TRANSFORMING THE DIGITAL TEXTBOOK: A MODIFIED DELPHI STUDY

by

Louay Chebib

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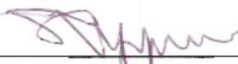TRANSFORMING THE DIGITAL TEXTBOOK: A MODIFIED DELPHI STUDY

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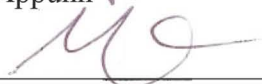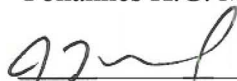
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Abstract

Digital textbooks continue to hold the potential to revolutionize the dissemination of knowledge to anyone, anywhere. The understanding needed to reach a new digital paradigm includes tools that are consistent with the needs of a new generation of educators and students. This qualitative modified Delphi study provides a foundation that defines the function, structure, and role of the textbook in education. The textbook is defined as a basic educational resource that provides definitive knowledge, defines and bounds the scope of discussion and learning, and helps assure that the stated learning goals are met. A textbook is an educational resource and may contain other resources. As such, the textbook functions as an educational workspace; digital textbooks need to function as the principal resource in an online or interactive educational workspace that supports a mix of materials, including and regardless of multiple media formats. As is the role of the best technology, a fully functional digital textbook seamlessly encapsulates the educational materials and resources needed by the specific course. The consideration of linear and non-linear study functions in terms of existing devices and interfaces played a critical role in understanding textbooks. Current PDF-based digital textbooks do not meet students' needs. A list of functional considerations, that need to be part of the next generation of digital textbooks, is included in this study. Students need to be able to tailor the interface to best suit their individual preferences. The importance of reducing costs in the marketplace will ultimately decide which technologies will succeed.

Dedication

This dissertation is dedicated to the advancement of and dissemination of knowledge to anyone who wishes to know. Knowledge has the power to tear away at the darkness and thereby banish ignorance. Technology supports every aspect of human endeavor and now has a chance to support the free dissemination of knowledge to anyone anywhere.

This dissertation is further dedicated to my family. They have been my inspiration, and my role models. Their example, patience, understanding, support, and pride has kept me motivated and helped me redouble my efforts, even in the most challenging of times. May this effort serve as an inspiration to our next generation of lifelong learners.

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I also need to acknowledge my panel of subject area experts and to those members of the public who reviewed and commented on our initial findings. Each of you took the time away from your busy lives to add your insight, and to help create the knowledge and understanding we need to help transform the digital textbook.

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Chapter 1: Introduction

Recent technological innovations have revolutionized practically every aspect of human interaction (Watson & Straub, 2007). Quantum improvements in electronic communications speed, digital storage, and processing underlie radical advances and significant fundamental change in commerce, communications, knowledge acquisition and dissemination, and interpersonal relationships. In problem solving and organizational design, the question is no longer that of finding an appropriate fit for technology, but that of which technology provides the best fit.

The Internet provides ready access to the greatest information repository and communications network in the history of humankind. In this context, technology innovators need to remember that the essential role of technology remains the abstraction of complexity. People may choose, and are sometimes required to, remain continuously connected from virtually anywhere (Johnson, Levine, Smith, & Stone, 2010). However, gaps in technology adoption have created deficiencies, and not all fields of human endeavor have reached their potential. One of these technology gaps is in the field of higher education.

Low digital textbook adoption rates and a continued preference of paper-based textbooks suggested the existence of deeper burdensome issues such as a weak value proposition, gaps, or mismatches between the technology in use, and the users' needs and expectations (Fletcher, 2010; Foasberg, 2011; Mulvihill, 201; Nelson, 2008; Woody, Daniel, & Baker, 2010). The aim of this study was to identify and define the technical, social, and cultural factors hindering the adoption of digital textbooks and to identify and create a set of foundational transformational strategies that result in successful adoption outcomes. The identification of successful strategies that address the concerns of multiple stakeholders will lead to a better understanding of

textbooks and their function, resulting in an acceptance of consistent and effective approaches to digital textbook design, utilization, and implementation. This, in turn, will foster the outcomes needed to fulfill the predicted benefits promised by this revolutionary paradigm changing technology (Kirk, 2010; Kuhn, 2007).

Chapter 1 provides a background to this qualitative modified Delphi study that aimed to understand and improve the anemic adoption rate for digital textbooks in higher education. Additionally, Chapter 1 presents the research questions considered, provides an insight into the selected methodology, describes the scope of the study, identifies the limitations and delimitations of this work, suggests an underlying theoretical framework, and defines the key terms used.

Background

The field of education has selectively adopted some technologies while ignoring others (Kirk, 2010; Mulvihill, 2011; Simba Information, 2011). Many universities and other institutions offer online classroom models that use the latest in distance learning practices and technologies, but still require students to use traditional paper-based textbooks that have not changed much since Gutenberg first invented movable type in the 15th century (Vassiliou & Rowley, 2008). Some institutions, such as the University of Phoenix, mandate the use of digital textbooks wherever possible (Jackson, 2010). These electronic, or digital textbook, alternatives are seldom little more than electronic representations of the paper-based textbooks (Simba Information, 2011; Kirk, 2010). These digital alternatives have little advantage over their paper-based counterparts and resemble crude early attempts to place paper-based content onto the Internet. These attempts at digitization contain a basic flaw, in that there is a fundamental mismatch between the presentation format and the presentation media. "The medium itself may

not be as comfortable as a textbook experience for readers and that the design of an eBook may need to differ from that of a textbook to make for a more constructive user experience" (Woody et al., 2010, p. 947).

Computer screens or electronic readers each have unique capabilities. These attributes are fundamentally different than paper. What works well for one type of media, will not necessarily work well on another. In this research, I looked to identify and define the technical, social, and cultural factors hindering the adoption of digital textbooks and propose a set of foundational transformational strategies that should lead toward successful adoption outcomes. The identification of successful strategies, that address the concerns of multiple stakeholders, is foundational. These strategies should lead to effective approaches to digital textbook design and implementation that foster the outcomes needed to fulfill the predicted promise of this technology.

The benefits of digital textbooks are well defined. These include accessibility, portability, accuracy or timeliness, interactivity or flexibility, and cost savings to all stakeholders including authors, publishers, students, educators, and educational institutions (Gorski, 2010; Hughes, 2012). In the era of the near instant communications and knowledge sharing, textbooks need to provide timely, accurate, current, and factual information. The ability to access information online, at any time, from any place, has transformed the educational paradigm from teacher-based teaching to student-centered learning (Fillion, Limayem, Laferriere, & Mantha, 2009; Garrison & Vaughn, 2008; Kolb & Stuart, 2005; Sitzmann, Kraiger, Stewart, & Wisher, 2006).

However, the truism that by the time a textbook is printed, it is out of date continues to hold (Ganapati, 2010a). Rossman (2008) makes the case that "new information is being added to

human knowledge so rapidly that a textbook may be out of date by the time it appears in print, where digital online textbooks, downloaded from the Internet, can be regularly revised and updated" (2008, para. 1). A comparison of the digital textbook issues and promises from 2001 with those of the past few years showed that little has changed. Although the publishing industry has made some progress in the quality of textbooks and increased the availability of digital versions, adoption and acceptance of digital textbooks continues to trail the adoption of other digital technologies (Goldstein & Fowler/Longview, 2001a; ebrary, 2008).

The new "Google, Wikipedia, millennial" digital native generation expects more from their educational tools (Prensky, 2010). Tim McEwen, CEO, Archipelago Learning stated that "we're reaching a tipping point with this shift to digital content. Kids are digital natives and they're going to demand content digitally" (Converge, 2012, p. 38). Recent studies show that digital textbooks are not meeting the expectations of this new generation (Foderaro, 2010). The publishing industry has experimented with multiple presentation formats and delivery options (Mulvihill, 2011; Simba Information, 2011). Portable eReaders, tablets, and standardized eReader formats are beginning to enter the mainstream marketplace. These alternatives are starting to represent a significant portion of total book sales. The Association of American Publishers reported that electronic book sales have been consistently rising (2011); in the first quarter of 2011, eBooks outsold all other commercial book types (Sporkin, 2011).

Universities are revising their practice and studying the role of technology and technological readiness as factors for success in education (VITL Task Force, 2009). Dean Dad (2009) makes the case that university bookstores, and by extension administrations, have a financial interest in the sale of traditional paper textbooks. The apparent lack of standardization

and the acceptance of the status quo favor the publishers, who consistently provide the minimum functionality acceptable by institutions and textbook selection committees (Hampson, 2010).

At present, the most prevalent form of digital textbooks uses Adobe Systems Incorporated's (2014) Portable Document Format (PDF) based representation of the paper book with little added functionality (Hampson, 2010; Nelson, 2008). The strengths of PDF-based document presentation lie primarily with the ability to efficiently, and at little cost, present an equivalent to paper format consistently on any electronic media and the ability to apply digital rights management (DRM) capabilities to provide intellectual property protection (Seadle, 2009; RR Donnelley, 2012). Publishers fear unauthorized copying and rely on DRM to limit copying; students find reading of PDF-based textbooks cumbersome and the DRM protections limit access and portability (Dickson, 2010; Kirk, 2010; Seadle, 2009; RR Donnelley, 2012; Watters, 2011). The PDF format is very useful for many legal and commercial applications where end users need to treat documents as they would the paper equivalent. This very utility and the general acceptance of PDF coupled with the ubiquitous availability of PDF readers makes PDF the de facto standard for most electronic documents.

The existence of any functional standard, no matter how limited, creates a paradigm that acts as a barrier to the creation of the radically different technologies needed to meet the needs and requirements of today's and tomorrow's tech savvy students (Kuhn, 2007). Additionally, for many students and other stakeholders, the PDF-based textbook model, with all its limitations, has come to define the digital textbook paradigm (Kirk, 2010). This acceptance of PDF-based digital textbook limits the vocabulary of the discussion to a comparison of de facto objects: PDF or traditional textbooks and precludes a conceptual exploration of potential, yet undeveloped, future digital textbook alternatives.

However, PDF-formatted documents lack the flexibility that allows for optimized readability on different electronic devices. Simba Information (2011) suggests, "the key to acceptance… is the offering of materials that make good use of digital platforms, not just a transfer of a print book to a digital format… [and in doing so,] turns the value proposition around so that digital materials are the necessity in terms of value" (p. 3). Kirk (2010) described digitized or equivalent to paper presentations as "static digital information products" (p. 524) and contended that these represent "a form factor change, not a content or usage change (Koukova, Kannan, & Ratchford, 2008), and do not offer the many cognitive and affective benefits of interactivity" (p.527). Designers of user interfaces and successful providers of Internet-based content have long understood that consideration of the presentation medium is an essential ingredient of effective interface design. A number of innovators have recognized users' needs and have developed multi-function and specialized digital textbooks formats and eReaders.

