



PDHonline Course G354 (1 PDH)

Introduction to E-book Technologies

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Books in Transition

This course is about the latest incarnation of knowledge which we call printed books. An early, and arguably the most significant innovation in the printing of books, was the invention of mechanical movable type printing by the famous German Johannes Gensfleisch zur Laden zum Gutenberg in the fifteenth century, with the first major book printed being the famous "Gutenberg Bible" in 1455. Only twenty-one copies survive and are considered to be the most valuable books in the world. This book production innovation is widely regarded as the most important event since the Middle Ages, providing the material basis for the modern knowledge-based economy and the spread of learning to the masses.

With the advent of the digital age, there have been incremental moves toward changing to digital versions from the printed paper world initiated by Gutenberg. A noteworthy beginning was Project Gutenberg, started by University of Illinois student Michael Hart. His vision was to digitize and make available to the public the 10,000 most consulted books at little or no charge, and to do so by the end of the 20th century. As of February 2011, the Project website offers over 33,000 items in its collection as free e-book downloads. Click [here](#) for more details.

Another major project that is designed to help move existing paper books into the digital age is the Google Books Library Project. The goal is to scan and make searchable the collections of several major research libraries. Participating libraries include Harvard University, New York Public Library, Stanford University, University of Michigan and Oxford University at the project outset with others being added. An estimated 10 million books, including many hard-to-find and out-of-print books, will be accessible free. Click [here](#) to investigate this resource.

Moving to one more book transition data point, in July 2010 the giant bookseller Amazon.com announced that E-books outsold paperbacks for the first time with 115 Kindle e-books sold for every 100 paperbacks sold by Amazon.com the first half of that year.

What is an E-book?

In many ways the emerging e-book world is no different from many other technologies. The familiar categories of hardware devices, various storage formats and specialized software are all there competing for dominance in the marketplace,

in this case the carriers of electronic content produced by authors. There is even the open standard industry-wide sponsored format which is becoming increasingly important. The holy grail of the e-book world is the replacement of the traditional print media book that we all love. With the new found public affection for e-book technologies and the high derivative of the e-book sales curve one is tempted to believe that paper books may indeed become a scarce commodity in the not too distant future. Let's first take a look at the advantages of e-books.

Advantages

- Portability – the memory capacity of e-book readers allows the convenient storage of hundreds of books for carrying around on a device that weighs only a few ounces and has the approximate shape of a single traditional book.
- Instant Satisfaction – many e-book readers allow downloading of a book you desire at anytime and anywhere Internet connectivity is available.
- Reduced pricing – If a paper or hardback version of a book is published and an e-book version is also available, the e-book version will usually be marketed at significantly lower price.
- Flexible font size – the ease with which the font size can be changed on an e-book reader make it ideal for producing a “large-print edition” for those with impaired vision.
- Update and backup capability – Amazon allows the downloading of new editions of e-books with the same title or downloading any edition a second time for backup purposes at no additional charge.
- Bookmarking and tagging text – many e-book readers allow bookmarking and annotation of text for future reference.
- Free e-books – there is a vast number of out-of-copyright books that are now available as e-books at an ordering price of zero. This opportunity for accessing classic and ancient works alone is attractive enough for some to make the investment in an e-reader.

Disadvantages

- Cannot resell an e-book – when buying a paper book there is always the option of selling the used book to recover some of its initial cost. This is not possible for e-books since there is no physical artifact involved. Some are not happy with the prospect of not having used books available for purchase.
- E-book reader expense – the price of e-book readers has been dropping, but still represents a significant investment to begin taking advantage of the availability of e-books. Of course e-book reader software can be installed on desktop computers, laptop computers and smart phones, but one loses the attractive “traditional book” form factor of the specialized reader as well as the “paper and ink” like appearance of the text on some readers.
- Physical vulnerabilities - E-books are susceptible through the damage of the e-reader device technology. Examples of vulnerability are electromagnetic pulses, surges, physical impacts or extreme temperatures.

- Limited battery life – Dependency on batteries for access to books can be an issue.
- Multiple formats – E-book formats and file types continue to emerge and change.
- Paper book features lost – Physical feel of traditional book with its cover, paper, binding, etc. and the appeal of gift wrapping a book is also lost. One can't flip back through pages easily to find a section to read again, although if you know in advance you want to do this you can bookmark.

E- Readers

An e-book reader is an electronic device that is designed for the primary purpose of reading digital books. Some basic questions to ask when considering purchase are:

- How much are you willing to pay?
- What type of media will you be reading? E.g. e-books, blogs, newspapers, magazines
- What formats are supported? Note that at this writing Kindle does not support the open source format EPUB.
- What is the battery life?
- How easy is the screen to read, even in bright sunlight?
- Is a wireless download capability important?
- Will the reader have access to the content of interest? E.g. e-book stores, local library ebooks, etc.
- How important is brand?

