E-Books in Academic Libraries

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13 The User Experience of E-Books in Academic Libraries: Perception, Discovery, and Use

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ABSTRACT

E-books are being widely adopted as a new format of scholarly information to meet increasing educational and research needs in academic libraries. The advantages of e-books over print books from the libraries' perspective (e.g., cost and storage requirements) have been well discussed. Although a number of studies have reported faculty and students' perceptions and attitudes on e-books (e.g., Shelburne, 2009), there have been relatively few studies of actual e-book use and user behavior (O'Hare & Smith, 2012). Recent literature reviews on e-book-related research have identified several themes, including library adoption of e-books, the e-book market, supply side of e-books (publishers and aggregators), copyright and digital rights management (DRM), e-book readers, e-book acquisition models, promotion, and e-book cataloging (Kumbhar, 2012). These themes are useful in determining library acquisition strategies and designing e-book-related services, but there is a lack of emphasis on how users perceive and use e-books as part of their information-seeking behavior.

A few studies have examined specific e-book platforms (e.g., Heyd, 2010; O'Neill, 2009; Pierce, 2011; Shereff, 2010), but there is still a strong need for libraries and other stakeholders to understand better all aspects of the e-book user experience, including users' perception, discovery, and actual use. This paper outlines and discusses the key phases of using e-books in academic libraries from the user experience perspective. Understanding these phases and significant findings regarding user behavior can facilitate a user-centered approach to improving e-books and their use.

A CONCEPTUAL FRAMEWORK

User experience involves a person's perception, attitude, emotion, and behavior with a particular product, system, or service (Albert & Tullis, 2013). User experience is not a one-dimensional characteristic for complex systems like e-books, but should include multiple attributes: useful, usable, desirable, findable, accessible, credible, and valuable (Morville, 2006). It takes a broader view of the entire interactive experience and task flow than the concept of usability, which is essentially a quality attribute of a user interface, product, or service. As the complexity of technology grows, user experience becomes critical for system design and user acceptance. Although the idea of user experience has been discussed in previous studies of e-books under different terms, such as user friendliness and ease of use, there is a lack of conceptual framework of e-book user experience and systematic assessment methodology.

The authors review studies on various aspects of e-book user experience and align these findings in the course of major phases of user experience with e-books: perceiving e-books as a useful information resource, discovering e-books from library collections, and using e-books in different contexts (see Figure 1). Users' perceptions of e-books include their awareness of e-books as a resource as well as their attitude about and preference for using e-books (or not). Awareness, attitude, and preference jointly affect users' intentions to use e-books, which translate into the discovery and actual use. In the discovery phase, users search for relevant e-book titles and identify the ones that they will further examine. The results of discovery may affect users' perception of e-books as a potential resource. The actual use of e-books involves navigating within the e-book structure, seeking targeted information, and reading the content. Perception, discovery, and use of e-books are affected by users' interaction with the e-book interface and how the interface presents features and content to users. The assessment of these three phases from the perspective of user and e-book interaction could be helpful in understanding better the determinants of a quality experience.

USER PERCEPTION OF E-BOOKS

In user experience research, perception is the cognitive process or capability to attain awareness and understand a product or service by selecting and interpreting information from the task context. Perception has been

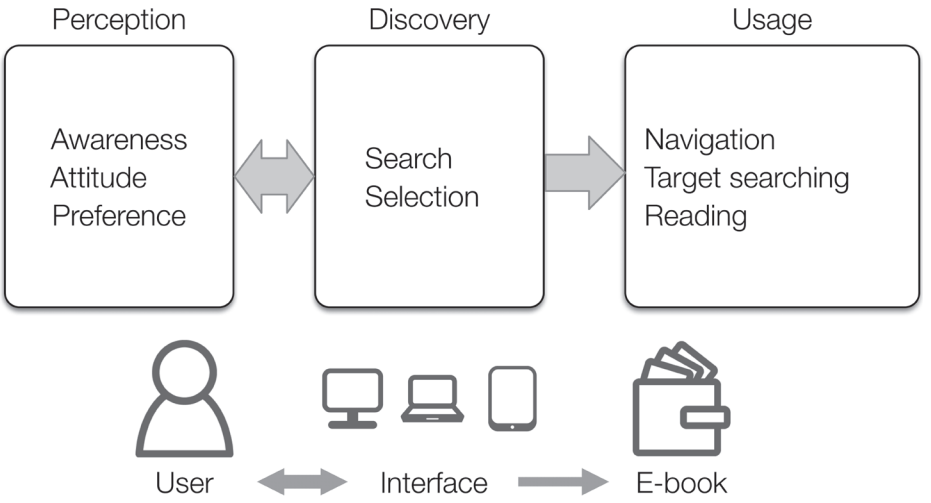

Figure 1. The e-book user experience conceptual framework.

considered as a fundamental cognitive measure and precedent of behavioral intentions. Studies of e-book perceptions have been focused on users' awareness of e-book resources, their attitude toward using e-books, and their preferences for e-books or print books for different tasks.

