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E-Book Technology in Libraries: An Overview

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Abstract

The shift towards electronically mediated texts entails major structural issues for libraries and the publishers and aggregators who supply them. Stakeholders within the digital supply chain are struggling to re-conceptualise the book as artefact (Esposito 2003). Academic and scholarly libraries are at the forefront of these changes and many are preparing for a significant shift from physical to electronic material presentation within the next few year. Within this context, we review some recent developments in the technology underpinning e-books, evaluate a number of e-business publishing models and introduce some of the key players.

Keywords: e-book, e-business publishing model, e-book devices

1. Introduction

Libraries have traditionally played a key role in providing access to and disseminating information across a community. That role has now been extended to facilitating access to innovative technologies. Technological improvements such as Amazon's 'Look inside the Book' technology and Google Print's offering of book pages via the web further accelerate demand for access (The Economist 2005). Such developments generate pressures on libraries to make research output more widely available through search engines and open access mechanisms which in turn result in rising accessibility of research material via downloads and citations (Rosenzweig 2005). Electronic access in

the form of electronic journal subscriptions, e-books and databases has resulted in the rapid and continuing evolution of library facilities.

In this paper we refer to studies from public libraries across the globe showing on-going experimentation with a variety of e-book devices. Academic libraries have had (and continue to undergo) a dramatic shift to online resources, reflected in the percentage of their budget allocation dedicated to the provision of digital resources[1]. Hence a review of current provision of electronic resources in libraries is both timely and likely to be of value to both librarians and the academic community more generally.

2   Engaging with E-Book Technology

The term 'e-book' is unsatisfactory in many respects. In the case of traditional print books, users can immediately understand and identify elements belonging to book technology. By contrast, the term e-book does not explain either the form or its operations (Lynch 2001 p125). Endeavouring to understand the term 'e-book' a little better, the Electronic Book Exchange (EBX) draft defines an eBook as a digital object which is the electronic representation of a book; adding that, although an e-book may consist of as little as a single page, it is normally thought of as an electronic analogue of a multi-page hardcover/paperback book (EBX 2000). The Online Information Exchange (ONIX) is "the international standard for representing and communicating book industry rich product information in electronic form between business partners in the supply chain" (Medra 2002) and identifies three e-book entities (Mooney 2000):

- E-book content: a package of text and other content a publisher puts together to be realised in one or more e-book formats

- E-book rendering: a realisation of an eBook content package in a particular format for a particular eBook reader or family of readers, whether for downloading for local use of by remote online access

- E-book component: a portion of text or other content which is used or available to be used in electronic form as part of an e-book content package (ONIX 2000).

As a generalised term, 'e-book' was initially applied to three types of appliances: e-book, e-tablet and Personal Digital Assistant (PDA). Only their design, purpose and size distinguished them from software book readers. Tables 1 and 2 illustrate the range of hardware and reading software available at the time of writing, making clear the general similarity of the products available at that time. Even the most recent of these offerings, the Sony Reader (touted as revolutionary by its designers) does not appear dramatically different from its competitors.

Table 1 lists e-book devices available in 2005/2006.

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[1] For example, US libraries have experienced a 227% increase in serials expenditure since 1986 - an average growth rate of 7.7% per annum (ARL Statistics 2001–2002). Australian academic libraries mirror this pattern. The University of Western Australia has switched 70% of its journal subscriptions to electronic resources (Kennewell 2005) and data from the national Australian Catholic University shows exponential growth rates in library expenditure on e-book subscriptions (personal communication, H Pearsall, ACU Nov. 2005).
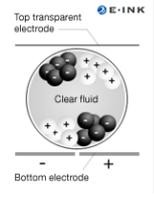
Table 1: e-book reader devices