Some of the most popular E-readers at the time of this writing are described below. The lending feature of allowing e-books to be shared is becoming common.

- Kindle – This is the Amazon reader with proprietary AZW format. The Kindle does not support the EPUB e-book standard at the time of this writing. However, there is software (e.g. Calibre) that can convert EPUB files to a format (MOBI) that can be read by the Kindle. The MOBI format is from Mobipocket, a company specializing in e-books for mobile devices that was bought by Amazon in 2005. Content in various formats (e.g. JPEG, DOC, GIF, HTML and BMP) can be transferred from a computer by USB or e-mailing to the Kindle using an Amazon assigned email address for the Kindle. As of early 2011, the Kindle offers only a black and white screen. Amazon has acquired Touchco, a small New York company specializing in touch screen technology. So a touch screen may be in Kindle's future.
- Nook - Developed by Barnes and Noble, the Color Nook was introduced late in 2010 and supports EPUB, PDF and PDB formats.

- [Sony E-Readers](#) – More than one “Edition” (size and features) is available and support PDF, EPUB JPEG and the Sony proprietary Broad Band eBook (BBEB) formats.

The world of e-readers is rapidly changing. Some think that the special purpose e-reader device will eventually be replaced by the emerging more general purpose tablet computer. For comprehensive reviews and comparisons of the landscape of e-readers click [here](#) and [here](#) .

Reader Software

Software is available for free download that will implement the functionality of an e-book reader on desktops, laptops and smart phones. There are several reasons why one might want to consider this option.

- It presents the opportunity to try out the technology without having to make any purchases of new hardware, albeit without the specialized “easy on the eyes” displays of e-reader hardware.
- You can do as I did for awhile and use this alternative as a delay tactic, taking advantage of the low prices of e-books now and waiting for the e-reader device prices do come down.
- Even if you have an e-reader device, having e-reader software on other hardware such as desktops, laptops or smart phones gives you great flexibility in the access to your e-book library.

E-book Formats

E-books come in a variety of file formats, but three dominate the market: PDF, EPUB and AZW. Some e-book readers will read many formats and others will read only one.

- PDF - The Adobe file format PDF has been around for some time and is designed to reproduce page images and PDF files designed for printing on standard paper sizes and are not easily viewed on the small low resolution screens of smart phones. However, Adobe has added a text reflow feature but the document must first be marked for reflowing at the time of creation for this to work.
- EPUB – This is the file extension of an XML format for reflowable digital books and publications. It is a free and open e-book standard by the International Digital Publishing Forum (IDPF) which became official in 2007 replacing the earlier open eBook standard.
- AZW - This is a proprietary Amazon format used by the Kindle e-reader.

For a comprehensive list of e-book formats click [here](#).

In the context of formats, the concept of digital rights management (DRM) should also be mentioned. DRM format is related to the locking mechanism placed on e-books by some companies to prevent copying and giving them away or accessing them in a competing e-book reader. In some quarters the use of DRM is controversial. For a more detailed discussion of these issues click [here](#).

Display Technology

E-reader display design has the challenge of producing a reading experience that is as close as possible to that of the old fashioned paper book. At the time of this writing e-ink is the technology used to approximate this goal. Color e-ink is the goal for the next generation technology.

E-ink Displays

An electronic ink display provides the reader with an experience similar to reading on normal paper, thus avoiding the eye strain of backlit displays. It also uses less energy since it requires power only when there is a change in the display. E-ink consists of many tiny capsules spread across the display surface (about 100,000 per square inch) that are filled with ink and also contain negatively charged white particles. This layer of capsules is connected to microelectronics in this surface that can produce a positive or negative charge in each of the capsules thus moving white particles up or down and thus switching the color of the top of the capsule to white or ink black, respectively. There are a number of variations of this basic concept and all must address the following challenges:

- Control electronics to activate the ink
- A design for the encapsulation
- A type of ink or similar material for filling the encapsulation

As with any technology, there are disadvantages. Electronic paper technologies compare poorly to LCD in terms of refresh rate thus preventing the implementing of interactive applications such as mouse pointers or scrolling. Also ghosting effects may be seen after refreshing parts of the screen. This can be corrected by turning every pixel from white to black then back to white again. This is the reason why some devices using this technology “flash” the entire screen white and black when changing to a new image.

For more details on electronic paper, the following two articles: [The Future of Electronic Paper](#) and [Electronic Paper](#) .

Mirasol[®] Displays

Although not billed as electronic paper, Mirasol[®] displays may have an impact on future e-reader displays as well as computers, TV and smart phones. It is an example of the new approach of finding answers to engineering design problems by looking to the biological designs in the natural world around us, biomimicry. In this case the mimicry involves observing how we see the intense colors of the wings of a butterfly. These colors are not created by bright pigments but by the nanostructures on the wings, producing interference among light wavelengths, reflecting only the brilliant color of specific wavelengths. This is in stark contrast with the typical display that generates its own illumination and deteriorates as the ambient light becomes brighter. Since mirasol[®] displays use reflective light, the colors stay bright and crisp as the ambient light increases.

