Ebook Navigation: Browse, Search and Index

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OBJECTIVE To examine the ways in which users can navigate within nonfiction ebooks by browsing, searching and using indexes and to consider potential improvements.

DESIGN & METHODS This article is based on a review of the literature, investigation of browse, search and index functionality in a variety of reading devices, and involvement in the International Digital Publishing Forum (IDPF) EPUB Indexes Working Group. The research includes all nonfiction ebooks that are readable on portable devices, but does not include retrieval of ebooks.

RESULTS Ebook navigation depends on searching, browsing and using indexes. For some books and some reading devices these navigation methods do not work as well as they should, and problems with navigation deflect readers from their main purpose. Future developments that will enable ebooks to provide the key navigation features available in print books (pbooks) as well as additional tools based on the ability to search electronic text were identified.

CONCLUSIONS Ebooks are not just digitised pbooks. They may have additional features but may also be missing components such as indexes and images. Developments in ebooks, including the EPUB standard, and ongoing improvements in ereader hardware, mean that ebook navigation through browse, search, and indexes has the potential to become less intrusive and more helpful to readers.

Introduction

Publishing of nonfiction ebooks and their inclusion in library collections has increased significantly in the last few years (R.R. Bowker LLC 2012; University of Melbourne 2011). While ebook formats have worked well for fiction and other texts that are read linearly, they have been less successful for non-fiction books where the ability to navigate through the work is crucial, and where complex formatting (e.g., tables, sidebars and figures) in the books may make this difficult (Marshfield 2012; Tamblyn 2012). In addition, useful features such as indexes may be missing from ebooks or may be presented with their print page numbers or no page numbers, rather than being linked directly to the text to which they refer (Cane 2009).

This article examines navigation within ebooks.

It is important to realise that ebooks are not just print books (pbooks) in another format. We look at the ways in which people can find and re-find information in pbooks and ebooks, and finish with the potential of ebooks to improve. This article will focus on nonfiction ebooks designed to be read on dedicated ebook reading devices. This article does not cover searching *for* ebooks.

Ebooks

For this article we define ebooks as book-length publications in digital form, either 'born-digital' or derived from a printed version. We have focussed on ebooks that can be read on portable devices such as e-readers and tablets. These include ebooks in PDF and those in reflowable formats (without fixed page layout) such as EPUB. We have not covered standalone eBook applications or o-books (web-based books that are usually accessed online and read on computers, and are often made available as part of a collection), as these warrant a separate article.

Googlebooks and eBooks on Demand are examples of mass digitisation projects that provide the scanned books in PDF (Price and Havergal 2011). Electronic and print versions of the same book do not necessarily have identical features; for example, some omit images and indexes. Digitisation of existing content increases resources, but scanned ebooks in PDF continue to rely on the printed page model and therefore do not offer any improvements on the pbook apart from the ability to search the text. 'Born digital' texts have the potential to embody all the advantages of ebooks, rather than simply replicating the printed page in a digital display.

Ebooks can include features not available in pbooks, such as connections linking parts of the book and linking to content outside the book. For example, when done properly, a linked index can take the user more directly to the content of interest than a pbook index can. An ebook can also be more easily corrected than a pbook can. Grenina (2012) lists some advantages of ebooks including the range of search possibilities they offer, but also notes disadvantages, including the need for users to have search skills, saying 'Insufficient computer skills, lack of experience of

e-book use and technophobia create barriers to e-book use'.

Because formatting ebooks can be complex and time-consuming, many have been published without features included in the equivalent pbook. Features that increase complexity in the conversion of text to ebook format include 'images, footnotes, lists, sidebars, pull quotes, indexes, glossaries, foreign languages, special symbols, math, multiple columns, complex page design, script/screenplay formatting, poetry [and] tables' (http://ebookarchitects.com/conversions/services.php).