Although these represent a general improvement in digital textbook reading, many of these devices remain best suited to purely textual work or lack sufficient content or utility to be universally accepted (Lardinois, 2009; MacManus, 2010; Martinez, 2010). Despite the many technological options and improvements, surveys still showed that "College Students Want Their Textbooks the Old-Fashioned Way: In Print" (BISG, 2011, para 1).

> The slow adoption of digital textbooks by students… highlight[s] the ways in which students' needs aren't being met yet by digital content providers. That means there's still a huge opportunity here to reshape what the textbooks of the future look like… Students' reluctance to move to digital textbooks should also be an indication that we have to make sure we're building learning tools that meet the needs of learners… Students' purchasing

habits indicate that they're making decisions about what works best for how they study

(Watters, 2011, para. 9-10).

Jessie Woolley-Wilson, CEO, DreamBox Learning, stated the need for a transformational

strategy that changes the educational model.

> We must move beyond the evolutionary phase of digitizing textbooks into a
>
> transformational phase of providing an interactive learning experience: Subject matter
>
> that interacts with and is shaped by the student. This intelligent adaptive technology,
>
> which is student-driven and student-architected, is key to transforming the way students
>
> learn. And it is available today (Converge, 2012, p. 38).

Additionally, J. Rollins, Senior Vice President, Solution Strategy, Houghton Mifflin Harcourt,

stated that

> the goal is not digitizing content because we can. Our goal is to continuously transform
>
> education by personalizing the learning experience in a way that traditional content
>
> delivery simply cannot. We will judge our success in education reform by how far we
>
> advance student achievement beyond what we could through traditional constructs (p.38).

Problem Statement

Although digital content and specifically textbooks have the potential to democratize

learning and revolutionize the dissemination of knowledge to anyone, anywhere, surveys showed

that students continued to have a preference for traditional paper-based textbooks (Converge,

2012; ebrary, 2008; BISG, 2011; Woody et al., 2010); this indicated an adoption problem for

digital textbooks that use the prevalent model (Jost, 2000). Despite the known potential benefits

and unprecedented technological advancements in other areas of electronic communications, the

expected rapid adoption of new function-rich models for digital textbooks has not occurred, and

the anticipated benefits have failed to materialize. Instead, the demand for well-structured, media-rich digital textbooks remains weak. While most industries have accepted, adapted, and incorporated digital technology as part of their mainstream operational models, the textbook industry has moved very slowly and with little innovation. The status quo of static digital information products is not satisfactory as it depends on an accepted, well-established, functional presentation platform: Adobe Systems Incorporated's Portable Document Format (PDF) (Alexander, 2009; Nelson, 2006; Weise, 2010; Kirk, 2010).

Static information-based digital textbook implementations do not reflect the interactive and dynamic capabilities available in other digital media. This situation has limited students, authors, educators, developers, providers, and educational institutions, because without functional, viable alternatives to static digital information products, digital textbooks will continue to be more of a burden than a benefit. Adobe has recognized the need for innovation in digital publishing; Adobe is a member and a premier sponsor of the International Digital Publishing Forum (IDPF) (2014).[1] A possible cause of this adoption problem was that although PDF is not an ideal format, it is sufficiently functional to have stifled further innovation. Educational leadership was not making digital textbook adoption a priority and some academics questioned the need for textbooks of all modalities in the educational environment (Martinez, 2010; Saenz, 2010).

The result was that stakeholders lacked an effective strategy to move digital textbook technology off the existing cultural and technological plateau, past the adoption chasm, and on to the next level (Moore, 2002; Nelson, 2006; Sarker & Valacich, 2010). Perhaps a holistic study, involving stakeholders and other interested parties, discussing collective and individual positions

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[1] IDPF is the open standards group that created the ePub standard format for eBooks. Most PCs and digital readers including Apple's iBook reader (Wikipedia, 2014a) use this standard.

and needs, in the context of the current situation of digital textbook adoption, could remedy the situation. A qualitative modified Delphi study, which incorporates dialogue-based inquiry approaches and works with subject area experts and interested parties, provided the framework for this discussion. A holistic strategy promotes transforming the digital textbook into a viable and acceptable alternative to traditional paper-based textbooks that meets the needs of the higher education community. A better understanding of the factors limiting digital textbook adoption may identify strategies for removing these factors.

Purpose Statement

The purpose of this qualitative modified Delphi study, which incorporated dialogue-based inquiry approaches to work with stakeholders from technology, education, publishing, printing, and end-user communities, was to investigate digital textbook adoption issues. With dialogue-based inquiry approaches stakeholders can discuss and cooperate in the accomplishment of a specific goal: removing the adoption barriers that have prevented digital textbooks from becoming a viable and acceptable alternative to traditional paper-based textbooks, and in doing so, transform digital textbooks into an integrated part of the digital education environment.

The stakeholders worked to identify specific factors hindering the general adoption of digital textbooks, suggested mitigation strategies, and tested the effectiveness of these mitigations. In an effort at fostering mainstream adoption, this study's methodology required a direct dialogue between those with the day-to-day hands-on experience and knowledge. Clarifying the state of digital textbook adoption, and the functional and esthetic needs of mainstream users, provides the context for removing adoption barriers.

A structured and well-controlled online discussion environment provided all stakeholder representatives a forum for the expression of their views and concerns. Schirr (2012) looked at available group-based research methods and found that traditional methods that allow face-to-face interaction are ineffective tools for innovation. "Especially for more innovative product development, uncovering customer needs and problems is hampered by their contextual knowledge and inability to express or understand the needs away from the context" (Schirr, 2012, p. 475). As an alternative to face-to-face interaction, Schirr proposed the concept of "alone nominal groups" (p. 438) that supports the concept of individual ideation. Virtual, online, pseudo-group and other non-face-to-face methods are preferred when innovation is required (Schirr, 2012). Girotra, Terwiesch, and Ulrich (2010) examined hybrid methods for idea generation in which individuals initially worked independently and then worked together as a group. Girotra et al. found that when compared to traditional groups,

> groups organized in the hybrid structure are able to generate more ideas, to generate
> better ideas, and to better discern the quality of the ideas they generate. Moreover, we
> find that the frequently recommended brainstorming technique of building on others'
> ideas is counterproductive; teams exhibiting such buildup neither create more ideas, nor
> are the ideas that build on previous ideas better (abstract).

Girotra et al.'s studies suggested that individuals working asynchronously in an online environment are better able to perform innovative discussion that leads to productive idea generation.

For this research study, qualified panelists included subject matter experts and interested parties who had written or expressed, preferably strong, opinions on the subject of digital textbooks, those individuals who appeared in literature or the media as authorities on this subject,

and individuals working directly in post-secondary education, publishing, or in related fields. Panelists were also invited to suggest other panel members based on their ability to add insight, value, and alternate perspectives to the discussion. This study's design allowed up to 20 subject matter expert panelists to participate in the discussion. The nature of the selection process assured that each panelist had the ability to represent more than one constituency. Although the selection process favored participants from the United States, this study took place online in a virtual meeting place. As such, the specific physical or geographical location of the panelists was unknown and it was possible for participants to post from any location.

Significance to Information Technology and Educational Leadership

Previous work has created a general understanding of the practical, sociological, environmental, and financial advantages of digital textbooks (Kingsbury, 2008). Digital textbook technology holds the potential to revolutionize the dissemination of knowledge to anyone anywhere (Nelson, 2006). Technological advances continue to challenge the traditional educational paradigm and drive innovation in new directions (Johnson et al., 2010).

> People expect to be able to work, learn, and study whenever and wherever they want to… The work of students is increasingly seen as collaborative by nature, and there is more cross-campus collaboration between departments… Digital media literacy continues its rise in importance as a key skill in every discipline and profession (p. 4-5).

The identification of effective, consistent strategies that foster the general adoption of this technology provides a critical component that will deliver a sea change in education by providing effective tools that are consistent with the needs of a new generation of educators and students. The findings of this study may help refine the function, structure, and role of the textbook in the educational system and thereby align the tools used in education with expressed educational

goals. The process of conducting this study using a virtual online environment has the potential of defining effective alternative consensus-building strategies for use in exploring the underlying causes of poor technology adoption. Understanding cooperative problem solving in a virtual environment provided an alternative model for inclusive decision-making that allowed stakeholders representing diverse interests to express their needs and concerns as part of the decision-making process.

Nature of the Study

A modified Delphi study, incorporating dialogue-based inquiry approaches, provided a holistic framework. In this problem-solving framework, the process allowed for the consideration of the needs and concerns of many expert and lay stakeholders. Each stakeholder brought with them their own personal concerns and desires. In complex problem solving, it is essential to have an understanding of all aspects of the problem. Since no single factor or action had substantially resolved this digital textbook adoption problem, a holistic approach offered possibilities that lead to greater understanding and ultimately to effective strategies.

A virtual online panel environment provided participants significant anonymity. The perceived degree of anonymity available in an online environment fosters free expression of views and independence from external or authoritative influence (Spears, Lea, Corneliussen, Postmes, & ter Haar, 2002). Anonymity allowed participants to bond with each other and form group alliances in pursuit of the group's goals while reducing consideration of outside influences. A virtual forum provided logistical benefits. The asynchronous communications model allowed panelists to contribute and participate without needing to coordinate meeting times and locations.

Research Questions

The fundamental research question for the study was as follows: How should digital textbooks transform into a viable and acceptable alternative to traditional paper-based textbooks and thereby foster effective adoption and acceptance in higher education? This research design leveraged the combined knowledge and efforts of stakeholders in solving a real world problem. Stakeholders each viewed the situation presented from their individual perspective and considered the situation in the context of the research questions, discussion topics, and the background information presented. The stakeholder panelists were aware of the research problem and of the questions under consideration. The stakeholders considered the following questions in the context of the prevailing situation as identified in a summary of the literature and augmented the case by identifying and expressing their community's concerns, resulting in the proposal of remedies based on a true understanding of each other's concerns.

With the goal of removing the adoption barriers that have prevented digital textbooks from becoming a viable and acceptable alternative to traditional paper-based textbooks, the following research questions guided this research study:

1. What is the definition and role of digital textbooks in higher education?

2. What, if any, factors hinder the general adoption of digital textbooks?

3. What are the possible mitigation strategies addressing the factors hindering the general adoption of digital textbooks?

4. What is the practical effectiveness of each of these identified mitigation strategies in transforming the digital textbook into a viable and acceptable alternative to traditional paper-based textbooks?