The display device is an example of interferometric modulator (IMOD) technology that consists of a mirrored surface that is overlaid with tiny flexible membranes that react to electrical charges from driver integrated circuits that switch between two states in much the same way as LCD panels are addressed. An IMOD element reflects light at one wavelength and color in one state, and in the second state it absorbs the incident light and appears black to the observer. Brighter ambient light produces brighter displayed colors on the screen with no additional battery power requirement. When the display is not being addressed it consumes almost no power. It is expected that the technology will be capable of the required 30 frames per second requirement for video applications. Mirasol[®] displays are great examples of microelectromechanical systems (MEMS) technology. For a more detailed overview of interferometric modulator technology click [here](#) .

E-books and Libraries

Public libraries are moving into the digital age and providing e-books for lending. This transition has been made possible by companies like [Overdrive](#) that have provided libraries with the infrastructure for managing, protecting and distributing e-books since 2002. Overdrive was a founding member of the International Digital Publishing Forum (IDPF) that developed the industry standard EPUB format. The Overdrive website above provides a way to find libraries in your area that provide e-book lending using this infrastructure, providing an interesting way to have 24/7 access to your local library.

There is also an Overdrive Corporate Download Library designed to help employees or members of associations improve their skills and knowledge with 24/7 access to digital audio books and e-books. These resources are particularly attractive to those who travel and have busy lifestyles.

At the time of this writing Overdrive is not Kindle-friendly since AZW is a proprietary format. This might change in the future. The best way to keep up with this issue is to follow some of the forums such as [MobileRead Forums](#) and [E-Book readers forum](#) . Clearly the fact that the Kindle format is not among the formats supported by Overdrive would be a factor in one's selection criteria for purchasing an e-reader if reading e-books from the local library is a priority.

Publishing E-books – A Business Opportunity

It has never been easier or less expensive to create an income stream from self-publishing. The digital age is finally making a substantial impact on the book publishing industry and changing the business models of publishing. The technology and tools now available have brought very low cost opportunities to self-publish books and making it very practical for authors to produce e-books, acting as their own publishers retaining copyright and using Amazon and others as distributors. There are many books out there on how to take advantage of this business opportunity. One of the best references (available in both paperback and e-book form) I have found on the detailed mechanics of publishing and marketing is "[How to Publish Anything on Amazon's Kindle](#)" (also includes Nook and others). This author seems to be keeping his content up to date in this rapidly changing field. Remember Amazon does not charge for downloading new editions of e-books if they have the same title.

To promote your e-books you may want to set up your own website. This means you will need to find a host and an approach to content management. There are many possibilities. One idea would be to use a free content management system like [WordPress](#) and a hosting vendor like [GoDaddy](#) . Prospective authors should clearly consider publishing in both the AZW and EPUB formats. Again, keep in mind in the self-publishing business model today, you are author and publisher. Barnes and Noble, Amazon and/or others are acting as your distributors and you hold the copyright. Take a look at an example of the self-publishing tools that are available and the high royalty programs for publishing for the Amazon Kindle Store by clicking [here](#). [CreateSpace](#) is an Amazon platform to consider if you are focused on Amazon and want to have a print-on-demand (POD) counterpart to your e-book.

Here are a couple of additional examples of other self-publishing sites to consider:

- [Lulu.com](#) – This organization began as a print-on-demand (POD) publisher and later added e-book publishing.
- [Smashwords](#) – A platform that emphasizes DRM-free e-books that can be read on multiple readers.

One of the important features of an e-book is the cover design. One approach to this challenge is to use your digital camera to produce a jpg file, download to your PC,

import into Microsoft PowerPoint and use text boxes to add title and author information. If you need more sophisticated graphics processing you might consider using the free image manipulation program [Gimp](#) .

A strategy that some use to enhance marketing is to write a short article related to the subject of the e-book for one of the online magazines. At the end of the article place a link to your website for your e-book. Candidate ezines are [isnare](#), [GOarticles](#) and [Ezine](#) .

Personal Experience

As an owner of a Kindle, I have found the experience of using it a very satisfying extension of my normal mode of reading. Having scores of books in one package to take on a trip or even the back yard is very convenient indeed. I have also used the ability to email transfer Word and PDF documents to the Kindle for later review very helpful. It is certainly still a far cry from being equivalent to a paper book in many ways. On the down side, I am very conscious of its more “sequential access” mode in contrast to the more “direct access” mode of a traditional book. So far I am not seeing the restriction of the market to Amazon as a problem. This attitude may change if I become interested in the local public libraries e-books that are inaccessible to the Kindle (at least at the time of this writing). For now, the huge Amazon market of retail and free e-books is plenty adequate for my needs. I have been using Amazon for book purchases for many years. The black and white only display has not been an issue for me yet either. I suspect that color for the Kindle is not far in the future.