eBook readers: user satisfaction and usability issues

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Abstract

Purpose – This article aims to present a comprehensive evaluation of user satisfaction and usability concerns related to five of the leading eBook readers including: the Amazon Kindle; the Apple iPad MB292LL/A; Barnes & Noble's Nook BNRV100; Borders' kobo reader N647-BUS-S; and the Sony Digital Reader PRs-950.

Design/methodology/approach – This study is based on a survey of 81 information studies graduate students, who responded about their ownership of specific readers, their likes and dislikes as well as perceived issues. Additionally, interested respondents were asked to volunteer for an ethnographic journaling study which allowed eight prospective users to live with each of the five eBook readers for a weekend or longer.

Findings – The authors found that the Kindle is the most popular, but regardless of reader the respondents disliked the poor navigation and inability to loan titles in their collection. In addition, the respondents also liked the portability of the readers as well as the ability to have multiple books on a single reader. However, they also identified a major issue: notably, the licensing of titles versus outright ownership. In contrast to some other published reports, the respondents did not value non-Roman script support or color display.

Originality/value – One of the first comprehensive surveys to analyze the top five eBook readers for user satisfaction and to identify usability concerns.

Keywords Electronic books, User studies, E-books

Paper type Research paper

With the advent of Michael S. Hart's Project Gutenberg in 1971, books have been crossing over the digital divide. As Hart said:

> An eBook has to be searchable, quotable, a source for new editions or republication of old editions, and be trivial to read, search, quote, and all those things via all common hardware/software combinations.

At the same time, the manifold advantages of print-based materials is well understood to include: wide availability, relatively cheapness, compactness and portability, legible in low light environments, offering random access (opening to any spot) versus serial access (think scroll), note taking in the margins or on the text with a highlighter, there is no need for an on-off switch or battery and it does not break when dropped.

Reflecting a vision of common hardware/software combinations, the first hand-held eBook readers appeared in 1998 with NuovoMedia's Rocket eBook and Softbook. By 2000, the Microsoft Corporation entered the market with its Reader with ClearType technology for pocket PCs. By 2010, the eBooks and eReader market had taken off, increasing from about 5 percent to nearly 10 percent of the market over the previous year (Bosman, 2010). Today, the market is clearly moving forward at a rapid pace and this technological change can be viewed as either a positive or negative source of anxiety or stress.

Yet, the usability and desirability of eBook readers still remains problematic. Just as the printed book replaced the scroll with its limiting serial access, nonetheless, Gutenberg "died bankrupt and disappointed" before navigational improvements such as the title page, pagination and a back-of-the-book index appeared in codices (Pettegree, 2010). At present, one may wonder just how well the features offered in various eBook readers will ultimately satisfy library users. Thus, a study of this incipient technology would be a highly, useful contribution to the profession's understanding of these devices. If the significance of this study is not already self-evidently obvious, the authors would point out that institutions, such as the Columbus Metropolitan Public Library with a major Institute for Museum and Library Services federal government grant, are already offering 11,000 free eBook downloads to their registered users. Other institutions are experimenting with short-term loans of these readers for their users to evaluate on their own. Clearly, the impact of eBook readers on reading habits, ILL, and library acquisitions could be profound.

In summary, this study is one of the most comprehensive reviews of eBook readers to date because it involves a user-driven comparison of the top five leading eBook readers. The nature of this research problem is a knowledge void around two key research questions about how usable eBook readers are at this point in their evolution and what do users want, if these devices are going to become the common reading platform in the future?

Literature review

As eBook readers are still relatively new in the marketplace, few research-based evaluation studies have been reported in the literature of library and information science and technology. Some have employed focus groups or small sample sizes, but nonetheless, still identified a small subset of desirable features (such as long battery life, display in sunlight, and page versus location numbers) (Allmang and Bruss, 2010). Yet, none of them have compared all of the most popular readers against an extensive

set of technical specifications, or more importantly, have asked potential users about their perceptions. Most studies have looked solely at the Kindle and its various versions and a few have evaluated the earlier Sony offerings. Also, the authors wish to observe that due to the paucity of peer-reviewed, research-based articles many of the following citations come from what might be considered the more popular literature; it certainly reflects the emphasis on North American, if not solely US studies, with two exceptions.