Many library users are not aware of the availability of e-books as library resources (Buczynski, 2010; Shelburne, 2009). Abdullah and Gibb's survey (2008a) found that e-book awareness and the level of e-book use among students was low: 57% of students were not aware of the availability of e-books from the library, and consequently, 60% of them had not used an e-book. Users' awareness of e-books varies across different disciplines. For example, Levine-Clark (2006) found that a significantly higher percentage of humanists were aware of e-books than users in general, probably because humanists rely more on books (and thus e-books) than researchers in other fields. Staiger (2012) found a wide range of percentage of e-book awareness reported in the literature and suggested that awareness is mostly dependent on how e-books are promoted at local institutions. In addition, users may not have a clear concept of e-books or which online resources are considered as e-books, since studies have found that students did not clearly distinguish among types of resources such as online journals, conference proceedings, and e-books (Hernon, Hopper, Leach, Saunders, & Zhang,

2007; Levine-Clark, 2006) and that they may be accessing e-books without knowing the exact type of the resources (Shelburne, 2009). The lack of awareness of the e-book concept and its availability may affect how users discover e-books in library resources and how they interact with the e-book features and contents (to be discussed in following sections).

Buczynski (2010) discussed the possible reasons for this lack of awareness, including: 1) not all e-books can be accessed through the library catalog, due to the lack of individual machine-readable cataloging (MARC) records; 2) the library catalog is not updated as frequently as the publishers' e-book platforms; and 3) publisher platforms may offer table of contents and full-text searching not available in the library catalog. The fragmented nature of e-book collections in libraries may result in missing titles in library catalogs and in user confusion. Recent developments in discovery tools could potentially mitigate the e-book discovery issue by indexing metadata from multiple collections. However, technical and access barriers still exist between e-book collections and discovery tools.

Users' attitudes toward e-books depend on their perceived value and utility, and more importantly, on the technical aspects of access to e-books. Previous surveys have shown that users view the convenience of online access and search functions as the most important advantages of e-books over print books (Jamali, Nicholas, & Rowlands, 2009). Users often regard e-books as a quick reference tool (Abdullah & Gibb, 2008b; Staiger, 2012). As a result, how e-books help users find relevant sections and extract information for further use affects users' attitude about using e-books as valuable information resources. Searching and navigation functions are thus critical to users' acceptance (Levine-Clark, 2006). Other e-book features, such as downloading, printing, text highlighting, annotating, copying, and pasting, have repeatedly been found important for users to develop positive attitudes toward e-books (Brahme & Gabriel, 2012).

In addition to surveys of users' attitudes, Chrzastowski (2011) conducted a diary study of user behavior with Elsevier e-books with 129 faculty and Ph.D. students at University of Illinois at Urbana-Champaign (UIUC). Participants' perceptions of the advantages of e-books included 24/7 online access, easy to search and navigate, downloading and storage, and off campus access. The top three behaviors with e-books reported by participants are brief look, reading from screen, and downloading PDF. Participants also regarded these

behaviors as the value of e-books. Nearly 70% of participants rated e-books as "need to have" or "nice to have," showing the perceived usefulness of e-books.

From the usability perspective, a common concern affecting users' attitudes toward e-books is the perceived eyestrain or fatigue from reading or viewing information on a screen for an extended period of time (Kang, Wang, & Lin, 2009; Levine-Clark, 2006). E-books are sometimes limited in meeting users' requirements of text size and clarity, although this limitation could be reduced by new display technologies such as e-ink and high-resolution screens. Print books appear to enable better reading comprehension (Jeong, 2013), and more use of cognitive strategies in analyzing, rereading, comprehending, elaborating, and integrating are required in electronic reading (ChanLin, 2013). Other usability issues of e-books, such as the book layout with limited display area on the screen and slow response, might also affect students' willingness to read e-books online (Hernon et al., 2007).

