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# WOULD STUDENTS BENEFIT FROM USING EBOOK EREADERS IN ACADEMIC PROGRAMS?

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## ABSTRACT

As eBook eReaders become more popular for personal use why are they not seen more in academia? In particular, would students benefit from using eBook eReaders in academic program? This paper means to investigate the current academic use of eBooks and eReaders including PC/laptops/netbooks as eReaders. As part of the investigation we conducted a small pilot study of graduate students enrolled in an eBusiness strategy course and reviewed existing research. However, current research is very limited in the area of eBook devices (eReader). This paper proposes a framework to classify and evaluate eBook eReaders, reviews the limited existing research then develops some hypotheses on the usefulness of eBook eReaders. The findings will indicate that enhancements are still needed for eBook eReaders in the area of collaboration and personalization before they are ready for academia.

## Keywords

eReaders, eBooks, electronic books, framework, conceptual model

## INTRODUCTION

Since Johannes Gutenberg's invention of the printing press in 1440 advances in printing technologies have reduced the cost of books. However, the book you read today is not that much different than one created by Gutenberg's press. However, in the digital age tremendous potential advances in content access exist that are not yet fully exploited in most academic settings. Advantages of digital access include flexibility, ability to link various texts, ability to display content in different formats, ability to link multimedia, ability to search and enhanced ability to share knowledge (Gordon 2002).

While eBooks can be read on any computing device, the recent emergence of eBook readers has created a renewed interest in delivery of these resources. Interestingly, research regarding the usage of eBook eReaders (as summarized later) has shown equivocal results. One of the primary reasons for such results is the wide variety of devices on which digital books can be read. These devices include PCs, iPhones, Sony readers, Kindle eReaders and netbooks to name a few. However, despite the number of devices no framework exists yet to classify these devices.

This paper provides such a framework. The framework provides two important outcomes. First, it provides a way to classify the various eBook eReaders. Second, this framework helps us understand existing research and draw hypotheses regarding the effectiveness of new enhancements to eBook eReaders. We conclude that even though knowledge integration dimensions are high in the eReaders that deficiencies in collaboration and personalization features leaves the eReaders lacking necessary features to support use in academia.

## EBook reader Classification Framework

In 1971 Michael Hart started Project Gutenberg. The goal of this project was to digitize and archive cultural works (Hart, 2004). As computer hardware evolved so did the digitalization of books. Eventually the product of digitalization became known as eBooks. By the early 1990's eBooks were available for purchase on floppy disks to be read on personal computers. The PC is already ubiquitous in most homes and remains the most common device for reading eBooks. However, a drawback to the PC or even laptop for reading books is that even small laptops and netbooks are relatively unwieldy when compared with a traditional bound book.

In 1998 SoftBook Press, Inc. is given credit for the introduction of the first dedicated eReader. The eReader is a lightweight high-capacity electronic book replacement. A review of the academic and practitioner literature since then shows that a wide variety of devices has emerged in this field. These devices are getting used in different academic settings. Additionally, these devices have a diversity of non-comparable features, making it difficult to compare the impact of these devices.

Thus, before we present a review of a literature it is important to present a framework to understand these devices. Since eReaders are knowledge devices we use a framework developed by Gupta et al. (2005) to classify different eBook eReaders. The framework provides three dimensions for evaluating knowledge tools: Knowledge integration, collaboration and personalization. The variety of features can be classified with these dimensions. We discuss each one of these in the context of eBook readers below. The discussion is summarized in Table 1 (with examples from eReaders available in the US).

Dimensions	Knowledge Integration	Collaboration	Personalization																								
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Table 1. Dimensions of knowledge tools for commonly found models of eReaders released in 2009

*Knowledge integration:* Knowledge integration refers to the comprehensiveness and accessibility of codified knowledge in a firm’s knowledge base (Gupta et al. 2005) (Sambamurthy et al. 2003). In an eBook eReader context it is represented by the ease which the various eReaders transfer information from the reader to the user and between different types of eReaders. Of

the dedicated eReaders the Sony eReader can not only read eBooks formatted in Sony’s proprietary format, but can also read PDFs, txt, rtf and ePub file types. In addition to being able to read many text formats the Sony eReader can play MP3s and ACC audio formats. Plus, the Sony eReader can display jpeg, gif, png and bmp which are all common image formats.

*Current weakness across all platforms:* Lack of integration across different types of eReaders is a weakness in the current set of products. There is a limited availability of textbooks in eBook format.

*Collaboration:* Collaboration is the ability to conduct a conversation while maintaining a common frame of reference (Schrage 1997). Digitized books can serve as the common frame of reference. Collaboration brings together the explicit knowledge within the eBook with the tacit knowledge that individual MBA students possess (Nonaka 1994; Polanyi 1967). To this point this dimension is greatly lacking in most commercial eReaders. The only significant collaboration function at present is note sharing. However, note sharing between students or professor and student is only available on the PC versions of eReaders. At time of publication a new eReader called the Nook was released by Barnes and Noble. The Nook is unique in its ability to allow users to lend books to other users of the device.