In any event, here are the most salient articles from the most recent professional literature in chronological order:

(1) Malama *et al.* (2005) examined ease of use and quality as well as overall subjective satisfaction among some unspecified number of "lecturers and postgraduate students in Computer and Information Science at Strathclyde University" in Scotland plus a further "twenty-five subjects comprising respondents to emails sent to the wider public." They were asked about the Scrolling Book Acrobat eBook Reader and Microsoft Reader. Navigation seemed to be an issue but overall most everybody preferred the Acrobat Reader because of its typeface and the ability to resize fonts.

(2) Clark *et al.* (2008) reported a yearlong study with Kindles at Texas A&M University. A total of 36 members of library staff and university faculty were provided with a Kindle e-book reader and $100 to spend at Amazon. The discussion in six focus groups ($n = 5$ or 6 per group) indicated overall interest in the Kindle as a basic reading device for fiction. However, its use in an academic setting was limited due to content availability and licensing issues, graphic display capabilities, organizational issues, and its prohibitive cost.

(3) Behler (2009) reported that Sony donated 100 eBook readers (their PRS-505 model) to the Penn State University Library for evaluation by students. Issues pointed out by the most participants include unsatisfactory battery life and difficulty recharging, slow refresh time when turning pages, glare on the page, and an expensive purchase price.

(4) Herther (2009) interviewed six college and four high school students in the US about their use of the Kindle DX. The respondents liked the ability of listening to music, better screen resolution, and hypertext note-taking option but complained about the lack of color, high price, more weight, lack of zoom or scroll in PDF documents, poorly designed keyboard, complicated web searching, and slow page turning.

(5) Moore (2009) interviewed ten British subjects, "aged between 18 and 68 and who read at least several books a year for pleasure or entertainment." Using semi-structured interviews, the author found that the storage capacity and portability of readers appealed to the participants in this study. However, several commented on the tactile appeal of paper books (i.e. "you're constantly in touch with the physical object whilst you're reading") and a kind of interaction which eBook readers do not yet offer to users.

(6) Rodzvilla (2009) conducted a pilot study of Amazon's Kindle with ten librarians at Simmons College in Boston. The participants "found the screen resolution comparable to a printed page, but found the interface confusing and non-intuitive."

(7) Allmang and Bruss (2010) tested three e-reading devices for Kindle books – the Kindle 2 and the larger Kindle DX as well as Apple's iPod Touch. They conducted two focus groups ($n = 3$ and 5, respectively) made up of scientists, engineers, and administrative staff at the National Institute of Standards and Technology (NIST), Gaithersburg, Maryland. Features examined included capacity, screen size, screen technology, weight, native PDF capability, touchscreen, note-taking capability, and battery life. The participants preferred the Kindle DX. The most significant finding was the participants' desire to read eJournal articles and personal documents in PDF format. In discussing options and shortcomings of these eBook readers, the authors concluded that the "perfect reader has yet to be invented."

(8) Johnson *et al.* (2010) mentioned that the Kindle DX was being piloted at Arizona State University, Ball State University, Case Western Reserve University, Pace University, Princeton, Reed College, Syracuse University, and the University of Virginia's Darden School of Business. Northwest Missouri State University and Pennsylvania State embarked on pilots using the Sony Reader. Most reports on these projects are still forthcoming.

(9) Kiriakova *et al.* (2010) evaluated two Sony eBook readers (i.e. models PRS-505 and PRS-700) with the help of 163 students of the City University of New York. The participants were offered 15-minute session to use eBook readers and answer a short questionnaire. Ninety-six percent of the students said that eBook readers were comfortable to use. After experiencing these two eBook readers, 84.5 percent of the students stated that they would prefer to use this device as compared to the printed book.

(10) Mentch (2010) reported that at Case Western Reserve University forty freshmen participated in the Kindle DX study. The features most favored by the students were dictionary, storage capacity, screen size, and text resolution. The weaknesses of Kindle, identified by the students, were: "page issues, including lack of page numbers and the inability to flip through pages in a sort of 'random searching' way, the books on the Kindle cannot be shared, rented, or resold, and the lack of color."

(11) Marmarelli and Ringle (2010) involved 43 students enrolled in three undergraduate courses to evaluate the Kindle DX at the Reed College in Oregon. Referring to the participants' comments the authors concluded that "the Kindle DX – in its current incarnation – was unable to meet their academic needs."