Device	Example Image	e-book Format	Weight	Size	Screen
Sony Reader		BBeB Book / Adobe® PDF / JPEG / MP3	8.8 oz.	6.9" x 4.9" x 0.5"	6" "electronic paper" display SVGA 800x600
Franklin e-bookMan		Mobipocket	6.5 oz.	5.17" x 3.39" x 0.67"	240 x 200 pixel LCD
Gemstar e-book		Gemstar e-book	17 oz.	5" x 7.5" x 1.5"	4.75" x 3" Monochrome Back lit Touch screen
Handheld PC		Palm Reader Mobipocket	1.1 lbs	7.44" x 3.74" x 1.34"	6.5 in color LCD display 640 x 240 px on screen
Handspring Visor		Palm Reader Mobipocket	5.4-6.9 oz.	4.8" x 3" x 0.7"	about 3"x4", some color, some not
hie-book		hie-book	8.8 oz.	4.5" x 5.7" x 0.67"	Back lit 480 X 320 px touch screen LCD display
Palm		Palm Reader Mobipocket	4-6 oz.	4.82" x 3.1" x 0.87"	Advanced LCD with backlight
Pocket PC		Microsoft Reader Mobipocket	6-16 oz.	Depends on device	Reflective or Transflective LCD, 16+ colors

(adapted from e-book Mall 2005: http://www.e-bookmall.com/knowledge-collection/device-comparisons.htm – accessed 30 Jan 2006)

Reader software can be categorised by e-book format (for example Adobe PDF, HTML and Microsoft readers are examples of e-book document formats). Table 2 lists a reasonably representative selection of different e-book software formats.

Table 2: e-book reader format

Format	Advantages	Reader Software	Navigation	Images	Platforms
	Reading experience similar to paper - high contrast/ resolution, viewable in direct sunlight, at a nearly 180º angle, requires no power to maintain image.	Sony E-Ink ® technology enables access to: BBeB Book / Adobe® PDF / JPEG / MP3	Library, Table of contents, Chapter links, bookmarkable	Yes + MP3 music files	Sony CONNECT ™ allows access to books from Windows or Macintosh platforms
	Cross-platform compatibility, printable, single or double page view		Library, Table of contents, Chapter links, bookmarkable	Yes	Windows PC, Macintosh, Palm
	Dedicated reader for e-books, carry titles with you		Library, Table of contents, bookmarks	Yes	Gemstar & Rocket e-book devices
	Dedicated reader for e-books, includes lots of other programs		Library, Table of contents, bookmarks	Yes	hie-book devices
	Easy to use, customizable, can be read on anything with a browser		Hypertext links	No	Windows PC, Macintosh, Linux, Unix, Palm, Pocket PC, e-bookMan
	No special reader software required (Internet Explorer), easy to use		Hypertext links	Yes	Windows PC
	ClearType Display, book-like reading environment, bookmarks and annotations		Library, Table of contents, Chapter links, bookmarkable	Yes	Windows PC, Pocket PC
	Familiar environment, printable, resize text		Hypertext links	Yes	Windows PC, Macintosh
	Can be used on any PDA		Library, Table of contents, Chapter links, bookmarkable	Yes	Palm, Pocket PC, e-bookMan, Windows PC
Text	Very simple and plain, can be read on just about anything, printable		None	No	Windows, Macintosh, Linux, Unix, Palm, Pocket PC, e-bookMan

Format	Advantages	Reader Software	Navigation	Images	Platforms
palm	Can be used on any PDA	palmreader MOBIPOCKET Reader	Library, Table of contents, Chapter links, bookmarkable	No	Palm OS, Pocket PC, Handheld PC, Windows CE, Windows PC

(adapted from e-book Mall 2005: http://www.e-bookmall.com/knowledge-collection/format-comparisons.htm – accessed 30 Jan 2006)

2.1 E-books in Public Libraries

The period between 1999 and 2001 saw a surge in e-book reader trials in libraries in the United States, Canada, Denmark, Norway and Australia[2]. Responses to trials of e-book reader hardware in Australia, Canada and the US, from pilot group users and librarians alike, were overwhelmingly positive (Wilkins et al 2001). In Australia, user-participants in the Brisbane Public Library e-book reader pilot study enjoyed the compact, portable nature, adjustable font size, dictionary; and search and book mark functions of dedicated e-book readers; and the librarians were keen to showcase the new technology. Many saw the readers as an opportunity to expose their community to technology as it *'came down the pipeline'* (Wilkins et al 2001).