The panelists' discussion framed digital textbook technology considerations in terms of a technology adoption problem. The panelists, representing their stakeholder communities, discussed and considered the presented discussion topics and literature, and provided experiential and anecdotal input identifying the issues and concerns that tend to hinder the acceptance and general implementation of this technology. Having identified barriers to the general adoption of digital textbooks, the panelists suggested and discussed viable mitigation strategies.

This phase of the discussion process yielded a list of mutually acceptable strategies and action items. The panel's suggestions and list of action items formed the focus of an open virtual discussion that allowed for public input. This open input process served as an external validation step in which the public had the option to accept the findings and suggest specific alternatives and concerns that may have been overlooked by the panel. The panelists subsequently reviewed these comments and concerns.

Theoretical Framework

Moore (2006) suggested that the introduction and adoption of new and potentially disruptive technologies functions in a predictable manner, and that success occurs when stakeholders recognize the present adoption stage and create the stakeholder relationships needed for that stage. Successful technology adoption results from a cautious, well-coordinated building of unity, understanding, and the creation of a perceived standard. Moore (2006) stipulated the need to articulate the case for adoption succinctly in two short sentences and provided a formulaic approach. Based on Moore's stated formula, the case for digital textbook adoption would read:

For [educators and students in higher education] who are dissatisfied with [printed textbooks,] our product is a [portable digital textbook] that provides [functionality and

accessibility on any device]. Unlike [PDF-based textbooks], we have assembled [all the

functions and features needed by educators and students] (p. 154).

At the core of any product design is the product definition and an understanding of the

requirements implicit in the product. The adoption design process takes the form of defining

functionality and identifying the additional effort needed, by multiple parties, to meet the

requirements. As such, it is not possible to deliver on the above claim of providing "all the

functions and features needed by educators and students" without first understanding and

defining these functions and features.

Lin, Shih, and Sher (2007) considered Moore's adoption chasm as part of integrating the

ideas of technology readiness (TR) into Davis' (1989) existing technology acceptance model

(TAM) and defining a new technology readiness and acceptance model (TRAM) and framework

to help explain consumer driven behaviors. TRAM considers consumers and their attitudes as

necessary parts of the acceptance model, and customers' technology readiness and intention to

use the technology as functions of perceived usefulness and ease of use. TRAM measures

technology readiness (TR) using an index of "four sub-dimensions: optimism, innovativeness,

discomfort, and insecurity" (Lin et al., 2007, p. 643). TRAM helps to identify the critical chasm

between the early adopters and the early majority. "The chasm is signaled when the adopters'

mean TR index decreases dramatically" (p. 653). All these models consider that user or

consumer attitudes have a significant influence on the ultimate adoption of innovative and

potentially disruptive technology.

This modified Delphi study, incorporating dialogue-based inquiry approaches, supported

the identification of the current stage of this technology's adoption as the basis for further action.

The success of this study depended on the identification and cooperation of stakeholders and

subject matter experts from a variety of disciplines. Each of these parties presented and represented their interests and views on the subject in an open dialogue. The stated goal of these discussions was the greater understanding of each other's needs and abilities. The literature review process set a solid foundation for the rest of this work by identifying the current state of the art, existing and past practice, available technology capabilities, and relevant technology theories. The literature review identified the relevant questions in the context of the current environment and relevant theories. These questions formed the basis for the panel discussion.

Definitions

For the purposes of this study, an initial "simple definition, is that a textbook is a book specifically conceived for instructional purposes" (Simon, 2012, p. 340). As such, a textbook contains a wealth of detailed information about a specific subject that serves as a central repository and authority for whoever is studying that subject. From a functional, operational perspective, a textbook is a useful informational product that helps provide the underlying theoretical and practical framework for a specific subject. A textbook helps to define the scope of discussion on a specific subject. Multiple textbooks or textbooks that approach a subject from diverse perspectives or that rely on a mix of author opinions and include scholarly research bring credibility to the subject and help students contrast these perspectives as part of a wider discussion (Bean, 2008). Textbooks play

> an essential role in science and in academic disciplines… Textbooks are the primary pedagogical method for embodying what is known about a field and are the tools of socialization into a profession and practice… Scholars studying the sociology of scientific knowledge describe textbooks as "intrinsically important to the constitution and maintenance of a discipline" (Lynch & Bogen, 1997: 482)… [The textbook] embodies

the visions of legitimate knowledge of identifiable groups of people. In most cases it also

becomes the "real curriculum" that is filtered through the lived culture of teachers and

students as they go about their daily lives in classrooms (Stambaugh & Trank, 2010,

p. 663).

A digital textbook (aka eTextbook or electronic textbook) is "an educational or instructional

book in digital form… [digital] textbooks are increasingly taking the place of printed books" (PC

Magazine, 2011a, para. 1) or a digital notebook: "An all encompassing catchment for a subject

area or [areas] combined. Pulling in [text, images,] audio, video, and other resources into a

home base for students" (Clark, 2011, para. 9). Chesser (2011) explains that:

> eTextbooks can look exactly like the old print versions, or they can pull away slightly and
>
> remove page layout restrictions to adapt to new form factors, or they can now even add
>
> multimedia, active assessments, sharing, accessibility features, and interactivity to form
>
> entirely new offerings. They can be authored by the trusted publishers of old or by
>
> exciting new ad hoc consortia on the Web (p.39).

Text on a display may be in either fixed or reflowable layout formats (Amazon, n.d.). Fixed

layouts do not adapt to the display, and reflowable layouts are flexible and change line lengths

and other display attributes to adapt to the display.

> Fixed layout formats are typically designed for printing, they include PostScript and
>
> Adobe PDF. …The content of fixed layout files is displayed the same way things will
>
> appear once printed. Images, words, paragraphs, columns are positioned at fixed
>
> coordinates within a page. The size of the page is imposed. Reflowable formats are
>
> typically designed to be displayed on a screens for which the size is not known or
>
> imposed. HTML and plain text are reflowable formats (para. 1-2).

According to CampusGrotto (2011),

> Open textbooks are typically authored by experts in academia and published on the Internet, enabling free online access to the textbook. With open textbooks students can read the full text free online, download a printable PDF, or purchase a hard copy at a fraction of the cost of traditional textbooks (para. 3).

A digital book or eBook is a digital version of a printed book. A digital information product contains "digital content whose primary purpose is conveying information and which in print form traditionally took the physical form of a book, magazine, or newspaper" (Kirk, 2010, p. 542). Kirk refers to eBooks "as static digital information products or static eBooks," [and to] "digital information products with an interactive user interface closer to that of a typical web site… [as] interactive digital information products or interactive   eBooks" (p.542). This distinction is valuable in recognizing the intrinsic importance of interactivity to the functional capabilities and the usage of these two types of digital products.

Digital book readers or eReaders are a combination of hardware and software that allow users to access the information contained in a digital book. Specialty devices are devices created for a specific purpose such as Amazon's (2014) original E Ink (2012), Kindle eBook reader that is "a handheld device specialized for reading electronic books" (PC Magazine, 2011b, para. 1) or the original KNO digital textbook workstation that uses single and dual-screen tablets to mimic a student's notebook or binder (Topolsky, 2010; Miller, 2010). In comparison, multiuse devices such as personal computers, smartphones, Android (2014) based tablets, and Apple's (2014a) iPads are devices designed to support a wide variety of application functions.

> Learning management systems [or online learning systems] aim to be one-stop shops where students and instructors (as well as parents and administrators) can find

curriculum; student data such as test results, grades and other assessments; email; and

links to other communication media in the classroom — message boards, wikis or social

media sites (Converge, 2012, p. 16).

Subject matter experts and interested parties are people who have written or expressed an

opinion on the subject of digital textbooks, those individuals who appear in literature or the

media as authorities on this subject, and individuals working directly in the field or in related

fields (Lavin, Dreyfus, Slepski, & Kasper, 2007; SIOP, 2003). Selected subject matter experts

and interested parties participated as panelists in an online discussion. Each panelist represented

one or more stakeholder communities.

Assumptions

This research included several assumptions. Some of the major assumptions dealt with

the panel recruitment process and the subject matter experts who would form the panel. First,

that this project would be of sufficient interest as to motivate and attract the needed population of

subject matter experts to act as panelists. Second, that these panelists would have the time and

dedication to follow through the discussion process and the ability to make meaningful

contributions. Third, that the method used provided a safe environment in which panelists would

be free to discuss and seek viable alternatives. Fourth, that the mix of panelists participating

would be sufficiently diverse to facilitate true discussion. Fifth, that the panel would be able to

identify and mitigate the effects of hidden agendas.

Additional assumptions dealing with the nature of the problem included the assumptions

that:

- The problem, although complex, is fundamentally that of incomplete

  communication, miscommunication, or a lack of understanding between

stakeholders that has led to incomplete and inadequate functionality that does not align the available technology with the true stakeholder needs. Anecdotal evidence shows that stakeholders do not share a common definition of digital textbooks and are not aware of the technological capabilities available to integrate digital textbooks as interactive digital information products into a functional interactive learning environment (Berg, Hoffmann, & Dawson, 2010; Chesser, 2011; Kirk, 2010). Apple's 2012 announcement of a new interactive textbook initiative based on its iBooks 2 model has raised the awareness among the public of some of the available alterative possibilities (Domonell, 2012). As such, a holistic approach would lead to greater understanding in removing the barriers to adoption;

- Moore's (1999; 2006) frameworks and methods for bringing disruptive technology to the mainstream apply to this problem. As such, understanding the problem and the stakeholders' concerns would lead to effective alignment between the technology and the underlying stakeholder needs; and

- Industry leaders would be willing to embrace the recommendations that come from this study.

Scope, Limitations and Delimitations

This study includes references to some of the educational material and digital textbook needs, concerns, and efforts of the K-12 communities. The complexities associated with the socio-political forces at play between K-12 stakeholder communities rendered any attempt to include K-12 perspectives prohibitive within the available reach and timeframe. The specific focus of this study was post-secondary digital textbook adoption from a marketing perspective

with the goal of taking a disruptive technology over the adoption chasm and into the mainstream market (Moore, 2006). A preliminary analysis of the K-12 textbook issues at play in the United States indicated that the K-12 issues are not of the same nature in that the stakeholders in these communities do not share a common goal, vision, or understanding of the fundamental nature and role of the educational system (107th Congress, U. S., 2002; Fletcher, 2010; Jobrack, 2012). Each of the stakeholders continues to pursue fragmented, and often conflicting, visions and policies for K-12. This fragmentation has resulted in a highly fractious, Balkanized educational system, and attempts to rationalize its operation have only added additional bureaucratic complexities. Progress on the technical aspects of delivering effective digital textbooks and other learning materials to the K-12 environment will only occur after the stakeholders in the K-12 communities agree as to the goals of their educational systems and create a common shared vision and understanding.