(12) Pattuelli and Rabina (2010) analyzed opinions of 20 students of Pratt Institute's School of Information and Library Science about their use of the Kindle 2. "Although the participants reported some dissatisfaction with specific features of the e-reader, they generally valued the portability and ubiquity that the Kindle offers."

(13) The Office of Information Technology (OIT) at Princeton University (2010) used the Kindle DX in a classroom setting. The study was conducted in three courses, involving fifty-one students. On a seven-point scale ranging from "a failure" to "delightful," "battery life, text resolution, internal memory, screen size and physical weight were the most highly rated features, while the Kindle web browser, navigation between books and documents, highlighting text, the keyboard, and annotating text got the lowest rankings."

The results of these earlier studies reveal mixed opinions about the usability of eBook readers and the desired feature set. The identified disadvantages are numerous: single purpose versus multi-purpose devices (such as the iPad, relative high price of devices, which must be under $100 for reluctant buyers); no uniformity in download prices (read potential lawsuits in the future); disposable, not easily recyclable (i.e. it is not a green product); short battery life (with some exceptions; for instance, several weeks for the Kindle); limited number of titles to download (about 600,000); downloads only via Wi-Fi or 3G; small display screen (e.g. 6 inches is common) and subsequent eyestrain; poor resolution (try reading charts and graphs or in the direct sun); little, or no color (photos and illustrations; children's books; slow refresh rate between pages); software bugs which cause freeze-ups; need to reboot; and fragile technology (i.e. scratches, beverage spills or breakages when dropped). At the same time, these eBook readers clearly hold tremendous potential appeal for users, but the previous generation of readers reviewed above did not fully meet user expectations.

But, of course as also mentioned above, the rates of technological change with the continuous introduction of "new and improved" eBook readers means it may be time again to reexamine the current market place's offerings and certainly look more comprehensively at more than one or two devices than have been reviewed in the past.

Goals and objectives

The two overarching goals are to find out the users' current state of satisfaction with the latest technology by moving beyond mere anecdotal observations and to determine the true capabilities (and limitations) of multiple eBook readers by examining the following objectives:

(1) To identify, describe, and analyze the advantages and disadvantages of eBook readers.

(2) To compare and contrast the most popular (i.e. best selling) devices against a comprehensive, if not exhaustive, set of technical specifications as well as the qualitative judgments of users.

(3) To test these two theses:

- some people will prefer one reader's feature set over the other available devices; and

- users will want a variety of download sources.

In short, the authors want to know how much closer the marketplace has come to offering the ideal eReader alluded to above in the literature review. The authors are aware of the diversity in the current marketplace and know that not all of the eBook readers discussed below will survive. Obviously, too, the technical specifications are changing in a dynamic environment. Furthermore, please note that the authors are not endorsing any particular reader over another; rather they are simply reporting on user preference for certain features in the current, rapidly changing technological environment.

Research questions

Following from the previous section, one might like to know explicitly the answer to two questions about the usability of these devices and the desirability of certain features (as mentioned above):

(1) In terms of usability, what are the pros and cons of eBook readers in terms of usability; in other words, what are the users' attitudes (perceptions and/or prejudices) towards these devices?

(2) As for the desirability of certain features, what are they?

In short, the near-term future for the present generation of eBook readers will be guided by user preferences. A truly successful reader will need to answer such questions in the market place. The authors hope that the answers to these questions will give the information studies research community as well as acquisitions and ILL librarians a solid understanding of the state-of-the art when it comes to eBook readers and likely near-term directions for improvements in this product.

Tentative hypothesis
The following hypothesis (stated in the null and the alternative) guided the study:

H0. There is no difference between the eBook readers' features under review.

H1. There are differences among the eBook readers under review, because users will prefer one particular reader because of its feature set.

The evidence collected via the methodology outlined below will allow the authors to test these two statements in a reliable and valid manner.

Method
As mentioned above, the authors realize that the marketplace offers many different eBook readers and the market is changing. So, out of the population of more than a dozen eBook readers, the authors have selected the five most popular (which is not the same as the most often reviewed) eBook readers for analysis. Based on reported sales and market penetration, the authors purchased:

(1) The Amazon Kindle Keyboard 3G.

(2) The Apple iPad MB292LL/A.

(3) Barnes & Noble's Nook BNRV100.

(4) Borders' kobo reader N647-BUS-S.

(5) The Sony Digital Reader PRs-950.