*Current weakness across all platforms:* Features to connect users for global study groups are not robust or integrated. There is a lack of real-time collaboration features.

*Personalization:* Personalization is the extent to which the device can be customized to fit a specific users needs (Gupta et al. 2005). Personalization significantly impacts the ability to transfer knowledge since it presents presorted knowledge based on individual needs (Ho et al. 2008; Mayer et al. 2004). Technology supporting learning material creation customized based on student feedback exists for PC versions of the reader but is not in use.

*Current weakness across all platforms:* Ability to move chapter information based on user or professor’s preferences does not exist. No user friendly customization to allow users to tailor learning to their particular level or learning style.

*Dimension outcome:* Taken together the set of dedicated eReaders that were used in the pilot had no clear winner. Sony had the most points but by a small margin and the criteria used were not comprehensive. There is much room for expanding and perfecting the criteria.

**LITERATURE REVIEW AND HYPOTHESIS DEVELOPMENT**

A review of literature provided limited number of studies using eReaders. While the results of these studies do not provide a clear review regarding the effectiveness of eReaders, they do provide critical insights when viewed from the lens of the framework outlined above.

In this section, we develop hypotheses based on the above lens. We use the existing literature to substantiate our hypotheses. These hypotheses allow us to evaluate each of the dimensions of the eReaders rather than focusing on individual devices. Propositions based on these dimensions would be applicable across all eReaders, and thus more generalizable. Table 2 summarizes the studies, evaluates the technology used in terms of the dimensions and tabulates the results. These are discussed further below.

Study and context	Classification based on the framework	Findings
<p>Marti’n, Estefani’a &amp; Carro, R.. Supporting the Development of Mobile Adaptive Learning Environments: A Case Study. (2009)</p> <p>This case study focuses on how to introduce adaptive learning experience using portable learning environments. University students used a web-based tool to guide their study for two courses during a semester. This tool was customized to provide each individual specific material designed to match their self-reported learning style. During the course of the study this team</p>	<p><b>Knowledge Integration</b>-Student able to select and search information based on individual request.</p> <p><b>Collaboration</b>-The main collaborative element of the tool was the ability to get names of other students taking the course who were also interested in a study group.</p> <p><b>Personalization</b>-Students got study recommendations based on questions answered by student. Students were also able to take advantage of mobile learning when the internet was accessible.</p>	<p>The study used web-enabled devices such as PC, laptops and PDA’s.</p> <p>The study determined that students found mobile learning useful and they accepted this type of mobile learning.</p>

gathered student's specific recommendations for learning. This study was not specifically focused on eReaders, but does provide a path for future eReader design to follow.		
<p>Chen, G., Wei, F., Wang, C., &amp; Lee, J. (2007). Extending E-Book with Contextual Knowledge Recommender for Reading Support on a Web-Based Learning System.</p> <p>Reading comprehension among university students was the focus of this study. A relationship between reading behaviors and test results was theorized. A web eBook that would give students study recommendations and tests every two weeks to validate knowledge retained was used to test this theory.</p>	<p><b>Knowledge Integration</b>-Textbook with problem solving questions incorporated for quick comprehension evaluation.</p> <p><b>Collaboration</b>-Within the web-based eBook learning system students could find the name of mentors and discussion forums.</p> <p><b>Personalization</b>-Individual assessments at scheduled checkpoints resulted in customized recommendations on future course of study and materials to be used.</p>	<p>The study used web-enabled devices such as PC and laptops.</p> <p>The study found that this web-based eBook significantly enhance student learning.</p>
<p>Carlock, D., &amp; Perry, A. (2008). Exploring faculty experiences with e-books: a focus group.</p> <p>Perceptions and use of eBooks by faculty at Arizona State University (ASU) were studied. This team used a trained focus group facilitator to talk to a small group of faculty.</p>	<p><b>Knowledge Integration</b>-Web accessible books were convenient when available for use and with ample internet bandwidth.</p> <p><b>Collaboration</b>-Not available.</p> <p><b>Personalization</b>-Limited to no customization perceived as available by the participants of the focus group.</p>	<p>The group focused mostly on web-enabled eBooks including eBooks accessed through the University's own library.</p> <p>They found the faculty to be generally unsatisfied with their eBook experiences. Reasons included the perceived steep learning curve, lack of manipulability and the unreliable access to web eBooks. An additional complaint noted was the lack of color on the eBooks.</p>
<p>Rowlands, I., Nicholas, D., Jamali, H. &amp; Huntington, P. (2007). What do faculty and students really think about e-books?</p> <p>This team received 1,818 responses from 27,000 surveys sent to faculty and students. This large scale online study survey set out to evaluate the use of eBooks among university students and faculty in the United Kingdom.</p>	<p><b>Knowledge Integration</b>-Ease of use perceived as poor with respondents of survey stating that they printed the materials then treated as a traditional book. Thus not taking advantage of any electronic features.</p> <p><b>Collaboration</b>-No collaborative features specifically mentioned in this study.</p> <p><b>Personalization</b>-No personalization mentioned in this study.</p>	<p>Study included eBooks and eReaders with no mention of eReaders other than those accessible on PCs including web based eBooks and eBooks available from the library.</p> <p>Responses to the survey showed 44% had used some form of eBook. Of the age groups studied the 17-21 year olds had a 48% preference to reading from a screen. When this team evaluated the kinds of eBooks that are being used by faculty and students they found that nearly 60% were textbooks.</p>