Browsing ebooks can be more difficult than browsing pbooks, as readers lose the context that a pbook gives. Cull (2011) points out that the 'paratext' — the framework of a text — affects the meaning that readers derive from the text. Readers are depending more on browsing and keyword spotting, and are spending less time on in-depth reading. Marshall (2010) suggests that 'adding value to ebooks requires a good understanding of what people are doing when they read and why they are doing it'. There appears to be little research yet into how people read and use ebooks, and 'in the absence of field studies, technology designers and developers often rely on introspection (thinking about what they do themselves)'. People's approach to ebooks has been compared with cargo cults. Librarians have heard stories of great potential, they invest in ebooks, but then do not find what they were expecting (Bonfield 2012).

Disabato's two-part web article on publication standards provides a good overview of the technical and business issues relating to ebook publication (Disabato 2012a, 2012b).

Ebook formats

Ebooks are published in different formats. The main difference is between a fixed-page format such as PDF, in which the ebook has the same layout as the pbook, and reflowable formats such as Mobipocket and EPUB, in which the text can be resized (by reading device or by user) so that the space taken by a certain amount of text and its orientation can change. Fixed formats are useful

for books with complicated layout and where the publisher wants total control over the viewing experience, while reflowable formats are essential for books to be read on devices with varying screen sizes.

EPUB is the standard format for trade ebooks. It is a free and open ebook standard developed by the International Digital Publishing Forum (IDPF), and supersedes the OpenEbooks standard. It has a strong focus on internationalisation and accessibility. The EPUB standard uses existing, open standards wherever possible (Garrish 2011; Kasdorf 2011).

Amazon Kindle readers use a proprietary format, meaning that Kindle books have to be read on Kindles, or using a Kindle app for computers. Older Kindle readers use the proprietary format, AZW or .mobi, based on the Mobipocket standard, while newer ones use KF8 (eBook Architects 2011).

PDF (http://www.adobe.com/au/products/acrobat/adobepdf.html) has been the main standard for fixed format ebooks; for 'born-digital' books, however, publishers now also have the option of creating fixed format ebooks based on HTML; in both EPUB (http://idpf.org/epub/fxl) and other formats (http://ebookarchitects.com/conversions/fixedlayout.php), http://toc.oreilly.com/2012/08/portable-documents-for-the-open-web-part-2.html and http://www.digitalbookworld.com/2012/keeping-up-with-fixed-layout-support-what-where-and-huh). IDPF also has a working group investigating advanced/hybrid fixed layouts, with one of the proposed uses being rendition of manga comics (http://code.google.com/p/epub-revision/wiki/TokyoWorshopForAdvancedHybridFixedLayouts). These formats will combine some of the benefits of reflowable text with the benefits of fixed formats.

Ebook readers

Ebook readers are devices on which ebooks can be read. These include eInk devices designed specifically for reading, with features such as light weight, screen quality for readability and good battery life, as well as ereading applications for use on a tablet or PC. Different ebook readers display content differently, and offer different features. The Book Industry Study Group (BISG) has released an EPUB3 Support grid that shows what EPUB3 features (e.g. TOC navigation, MathML, Unicode font support) are supported by each device (Book Industry Study Group 2012). The grid can be found at http://www.bisg.org/what-we-do-12-152-epub-30-support-grid.php. Pan Macmillan has an excellent introduction to ebook formats and reading devices at http://www.panmacmillan.com.au/ebook_faq.asp.

Navigation through ebooks

Overview

Ebooks can be harder to navigate than pbooks. A recent survey of e-textbook use at American universities found that students prefer pbooks because the ebooks are 'clumsy' and 'difficult to navigate (Chen 2012). Ebooks can, however, have the additional option of search and the ability to follow hyperlinks directly to content of interest.

