checked out to another patron who is no longer using it.

Restrictions on course reserve and interlibrary loan

Many publishers and aggregators prohibit the use of e-books in course packs or as reserve readings for courses (Breeding, 2011; Hodges et al., 2010; Nabe et al., 2011). Even when such uses are not expressly prohibited, limits on the number of users often achieve the same effect.

Likewise, many licenses limit or prohibit the use of e-books in fulfillment of interlibrary loan (ILL) requests. Of the 101 US libraries that gave answers other than *don't know* in response to a 2010 survey, more than half reported that none of their e-book licenses permit interlibrary lending (Frederiksen et al., 2011). Many providers of e-books impose an outright ban on ILL, while others greatly restrict the amount of material that can be used, or the ways in which it can be delivered (Connaway and Wicht, 2007; Hodges et al., 2010; Minčić-Obradović, 2011; Morris and Sibert, 2011; Nabe et al., 2011). Some vendors allow the use of individual chapters for ILL, but only if the pages are first printed, then scanned and faxed or emailed—a procedure that is especially difficult if there are limits on the number of pages that can be printed during any one session. Of course this is an attempt to make the process more cumbersome, and to limit the extent of interlibrary lending, by mimicking the steps that might be followed in the print environment. As in many other instances, the limitations imposed by vendors negate the advantages that e-books might otherwise provide.

Lending of e-book readers in academic libraries

In a recent large-scale survey, 84% of US academic libraries reported that patrons 'most often' use their own desktop or laptop computers to read library e-books (Library Journal, 2010). The other devices used for e-book reading include library computers (70%), portable devices other than dedicated e-book readers (22%), and e-book readers (12%). (Respondents could select multiple options.) E-book readers (e-readers) may be growing in importance, however, due to the strong marketing programs of the major e-reader vendors.

In 2010, 12% of American academic libraries circulated e-readers with pre-loaded e-book files (Library Journal, 2010). Likewise, 17% owned one or more e-readers, which may or may not have been made available for circulation outside the library (Primary Research Group, 2010). By November 2009, at least eight well-known academic libraries—Duke University, North Carolina State University, Oxford University, Princeton University, Simmons College, Texas A&M, the University of California, and Yale University—had begun to lend Kindles to library patrons (Rodzvilla, 2009).

The restrictions associated with e-book licenses apply to e-book readers as well. Those restrictions are a significant barrier to the adoption of e-readers in public, school, and academic libraries (Dougherty, 2010). Moreover, several authors have identified additional difficulties (discussed below) that are either unique to e-readers or especially problematic when e-readers are used.

Proprietary software and file formats

Many e-readers use exclusive, proprietary formats; they are optimized for a single format that cannot be read by any other type of e-reader. For instance, Kindle's Topaz format works only on the Kindle (Drinkwater, 2010). Some modern e-readers do support multiple file formats. As of May 2010, for example, the Kindle can display several formats other than Topaz (Quint, 2010). However, most e-readers rely on conversion software for the translation of non-native formats—software that does not always provide a complete and accurate rendition of the original file. As Dillon (2011) has noted, the loss of formatting can have a major impact on certain kinds of text. In addition, some file formats cannot be loaded onto the same reader as other formats. For example, the documentation for the CyBook Gen e-reader notes that 'For legal reasons Mobipocket and Adobe DRM cannot co-exist in the same device' (Drinkwater, 2010: 7).

Moreover, many of the e-book formats commonly used by academic libraries are not compatible with *any* e-reader. Of the 50,000 e-books acquired by Aalto University in Finland, 83% are in formats not compatible with the Amazon Kindle, the Sony Reader, or any of the other three e-readers that the library staff evaluated (Aaltonen et al., 2011). For example, no major e-reader can display the e-books that the University has acquired from library vendors such as ebrary, Safari, and dawsonera.

New mobile devices are released so often that any particular e-reader is likely to be out of date in just a few months (Drinkwater, 2010; Massis, 2010). This is a particular problem for libraries that hope to market themselves as high-tech information environments. The two e-book platforms highlighted at a 1999 library conference, RocketBook and SoftBook, both ceased production in 2003 (*CNN Money*, 2010; McLaren, 2000). While RocketBook and SoftBook were once industry leaders, neither format is supported by any e-reader introduced since 2004 (*Wikipedia*, 2012a). As Gall (2005) has noted, librarians' interest in maintaining long-term access to content is sometimes at odds with e-book vendors' interest in short-term consumer demand. The fundamental problem is not the loss of any particular e-reader, but the fact that so many e-readers use proprietary formats. The removal of an e-reader from the market too often signifies the loss of all the e-books that were issued in that format.