The scope of this study included the input of individual stakeholders and subject matter experts. The contributions and insights of these individuals were critical to achieving a meaningful and useful result. The process of identifying and qualifying participants included the possibility of overlooking the contributions from some communities. The selection process aimed at identifying a broad base of knowledge and opinion, and the use of a virtual discussion space simplified the study's process, but allowed for the possibility of overlooking or missing the needs of important constituencies. Timing and other logistic barriers hindered the full cooperation and participation of all identified potential panelists.

By necessity, the data gathering process required the input of people who were willing to participate. Not all identified potential panelists publicly listed their contact information. Many different individual subject area experts represent industry and technology. These experts have

the experience and motivation to advance this field. This expertise, by necessity, includes preconceptions driven by financial or emotional stakes in specific approaches or paradigms. A valid understanding of individual motives was a required prerequisite to any discussion.

The panel selection process endeavored to include as broad a spectrum of views as possible, representing the interests of as many stakeholders as possible. The panel members were not limited to representing their identified stakeholder constituencies, but were free to respond outside their own areas. The nature of this selection process favored English-speaking North American participants. Although this study could potentially have benefited from validation of assumed "fact," the validation of or debunking of assumed "facts" through scientific means was beyond the scope of this work. The discussion process included the validation of "fact" in that panelists were able to challenge the information presented and present alternatives based on their professional and personal experiences.

Although the Entertainment Software Association (2012) reported that gaming is the fastest growing technology market, that almost 50% of U.S. households have one or more game consoles, and that a majority of gamers are under 35 years of age, this study did not include game consoles as a channel for the delivery of digital textbooks. Gamers use game consoles primarily for entertainment: playing games, listening to music, and watching television or movies. Post-secondary digital educational models do not rely on game console technology as the users' primary access point to instructional media (Federation of American Scientists, 2006). Gaming technology remains outside the existing post-secondary educational paradigm. "Effective use of games and other new technologies is likely to be limited unless educational institutions are willing to consider significant changes in pedagogy and content, and rethink the

role of teachers and other educational professionals" (p. 6). As such, game console technology was beyond the scope of this study.

Summary

Although all stakeholders understood and agreed as to the importance of digital textbooks, the adoption of digital textbooks remains anemic and students still prefer using paper textbooks. This gap between potential and practice suggested that the role of textbooks and specifically digital textbooks is not well defined and that the stakeholders had not sufficiently communicated their desires and abilities. Providers view digital textbooks as an equivalent to paper products, and take a technical approach to providing a solution. Publishers remain fearful and skeptical. They have sabotaged the genre by including cumbersome DRM protections.

Technology companies have introduced many alternative digital textbook models operating on multiple platforms and devices, but have struggled with obtaining content. Academics have paper and PDF alternatives that work sufficiently and as such have little incentive to explore alternative digital textbook models. Institutions championed moves to digital textbooks and reducing textbook costs while looking for ways to protect the revenue streams provided by on-campus bookstores. Publishers met many of the academics' needs by providing custom paper textbooks consisting of chapters from several textbooks and original instructor-created content. Students looked at logistics, functionality, and cost, yet failed to find a benefit from the existing digital textbook model.

The market, users, institutions, government, and technology continue to move in different directions. A holistic study, which allows stakeholders to express their positions and needs and involves a cross-section of stakeholders and other interested parties in a virtual panel discussion, could remedy the situation. This study provides a path to better understanding the factors

limiting digital textbook adoption and identifies strategies for removing these factors. Chapter 2

presents a review of the literature on the digital textbook landscape beginning with a historical

overview.

Chapter 2: Review of the Literature

Although digital textbooks have a vital role in the new and increasingly digital education paradigm, the general adoption of digital textbook technology has fallen short of expectations. The goal of removing the adoption barriers that have prevented digital textbooks from becoming a viable and acceptable alternative to traditional paper-based textbooks requires an understanding of the available technological options and capabilities, while aligning these with the needs and aspirations of all potential stakeholders. The following review served as a baseline to this exploration.

This baseline includes a brief history and an identification of the current state of affairs in terms of technological capabilities and stakeholder needs. The intent of this review was to guide and stimulate a meaningful discussion among subject matter experts and interested parties representing the various stakeholder communities. These discussions aimed to develop a greater understanding of the factors hindering the general adoption of digital textbooks, identify mitigation strategies, and to look for knowledge grounded consensus among the stakeholder communities. These efforts formed part of a holistic strategy that promotes transforming the digital textbook into a viable and acceptable alternative to traditional paper-based textbooks that meets the needs of the higher education community.

History and Promise of Digital Textbooks

The Cambridge Advanced Learner's Dictionary (2014) defined a textbook as "a book that contains detailed information about a subject for people who are studying that subject." This definition served as a useful starting point in exploring the state and role of textbooks in higher education. Educators understand the benefits of paper and digital textbooks. The advent of digital technology highlighted the potential practical, sociological, environmental, educational,

and financial advantages of digital textbooks (Hughes, 2012). The coming of digital textbooks promised to reduce educational resource costs for schools, students, and taxpayers by offering more flexibility in material selection and less waste when textbooks become outdated (Ken, 2010). In many dynamic fields, textbooks are out of date by the time they are printed (Goldstein & Fowler/Longview, 2001b; Heinemann, 2010). Digital textbooks offer the possibility of seamlessly integrating the latest knowledge and reducing update cycles.

While no environmentally safe and effective ways to dispose of electronic waste are available, the debate will continue as to the environmental impact of digital books (Siel, 2008). A Korean study of children's backpacks found that "Carrying a heavier backpack is related to backpain in schoolchildren…" (Kim et al., 2010, p. 1). Digital textbooks have the potential of reducing the physical load on students (The Digital Textbook Collaborative, 2012; Bierman, Massey, & Manduca, 2006). South Korea has since adopted a program to convert all textbooks to digital textbooks by 2015 and is issuing tablets to students (Honig, 2011).

Educators use textbooks as an authoritative voice, to deliver accurate information in an effective manner, and to frame the context of the subject under consideration. From a functional perspective, textbooks are a knowledge container that provides a reinterpretation and distilled version of original work (Watters, 2012). The recognition of information as a service removes the need to aggregate information into a closed, all encompassing, concise container (Kirk, 2010). The open nature of digital technology allows for new and exciting textbook models based on the aggregation of materials from multiple sources, and provides for alternate perspectives to coexist effectively within the academic sphere. Open models allow for the inclusion of information from formal and informal sources including experts in the field, students, and other end-users (Crestani, Landoni, & Melucci, 2006; Cauthen, & Halpin, 2012; Ramaswami, 2010).

Chen (1998) explored the possibility of transforming the textbook into a non-linear hyperlinked repository similar to the wiki structure now common in many online knowledge repositories. The prototype she developed looks like a game space with knowledge resources spread out and organized geographically. Early (circa 1990) digital books took the form of self-contained electronic paperbacks distributed as complete systems, including software and content on CDs (Quiet Vision Publishing, 2000). Landoni and Wilson (2002a) understood that textbooks and other electronic resources serve specific academic audiences and their special requirements. They understood that the presentation medium plays an important role when designing digital material and that presenting material on-screen, over the Web or in digital books, requires special design considerations. Their evaluation of digital textbooks led to a useful set of best-practice guidelines (EBONI Electronic Textbook Design Guidelines). These guidelines emphasized presentation, functionality, and utility based on the technologies available at the time (see Appendix A). Anderson-Inman, and Horney's (2007) work with supported eText (see Appendix B) echoed the EBONI functionality guidelines. Both works made the point that presentation formats and functionality need to be flexible enough to not only meet the needs of the users, but also adapt to the delivery medium or device.

McKiernan (2011) detailed the findings of a workshop funded by the U.S. National Science Foundation (NSF). The working group considered the role of textbooks in an increasingly changing technological environment, and attempted to define the attributes of future digital textbooks.

> Textbooks serve to gather and lend authority to an established body of knowledge in the science, technology, engineering, and mathematics (STEM) disciplines; they function both as a mechanism for initial learning and as a reference… The textbook of the future

will be more than a static printed volume, according to the meeting participants. It will

function as a guide, interweaving and coordinating a variety of different learning

resources including animations, simulations, and interactive exercises. Such a package of

resources would be easily searchable, and thus would be learner accessible with a flexible

electronic interface. The textbook, whether printed or electronic, will be the organizing

hub of an integrated learning environment where the student experience is key. The goal

here is to retain the core stability and authority that make the textbook so valuable while

at the same time to provide the flexibility, timeliness, and inquiry-focused approach that

the Web and other electronic resources offer (Bierman et al., 2006, p. 306).

Many academics and educators envision textbooks integrated into digitally supported learning

environments or learning management systems (Bierman et al., 2006; Cauthen & Halpin, 2012;

Converge, 2012; Vanderlip, 2012). These environments provide the flexibility needed to shift

the educational paradigm from one that is faculty-dictated, to one of student-centered learning.

In such an environment, content shapes itself to the individual student's needs; the space and

time of learning become increasingly unimportant, and students are able to learn wherever and

whenever they wish (Johnson et al., 2010).

The advance of digital technology has allowed substantial and revolutionary changes to

take place in all aspects of human society. Although many textbooks come with additional

digital material and resources, the textbook itself stands alone without specific integration into

the educational environment. Most digital textbooks continue to lack integrated rich multimedia

content such as audio, video, and interactive functionality. Hampson (2010) contended that

"publishers need to respond to this challenge [of increased completion] by moving up the digital

content "food chain" and to focus on the development of sophisticated educational media that

takes full advantage of the properties of technology" (para. 10). Digital technology supported by

a nearly ubiquitous communications network continues to hold the potential to revolutionize the

dissemination of knowledge to anyone, anywhere (The Digital Textbook Collaborative, 2012).

Much of the pioneering work in textbook technology failed to gain general acceptance.

Publishers and other stakeholders embraced PDF archive-based standards for their ease of

mimicking the paper-based textbooks and ubiquitous availability of reader software (Seadle,

2009). PDF remains the de facto standard for digital textbooks; publishers produce PDF

versions of textbooks as a byproduct of the printing process (RR Donnelley, 2012).

In the 2011 State of the Union address, President Obama (2011) highlighted the

importance of ubiquitous broadband connectivity in supporting a new generation of digital

textbooks.