Readers may use the following methods and tools to navigate through an ebook:

- **browsing** (paging through the text)
- **looking at the table of contents** and following hyperlinks to the text, eg, to specific chapters or sections of interest
- **searching for keywords** and moving through hits one at a time or selecting from a listing of search results (if the reading device has a search function)
- **using the index** (if there is one) to get a feel for the book's structure and language

Browsing in ebooks

Browsing a book is a way for readers to get an overview of content or to perform rudimentary searches. In a pbook browsing means flipping through the pages and briefly reading parts of the text. Browsing one page at a time using most ebook reading devices is easy by simply pressing page forward or page back buttons or using a touch screen to move between pages, but it is more difficult to quickly skim a large range of pages. Tablets, such as the iPad, may allow more sophisticated means of looking at several pages

at once. Most ebook readers also display progress indicators, which show the reader how long the book is and how far they have read. Browsing is important for finding information that cannot be easily indexed or searched for. In addition, some kinds of information are only identified as relevant when they are discovered (Bates 2007).

Readers may also look at the table of contents or flip through the index for an overview. Most ebooks retain the table of contents, often hyperlinked to the beginning of each section of the book. This is a useful navigation tool assuming that the table is well-constructed and provides a good idea of the amount and type of content in the book. Skimming an index may also facilitate discovery for the reader, as they may find information that they were not initially looking for or were unaware was in the book.

An important feature for browsing is a Back button, or a means of returning to the last visited location in the book. If the reader chooses to follow a hyperlink, they should also be able to easily return to their starting point. For example, if an index entry has two locators (say, page or paragraph numbers), the user should be able to move from the text to the index to the text location suggested by the index and back to the same index entry, and then finally back to the place they were in the text before they started their exploration via the index. Unfortunately, many reading devices do not make it simple to navigate back to a table of contents or to an index from within the text.

Ebooks can also extend the browsing experience beyond the ebook itself. Amazon's X-Ray function (available only on Kindle Touch) provides access to Wikipedia and Shelfari information, as well as short blurbs on the ereader about characters and places.

Search in ebooks

Full text search assumes that the reader knows what word or phrase is used in the text. This method can be useful to re-find something that has already been read or when the reader is familiar with the subject. For example, full text search works well for proper names not

mentioned often in the text, and for minor concepts not included in the index, but can be slow and clumsy for readers who are not familiar with the text or the terminology used by the author(s). If users cannot find what they are looking for quickly, they may assume that it is not in the book, or decide it is not worth trying to find.

There is still a case to be made for full text searching; however, there is room for improvement of current search functionality. According to Marshall (2010), 'If we consider all of the ways that within-text search is used, it is clear that it may be a very powerful tool for eBook readers.' Approaches that are successful on the web do not necessarily translate well to smaller contexts, and research done in the web environment may not apply in the ebook sphere. Baker (2012) has pointed out that search is based on statistics, and functions best with a large body of text along with feedback from a large number of users. Meyers (2011) describes the awkwardness of current search functionality in ebook readers, saying:

> How's a reader supposed to decide which of these results is the one she wants? Think about how cumbersome it is to tap each item, get whisked off to its location, and then have to navigate back to the starting spot. What a pain. In a print book, at least you've got fingers, bookmarks, or a coaster to hold your spot as you leaf around (reviewing index entries, for example). But in an ereader device, the disruption readers suffer after following a link is significant.

Most of the current generation of dedicated ebook readers provide full text search options; however, search functionality varies between devices. Ebook readers are evolving, and we recommend that the reader do their own investigation of available devices and their navigation features. We suggest the following checklist for use in investigating ereader search functions:

- Are search results provided in a **separate search box** or must the reader jump from search result to search result within the text

to find what they are looking for?

- Does the search function allow for **stemming**, e.g. searching for 'mush' would also retrieve 'mushroom', or is it **whole word** only? If the default search function is for stemming, can the reader specify whole word searching only?

- Does the search function allow for **case sensitive** searches, e.g. allowing easier search for proper nouns that are also common nouns, e.g. retrieving the records management company 'Recall' but not the verb or noun 'recall'

- Will the search function allow use of **Boolean operators**, AND, OR, NOT?