In other words, it is a purposive sampling of what is available in the 2011 marketplace. Next, the research design employed a mixed-method approach:

(1) A volunteer pre-test group of four first-year reference service students in "Information Access," to discuss their familiarity with readers and their desired feature set so that the authors could design a more effective questionnaire.

(2) A short, seven-item questionnaire (see www.surveymonkey.com/s/MZY72DN) sent to all graduate students in the winter 2011 quarter who listed their email addresses in the student directory (i.e. $n = 192$).

The authors requested their responses via SurveyMonkey, which covered their preferences and the "likeability" of the present eBook readers. After three follow-up requests via e-mail, the total number of responses was 81, so the overall response rate

equaled 42 percent of the population. The nonresponses may be due to a variety of factors: lack of interest, too busy to respond, and in some cases invalid e-mail addresses on file. Thus, the authors caution the readers of this article about generalizing beyond the sample, although the response is the second largest of all the earlier studies cited in the literature review.

Finally, based on those responses, the authors asked any interested respondents to volunteer for an ethnographic journaling study which allowed eight prospective users to live with each of the five eBook readers for a weekend or longer. This mixed-method approach allowed for greater reliability and validity of results.

Findings

This section is divided into two parts: general issues or concerns raised and then specific comments about the five eBook readers. The reader of this article should be aware that the authors are not claiming that the respondents are comparing readers because it is unlikely that they would own more than one eReader.

General issues/concerns

Overall, 59 percent respondents ($n = 48$) did not own an eReader during the winter 2011 term. Of the 33 respondents who did own a reader (41 percent), the most commonly owned ones are shown in Table I.

Clearly, ownership of eBook readers is rather common since more than half own an eBook reader of some kind, but the authors caution about drawing conclusions about user ownership in a rapidly changing market. Despite the lack of anybody in this sampling owning a Border's Kobo, the authors still added it to this study because it is commonly discussed in the literature and in reports of market penetration (see above).

When asked what the respondents liked most about their readers, they responded in 12 ways as follows in Table II.

Obviously, respondents could check more than one response, but nonetheless, portability is the overwhelming factor here plus the addition to have additional book titles without the weight; so convenience is one of the driving factors.

And, when asked about what they most disliked, the respondents provided seven responses as shown in Table III.

In short, there are two major disadvantages among the present eBook readers, as identified in the survey's results. First, respondents reported that it is not easy to cite a particular passage in eBook and, secondly, it is not possible to share an item using certain eBook readers. Perhaps the most interesting results, however, were the

Type of reader	Frequency of ownership	%
Kindle	15	46.9
iPad	12	37.5
Nook	5	15.6
Sony	1	3.1
Kindle for Blackberry	1	3.1
Kobo	0	0.0

Note: $n = 32$

Table I.
Frequency of eBook reader ownership

Most to least common responses	Frequency	%
I like the portability factor (i.e. its light weight)	30	93.8
I like having multiple books on a single reader	27	84.4
I like the ease of downloading books onto my eReader	21	65.6
I like having the ability to find the meaning of words (i.e. built-in dictionary function)	18	56.3
I like the ease of navigation (i.e. its ease of use)	17	53.1
I like the ease of its initial setup	16	50.0
I can bookmark where I stopped reading	14	43.8
I do not have to recycle magazines or newspapers any longer	9	28.1
I like being able to take notes on my eReader	8	25.0
I can listen to audio books (without need of separate player)	6	18.8
I like being able to share titles with colleagues, friends, or relatives	4	12.5
I like the ease of being able to cite particular pages later on	2	6.3
Other	9	28.1

Note: $n = 32$

Table II.
Most common responses to what they liked about their own reader

Most common dislikes	Frequency	%
It's hard to refer to a particular page (i.e. no standard way of citing pages)	19	70.4
I can't loan books to colleagues, friends, or relatives	15	55.6
I can't take notes with my eReader	7	25.9
The reader has poor contrast, so it's hard to read in low light conditions	4	14.8
I didn't like the initial setup of my reader	3	11.1
I don't find it easy to download titles onto my eReader	3	11.1
I can't easily find my books (i.e. it's not easy to navigate)	1	3.7
Other (see all comments below)	14	51.9

Note: $n = 27$

Table III.
Most common dislikes about their eBook readers

respondents' comments in the open-ended "other" category (these are provided in the context of specific eBook readers below).