Users' preference for book format (e-books or print books) is influenced by the context of their information need as well as individual differences. Abdullah and Gibb (2008a) categorized e-book use into four types: finding relevant content, selective reading, fact finding, and extended reading. In a follow-up study (Abdullah & Gibb, 2008b), most students preferred to use a print book for extended reading, although they preferred e-books for finding relevant information and selective reading. Students had no strong preferences for book format for fact finding. For selective reading, students who had used an e-book before preferred print books and students without experience of e-books preferred to use e-books. This finding suggests that students expected e-books to be more effective for searching information, but they were not satisfied with their experiences. Foasberg (2014) conducted a diary study of a small group of college students and concluded that students prefer to use print for academic and long-form reading, and to engage more deeply with the text. Electronic resources are preferred mostly for shorter and nonacademic reading. As for individual differences, Shrimplin, Revelle, Hurst, and Messner (2010) identified four distinct clusters of users: book lovers, technophiles, pragmatists, and printers. Book lovers are emotionally attached to print books; technophiles prefer e-books as a new technology; pragmatists tend to be comfortable with both print books and e-books depending on their availability; and printers like to print out e-books without restrictions for further reading.

DISCOVERY OF E-BOOKS

Discovery and access have been identified as significant barriers to extensive e-book adoption in libraries, particularly because many users have difficulty identifying the e-books they need and understanding where to locate them. Other feedback from users regarding the discovery and access of e-books include the irrelevancy of e-book search results, or the fact that e-books from the search results were no better than other resources (Chrzastowski, 2012).

Earlier studies raised concerns about e-books not being indexed by library catalogs and suggested including indexes and tables of contents in the catalogs to improve users' browsing and searching capabilities of relevant e-books (Abdullah & Gibb, 2008b). Shelburne (2009) further suggested enhancing the full-text search ability and bibliographic information for e-books in the same way that journal content can be searched and discovered. With recent technological development, libraries have implemented three major mechanisms for improving e-book discovery and access: e-book vendors' platforms, library catalogs (OPACs), and discovery tools. Walters (2013) summarized each mechanism's challenges in meeting users' e-book needs. Users may have to search and access e-books on multiple vendor platforms to identify a library's e-book holdings. E-book vendors' interfaces vary in appearance, layout, and functionality, creating additional learning requirements for the user. Presenting e-books in library catalogs has some common challenges, including limited availability of record metadata, lack of standardization, difficulties managing the addition and removal of titles, and the generally low quality of vendor-supplied records (Martin & Mundle, 2010). The challenges of e-book discovery tools include incomplete coverage, reliance on metadata from external sources, problems with subject headings and authority control, difficulties with guest-user access, and continuing dependence on vendors' platforms for access to full text. Without proper guidance on the incomplete coverage, users could have the false impression that all the library's e-books could be accessed from the discovery tool's single search interface. Users may be able to use a single interface for e-book discovery, but must still deal with a wide range of platform-specific display and control options at the access stage.

Analyzing transaction logs from catalogs and discovery tools is an effective way of studying users' e-book search behavior. Most transaction

logs contain information elements such as the particular page requested by the user, the identity of the requesting user (IP address), the date and time of the request, and whether the request was successful. Transaction log analysis is an unobtrusive and inexpensive way of collecting large amounts of data about users' searching behavior. The authors collected and analyzed one month of transaction logs with over 50,000 search records from two discovery tools (VuFind and Ex Libris Primo) at the Purdue University Libraries (Niu, Zhang, & Chen, 2014). They found that the format (e-book and book) and availability (online and at the library) were among the most used facets in all search sessions. However, the use of facets in the discovery tools was low (8.4% of all searches in VuFind and 9.7% in Primo). Using transaction log analysis, Urbano, Zhang, Downey, and Klingler (2015) examined how the library catalog facilitates e-book discovery and use in patron-driven acquisitions (PDA). Their analysis showed that general keyword and title searches are most frequent for e-book searches. E-books accessed from the full bibliographic record pages in the catalog resulted in significantly higher use. This finding highlights the importance of providing the necessary information in the catalogs or discovery tools for users to identify relevant e-books from the search results.

In addition to searches in the catalog and discovery tools, how users select e-books and determine their usefulness before fully committing to reading is also a critical part of the discovery phase. McKay, Hinze, and colleagues (2012) analyzed a sample of transaction logs of 100 randomly selected browsed e-books and 100 e-books loaned to users. The data covered the period during which users were making a selection (i.e., before a loan was created) and includes all the pages users viewed to a maximum of 19 pages. The results of log analysis include the book features users viewed, the length of time users spent with books, and how users examined books and their features. The analysis identified the five most commonly viewed parts of the e-books: front matter, chapter headings, table of contents, the first page of content, and the introduction. Almost all users reviewed the front matter before initiating a more thorough investigation of the e-book. Users were seen to move page-by-page through the book (21% loaned, 14% browsed), flip to the middle of a section within the content (49%, 29%), and directly navigate to a chapter heading (51%, 55%). Users appeared to use the table of contents (ToC) navigation more often than they entered a page

number into the top navigation (63 of 200 vs. 14 of 200). The conclusion and index seem to be used less often than in similar studies, possibly because users in the discovery stage might be focusing on the overall relevancy of the e-book and not on a particular piece of information. The e-book platform (EBL) in this study provided three navigation methods for the user: the ToC, pagination, and scrolling; however, there may be different interaction methods that would better support users' sampling of the e-book content.