- How easy is it for the reader to **find the search function**? How easy it is to navigate back to the search function from within the text to change search terms or parameters?

For example, the search function in Amazon's Kindle device (https://kindle.amazon.com/) does not allow for stemming (except for plural nouns), case sensitive searches, or use of Boolean operators; however, it does have a separate search box and it is easy to find the search function. On the other end of the spectrum, the Kobo Touch eReader did not, until recently, have a search function at all (Kobo 2011).

Indexes in ebooks

An index is an 'explorable' document which provides at the same time an overview of a document and a view of a selection of concepts discussed in the document, as well as providing entries that lead directly to content of specific interest to a user at the time. The provision of the index as a whole, and the gathering of broad and narrow concepts and related terms within the index, is one thing that sets it apart from an unfiltered list of search results.

Indexing a text is a way of providing pointers to quickly take users to the information they need. In this article 'indexing' is used to mean the creation of a back-of-book-style index by a person (rather than automated indexing by a search engine).

Lamb (2008) offers an excellent answer to the question 'Why have a human-produced index

where full text searching is available?' He identifies the following problems with full text searching:

- **does not cope with homographs** (words spelt the same but with different meanings)

- **does not cope with synonyms** (words spelt differently but with the same meanings)

- **does not distinguish between significant and trivial** references to a topic

- **does not pick up inferences** (where a concept is discussed but the actual search term is not used)

- **does not cater for graphics** (they may pick up the caption to a picture, but cannot access the content of a picture).

In addition, search results in most ebook readers show up in the order they are found in the text, and do not show relative importance, meaning that users have to step through all hits before they get to the content of relevance to them.

Human-created indexes have features that address these problems.

- **Homographs** can be distinguished through the use of parenthetical qualifiers, e.g., 'articles (grammar)' and 'articles (writing)' or 'Jackson, Jesse (born 1941)' and 'Jackson, Jesse (born 1965)'

- **Synonyms** can be collocated using *see* references or double entries

- **Trivial content** (passing mentions) can be omitted from the index

- **Inferences** can be indexed, e.g., a discussion about 'the Prime Minister's partner' can be indexed under 'Mathieson, Tim' and a discussion about 'Canberra' or 'Washington' (used to refer to the governments based in those cities) can be indexed under the appropriate government term

- **Graphics** can be indexed using words that describe the content and the meaning it adds to the text.

Many publishers have been caught unprepared for the need to produce ebooks and have not developed the procedures necessary for the inclusion of useful, active indexes in books with reflowable text. Publishers' approaches have been:

- **to omit indexes**
- **to include terms from pbook indexes without page numbers** (an 'index without legs'), offering them as suggestions of search terms (Cane 2009)
- **to include indexes from pbook versions without linking them**, with page numbers that have no relevance in reflowable text
- **to include fully-linked indexes using embedded indexing or linking**, either done in-house or using an ebook production company (Wright 2012b)
- **To create new types of indexes using language processing or metadata**

Examples include:

- Amazon's X-Ray function (available only on Kindle Touch) (Wright 2012a)
- Stephen Fry's visual index (https://www.youtube.com/watch?v=kxLpMMzXVCk&feature=youtu.be)
- the mapping of Pride and Prejudice in Ken's blog (http://blog.kenperlin.com/?p=7907)

For books with reflowable content, one of the biggest differences between pbooks and ebooks is the loss of (or change in) the concept of a page number. This makes it more difficult to communicate text locations with others when using books socially, and also means that the ebook reader option 'go to page #' is of limited use. That option either becomes meaningless (if page numbers are totally lost) or complicated (if the page number concept is retained but print page numbers do not match the screen view on a mobile device).