A generic feature of rapid technological change is the proliferation of designs, many of which will inevitably fail over time (Bijker 1995). At a time when proprietary platforms dominated the marketplace, librarians found it difficult to make decisions about which device to select, which text format to choose; and what copyright arrangements to take up. Librarians who had pioneered e-book reader technology trials in multi-year pilot projects found themselves tied to restrictive access models with exclusive proprietary book file formats[3]. Such formats, which can become obsolete at any moment, restrict the uptake of and support for e-book reader hardware. The limited range of titles available on the hardware also meant their appeal to borrowers faded over time (Lynch 2001). By 2005 a number of these early adopters had concluded that 'dedicated readers with pre-loaded content were not what patrons most wanted in an e-book'[4].

The introduction of software book readers which operate on general-purpose computers and require no additional financial outlay for a separate hardware device or book reading appliance has effectively turned the desktop or laptop into a book reading device, although this means that reading must be undertaken while sitting in front of a computer –

not as convenient an experience as 'traditional' reading, which can take place anywhere. Many of the users accessing texts electronically on general-purpose computers appear to be doing so in academic and research library settings, where convenience is a less important issue; and where access to a wide range of material is particularly important and time-critical.

A breakthrough technology from Sony has the potential to 'move the goalposts' for e-book uptake and acceptance. The Sony Reader™, launched at the Consumer Electronic Fair in Las Vegas in January 2006,

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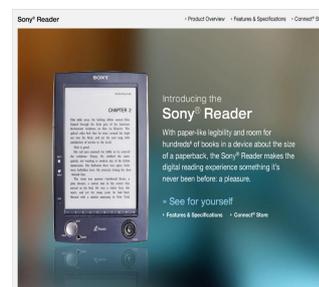
[2] For example, Maricopa County Public Library in Phoenix, Arizona had 100 Rocket e-Book Pro readers available for loan in 2001 (Wilkins et al 2001).

[3] Table 2 shows that the majority of e-book reader formats currently available are no longer restricted to proprietary platforms.

[4] Personal communication: M Williams, Indianapolis-Marion County Public Library US, Nov 30th 2005.

replaces the traditional LCD device with electronic paper. Sony believes that this dedicated e-book device may well do for consumption of books by the general public what the iPod has done for consumption of music. The Reader, which is about the size and weight of a small paperback book, displays its text on a page of high-resolution electronic paper using Sony's proprietary E-Ink™ format (Sony 2006). The Reader can hold up to 80 books at a time and e-books can be downloaded from about 10,000 titles at CONNECT, Sony's online store (where books out of copyright can be downloaded without charge). It remains to be seen whether the quality of the resolution and ease of use of the Reader will outweigh the proprietary nature of this device (Sony's previous attempts to restrict access to their own proprietary format, as with the Beta video format, have not proven successful). If consumers take up Sony Readers with the same enthusiasm they have shown for iPods, however, public access to e-books (in libraries as well as from home) may increase exponentially.

2.2 E-books in Academic and Research Libraries

'Our customers expect electronic content'   (Woodward, 2005)

Academic libraries are particularly well-suited to the e-market with their large, expensive and rapidly dated reference books, which are costly to weed out (Michael 2005). While all librarians have a professional commitment to efficient document delivery and place priority on offering the content their users require, librarians in research settings are under significant additional pressure to seek optimal methods for: providing access, disseminating, receiving and reporting publications. Students have now come to expect free internet access on-campus; and part-time students require remote, 24/7 access via private ISPs, while researchers place priority on speed, timing and having the latest in cutting-edge technology[5]. Institutional requirements for the library to provide information in a cost-effective way add to these pressures from competing constituencies.

Electronic delivery systems appear to offer solutions to many of these requirements and differing needs. Online search functions, easier navigation, the ability to cut and paste, well-organised and up-to-date materials, convenience (no carrying of books), paper-saving and lower levels of physical maintenance are all attractive features of e-book provision. A further major attraction (perhaps the most important of all) is the much wider potential access which a move to e-books might be able to bring about. For academic libraries, in particular, reader access to conference proceedings and a broader range of academic journals is a very attractive feature of these new technologies (provided, of course, that conference organisers and journal publishers make their material available in this way).