> The digital textbooks envisioned will come in an ever-evolving variety of technological
>
> and instructional variations to meet diverse educational needs and interests. But they will
>
> all have in common digital devices with access to rich, interactive, and personalized
>
> content that will encompass the primary toolset in digital learning… New digital
>
> textbooks will be light digital devices, such as a laptop or tablet, that combine Internet
>
> connectivity, interactive and personalized content, learning videos and games, and other
>
> creative applications to enable collaboration with other students while providing
>
> instantaneous feedback to the student and teacher. Digital textbooks can revolutionize
>
> teaching and are not simply the digital form of static textbooks (The Digital Textbook
>
> Collaborative, 2012, p. 7).

Španović (2010) emphasized the need for tailored, flexible, programmable, digital textbooks that

adapt to students' individual levels and needs. Španović advocated for an electronic textbook

that provides a flexible and rich experience by including "speech, text, still and motion pictures, film, virtual reality, etc." (p. 460). The need and ability to tailor the content of these textbooks to the individual student, envisions a new educational paradigm where educators take on new technical and authorship roles.

Apple (2014b) introduced a textbook initiative in early 2012 aimed at creating a new rich standard based on the use of tablet technology. Apple's iBook Textbooks have drawn criticism over DRM concerns and Apple's apparent or perceived attempt to control the ownership and distribution of textbooks produced for this format (Miller, 2012; Tariq, 2012). Apple has gained the cooperation of leading textbook publishers in their effort to create the next generation of digital textbooks (Tsukayama, 2012). Apple's strength and reach as a global technology provider allows them to shape the educational technology landscape in accordance with their own vision.

Each of the stakeholder communities envisioned digital textbooks that serve their own needs and goals. Although these visions share some commonality, the differences and lack of true dialogue continued to hinder the development of a shared common vision. Without this shared common vision, stakeholders continued to work at cross-purposes and struggle with adoption.

Students' Needs, Attitudes, and Concerns

Prensky (2001a, 2001b, 2005) argued that the current generation of students thinks and acts differently than their predecessors. These students represent a generation of digital natives who "are native speakers of technology, fluent in the digital language of computers, video games, and the Internet" (2005, p. 9). These students live digital lives and demand new and innovative technology-based interaction models in all things, including their educational

experience. People of this generation are able, and choose to, remain continuously connected from virtually anywhere (ebrary, 2007; ebrary, 2008; Hughes, 2012; Johnson et al., 2010; The Digital Textbook Collaborative, 2012). This digital generation uses this anywhere-anytime ubiquitous connectivity in ways never dreamed of in the past (Rideout, Foehr, & Roberts, 2010).

From a broader perspective, academics have reported early trends indicating that ubiquitous computing and access to information has transformed the nature of memory (Sparrow, Liu, & Wegner, 2011; Palmer, 2011). People no longer need to remember details. People only need to remember that information exists, and know how to use the tools to find it. In information management terms, for contemporary students and other digital users, the "search" has become primary and the search tool incorporates and abstracts the cataloging functions and skills needed by past generations.

> The advent of the Internet, with sophisticated algorithmic search engines, has made accessing information as easy as lifting a finger… The results of four studies suggest that when faced with difficult questions, people are primed to think about computers and that when people expect to have future access to information, they have lower rates of recall of the information itself and enhanced recall instead for where to access it. The Internet has become a primary form of external or transactive memory, where information is stored collectively outside ourselves (Sparrow et al., Abstract).

To date, there is no evidence that these changes to memory have a physiological effect, but some work indicates that this may be possible (Fox, 2012). Educational technology is working to integrate this ubiquitous connectivity and ability to access information, at any time, from any place, and has already transformed the required educational paradigm from teacher-based

teaching to student-centered learning (Fillion et al., 2009; Garrison & Vaughn, 2008; Kolb & Stuart, 2005; Sitzmann, Kraiger, Stewart, & Wisher, 2006).

Although ebrary (2008) showed that students had mostly positive attitudes to digital textbooks, a recent survey by OnCampus Research shows that "74% still prefer to use a printed textbook when taking a class" (Schmidt, 2010, para. 1). Further anecdotal exploration indicated that students are concerned with cost, utility, and functionality. Students complained that reading on screens could cause eyestrain (Foderaro, 2010). In a utility study, Kang, Wang, and Lin (2009), compared reading using eReaders with reading using conventional books. This study reported significantly higher eye fatigue for eReaders than when students were reading conventional books. Kang et al. attribute part of this effect to the low contrast and resolution of the eReaders, and in part to reading habits established in youth that remain dominant in later life.

Most PCs and tablets use backlit screens that are not conducive to long periods of reading and can cause eyestrain and fatigue (Gillooly, 2012). A new generation of non-backlit E Ink (2012) technology has already provided an effective alternative to traditional displays. These displays provide high-contrast and readability in direct sunlight. Many eReaders, including Amazon's Kindle and Barnes & Noble's Nook, use E Ink black and white technology. Alien (2011) predicted that the next generation of color eReaders will include E Ink-like color displays. Gillooly reports that E Ink's color displays are still incapable of effective video rendering, and suggests Qualcomm (2014) displays as a viable alternative.

O'Shaughnessy's (2010) list of the 12 most expensive college textbooks in America starts with a chemistry book that sells for $500. By some estimates, average textbook costs have surpassed $1,000 per student per year (Allen, 2011; College Board, 2011; Zinser & Brunswick, 2010). Textbook costs continue to rise at over 10% annually (Driscoll, 2011; Gorski, 2010;

Hasberry, 2010; Jackson, 2010; Silver, Stevens, Tiger, & Clow, 2011; Florida Distance Learning Consortium, 2011). Students have learned how to reduce costs when buying traditional paper textbooks. Students buy and trade used textbooks, rent textbooks, share textbooks, borrow textbooks from the library, use older or international versions, and resell their books at the end of class (Follett Higher Education Group, 2010; Reynolds, 2011a; Reynolds, 2011b). Other students forgo purchasing textbooks altogether and depend on online and other resources (Allen, 2011; Gorski, 2010; Hasberry, 2010). It is interesting to note that students whose scholarships allocated specific funds to textbook purchases are more likely to purchase the required textbooks (Dean Dad, 2009; Florida Distance Learning Consortium, 2011).

In an effort to support textbook sales, publishers have sped up the release of new textbook editions, included supplemental or bundled materials that are of little use, used differential international pricing, or tied textbooks into online material using unique activation codes (Allen, 2011; State Public Interest Research Groups (PIRGs), 2005; Zinser & Brunswick, 2010). Publishers also encouraged the creation of custom textbook editions by including instructor-created material (2011; Koch, 2006; RR Donnelley, 2012). Many institutions including the University of Phoenix have adopted digital first policies and a flat resource fee per course model (Jackson, 2010; Kraker, 2010; Kolowich, 2010a; Paxhia, 2011). Many of these universities allow students access to their entire digital textbook library.

Although these efforts help reduce costs, students demand utility and functionality. Students want and need to take notes and make annotations. Thayer, Lee, Hwang, Sales, Sen, and Dalal (2011) made the case that students read in a variety of ways depending on the specific academic goals. Students use five specific reading types:

1) Scanning for specific information based on a known word or phrase;

2) Search reading based on identifying a topic;

3) Skimming, which helps students identify the flow or structure of the material and ideas;

4) Receptive reading is sequential. The student reads the text without interruption or analysis; and

5) Responsive (active or close) "reading is the process of developing new knowledge or modifying existing knowledge by engaging with the ideas presented in a text. Students often engage in responsive reading, as when they annotate parts of a text" (p. 2918).

Of the students interviewed by Thayer et al.,

75% included the task of marking up texts as part of their academic reading practice… any marks made on, or while reading, a text: annotations, highlights, notes and comments, underlined passages, and so on. Producing markup is a defining aspect of responsive reading, or using a text to develop ideas or modify existing knowledge (p. 2921).

Thayer et al. (2011) reviewed students' experiences when using Kindle (Amazon, 2014) readers. This study reported that students found using the Kindle awkward in supporting their educational workflow. The students in this study

struggled, and sometimes succeeded, at integrating the eReader into their academic reading practices. Rather than focusing on the low rate of adoption as an endpoint, we explored the larger context around eReader "pain points" of creating markup, using references and illustrations, and building cognitive maps. Our data revealed that students

routinely switched back and forth between reading techniques, and that different

techniques engendered different ways of using text (p. 2925).

Foasberg (2011) reported similar results from a survey of students' attitudes towards eReaders at

Queens College, at the City University of New York. In the Foasberg survey, students reported

the use of eReaders primarily for leisure reading and traditional paper for academic reading. The

Florida Distance Learning Consortium (2011) reported that students'

most frequently mentioned reasons [for not wanting to use digital textbooks] were a

desire to have a printed copy to write in and highlight (78%), the inconvenience of

reading electronic books (47%), the difficulty of moving to different pages and sections

of the book (35.4%), and the lack of access to the necessary technology (11.7%) (p. 24).

Students found the intellectual property and digital rights management protocols included

on digital textbooks cumbersome (Foasberg, 2011; Nelson, 2008). These technologies

complicate and tend to detract from the user's experience. These protection protocols close

down products to the level that users gain little value from the digital format. An International

Digital Publishing Forum (2006) eBook user survey found that users are concerned with limits

placed on their ability to move content between devices and to lend digital books to others.

Digital textbook technology requires a new unobtrusive business and technical model that

provides the needed protections without detracting from the user experience. "The challenge

here is finding the appropriate balance between usability and [intellectual property] protection.

Until that happens, eBooks may continue to languish" (Nelson, 2008, p. 48).

Students and other users of information technology products are increasingly concerned

over privacy and control over the information companies and other providers collect. Although

service providers disclose details of how collected information is used and many provide users

with the ability to tailor their privacy settings, most users are unaware or lack the skill or knowledge needed for the effective management of these privacy profiles (Toch, Wang, & Cranor, 2012). Alter (2012) warned readers that "your EBook is reading you" (title) and shows how eBook providers collected data about readers' specific habits. Cohn (2010) cataloged privacy concerns over what information eBook providers may collect and how providers use this information (see Appendix C).