To provide a pbook index without page numbers as a list of suggested search terms does not provide the value that a full index would; and except for the provision of cross references it is not likely to be a useful tool for searching – the terms in an index are created for a different purpose, and are not guaranteed to be any better as search terms than the first word a user thinks of. To provide a pbook index with unlinked page numbers is of some small value as a browsing tool,

and the page numbers give an idea of the location and length of concepts throughout the ebook, but an index created for a pbook with page numbers is not the ideal tool for an ebook with reflowable text. Marshall (2010) rightly asks 'how much is human attention worth?' There is no comparison between this potentially difficult approach to finding information in a text and a hyperlinked index with linked locators allowing the user to go directly to the paragraph level or exact location of the discussion in one step. The solution to this problem may be abandoning the page concept entirely and considering text at the section or paragraph level (Coe 2012) or using new methods (e.g. size or colour) to indicate depth of coverage (Castro 2010).

An informal study of Kindle ebooks by Bosschieter (2010) found that of 21 titles that had indexes in print form, only two had fully functional, linked indexes in the ebook. She also commented that when Amazon says that a book has an index, there is almost no way of finding out in advance whether it is an active, linked index or just a copy of the print-format index.

A good index is not only useful for finding information within the ebook, but can be used in ebook samples as a sales tool (Wikert 2012). Unfortunately technical support for linked indexes is not always strong, and even linked indexes based on XML can show formatting irregularities. For example, *The Indexing Companion* (Browne and Jermey 2007) has a linked index, but the entries are not always indented as they should be, making the index less easy to use than it might have been. Unfortunately, the lack of quality indexes at this stage in the expansion of nonfiction ebook publishing means that 'people are being trained not to use indexes in ebooks' (Wright 2012b). There is a useful overview of ebook indexing in the March 2012 issue of *The Indexer,* which focuses on this topic (http://tinyurl.com/indexermarch2012).

Future of ebooks

Navigation within ebooks should not interrupt their primary purpose, which is to be read (Marshall 2010). Offering the reader quick and

easy ways to find what they are looking for will allow them to use the ebook optimally. The ebook of the future should also provide new ways of accessing the index. For example, the index should be easy to find and easy to use. It should also allow the reader to move seamlessly back to where they started. The optimal ebook index will:

- **be hyperlinked**
- **be displayed at the front or back of the book** (with the potential to set the first-displayed page to jump past the index)
- **be accessible from any location in the text**, and allow easy return to the place at which the user left the text
- **be easily readable**, with flexible formatting for device and user (e.g., having the option to collapse or expand main entries or letter groups
- **provide information about the expected content in the text** (e.g., while a pbook may show a page range, an ebook might highlight the targeted range of text or its background in a different colour)
- **be linked to a dictionary or thesaurus** for term definition.

There are two areas in which ebook indexes will develop. The first is simply the provision of better hardware and software to enable the implementation of basic index functionality (the same as is available in pbooks) along with the use of links from the index to the relevant part of the text. The second is the extension of the concept of the index, to offer functionality that doesn't currently exist with print indexes.

The International Digital Publishing Forum (IDPF) is a 'global trade and standards association for electronic publishing' (http://idpf.org). In January 2012, following submission of a Charter Proposal by the American Society for Indexing (http://www.asindexing.org/i4a/pages/index.cfm?pageid=3647), they started an EPUB Indexes Working Group (Browne 2012). Working Group documents are all publicly available (https://code.google.com/p/epub-revision/wiki/IndexesMainPage?ts=1322858948&updated=IndexesMainPage) and include a detailed use case for a basic index, and implementation ideas for:

- Index term search (search from within the text)
- Index locator search (display of index entries that have been applied to a range of text when that text is highlighted)
- Standalone index (an ebook that comprised of an index to content in a number of other ebooks) (International Digital Publishing Forum 2012).

Perhaps in the future this could allow people to make a common index of all the ebooks in their library or to enhance indexes for books they are using. A web-based version of a combined index is at http://indexmasher.com/. EPUB3 also allows linking within audio and video files that are included in an ebook, so index entries could lead to timed segments within an audio or video file.