These features of the research constituency favour electronic delivery and thus offer a partial explanation for the dramatic growth in e-resources as a proportion of academic library budgets. Underpinning the drive for uptake is the fact that electronic publishing has transformed the book into a digital *product* and thus into a market offering. The potential for expanding this market underpins the considerable economic interest in e-books amongst publishers and aggregators.

[6] A prime example of such researcher-driven demand is the members of medical faculties who - on an individual basis - typically rate as the highest users of electronic resources (Kennewell 2005).

3   Changing Business Models in E-Publishing

Many of the authors writing about evolving business models in the area of digital content take a value-chain oriented approach to identifying the roles and responsibilities of the content providers (see, for example, Eisenmann 2002; Farhoomand and Lovelock 2001; Wirtz 2001; Niewiarra 1999; Rayport 1999), identifying the contribution(s) made by the various stakeholders primarily in terms of what they contribute to the value chain – and at which level. Woessner (2001) distinguishes the media products value chain from the general B2B eBusiness value chain, because it is concerned with: generating ideas, editing those ideas to create utilisable content, production of media products, the copying of these products; and, ultimately, with the distribution of the products themselves. Content providers, he adds, are: "those firms that provide users access to content of interest including news, information and entertainment, leisure activities, and other material" (p. 20).

Fetscherin and Knolmeyer (2004), focusing on the newspaper market, identify the five critical components of a successful business model in the content market: product, consumer, revenue, price and delivery. These components are equally relevant to an analysis of the publication of e-books in an academic context – whether the value chain consists of the production, dissemination, sale and consumption of e-books, online music, or newspaper articles, the underlying theory (as well as the practical necessities) of all forms of digital content are very similar.

Few authors have articulated a set of business models for e-publishing as yet, although Henke (2001) has identified a number of possible e-publishing business models which are clearly relevant to this discussion of the relevant of e-books for academic libraries:

Table 3: e-publishing business models (adapted from Henke 2001)

E-Publishing Business Model Comparison			
Business Model	**Description**	**Advantages**	**Disadvantages**
Prevention	The e-book is encrypted / decrypted on purchase. This is the model most publishers and retailers support and the basis for most DRM systems. It assumes DRM technology can prevent theft and encryption keys can be protected from hackers.	• Straight-forward model; • Support within the publishing industry from authors, publishers and retailers	• Requires an infra-structure of clearing-houses and tools to en/de-crypt e-books; • Users cannot lend, or donate the e-books
Advertisement	The e-book is packaged with advertisements the user must read as part of the eBook. Publishers make money by selling advertisement space and users buy the book at a discounted price or for free.	• Advertisements can be targeted to specified consumer groups; • Users could send a book to another user, requiring user to go through the adverts	• This model has never been implemented – is it attractive to users? • How would advert updates be handled? • Who controls choice of advertisement?
Marketplace	The eBook is sold through a clearing house where users can buy the eBook and trade it to another user who pays a fee for reading the eBook to the clearing house (the 'music' model).	• Easy to use and familiar to many users already; • Enables user to act as marketing representatives	• Requires a clearing-house infra-structure • Music has a standard price – books prices vary widely depending on type and content. Setting prices will be difficult
Subscription	The eBook is sold through a clearing house or the publisher in the form of a subscription. Users pay for a series of books or for chapters of a book (the 'software' model).	• Publishers obtain a steady income stream; • Users could pay a single subscription fee for more than a single book (no 'micro-payments' problems)	• Users are not willing to wait for chapter download availability (the Stephen King experience); • Are subscribers willing to pay up-front?
Author-Server-User	Authors (alone or with help from service providers) could replace their publisher by performing the 3 most important publishing tasks: (1) print; (2) distribute; (3) advertise. Copyright protection is limited to 'general' copyright rules.	• Publishers can build books to order; • No warehouse costs; • Niche publishing – fixed costs are small; • Workflow very similar to 'normal' e-books; • Even out-of-print books are available.	• As authors become self-publishers, subsidy publishers grow; and traditional publishers sponsor more first-time authors, who will sort the wheat from the chaff?