Reporting on the growing popularity of small laptops and multi-purpose devices such as the iPad, Drinkwater (2010) raises an interesting possibility: the disappearance of all dedicated e-readers over the next few years. That might be an advantage as far as e-books are concerned, since it has the potential to encourage standardization and to reduce the number of proprietary file formats. At the same time, major players in the consumer e-book market can be expected to oppose any such development.

Internet connections and the withdrawal of content from users' devices

Most e-book distributors maintain permanent control over the content that is loaded onto users' devices. In many cases, the entire e-book file never resides on the user's machine. Instead, sections of text are loaded as they are read (Aaltonen et al., 2011; Zinn and Langdown, 2011). E-book readers appear to hold so many books simply because only a few of the licensed e-book files are present on the device at any particular time. Consequently, most e-readers require continual access to the Internet in order to function. Scott (2010), testing the Amazon Kindle, the Barnes & Noble Nook, and the Apple iPad, found that none of those e-readers could function at his cottage in rural North Carolina.

Just as each device downloads content from the vendor's server, the vendor's server can remove content from the user's device whenever an Internet connection is made. Vendors therefore have the ability to remove or alter e-book files even after they have been delivered to the consumer. In many cases, they also have a legal right to alter or

withdraw files from the user's device without his or her permission (Stone, 2009). In July 2009, Amazon removed Orwell's *1984* from the Kindles of customers who had downloaded the MobileReference version of the book, since MobileReference had not secured the rights to distribute the work. Unfortunately, Amazon deleted the e-book without notifying the customers who had downloaded it (Johnson, 2009). Amazon's action was legal, since the 'purchase' of an e-book is not a purchase at all. Instead, it is a lease that gives the consumer limited rights to use the e-book in specified ways. As Scott (2010: 30) has pointed out, vendors maintain legal ownership of the e-book, which 'can be taken back [anytime] you connect up with the network'.

Other considerations in the lending of e-book readers

E-books designed for use with desktop or laptop computers are generally acquired through institutional licenses that allow for annual access, perpetual access, or access on a pay-per-use basis (Silberer and Bass, 2007). In contrast, e-books that load onto e-readers are almost always intended for use by a single, individual user (Kirchhoff, 2011; Savova and Garsia, 2012; Zinn and Langdown, 2011). For example, each Kindle e-book file is linked to a particular e-reader and cannot be transferred to any other device (Berry, 2011). This poses major problems for libraries, since it effectively ties each book (each file) to a single physical object that contains many other files. The end result is the same as if several hundred books were bound together in a single print volume. With e-readers, the patron checks out not a single title, but several hundred titles, thereby removing all of them from circulation.

A few libraries have found ways to bypass the single-device restriction. For instance, Penn State University has developed an elaborate procedure to make their 100 Sony E-book Readers function in the library environment (Behler and Lush, 2011). They use two dedicated computers and 18 virtual machines to supply content to their 100 e-readers. To circumvent Sony's individual (end-user) billing, the library staff created a single email account with 20 aliases, acquiring and paying for each e-book through one of 20 individual user accounts. In another project, librarians at McGill University found a way to remove each borrower's authorization when the e-reader was returned so that subsequent users could re-authorize the device and download new content (Savova and Garsia, 2012). Unfortunately, the library staff found no way to prevent each machine from displaying information about the patron who last used the device. (For additional case studies, see Thayer et al., 2011.)

The acquisition of e-books for e-readers poses additional difficulties, since the processes used by Amazon (for instance) are not well suited to the needs of institutional customers. As Cook (2011) has demonstrated, even basic operations such as generating invoices and paying sales tax can be difficult when libraries (and universities' accounting offices) are forced to adapt their workflow to a business model intended for single-user downloads and payments. For example, the staff at Oregon State University purchase e-books from Amazon using $250 gift cards, loading each title onto a particular Kindle device (Sapon-White, 2012).

Cataloging is a problem as well. In fact, most academic libraries that lend Kindles do not formally catalog the devices or the titles loaded onto them (Rodzvilla, 2009). Instead, many have established web pages that list the available titles and the devices on which they reside. That may be acceptable—or not—when the e-book collection is small, but it is hardly a substitute for the cataloging of individual titles. At Texas A&M University, the library provides no discovery mechanism for e-books; patrons have no way of knowing which titles are already included in the collection (Clark, 2009). Instead, e-book lending is handled much like interlibrary loan. Titles are acquired only in response to patrons' requests, and each title is downloaded to the Kindle that the patron intends to use. Each patron may request three titles at a time, keeping the device with those titles for two weeks.