When asked "how concerned are you about the following issues," which the authors had found discussed in the literature, the respondents said as follows in Table IV.

Respondents were also as concerned about the following issues:

- lack of outright ownership of titles as compared to a book;

- being tied to a particular eBook vendor; and

- planned obsolescence requiring the owner to purchase a new reader when the batteries will no longer charge.

Color display was not of particular concern nor was the inability to display non-Roman scripts.

Finally, the authors also queried respondents about their reasons for not owning an eBook reader at present. Table V reveals their reasoning.

Again, it is obvious that the relative high price is still a perceptual issue with this user group. Indeed, several of the respondents noted that eBooks are in their prototypic era so the price is likely to come down in the future; others noted that rather than

	Very concerned		Concerned		Neutral		Not concerned		Totally unconcerned	
	n	%	n	%	n	%	n	%	n	%
License of books versus ownership of titles outright	12	36.4	10	30.3	6	18.2	5	15.2	0	0.0
Dedicated versus open bookstores	5	15.6	11	34.4	10	31.3	5	15.6	1	3.1
Hard-wired versus replaceable battery	4	12.5	13	40.6	10	31.3	3	9.4	2	6.3
Black and white versus color display of information	2	6.1	9	27.3	10	30.3	9	27.3	3	9.1
Ability to read only Roman versus non-Roman script	1	3.0	5	15.2	11	33.3	9	27.3	7	21.2

Note: $n = 33$

Table IV.
How concerned are you about the following issues

Reasons for not owning a reader	Frequency	%
The readers are too expensive	24	80.0
The readers don't have the features I want	6	20.0
The readers I have looked at don't impress me	4	13.3
The readers seem too complicated	3	10.0
My friends who own readers don't rave about them	4	13.3
The reviews I have read are too negative	1	3.3

Note: $n = 30$

Table V.
Why don't you own a reader?

develop their own look and feel, some eBook readers seem to reflect intentionally the older, printed based technologies. For example, the *USA Today* application on the iPad opens with a deckle edge at the top, much like their printed newspaper. When using either Google eBooks or the iPad's iBooks – each page curls like the earlier printed book and one can even see the print bleed through as the page turns. In short, the word which occurred to the authors is simulacrum.

Specific eBook readers
This section addresses the respondents' attitudes (if not, perceptions and prejudices) toward the perceived advantages and disadvantages (aka pros/cons or the likes/dislikes) of the five eBook readers evaluated in this study. In particular, the authors do not intend to endorse any specific reader, rather to report on a rapidly changing technological situation.

The five eBook readers are reviewed in order of ownership.

Amazon's Kindle Keyboard 3G (46.9 percent ownership)
The authors found a seamless, automatic setup; and it connected to through the secure wireless without wired equivalent privacy (WEP) password. The authors did need to

contact the helpdesk to order books, though; but after they recommended a reboot, the authors could order items from the store.

As for the Amazon reader, the authors were told by one of the survey respondents:

> I don't like the page numbering (or lack thereof) system that works by giving the reader a percentage of the book read, rather than an indication of the page they are on. Regardless of whether or not I am on the same physical book page for multiple Kindle pages, it would still be nice to be able to use the page numbers when referring to a particular passage or part of the book.

In the longer term evaluation, one reviewer wrote:

> It was fairly easy to use and read from, and I liked being able to carry around an extensive amount of reading material in one small device. The Kindle is the perfect size, and I liked the rubberized back, which provided a better grip and kept it from sliding around on a desk. Page turns were quite fast, and the E Ink Pearl text was just as easy to read as a page from a paper book. Whenever the screen changed, it flashed the negative (black and white instead of white and black) of the page it was going to show next; I became used to this very soon. I found it interesting that one does not turn the Kindle off when one wants to stop using it; after a while a screensaver begins, presumably to keep the text from "burning" into the screen. The screensavers from the Kindle were either gorgeous black and white versions of illustrations from old books or portraits of famous authors; they were one of my favorite things about the Kindle. The buttons were small but fairly easy to use; pushing them felt different than I expected, like they should have more "give" than they did. The page-turning buttons were on either side of the screen, which I liked because I could use either hand to turn the page, but it felt as though I had to press them a certain way (away from the screen in a rolling motion) in order for them to work correctly. Their location made sense, but as I tend to hold my reading material towards the bottom/base, I had to move my hand up to push them and that felt a bit inconvenient. Just pushing the side buttons straight down felt like I was doing it wrong. Whenever I pushed the button to turn the page, the device would emit a sort of muffled click or tapping noise, which was not very loud but somewhat disconcerting. This happened about three-fourths of the time when I turned the page; I heard it regardless of whether the Kindle was resting on a hard surface or in my hands. I also found it rather heavy for its slim size, more so than a paperback of the same length and width would have been.