Students no longer depend exclusively on textbooks to provide the authoritative voice when studying a subject. The Internet provides a wide variety of information presented from a variety of perspectives. One of the more contentious sources remains Wikipedia (2014b). Although students value the open source nature of Wikipedia, many educators still struggle with this and other open source models (Ferris & Wilder, 2008; Williams, 2008). Ferris and Wilder concluded that the potential for wiki-based educational applications is endless, but warn that as with any tool, effective application of wikis needs "thoughtful and deliberate planning as well as creativity and enthusiasm" (p. 6). Educators need to consider wiki-based information as they would any oral history. In an exploration of educational paradigms, Parker, and Chao (2007) conclude that

> wikis and other emergent technologies are beginning to fill a gaping void in existing
>
> practice (Lamb, 2004) [by] enabling extremely rich, flexible collaborations that have
>
> positive psychological consequences for their participants and powerful competitive ones
>
> for their organizations (Evans and Wolf, 2005). Collaborative creativity promises to be a
>
> key business skill in upcoming years… Educators need to teach what wikis and other
>
> social software may mean to business, not just as a phenomenon, but also as a skill

(Evans, 2006). By incorporating wikis into the classroom, educators can better prepare

students to make innovative uses of collaborative software tools (p. 67).

In a recent survey, a majority of students reported that they were willing to pay a modest fee for

maintaining open textbooks (Florida Distance Learning Consortium, 2011). The survey question

defined

open textbooks [as] freely accessible digital textbooks that can be read online, self-

printed or downloaded via any computer with Internet access at no or low cost. In

addition, students may often be able to order a commercial "print on demand" copy of an

open textbook at a modest cost (p. 18).

Kendrick (2012) proclaims that "the [bring your own device] BYOD movement is just getting

started, fueled by the capable tablet. It is now possible to get a full day's work [done] from

almost anywhere, without compromise" (para. 1). Device consolidation trends are not new.

Although some argue that a single device that does everything well remains the goal, others

contend that professionals and dedicated enthusiasts will continue to demand the higher quality

and functionality available from dedicated devices (Abalta Technologies, 2011; Pilon, 2012;

Staff, 2006). However, technology innovators and corporations continue to pursue the elusive

portable full-function device as postulated in the science fiction and predictions of the past

century (Adams & Moore, 1978; Diaz, 2010; Edwards, 2012; Novak, 2012). The latest advances

in cloud computing, coupled with a ubiquitous communications system using virtual service

models, have blurred the traditional separations between processing, storage, and the interface

(Calheiros, Ranjan, De Rose, & Buyya, 2009; Mell & Grance, 2011). Users, who have choices,

choose the device most appropriate to their needs.

Digital textbook and educational technology companies have experimented with multiple dedicated, proprietary, and open formats. Prensky's (2001a, 2001b, 2005) digital native students have an unrivaled understanding of digital technology. They have repeatedly adapted to disruptive technological change and innovation. They have grown up in an ever-changing educational and technological landscape and have adapted to the complexities inherent in continual technological change. Students have worked with a wide variety of educational platforms and offerings. Educational technology continues to be in flux, and no single product offering or vision has prevailed.

> The slow adoption of digital textbooks by students… highlight[s] the ways in which students' needs aren't being met yet by digital content providers. That means there's still a huge opportunity here to reshape what the textbooks of the future look like… Students' reluctance to move to digital textbooks should also be an indication that we have to make sure we're building learning tools that meet the needs of learners. …students' purchasing habits here indicate that they're making decisions about what works best for how they study (Watters, 2011, para. 9-10).

Institutions' Needs, Attitudes, and Concerns

Educational institutions are neither uniform nor monolithic. These complex organizations each constitute a different arrangement of constituencies competing for influence and dwindling funds (Kingkade, 2012). However, all institutions operate in cultural and political environments that demand reduced costs and effective outcomes. Institutions increasingly accept technology-driven change as a critical part of their continually evolving operational model, and struggle to prepare for the needs of the coming digital native generation (Brindley, 2009; Evans, 2007; Rehm, Koller, Selingo, Carey, & Struck, 2012). The recent leadership crisis and

controversy at the University of Virginia over resource allocation, in a time of increasing costs

and reduced budgets, highlights the need for reform (DeVise, 2012; VITL Task Force, 2009).

Online and other technology-based solutions offer some of the best alternatives in creating viable

education delivery models.

Driscoll (2011) and Koch (2006) compared textbook marketing to healthcare delivery

and find that in both cases a captive market exists in which the end client has little control over

the product selection process or costs. In a captive market, the persons who make the textbook

choices are not the ones who buy or pay for them. Using a competitive analogy from the health

care market:

There is one entity who chooses the good[s] or service[s] (professors for textbooks,

physicians for medicine), one entity who consumes it (students for textbooks, patients for

medicine) and, often, a third entity who pays for it (parents or loans for textbooks,

insurance companies for medicine) (Driscoll, 2011, para. 10).

Whinery (2002) asks, "Should a campus bookstore profit from a student's education"

(title)? In this article, Whinery contended that classical campus bookstores' profit-based model

represents an inherent conflict of interest that overcharges students for convenience. Whether

directly owned by the institution or outsourced to private companies, by seeking to maximize

profits, bookstores act as an additional source of institutional income and place little value on

representing the best interests of the students (Dean Dad, 2009). The Higher Education

Opportunity Act (2008) included provisions that require institutions to reduce textbook costs by

providing students with the information needed to shop around for less expensive textbooks, and

to create rental or buy-back programs while exploring and implementing alternative cost-saving

strategies. The Advisory Committee on Student Financial Assistance (ASSFA) (2007) recommends that

> in the short term, steps must be taken to increase affordability for all students, but especially for those from low- and moderate-income families [and] in the long term, a supply-driven, producer-centric market must be transformed into a demand-driven, college- and student-centric market (p. iii).

ASSFA proposed that higher education communities lead a cooperative effort with stakeholders from the publishing and technological industries to create a shared national digital marketplace as "an enabling infrastructure of technology and support services with which institutions, students, faculty, bookstores, publishers, and other content providers can interact efficiently" (p. v). This unified marketplace would act as the shared repository of instructional materials where stakeholders could deposit or access material at will. The proposed marketplace would include tools for creating course content and processes for collecting fees and tracking materials use.

"To address the high cost of textbooks, Rice University's OpenStax and the Community College Open Textbook Project (CCOTP) collaborated to develop a proof-of-concept free and open textbook" (Baker, Thierstein, Fletcher, Kaur, & Emmons, 2009, Abstract). CCOTP results proved the feasibility of free and open textbooks. CCOTP recommended using this prototype "as the common repository for open textbook content in an effort to provide greater national and even international access" (p. 11), and as a tool for institutions to collaborate in the creation, "sharing, reusing, customizing, and disseminating open textbook content" (p. 11) and other instructional material. Open models of this sort provide continuity of instructional material between educational institutions while saving students money.

According to the Association of American University Presses (AAUP, 2011):

The findings of the AAUP 2011 Digital Book Publishing Survey contain few surprises. The digital revolution of university press publishing has already come. Every press is pursuing at least two digital publishing strategies, and almost all are expanding into many more. However, resource constraints continue to slow the development of healthy experimental models or delay the implementation of necessary digitization and workflow projects. Optimism over rising eBook revenues is well-grounded, but tempered by realistic estimates, falling print sales, and the need for greater capital investment. Incorporating XML workflows into book production is widely seen as a way to ease the burden of proliferating digital formats and channels, but also opening up a gap in technology and staff resources that may not be easy to bridge. Finding new models to support scholarly publishing and strengthening the digital backbone of AAUP members are the top priorities in digital book publishing for our community (p. 11).

Gorski (2010) described an increased movement towards open content in which learning communities develop textbook content and share these open textbooks with others. Biermanet et. al. (2006) envisioned textbooks as "collaborative effort[s] involving not only faculty and publishers but also experts in learning and technology" (para. 10). CampusGrotto (2011) showed that open or free textbooks are already available from many sources. However, these independently created alternative models have little cross-standardization in functionality and interface. The size of the available textbook catalog remains relatively small. Grass-roots educational and governmental organizations are exploring open education alternatives. The Student Public Interest Research Groups (SPRGs, 2012) is asking educators to sign an "Open Textbooks Statement of Intent" with the goal of encouraging educators to

Seek and consider open textbooks and other open educational resources when choosing

course materials. Give preference to a low or no cost educational resource such as an

open textbook over an expensive, traditional textbook if it best fits the needs of a class.

Encourage institutions to develop support for the use of open textbooks and other open

educational resources (para. 5-7).

Wukman (2012) reported on the promise of technology supported open education models to save

students money. As stated above, many academics and educators envision the digital textbook as

an element or hub in integrated digitally supported learning environments or learning

management systems (Bierman et al., 2006; Cauthen & Halpin, 2012; Converge, 2012;

Vanderlip, 2012). Ramaswami (2010) explained that educators needed to look beyond the

financial saving, and consider the flexibility inherent in open models. Open content

offers, for free, many more ways to teach—podcasts, videos, music, etc.—than are

available by traditional methods. Because the material is "open" and can be modified or

expanded instantly, the material is dynamic, up-to-date, and constantly changing, unlike a

static printed textbook… open content makes it possible for teachers to differentiate

instruction based on students' individual reading levels, interests, or learning styles (p. 2).

These environments provide the flexibility needed to shift the educational paradigm from that

faculty-dictated to one of student-centered learning. In such an environment, content shapes

itself to the individual student's needs, the space and time of learning become increasingly

unimportant, and students are able to learn wherever and whenever they want to (Johnson et al.,

2010).

Lepionka (2006) provided a guide to selecting the appropriate textbooks and choosing

appropriate primary source material. According to Lepionka, appropriate instructional material

meets the style and needs of the instructor, the level, and complexity of the course, and the needs

and intellectual level of the students. It is important for educators to understand the role of the

textbook in each educational environment. It is equally important to recognize that textbooks are

not required for all classes.

> Many upper-tier and graduate courses are prime candidates for not using a textbook,
>
> especially with motivated, independent learners with good attendance, and especially in
>
> interactive seminar courses with small enrollments that rely heavily on discussion (p. 14).

Wilson (2012) asked educators and institutions: "Are you ready to BYOD?" In light of current

trends in mobile technology, bring your own device (BYOD) issues are of increasing concern

throughout the technological landscape (Heath, 2012; Ranger, 2012). Ubiquitous

communications networks capable of supporting cloud computing, and the proliferation of

tablets and other smart mobile devices, make possible new information technology and

communications models that have begun to revolutionize the technological landscape.

Technology leaders are reevaluating their policies in terms of services and applications

and not in terms of hardware (Ranger, 2012; Lowe, 2011). Ranger notes that corporate chief

executive officers, who are accustomed to limiting, certifying, and controlling every device used

in their environment, are concerned over security and interoperability issues. Lowe notes that

BYOD is not new and has been the normal mode for educational institutions that need to support

a full range of student owned devices. Snow (2012) contended that "these devices have

undoubtedly changed how employees work… creating an always connected world where only

one device is used for work or play" (para. 6). These new mobile technologies have already

changed the information technology model, and have highlighted the role of the communications

infrastructure in supporting BYOD. For digital textbooks and educational technology, BYOD

implies device neutral access from multiple popular devices.