Henke believes that the Author-Server-User business model is the most effective of those he describes, pointing out that librarians may resolve the problem of deciding which

books are useful and which not because they have always acted as 'filters' of book quality and will be able to bring these skills to bear on the issue just as easily in an electronic environment[6]. He also notes that e-books make it possible to hold an enormously greater collection than was previously possible; and that libraries may soon be able to loan e-books in exactly the same way they currently loan 'p-books'.

Rao (2004) points out that, from the point of view of libraries and information centres, e-books have already enabled the instant delivery of material; in addition to saving shelf space and solving the problem of lost or damaged titles. Rao also points to the advantage which e-books' adjustable fonts offer in providing resources for the visually impaired – and identifies the possibility of offering electronic "course packs" to support specific modules in e-book form for academic courses. In an earlier paper, however (Rao, 2003) he notes that e-book technology creates circulation problems for librarians, whose standard methods of lending and retrieving books do not work so well for e-books – the Digital Rights Management (DRM) technologies in use, as well as the incompatibilities of various proprietary standards, mean that downloaded e-books are frequently locked into a particular format and/or device, making it difficult for readers to access some books in some environments.

It is still very difficult to obtain reliable empirical data on business models in the area of e-publishing and e-books. The Academic Research Libraries (ARL) surveys of 2002 and 2003 (ARL Statistics 2004), designed to discover current academic library activities in this area, identified only publishers' pricing models of all the various components of a complete online business model: "eight of the publishers offered options that included print, plus a fee for access to electronic equivalents; print, plus a fee for access to the full set of electronic titles; or electronic, plus a fee for print equivalents. Many publishers were still offering electronic access free with print, but this option seems to be disappearing in favor of options that secure greater rights for libraries, such as more content, archiving, interlibrary loans (ILL), e-reserves, and course packs" (Case 2004). Some of the key players amongst e-book suppliers are listed in Table 4.

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6 In the academic environment, librarians frequently rely on researchers and faculty for recommendations on which literature to purchase. According to Henke, these faculty members have taken on the role of 'server' in the 'Author-Server-User' e-business publishing model.

Table 4: Some e-book suppliers for libraries

Some e-book suppliers	Descriptions
EBL www.eblib.com	• offers around 18,000 titles from around 90 publishers. • includes options for multiple concurrent use, unlimited access and short-term circulation. • individual e-book chapters can be set aside for reserve lending or be included within course packs.
Proquest Safari Books Online proquestcombo.safaribooksonline.com	• prices are weighted based on book demand. • publishes mainly IT books[7]. • offers outright purchase rather than subscription; as well as the option of a small starter package (Cox 2004).
NetLibrary www.netlibrary.com	• offers a collection of some 90,000 e-book titles, from more than 300 publishers. • a subsidiary of the OCLC library cooperative. • Accessed by 5,500 libraries and organizations.
ebrary www.ebrary.com	• more than 60,000 e-book titles from more than 200 publishers, • accessed by some 500 libraries in 60 countries.
Questia www.questia.com	• offers 50,000 e-book titles, more than 119,000 journal articles and over 159,000 newspaper articles • claims to be the world's largest online library of books and journal articles.
Science Direct www.sciencedirect.com	• offers over 2,000 journal titles and hundreds of books from Elsevier • claims that users can "access more than 7 million full-text articles and more than 75 million abstract records, from all fields of science"

4. Issues for the Future

International multi-year pilot studies, focus groups and case studies conducted with publishers, librarians and library users between 2001 and 2005 revealed a number of concerns that continue to have an impact on e-book uptake in libraries.

Competing Constituencies: Instead of joining forces in the digital era, libraries and publishers have been fighting a battle sometimes described by librarians as the fight between Good and Evil (Vigen and Paulson 2005). Frequently at issue is the fact that libraries aim to address community needs on the basis of sharing, borrowing and recycling – facilities traditionally offered to patrons on a non-paying basis. Publishers' transaction models for e-books accommodate the concept of controlled sharing only with considerable difficulty (Hoorebeck 2003). Libraries must also cater to diverse stakeholders. Students welcome the additional features e-texts offer. They want and expect uninhibited access to information in multiple formats where and when they require it. Academics and researchers place far greater priority on the *quality* of content (Michael 2005). Archivists are concerned that the move to e-resources leaves unanswered questions about preservation issues and continuity of access over time.