Apple iPad MB292LL/A (owned by 37.5 percent of respondents)
For the authors, setup was straight forward but when connected to iTunes, it copied all of the previous apps from the iPhone whether the author wanted them or not on the iPad. The authors observed that it probably needs a cover to protect it, too. One respondent told us:

> I have never read a book online until I downloaded a book on iBooks. The quality of the text and my ability to highlight words and bookmark pages made it seem as if, I had the actual text in front of me.

Yet another wrote the authors to say that: "I got the iPad because I could download books from any eBook provider that developed an app. I also liked the wifi and the ability to use multiple apps. I primarily use it to read PDFs for class" while another told us: "I'll note that I like taking notes on my iPad, but that this is an extremely problematic aspect of eBook use for scholars. I could write a book about the issues, but suffice it to say, it's so problematic that I've thought about writing a dissertation about it."

Another informant wrote:

> While many iPad-specific apps were visually rich and technically mind-blowing, my favorites being Aweditorium (for music discovery) and Zinio (for digital magazines and books), I couldn't help but feel like it was a bit redundant. I already have an iPhone that enables me to read, see, watch, and play everything that I could want and without the occasional but noticeable pixilation on the iPad.

Finally, another person told us:

> I can take notes on my reader, but the annotation function is poor. I had to download a third-party application to be able to take better notes. I also wish I could take notes on the margins in text boxes. The iPad lets you drop a pin on the text and then pops up a little sticky note that disappears after you've finished the note. I'd rather have the option to take notes on the side because that's how I take notes on printed articles.

Barnes & Noble Nook BNRV100 (15.6 percent ownership)

Before the authors could setup the nook, the authors had to charge it. Setting the time was most frustrating; the time set was wrong even after selecting Pacific Standard Time and then daylight savings. The authors had further problems when we received "Error c7852," and the $1 + 800$ number help desk person had never heard of it! Turns out the authors did not have a credit card attached to the B&N account.

In this survey, one person wrote at length:

> If a book is poorly scanned as a pdf, the Nook has no ability to re-size the text. There is no zoom function; only a text re-sizer.

In the longer-term evaluation, another person who borrowed the Nook elaborated at length:

> The inclusion of the touch input screen is mostly awkward, particularly for the device's combination of mechanical buttons for turning pages of eBooks and the touch screen as the primary means of interaction with the device. Though a seemingly small distraction, the difference lies in having to tap a screen versus press a button. Furthermore, the reading display screen is not touch sensitive, which seems to be the effect of retaining the eInk display (as opposed to the full color touch-sensitive screen of the Nook Color). From a design standpoint, the combination of the reading screen with the sole function of display, the touch screen, and mechanical buttons makes for a somewhat confusing user experience, especially for a user who is just becoming acquainted with the device. Because of this awkward combination of the reading screen and the touch screen, there is a noticeable lag between input and presentation. This is especially apparent when attempting to annotate or highlight selected text of the eBook. From a user experience perspective, the user needs to shift his or her glance from the reading screen to the touch screen, manually designating what text to select. Adding annotations is an equally cumbersome affair, if not more so: since the touch screen is the primary means of input, the user adding notes is forced to use the virtual keyboard displayed on the touch screen. The small touch screen, and the even smaller keys of the virtual keyboard, makes it difficult for those of us with big fingers to input text notes.

Finally, one longer term evaluator wrote telegraphically:

> Likes: size, eInk, weight, touch screen for scrolling and selecting, games pre-loaded. Dislikes: battery life was short, touch screen was not very good for navigating full size web pages; pros: ePub compatibility, small touch screen assists with simple tasks, cost is reasonable, did

OK with PDFs; cons: short battery life, touch screen/regular screen can be confusing – made me want to treat the whole screen as touch screen; notes: overall I've come to realize that if you evaluate these eBook readers simply as devices to read books on, they work pretty well.