Table 2. Literature review

**Knowledge Integration:** Knowledge access through integration of textbooks to eReader devices has been the primary focus of much of the research. An analysis of existing research based on the framework suggests that knowledge integration is

currently aimed at increasing the knowledge resources available on eReaders. A further analysis shows this has been a primary factor in enhancing the perception of the usefulness and ease of use of the eReaders (Rowlands et al. 2007). Interestingly, no evidence regarding its ability to enhance learning was present. Thus, we hypothesize

*H1: EReader devices that have a high level of knowledge integration will have a positive effect on perceived usefulness.*

**Collaboration capabilities:** The extensive literature in knowledge management has always emphasized the importance of collaboration in knowledge creation (Alavi et al. 2001). The two studies in our review also support this assertion. While both provided limited collaboration capabilities, ranging from finding names for study group (Martín et al. 2009) to accessing discussion boards (Chen et al. 2007), both studies provide evidence regarding the utility of collaboration tools in enhancing learning outcomes. Thus, we argue

*H2: EReader devices with high levels of collaboration capabilities lead to significantly higher levels of learning outcomes.*

**Personalization:** The importance of personalization is being extensively studied in contemporary research. In our literature review two studies used extensive customizations to model learning based on individual differences. The first study introduced adaptive learning (Martín et al. 2009) and the second study focused on reading comprehension (Chen et al. 2007). In both cases student satisfaction (an important learning outcome) was considerably increased. This is also consistent with the personalization and training literature which argues in favor of personalization to enhance knowledge retention. Based on this, we argue

*H3: EReader devices with high levels of personalization capabilities lead to significantly higher levels of student satisfaction.*

## **RESULTS FROM A PILOT STUDY**

To test the hypotheses presented above a small action research based study was conducted. An eBook textbook was introduced in the graduate eBusiness strategy class. Out of the 24 students in the class, three students used the Sony Reader Touch 6, one student who used the Sony Reader also had a Kindle, four students used smart phones, and the rest used PCs. Observations were made throughout the course. We outline our experience and observations below.

**Knowledge Integration:** The Sony reader was able to read many different formats and this made it convenient to read the needed materials for the course in which the eReader was used. The team was required to read the course book that was in a PDF format as well as read student written chapters that were converted to txt, rtf or PDF. The Sony reader does not directly connect to the internet so using a PC was required to load this eReader with eBooks and any other materials needed for reading. Purchasing eBooks from the online Sony store was not as easy as purchasing a book from an online store such as Amazon.com, however, each of students did make purchases from the Sony Reader Store. The Sony reader has eInk display technology, which users reported made reading for extended periods of time easier than when compared to a computer screen or monitor. The students using the Sony reader found the selection of titles on the Sony Reader Store to be good but there was a limited selection of textbooks available. All the eReaders in the study did have a high level of knowledge integration and users felt positive about the perceived usefulness and for the most part the devices were perceived as easy to use.

**Collaboration:** The Sony reader offers the ability to borrow eBooks from libraries. However, the students in this study did not test this feature and did not find any other types of collaborative features worth noting in the Sony reader. With the exception of the PC/laptop/netbooks, eReaders have a limited ability to allow the user to collaborate. The only current collaboration features include checking out materials from a library with the Sony eReader and the Nook's ability to share books with other Nook users. Because levels of collaboration are low, students are not experiencing higher levels of learning.

**Personalization:** The students were able to take notes in the margins of eBooks of the Sony reader. In addition to taking notes in the margins, the students were able to take notes on a separate notes section using a stylus that came with the Sony reader. A customization feature worth mentioning is the ability to change the size of the text being read in the Sony reader. This allows different users to read comfortably. Again, with the exception of the PC/laptop/netbooks, the other eReaders have very little personalization flexibility. The ability to manipulate information in the eReader or to customize the eBook in the eReader was not available to students. Thus, the lack of personalization features on the eReaders contributes to students reporting a low level of satisfaction for the devices.

## **CONCLUSION**

There has been little study to determine the usefulness of an eReader for Academia. Tools and conceptual frameworks to adequately evaluate the technology and hardware did not exist. This paper outlines one such framework. The use of our framework leads us to the following conclusions. While enhancing knowledge integration has been the primary focus of eReaders, this is not the dimension that we expect to have the most substantial impact on learning outcomes. A primary reason for this is that the current focus of eReader devices is not on integrating different knowledge resources, but only on

making them discretely available. It is clear though that knowledge integration enhances the perceived usefulness and perceived ease of use for the device. As technology adoption research has shown, these are the critical elements in adoption of technology (Lee et al. 2003).

However, as the discussion above shows, the critical component for enhancing learning using eReaders is their ability to enhance personalization and collaboration. However, as illustrated in Table 1 considerable potential for development exists here.

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