As stated above, many institutions, including the University of Phoenix, have adopted

digital first policies and a flat resource fee per course model (Hughes, 2012; Jackson, 2010;

Kraker, 2010; Kolowich, 2010a; Young, 2010b). Many of these universities allow students

access to their entire digital textbook library. These models primarily depend on publisher

supplied PDF content. Although this practice works to reduce students' textbook costs, the

fundamental issues of utility remain. Students find reading of PDF-formatted digital textbooks

cumbersome, and digital rights management (DRM) limits the ability for students to access the

material when not connected to the Web (Dickson, 2010; Kirk, 2010; Seadle, 2009; RR

Donnelley, 2012; Watters, 2011). The PDF model fails to meet students' need for an effective,

integrated digital textbook and interface. The strengths of PDF-based document presentation lie

primarily with the ability to efficiently, and at little cost, present an equivalent to paper format

consistently on any electronic media, and the ability to apply DRM capabilities to provide

intellectual property protection (Seadle, 2009; RR Donnelley, 2012). This very utility and broad-

based acceptance of PDF coupled with the ubiquitous availability of PDF readers makes PDF the

de facto standard for most electronic documents.

The existence of any standard, no matter how limited, creates a paradigm that acts as a

barrier to the creation of the radically different technologies needed to meet the needs and

requirements of today and tomorrow's tech savvy students (Kuhn, 2007). Additionally, for many

students and other stakeholders, the PDF-based textbook model, with all its limitations, has come

to define the digital textbook paradigm (Kirk, 2010). This acceptance of the PDF as the accepted

digital textbook model limits the vocabulary of the discussion to a comparison of de facto

objects: PDF or traditional textbooks and precludes a conceptual exploration of potential, yet undeveloped, future digital textbooks.

Even in institutions that have adopted digital first policies and flat resource fees per course models, decision makers praise the ability of centralized volume purchasing to leverage cost savings and overcome logistical issues. In an interview, David Bickford, vice president of academic affairs at the University of Phoenix stated that

> "At most colleges and universities, textbook adoption decisions are made instructor by instructor, and most purchasing decisions are made student by student," he says. "That gives everyone a lot of autonomy but erodes buying power." Bickford believes more institutions should centralize their purchases and rely on faculty members with subject-matter expertise to recommend appropriate textbooks (Hughes, 2012, para. 5-6).

These institutions have replaced one form of captive market with another. As stated earlier, the existence of a captive market creates disconnects in textbook selection and in the selection of effective digital textbook delivery models (Ancey, 2011; Driscoll, 2011; Koch, 2006). Decision makers in these models tend to overlook the needs of the end users and act pragmatically while working within the organizational model and policies provided by the institution. Since many institutions have contractual agreements with specific publishers, the models used favor those created by the specific publishers (Germano, 2008). Not all instructors understand how to select the best textbook alternatives for their class (Lepionka, 2006); central committees often fail to consult all affected or concerned faculty. Institutions seeking to break out of the captive market scenario need to embrace team-centered approaches in the decision making process (Kraker, 2010). These teams need to include professional staff, faculty, subject matter experts, and the

end-user community with the goal of selecting, or creating the educational content needed to support the educational goals of the class.

Industry Needs, Attitudes, and Concerns

In considering the textbook and educational material industry, this study focused on the needs, attitudes, and concerns of authors, publishers, printers, bookstores, and providers of digitally supported learning environments or learning management systems (Bierman et al., 2006; Cauthen & Halpin, 2012; Converge, 2012; Vanderlip, 2012). Heinlein (1988) described writers (authors) as antisocial addicts who need to have their fix, and who will break down in tears if they are disturbed, or unable to indulge in their addiction. The following are Heinlein's rules on the writing of speculative fiction:

1. You must write,

2. You must finish what you write,

3. You must refrain from rewriting, except to editorial order,

4. You must put the work on the market, and

5. You must keep the work on the market until it is sold (Heinlein, 1947).

"Textbook writers compose nonfiction books used to educate others. Becoming a textbook writer requires formal education and subject matter expertise, along with an aptitude for writing" (Education Portal, 2014, para. 1). Writers also require a willingness and tenacity to pursue publication through a variety of efforts and means. The motivations of textbook authors vary and although large financial rewards are rare, authors continue to write motivated by other rewards such as organizational incentives, advancement, recognition, and dissatisfaction with existing material (Bauman, 2003; Rees, 2000; Roediger, 2004). Bauman took a sardonic look at the textbook writing process and advised authors that the process requires patience,

perseverance, and the ability to accept advice. "Many textbook authors are genuinely motivated by a desire to shape a field and to excite beginning students. But beyond that, as Willie Sutton said of bank robbing, that's where the money is" (Germano, 2008, Textbook, para. 3). Roediger (2004) writes that:

> the rewards were largely non-monetary. I learned a tremendous amount in writing these books and enjoyed thinking through some issues in ways that would not have occurred otherwise. I think writing the [text]books has made me a better researcher and certainly more knowledgeable about my field. Writing three textbooks has certainly made me a better writer, too, with much advice from reviewers, copyeditors, editors, and students. Textbook writing has been but one facet of my professional career and not the central one, but I have still enjoyed it (para. 4).

Hampson (2010) described content creation in higher education as a cottage industry where personalization of content by each academic limits the ability of content to reach other institutions who are teaching similar courses. However, the resources available to individual academics limit the scope and quality of the produced materials. As such, this cottage industry model has sprouted innovative solutions to the sharing and distribution of academic content including exploring individual and community-based open education alternatives (Bierman et al., 2006, Gorski, 2010).

Wikibooks (2014) provides an open book model designed for community shared authoring of instructional books available freely to everyone. The attributes of a wiki model create dynamic, constantly evolving works whose accuracy depends on user validation (The Glasgow School of Art, 2012). The passion of the community provides effective, up-to-date

information on a specific subject. The Glasgow School of Art reminds users of wiki materials that

> Wikipedia's policy of neutral point of view states that:
>
> - All significant and noteworthy perspectives should be included in each article. This includes all viewpoints from verifiable sources, and not just popular ones.
>
> - Where conflicting views are held, all must be presented fairly, and no view should be given undue weight or presented as the truth.
>
> - Opinions can be stated, but must be clearly presented as this, and readers should be left to decide on the viewpoint they subscribe to.
>
> Wikipedia's policies like neutral point of view are safeguards to attempt to stop bias or inaccurate or misleading information from appearing in articles. Wikipedia is however, self-policing and contributors comply with these policies voluntarily (p. 5-6).

Models like OpenStax (2014), Merlot (2014), OER Commons (2014), and Writing Spaces (2014) offer authors an alternative open repository model. Authors submit educational material and allow educators to include these with other materials in compiling the customized textbooks or materials for classroom use. Instructors and students are also able to purchase bound paper copies of these works. Other authors such as Jewell (2014) have created online textbook websites that act as the authoritative core of a given subject, and permit free use by students for self-study or instructors as part of a formal curriculum. Creative Commons (2014) philosophy and license tools

> give everyone from individual creators to large companies and institutions a simple, standardized way to grant copyright permissions to their creative work. The combination of [Creative Commons] tools and users is a vast and growing digital commons, a pool of

content that can be copied, distributed, edited, remixed, and built upon, all within the

boundaries of copyright law (para. 1).

> There are all kinds of publishers. Most deal in hard copy. Anything printed and
>
> disseminated can be described as a publication—a mimeograph handout, a 500,000-copy-
>
> a-month magazine, a scholarly journal, a book. Anyone who produces any of these might
>
> describe himself as a publisher. Today, [any author] can self-publish. In fact, [they]
>
> always could (Germano, 2008. para. 1).

Germano described textbook publishing as a highly profitable branch of publishing that relies on

creating what educators need for a given course and for publishers to sell their products and ideas

actively and directly to professors. McIlroy (2009) quoted the Association of American

Publishers that more than "4,000 publishers offer more than 262,000 titles that are used in

America's post-secondary classrooms" (para. 11). However, through consolidation, three big

publishers, Pearson, Houghton Mifflin Harcourt Publishing Co., and The McGraw-Hill

Companies, control over 75% of the K-12 textbook publishing business (Jobrack, 2012; Strahler,

2012). Zinser and Brunswick (2010) described

> the textbook industry distribution channel [as] the publishers, distributors or wholesalers,
>
> and college bookstores. The market of publishers is oligopolistic as five companies sell
>
> about 80% of all new college textbooks. The market for wholesaling and distributing
>
> books is also oligopolistic as four firms dominate the market. Furthermore, these four
>
> firms also own or operate more than 1,500, or approximately 35%, of all college
>
> bookstores and are very active in the used book market as profit margins tend to be
>
> higher for selling used books versus new books (Koch, 2006) (p. 42).

ASSFA (2007) reported that publishers understand the need to reduce textbook costs, and have made efforts to create up-to-date digital textbook alternatives that include high quality peer-reviewed supplemental material.

Individual publishers are moving into the digital and multimedia markets, but investments in technology infrastructure and research remain high as competition among publishers depresses collaborative effort.

The significant investments in proprietary materials and the integrity of their peer-reviewed textbook development processes can inhibit publisher flexibility to student demand. Publishers stress that they are dedicated to producing and bundling supplemental materials as learning enhancements, which clearly add value to instruction. They argue that frequent edition changes in many subjects are necessary to keep up with the pace of research and knowledge acquisition. Finally, publishers maintain that the unbundling of textbook packages does not necessarily reduce price because development costs are attached to each piece, and they are able to offer a discount only when a student purchases the materials as a group (p. 3).

McKiernan (2011) reported that publishers experimented with non PDF-based models in the early 2000s, but found "that there was no market for these products and that the technology could not be adequately supported" (Experimentation 2000-2003). Publishers continue to fear and push back from changes to the existing digital model, and are hesitant to embrace new technologies that will reduce sales, add complexity, increase the risk of illegal copying and digital piracy, and add cost to the distribution model (Hill, 2012; Woudstra, 2012). Additionally, "publishers and manufacturers have been hesitant to establish lending models for their [digital] books" (Foasberg, 2011, p. 109). This perceived need to protect is in direct conflict with user

complaints as expressed in the IDPF (2006) eBook user survey. Foasberg (2011) reports DRM and a lack of flexibility continue to hinder the adoption of digital textbooks. FCC chairman Genachowski (2012) noted "the challenges to universal digital textbooks [as]: affordability, content, interoperability, connectivity, technology, and state policies" (p. 1).