Additional processes must be completed each time an e-reader is returned. Library staff must ensure that the device is recharged, of course. In addition, any notes or bookmarks added by the user must be removed before the e-reader is checked out to the next patron (Kiriakova et al., 2010). Unfortunately, most e-readers provide no mechanism by which individual users can save their annotations in a multi-user environment.

Conclusion

The use of e-books in academic libraries is fundamentally different from the use of e-books by individual consumers. Colleges and universities face a number of significant challenges when adopting e-books on a large scale. Among other things:

- Many institutional e-book licenses place major restrictions on the viewing, printing, saving, transferring, and copying of files by individual library patrons. Some are *hard restrictions*, which prevent unauthorized use, while others are *soft restrictions* that discourage the use of a function or eliminate the advantages it would otherwise provide.
- Digital rights management, instituted by publishers and vendors to prevent the unauthorized use of e-books and other online materials, shifts the burden of proof from vendors to users. Instead of requiring publishers and vendors to demonstrate that violations of copyright have occurred, the law now requires users to prove that certain kinds of use (viewing, printing, saving, etc.) are permissible.
- E-book licenses restrict not just the activities of individual patrons, but the ways in which e-books

can be circulated and shared by university libraries. Common restrictions include limits on the number of simultaneous users; prohibitions on use by community (walk-in) patrons; limits on the number of times any particular title can be viewed; and limits on the use of e-books in course packs, as reserve readings, and in fulfillment of interlibrary loan requests.

- The lending of e-book readers is subject to additional restrictions, many of which arise from attempts to adapt single-user licenses to the multi-user environment. Proprietary software and file formats are especially challenging, since they make e-book access contingent on the sustainability of formats that may be obsolete in years or even months.
- E-book readers require continual access to the Internet—access that gives vendors permanent control over the content that has been downloaded to users' devices. Many licenses grant vendors the right to alter or withdraw files without notifying the customer.
- The management of e-book readers requires an extensive investment in staff time and equipment, much of it employed in attempts to provide multi-user access while adhering to single-user license restrictions.

Overall, restrictions on sharing and use are among the most important barriers to the large-scale adoption of e-books in academic libraries (Armstrong and Lonsdale, 2005).

Responding to restrictions on sharing and use

The most direct methods of responding to license restrictions are to acquire e-books from vendors that place the fewest restrictions on use, to work with other libraries and consortia to negotiate favorable license provisions, and to avoid acquiring e-books altogether if no vendor can supply them on acceptable terms.

In some cases, librarians can also educate faculty and students about the use of e-books in the academic environment. This is especially true in the case of textbooks, which are generally chosen by course instructors rather than librarians. At the author's institution, students using a popular McGraw-Hill textbook could choose between two license options: *downloadable version* (the e-book can be installed on just one particular computer/device but may be viewed any number of times from that machine) or *online viewing* (the e-book may be accessed from any computer/device, but only for a limited—and unknown—number of times). The instructor and the students soon discovered that neither license option was acceptable, and the library ended up buying several print copies to place on course reserve.

A fundamental problem is that e-book suppliers seem unwilling to adopt the practices that have proven successful in the e-journal marketplace. The largest journal publishers have generated record profits by distributing articles in a format (PDF) that allows users to print and transfer files without restriction. In contrast, most e-book suppliers continue to build restrictive, proprietary interfaces designed to prevent users from gaining the full benefits of e-book technology (*Economist*, 2012). Of the larger academic publishers, only Springer is notable for distributing e-books in PDF format without DRM restrictions (Ashcroft, 2011).

Unfortunately, many librarians seem to have grown accustomed to extensive restrictions on use. When e-books were first introduced to students at the University of Liverpool in 2006, 'users disliked digital rights management (DRM) intensely. [They] expected to be able to view, download and print e-book chapters just as they already did with e-journal articles: as DRM-free PDF files' (Bucknell, 2010: 126). Just a few years later, however, most librarians had accepted a wide range of restrictions. As Eschenfelder (2008: 219) has noted,

> If librarians do nothing to protest these restrictions, they give implicit consent that the use restrictions are acceptable. Librarians have advocated for other interface issues like accessibility; they should also advocate for removal of use restrictions, or encourage new vendors to offer competing restriction-free products.

We should remember that customers—not suppliers—determine the success or failure of any business model, and that larger libraries and consortia may have the economic influence to negotiate favorable license terms. As a group, librarians can decide whether barriers to e-book use and sharing remain in place, but only if we spend our money in ways that are consistent with our expectations and requirements.

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