Another study by McKay, Buchanan, and colleagues (2012) analyzed transaction logs from e-book publishers to determine which user interface elements affect users' selection behavior. The results demonstrated that flaws in the presentation of the covers and ToCs of e-books increased the volume of short time-span reading, and reduced the likelihood of long-span reading. Inconsistencies or errors in e-book covers and ToCs caused extended investigation of books without further significant reading. The log analysis showed that e-books with clearer and more consistent indicators of their content would either be examined briefly or read over an extensive period of time. Reducing errors in cover image and table of contents would make it easier for readers to determine which e-books are useful without having to engage further.

Although transaction log analysis can generate quantitative information about users' e-book search behavior, it fails to capture any information about the context in which the search event occurs. Behavioral observations complement the limitations inherent of logs by providing such missing contextual information. An exemplary study by Hinze, McKay, Vanderschantz, Timpany, and Cunningham (2012) observed the physical book selection process at the library shelves, and their findings have implications for designing e-book discovery and access systems. For example, when selecting books users tend to be close to the shelves in order to retain the context of their search. Hinze and colleagues (2012) suggested that e-book collections could provide users with richer context information (e.g., previous interaction history) to aid the search and selection process.

THE USE OF E-BOOKS

Users tend to have different use patterns for e-books and print books, the latter of which tends to be constant, frequent, or linear. E-books in academic libraries usually are used as online references to extract information for study and research (Folb, Wessel, & Czechowski, 2011; Staiger,

2012). For example, Hernon and colleagues (2007) studied e-book use by undergraduate students in economics, literature, and nursing. They found that students used ToCs to determine which chapters seemed relevant for browsing and scanning, and they did not read e-books entirely. The eBooks Observatory Project of the United Kingdom's Joint Information Systems Committee (JISC) found that course-related e-books were not being used as a substitute for print books. Most users spent less than one minute per page with the e-books tested, and they used e-books in a nonlinear, just-in-time manner (Estelle, Milloy, Rowlands, & Woodward, 2009). Therefore, McKay (2011) suggested that e-books are more analogous to journal articles or other scholarly publications with clear in-document navigation points such as title, abstract, and section headings. McKay's (2011) exploratory log analysis showed that academic e-book use involves nonsequential reading with frequent flipping back and forth at chapter headings and other breaks, similar to the use and reading behavior in other scholarly documents.

Although navigation is a key function for information retrieval, users struggle to navigate effectively in e-books with similar features of print books presented on screen. Berg, Hoffmann, and Dawson (2010) examined undergraduate students' information retrieval performance with print and e-books. Participants were asked to search for discrete facts and sections (i.e., "fact searching") within a print book or e-book. Their observation showed that participants used linear approaches to seek information in print books, from identifying keywords, looking for keywords in the ToCs and index, turning to the designated pages, and scanning for relevant content. However, participants' sense of linearity appeared to be lost with e-books, nor did they use the indexes in e-books. Participants used the physicality of print books to track their reading, but they were unable to make immediate observations of e-books such as point of entry, current position, length, and structure of the book. Berg and colleagues (2010) noted that compared to print books, moving through e-book pages was sluggish. Participants expected to interact with e-books in a way similar to navigating websites. For example, they expected that all chapter titles, keywords, indexed terms and page numbers would be hyperlinked, which was not true for the tested e-book platform. Finally, participants showed a strong preference for searching within e-books, but the nature and structure of the search function in e-books did not meet their expectations.

There may be a disconnection between users' experience of print and e-books. Berg and colleagues (2010) suggested that the e-books in their study did not facilitate the transfer of linear information retrieval skills from using print books. One example of this lack of transfer is that participants did not know of the existence of indexes in e-books. In addition, Liesaputra and Witten (2008) compared users' navigation within books in four formats (three online and one in print) and found that users had disorientations with e-books and could not determine the size of online documents. It is possible that the digital environment of e-books does not provide enough contextual information for users to orientate and navigate in e-books as they would with print books. As the respondents of Shelburne's (2009) survey noted, many e-books are designed for sequential access, which is not very efficient for reference and research work, such as flipping through pages in different chapters and cross-referencing. Without efficient and accurate navigation in e-books, it is a major challenge for users to develop cognitive maps as the basis of their critical thinking and deep understanding of the content (Thayer et al., 2011).