Sony Digital Reader PRs-950 (3.1 percent ownership)

Again, the authors had to charge it before proceeding with the setup; but, setup started smoothly and the authors found four titles already installed and a dictionary option was included. However, setup never finished due to a slow wi-fi setup connection; the authors received a domain name system (DNS) error and the help desk never heard of this model and it turned out that 3G has to be turned off to do the registration the first time (i.e. an undocumented procedure).

The sole owner among the respondents told the authors:

The Sony Reader (Touch Edition) that I use does not handle PDFs too well. The Sony Reader Library store is quite clunky to use (in terms of user interface, and generally, the user experience in using the software to interface with the Reader). Academic titles (the majority of my interests) are either cost prohibitive (despite the fact that they are digital, and especially for titles that are out of print).

In the longer term ethnographic study, one respondent wrote:

The Sony eReader is not an ideal machine. The "multicolor" interface is only in the navigational sub-screen, not part of the reading screen above. It took me a while to figure out how to access and navigate the various titles within the reader. The sub-screen is poorly designed. The color feature does not enhance reading, but seems only to be a gimmick. I have used other readers such as the kindle and the iPad. Compared to the other readers I have used, the Sony eReader is substandard and not as intuitive in its design.

Borders' Kobo N647 (0 percent ownership)

Of all the readers, the authors had the least problems during setup of the Kobo. After easily setting the time and date, the authors had absolutely no difficulty using a wifi connection to complete the registration at Borders.com. Before giving it out on longer term loan, the authors also found it easy to downloaded titles. As for navigation, there is no touch screen, but the device has easy-to-use arrow keys. Display options included size of font (five settings ranging from smallest, small, medium, large, to largest) and two justification settings (either left flush or default).

One respondent wrote at length about his experience:

1. The obvious advantage of portability is not as one-sided as the marketing for eBook readers in general would have us believe. Battery-life, physical environment (i.e. a sandy beach), and the potential for theft are just three factors that are usually not brought up in the marketing campaigns. What's worse is that there have even been some advertisements which suggest that taking the device to the beach would be desirable. However, given the expense weighed against the possible hazards such an environment presents to the device, I would opt not to bring a device like this anywhere near a place where I could break it or where it could easily be stolen.

2. Considering the above, for all that increased portability offers (basically, the ability to transport more books at a time), I found that the quality of my reading experience on the Kobo was significantly reduced, hence outweighing the above stated "advantage". Not only was there a serious lack of graphic design providing for a very low aesthetic quality (e.g. poor

font selection, lack of color, etc.), the load time in both bringing up new works in the device's memory and the simulated turning of a page had a delay that, although for the most part comparatively slight, was distinctly annoying when compared to ease of performing the same functions with a printed codex.

3. [Also] The interface of device wasn't exactly the most intuitive for having such a simple range of functions. I found navigation and operation in the device to be rather clunky and prone to error.

Overall, considering that I have been, up until the recent closure of the majority of its physical store branches, a Borders loyalist, I was very disappointed by their Kobo eReader. I got the impression that they just pulled the thing together at the last minute once they saw how well Amazon and Barnes and Noble were doing with their devices. Unfortunately, it was a minute too late, and now it seems that Barnes and Noble is thriving while Borders, on the whole, continues to plummet in a downward trajectory. I have found the Nook Color to be a far superior device that lacks most of the inefficiencies I encountered in the Kobo. Anecdotally, I believe it speaks volumes that when I asked one of the Borders store clerks about the commercial viability of the Kobo one day at a local branch he told me frankly that it was "kind of piece of junk," and that he didn't believe there would be much of a future in it.

As for the fate of the theses and hypotheses laid out above, the authors found that users did prefer a certain set of features; further, that these where embodied in one particular reader (i.e. the Kindle followed by the iPad). To be more specific, its desired feature set included: ease of setup, portability – the perfect size, and long battery life (e.g. one does not even have to turn it off). And, the alternate to the hypothesis was accepted – that users preferred a small set of features compared to all features available (see findings above).

Implications

The ideal eBook reader does not exist, according to our participants. No surprise there, but the marketplace seems to have come closer (for example, Amazon announced its inexpensive Fire to compete with the iPad). Yet, the authors clearly discerned certain advantages (i.e. pros) as well as disadvantages (i.e. cons) to eBook readers as mentioned above, but underlying these are four themes: convenience, reading ease, non-book formats, and reading at the digital table (Richardson, 2011).