A Plethora of Standards and Devices: Despite attempts by the Open E-book Forum (now The International Digital Publishing Forum)[8] to provide general access to electronic

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[7] IT books represent a category frequently selected by librarians undertaking e-book trials 'as their audiences are more accepting of their delivery mechanisms' (Michael 2005).

content, a wide variety of proprietary standards still exist rendering most e-books compatible only with certain devices. The lack of an agreed standard implies that an 'agreeable machine' to deliver books to a mass audience has not yet arrived on the scene (Turney 2005).

Content: Low levels of currency and relevance to reader requirements and the time-lag between printed and electronic versions of texts have presented serious drawbacks to the spread of e-books, particularly in research collections.

Authentication: Products developed by providers and distributors are often not geared to procedures that libraries use for controlling access to e-resources. Agents offering competitive 'deals', cast librarians in the unfamiliar and time-consuming role of negotiating terms, generating increased work loads for librarians.

Work flows: Collection managers find that making monthly new selections can generate considerable additional work for some of the library staff (Abbott and Kelly 2004). Payment methods can also be comparatively cumbersome and a disincentive for uptake: 'For e-books to succeed, selecting and purchasing them needs to be as easy as ordering and buying from the campus bookstore' (Abbott and Kelly 2004).

Budgetary pressures: Research resources are provided or supported by major national institutions and organisations, and by many local bodies including universities, libraries and archive offices. These bodies are all experiencing funding pressures, and challenges in balancing electronic and non-electronic resource provision (British Academy Report 2005).

Although the e-book delivery value chain as it currently exists has been described as *'ad hoc and fragmented, lacking in leadership and coordinated strategy'* (British Academy Report 2005), some signs of progress do exist. Major publishers have now come to the realisation that they cannot afford ***not*** to have a fully developed e-book strategy (Turney 2005). Google's commitment to an e-book scanning project in partnership with leading universities in the USA and the UK represents a major push to address the dearth of quality material on the Web. These developments have accelerated adaptations in publishers' business models and supply chains to facilitate e-book uptake (Rosenblatt 2005). Market forces would therefore appear to favour digital delivery of information to libraries. There are also indications that barriers to the free flow of information and the costs these barriers represent to publicly-funded research may result in policy and legislative moves which will further advance diffusion of e-book technology (for UK see Harnad 2003; for Australia see DEST 2004).

5.   Conclusion

This paper has provided a necessarily somewhat superficial discussion of the current state of e-book uptake in academic libraries; and the possible future implications of e-books for scholarship. We have endeavoured to link existing research literature on digital content business models and value chains, with the essentially commercial material on e-book hardware and software facilities and the provision of content for existing e-book devices. This has, inevitably, meant a somewhat unnatural coupling of commercial references for the e-book material with the more conventional academic references relating to changing business models for digital content and their applicability to the e-book phenomenon.

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[8] The Open E-Book Forum International Digital Publishing Forum (IDPF) can be accessed at http://www.idpf.org/

We believe, however, that despite its 'patchwork' nature, this paper provides a useful jumping-off point for future research into the important topic of electronic information provision within academic libraries. The now widely accepted move from physical serials provision to electronic journal access is, we suspect, likely to be merely the first stage in a longer move away from physical provision of academic material. It seems likely that this move will apply across all types of information provision, but academic libraries – with their need for huge volumes of rapidly-changing material – are likely to be most vitally affected.

The paper, having surveyed the currently available types of e-book hardware, software and content provision, makes its major contribution in evaluating research into digital content business models – and extrapolating that material to the increasingly large, global providers of academic material, many of whom are already thinking carefully about how to ensure their survival in the 21st century. Although digital formats such as music, movies and newspapers have been thoroughly researched for some years now, research into the impact of digital publishing and e-books for online libraries is still in its infancy. The present paper attempts to identify the major issues and likely future trends, upon which further research activities can be based.

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