The disconnection between print and e-book user experience is probably caused by the lack of support in e-book interface for the effective navigation and information retrieval that is critical for nonlinear reading of scholarly publications. As an example, studies of information retrieval with e-books have identified the importance of navigational features other than ToCs and paginations provided upfront in most e-books. Abdullah and Gibb (2009) investigated the usability and information retrieval performance of three common searching and browsing features in e-books: back-of-the-book index (BoBI), ToC, and full-text search (FTS). Their data showed that BoBI was more efficient (i.e., shorter task time) and accurate than ToC and FTS for finding information in an e-book. This result highlighted the importance of a BoBI for information seeking in e-books even when an FTS tool is available. Compared to FTS, BoBI directly identifies important topics in the book and distinguishes those topics from simple occurrence of keywords in the FTS results. BoBI also supports cross-references of preferred and related terms, which could be more efficient than alternating keywords in the FTS tool and understanding the information organization in the ToC.

Transaction log analysis has identified three distinct e-book reading patterns: linear progression, contextual confirmation, and exploratory

assessment (McKay et al., 2012). Linear progression involves readers paging through the initial parts of the book, before using the left-hand ToC navigation to jump forward in the book to the start of a chapter. Contextual confirmation represents a user jumping to the first page of a chapter before paging forward two to three pages, then jumping backward in the book to the final few pages of the previous chapter. Exploratory assessment shows the user jumping back and forward throughout the book, seldom looking at more than one page. Linear progression was most likely to be the only pattern used; the other two patterns were most commonly used in conjunction with other interaction patterns.

Academic reading is an active process of sense-making and knowledge development. A number of e-book features have been identified as crucial to support strategies of academic reading and ensure usability and user satisfaction. Features that most users would expect include download and offline use, text highlighting, copying and pasting, printing, and note-taking (Croft & Davis, 2010; Hernon et al., 2007; Lam, Lam, Lam, & McNaught, 2009). These features are implemented differently on different platforms (e.g., printing availability and access restrictions), which pose challenges for libraries to provide a consistent e-book user experience (Hodges, Preston, & Hamilton, 2010). It is also a challenge for users to be aware of all available features of e-book platforms (Brahme & Gabriel, 2012). Future studies should closely examine how users utilize e-book features in their reading process (i.e., human-document interaction), and how to improve those features for better reading efficiency and comprehension (Qayyum, 2008).

DISCUSSION AND CONCLUSION

There have been many studies of users' attitude, preferences, discovery, access, and reading of e-books. Unfortunately, those studies have not been interpreted and discussed in a user experience research framework. Furthermore, there are few sets of guidelines of optimizing user experience and task performance throughout the phases of using e-books in academic libraries. In general, librarians have observed that there is an issue of e-book awareness among users, whose attitudes toward and preference for e-books are dependent on the context of information needs. In the discovery phase, the fragmented nature of library resources affects users' ability to find relevant e-books; additionally, navigation features of e-book platforms influence users'

assessing and selection behavior. This summary of e-book use studies indicates that users mainly extract discrete information from e-books, rather than perusing the content. This reading pattern has significant implications for the design of e-book navigation features. The authors also observed that users have high expectations of e-book features that can support their reading strategies, such as printing and downloading of sections, annotations, and copying and pasting of text. The different access and copyright restrictions from e-book vendors have hindered the creation of a consistent user experience.

To promote awareness of, and a positive attitude toward, e-books among users, it is important for librarians to integrate e-books in their information literacy and instruction efforts. Librarians should work with system providers to improve the coverage and metadata quality of e-books in the catalogs and discovery tools. Results of user studies on reading behaviors need to be converted into new interaction designs that address the disconnection of reading experience from print books, and support effective navigation and information retrieval in e-books. The authors believe that a structured, user-centered research and design methodology is fundamental to these directions. To understand users' interaction with e-books in different phases, traditional transaction log analysis should be integrated with behavioral research methods to generate a comprehensive assessment of users' information-seeking activities. Findings of user research must be utilized to drive the design of e-book features, and the overall interaction between users and the e-book system. Usability issues with supporting evidence identified from user evaluations should be fed back to interface design for iterative refinement and improvement. E-books with an engaging user experience will be a great addition to users' current scholarly information resources.

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