Convenience

Looking at the overall picture (based on the survey and ethnographic reports), the respondents seem to value convenience in an eBook reader. The respondents talked about the need for an eBook reader to be lightweight; and, although they did not use the phrase "form factor," the authors believe that this term describing compactness and portability describes a large part of the desirable feature set. Respondents consistently mentioned the ease of downloading books (i.e. "no waiting" or shipping charges) rather than having to travel physically to a library or a traditional bricks-and-mortar bookstore which requires travel time and the use may have to pay local tax. The authors noted that recently Borders Group liquidated its stores nationwide and Books-A-Million, the third largest retailer, is closing some of its stores.

Reading ease
Likewise, it is interesting to observe what the respondents passed over. For example, the perceived differences in reader display technology (i.e. e-ink versus LCD) did not emerge as a significant issue. One might think that device size and weight are related to price, but the survey's respondents appear to identify weight as a significant concern. In hindsight, the authors would have asked about the respondents about OverDrive, which deals with digital rights management, because several did comment about the inability to share eBooks. Some respondents mentioned reading newspapers on eBook readers, and how one knows that one has one read or at least scanned the entire issue – they liked, for example, the *New York Times* which, once selected, grays out the read articles.

Other formats
While most respondents talked about books per se, some users of eBook readers commented about using magazines and journals on their devices. For instance, some magazine apps on the iPad require "a per" issue purchase rather than discount from the full subscription price as would be extended on a print version; oddly as one respondent said, the digital version's price can far exceed the regular price of the magazine. For example, the free trial to the digital version of the *New York Times* expires and automatically rolls over to a per month rate without any notice. Finally, one respondent mentioned Zinio, which is a platform allowing one to view a single featured article from dozens of magazines and then purchase the issue or an entire subscription, if desired.

In a wired world
Another technical issue arises with the slowness of connections; for example, digital magazine files (250 MB for *Wired*; 100-150 MB for the *New Yorker*) required an extremely long download time (as much as 15 minutes) due to slow internet connection speeds (BITS – "A race between print and digital," *New York Times*, 7 February 2011, p. B10). The national network infrastructure needs to improve before everybody can read at the digital table (Richardson, 2011).

Conclusions

Thinking along Darwinian postulates, it is obvious that there are more eBook readers than the market will support and that eBook readers vary within the population of all readers available in the market place. The respondents found certain characteristics to be desirable:

- portability (i.e. size and weight – called the form factor) of the readers;
- having multiple titles on a reader;
- the ease of downloading titles; and
- having a dictionary definition available at one's fingertips.

From an information ecology point-of-view, eBook readers are still a new and different species in competition with native species (i.e. the printed book) and whether type conversion of the habitat continues from print to electronic version will depend upon the preferences of users. Respondents did not perceive the lack of color or the lack of non-Roman character support to be serious issues. However, certain disadvantages persist: relative high cost, poor page navigation, being tied to a particular vendor, the

inability to loan books, and planned obsolescence (i.e. the battery in most eBook readers cannot be replaced). Since the authors believe that this sample is representative of the marketplace, then those eBook readers which have these favorable characteristics will have a higher survival rate in the marketplace. So, to capture the rapidly changing marketplace, the manufacturers of eBook readers will have to address these issues.

Note: as mentioned above, due to the paucity of peer-reviewed, research-based articles many of the following citations come from the more popular literature.

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Appendix

(1) Complete set of technical specifications at the time of review (to be provided) because there was no single, comprehensive website with this data at the time of the authors' research

(2) Websites for free eBook downloads:
   - Michael Hart's Project Gutenberg at www.gutenberg.org/wiki/Main_Page
     – About 100,000 free eBooks.
   - http://preprints.readingroo.ms/
     – "Items submitted to Project Gutenberg which for some reason were not quite ready to be added to that collection."
   - Digital downloads, a library collaboration at http://digitalbooks.moldi.org/D6A52DAD-180A-4D65-8338-EBE0622E05B3/10/249/en/default.htm
     – "11,000 + titles in audio, print and film."
   - Google eBooks at http://books.google.com/
     – Claims "over 3 million eBooks to read."

(3) The questionnaire: see www.surveymonkey.com/s/MZY72DN

(4) The journaling directions and questions: write an evaluation of the reader; what did you like/dislike, what were the pros/cons, the advantages/disadvantages?

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