Orna has discussed the potential benefits of collaboration between IT, librarians and information designers in the development of information products. She says 'Users do not know of the existence of the information products they need, because nobody has told them about them' and that 'When they seek information their search is frustrated by inappropriate indexing, lack of metadata, and lack of standards for the information architecture of the products' (Orna 2007). Research by Noorhidawati, reported in a thesis (2008), found that indexes were significantly more efficient and useful for finding information in an e-book environment than a table of contents and full text search and suggests incorporating browsable and searchable indexes and tables of contents into catalogues or ebook collection management systems to improve users' abilities to find and access relevant ebooks and pbooks.

Role of librarians

What does this all mean for librarians who are building ebook collections? With the multitude of formats and reading devices, it can be difficult to choose ebooks and educate readers on their use. Many library users still have questions about ebooks such as, 'is it the same as the pbook' or 'how much of the book is included?'(Price and Havergal 2011). Understanding when to choose an ebook over a pbook and gaining experience in

using ebooks will enable librarians to answer these questions.

Martin Palmer states 'the quality of library staff input will be crucial to the success of ebook provision' (in Price and Havergal 2011). However, due to lack of time and resources, evaluation and purchase of individual ebook titles by librarians is not always feasible. Many libraries choose to subscribe to or purchase ebook packages from aggregators, such as OverDrive or Ebrary, who may not only be selling content but also the service that supplies books directly to the user (Price and Havergal 2011). This offers some advantages, but it also limits a librarian's ability to monitor quality of both content and service. Many suppliers offer ebooks not only for download to specific reading devices but for reading online. The ability to test ebooks intended for a variety of devices on a personal computer may make it easier for librarians to investigate ebook navigation features (Price and Havergal 2011). If possible, 'test driving' ebooks on individual reading devices may help not only in evaluating suppliers but in gaining knowledge that will be needed in assisting readers.

At the very least, librarians will be called upon to manage ebook collections and to help readers to use ebooks. Knowing the differences between formats and devices and the impact of digital rights management (DRM), and choosing the appropriate ebooks and devices for all readers, who may be using ebooks in a variety of ways, is important. For example, purchasing only Kindle devices and ebooks for a library collection would severely limit readers, who would be tied to that one device and possibly not able to read ebooks on other devices. The current market allows much freedom for the device manufacturers, but this may change. As publishers become more adept at producing quality ebooks, they may take greater control of formatting and quality control. Amazon's policy of not encouraging indexes in ebooks (Lamb 2011) could prove to be a problem for them if other publishers decide that indexes are, in fact, added value. A library collection linked exclusively to the Kindle device could have a short life.

It is also important for librarians to consider accessibility issues when purchasing ebooks and advising clients on their use. Important features for visually-impaired users include voice-activated controls, text-to-speech rendering and dynamic lookup (e.g., an auto-completing search box) as an alternative to manual navigation. The EPUB standard emphasises semantic markup and consistent structure in documents – these make it easier for blind people to navigate through documents (Garrish 2012). For example, having letter headers at the top of each alphabetic section of an index makes it easier to navigate through an index. Herther (2010) reported on a court case based on the inaccessibility of Kindles to visually-impaired library users. A detailed list of functional criteria for ebook accessibility can be found at http://wac.osu.edu/ebook-access-overview.

Conclusion

Ebooks have the potential to offer a variety of powerful navigation tools; however, user experiences with searching, browsing and using indexes have often been inadequate. Different users have different navigation needs and preferences. Good practice for ebook reading devices of the future will mean offering users a choice of access methods, including efficient free text search functionality and easy browsing, as well as a well-conceived index. These tools should be effective and easy to use, minimising interruption to reading flow and research – navigation within an ebook should not interrupt the primary purpose, which is reading. The ideal ebook of the future will retain the best of the past, while also making full use of the electronic environment.

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