Hampson (2010) explained that publishers face conflicting forces. Although the drive to go digital would substantially reduce their profitability, the market and investors are pushing for digital alternatives and "on the other hand, the demand for strong quarterly results encourages them to stick to their core business of print textbooks, which still constitute the bulk of their earnings" (para. 12). Hampson contended that publishers focus on the development, creation, and integration of peer-reviewed sophisticated educational content that takes full advantage of the available technology.

However, publishers continue to fight change, and use old tactics in an effort to retain control over the textbook marketplace (Allen, 2011; Wukman, 2012). In a PIRGs survey, students noted publisher practices that increase textbook costs.

> 93% of the students said at least one such practice had affected the price or resale value of their books. 81% had been affected by new editions… 59% had been affected by bundling… 48% had been affected by custom editions created for their school (Allen, 2011, para. 7).

Publishers continue to include DRM that limits the utility and portability of digital textbooks. Wukman (2012) reported on efforts by the Florida Distance Learning Consortium's (FLDC) Open Access Textbook Project, to create a clearinghouse of

> open access textbooks and open education resources for Florida educators… DRM and the way publishers implement it is a very real concern [to FLDC]… FLDC staff

consistently see traditional publishers including highly restrictive DRM software in the digital versions of their textbooks. The DRM can range from limiting the amount of time students have access to the textbook file—typically for about 180 days—to requiring students to access the content through a dedicated, locked-down browser-based application, or only allowing students to print out a certain number of pages at a time…

[These] anti-piracy attempts are only serving to frustrate students further (para. 37-39). Opper of the FLDC Open Access Textbook Project said that "the problem is that in an attempt to prevent content from being shared or pirated, publishers are locking down feature sets and making the content less useful to students" (para. 40).

The large publishers have been slow to move into true digital alternatives and continue to support PDF as the most prevalent digital format. For many publishers, educators, and textbook users, PDF is synonymous with digital textbooks (Paxhia, 2011). Vanderlip (2012) argued that to reduce costs, just switching to digital is not enough; textbooks need to provide flexibility by including traditional and free content and allow "the professor to comb for the very best content in his or her discipline, mix and match that content into a consistently presented and compelling narrative or set of chapters, and to deliver the completed product to students (para. 10). Smaller and innovative start-up publishers have attempted to fill the void left by the big publishers by providing open content and integrating this content into educational learning systems, removing DRM and allowing portability between devices (Wukman, 2012). However, this new generation of textbook publishers suffers from a small footprint, incomplete catalogs, a dependence on PDF, or proprietary or non-standardized interfaces. Every publisher depends on PDF for rapid digitization at a low cost, and for compatibility and access to institutions that mandate and only support PDF-formatted digital books. The entrenched position and relationships the big

publishers enjoy with educational institutions and college bookstores blocks the reach of these smaller publishers into their natural marketplace. Innovative and free alternatives challenge the big publishers' traditional control over the educational market and the distribution channel (McIlroy, 2009). Although cooperating with some new educational technologies such as Apple's (2014b) iBooks textbooks, publishers continue to fight innovative start-ups that threaten their control of the distribution channel (Huang, 2012).

Reynolds (2011) reviewed the digital textbook environment and predicted a significant increase in digital textbook sales over the next five years. Reynolds contended that publishers are under pressure to offer digital textbook alternatives. Although students are not the principal decision makers in the selection process, students' buying practices have forced publishers to give up some control over format. All publishers are making more content available digitally. Additionally Reynolds predicted that

digital textbook sales will be influenced by the following factors:

The cost of textbooks and other learning materials. The availability of digital textbook content. Student buying and sharing trends. The continued growth of for-profit institutions and online learning. The increased popularity and availability of [Open Educational Recourses] OER and open digital content. An increase in digital-first publishers and open textbook movements. The textbook rental market. The popularity of online retail and distribution options. The popularity and evolution of tablet devices and smartphones. The advance of eReader software/hardware technology. Format standards for digital textbook. The growth of e-textbooks in trade publishing (p. 178-179).

Traditional textbook publishers face significant challenges from competitors and from the inevitable move to digital textbooks. Hampson (2010) argued that, to survive, traditional

textbook publishers, need to leverage their content base, expertise, and network to the creation, packaging, and distribution of sophisticated, high quality, peer-reviewed educational material in a variety of media. The publisher becomes a sponsor, creator, integrator, and distributor of the consistent standardized products needed by educators. Publishers will add value by selling an educational solution backed by a wide catalog of existing and newly developed content.

Stambaugh and Trank (2010) considered that since textbooks define a discipline and that the textbook acts as a force to institutionalize the knowledge, the subject, and the understanding of the field, there is a need to manage the introduction of new knowledge and effectively integrate this new knowledge into the discipline and into the textbooks. The essential role of technology remains the abstraction of complexity. As such, the new technology-centric publishers and educational learning systems providers have taken this integration approach.

A recent startup, Boundless (2012) has experimented with a model based on "a free replacement to a student's assigned textbook that covers the same key concepts more efficiently" (para. 6) by integrating open content from a variety of sources and presenting the information using a dynamic non-PDF interface. Although this aligns with the envisioned future publishing model, three of the largest educational publishers have decided to sue Boundless (Huang, 2012). The redevelopment of materials takes time, money, and effort. Boundless and other startups bring innovative and fresh perspectives, but lack the deep content libraries and catalogs and need to develop basic content structures, in addition to the enhanced content demanded by this new educational model. Boundless settled the lawsuit by agreeing to respect existing publishers' copyrights (Diaz, 2013).

College bookstores depend on the traditional paper textbook model. Although these bookstores have worked to create innovative buy-back and rental models, college bookstores

face increasing pressure from online vendors such as Amazon (2013) (Follett Higher Education Group, 2010; Paxhia, 2011; Simba Information, 2011). Students have learned to reduce the overall cost of textbooks by using Amazon and other online booksellers. The industry remains in flux and the existing paper-based model is in decline. "In the long run, the roles of today's retailers and wholesalers are likely to be significantly reduced as publishers sell more institutional licenses and offer customized pedagogical solutions directly to students" (Paxhia, 2011, p.323).

As part of the inevitable collapse of the traditional paper textbook model, bookstores need to reinvent themselves to stay relevant (Young, 2010a; Kolowich, 2011; Wallace, 2010). A print-on-demand model allows bookstores to remain relevant. Print-on-demand also serves the needs of open content providers looking to deliver printed content directly to students. However, print-on-demand requires a significant capital investment. As online suppliers such as Amazon have shown, an effective fulfillment and distribution model reduces the importance of location. This presents an opportunity for existing printers to become effective print-on-demand and fulfillment service providers (RR Donnelley, 2012b).

From a marketing perspective, Koukova et al. (2008) looked at the marketing of digital product and found that clients needed to perceive the value in the digital product in terms of functionality and usefulness. Effective marketing of digital products requires that marketers make a clear case and explain the value proposition.

In the publishing industry, the big question remains who will prevail? The open movement, which can supply educational material at little cost to the consumer, or the traditional powers, who are looking to collaborate with Apple and other technology companies to directly sell higher quality content? The open model's success could herald the creation of a new

paradigm in which the existing corporate model will become irrelevant. The growth of Apple and other digital textbook technologies allows small authors to publish directly and equally with the big publishers. Collaboration between these players would bring together the strengths of each to serve the common good.

The publishing industry's financial model is under pressure from freely available open content, and from the lower prices and profitability of digital books (Card, 2009; Strahler, 2012). From a financial perspective, the industry needs to find a replacement for the existing royalty-based financial model. The recognition that information is a service combined with the resource fee model used at many institutions provides alternative perspectives on the creation of effective new business alternatives (Jackson, 2010; Kraker, 2010; Kolowich, 2010a; Paxhia, 2011; Watson, Pitt, Berthon, & Zinkhan, 2002).

Interfaces

Anderson-Inman, and Horney (2007) noted that text in electronic form offers flexibility for students with learning difficulties. "In order to really take advantage of its potential as an assistive technology, an electronic reading environment that intelligently transforms text into something that supports comprehension and extends meaningful learning is required" (p. 153). More importantly, the functionality, flexibility, and interconnectedness inherent in using text in an electronic learning environment benefit all students. Students may alter font sizes and foreground and background colors to ease eyestrain. The environment allows students to reflow text to fit inside the available viewing window and includes read-out-loud technologies. The learning environment allows students to link to embedded and external material as part of gaining a greater understanding and provides for related evaluations (see Appendix B).

Although implementations of supported eText are potentially appropriate for any learner at any reading level, most applications to date have focused on the needs of students with reading disabilities that make it hard for them to access or comprehend printed text in traditional formats" (p.153).

Including these supportive attributes in digital textbooks is essential to all students; without these enhanced functionalities, the value proposition, for students, still favors paper over digital textbooks (Paxhia, 2011; Simba Information, 2011). "Students seem to have higher expectations for the functionality of digital products. Therefore, the long term prospects for PDF replica versions of printed textbooks are quite limited" (Paxhia, 2011, p. 323). Students in a comparative study of digital and print textbooks found that the digital textbooks lacked functionality and did not perform as expected (Berg, Hoffmann, & Dawson, 2010). Specifically, navigation was slow and cumbersome, hyperlinks and search functions were missing or did not function as expected, and the physical positional aspects were lost.

Beach (2008) showed that students' reading comprehension did not suffer when students read text on electronic devices. However, Beach reported

a significant relationship between reading medium and reading rate; the effect of reading rate on reading comprehension scores differed for those reading a print passage and those reading an electronic passage… the faster the student's reading rate of an electronic passage, the lower the reading comprehension score (p. 72).

Students do not read digital content the same way they read paper (Thayer et al., 2011; Shin, 2011). As such, designers of digital material need to tailor the presentation format to students' requirements and to provide students the ability to tailor the interface to their specific cognitive needs and style preferences.

Wikipedia (2014a) contains a concise list and brief description of available open and proprietary digital book formats along with a list of devices that support each format at http://en.wikipedia.org/wiki/Comparison_of_eBook_formats.[2] A comparison of these formats showed that other than plain text, PDF and ePub were the most supported formats. Kindness (2010) made the case that both proprietary and standards-based models have their place, and used a three stage chasm-crossing model in explaining the role of each:

- During the innovation stage, innovators use proprietary models to differentiate the products and to provide radical new features and functions in a bid to standout from the competition;

- during the chasm-crossing stage, the market chooses which technologies are best able to provide real-world solutions; and

- during the standardization stage, standards bodies with help from stakeholders from industry, academia, and the end-user community define the standard.

Studies that attempted to use existing eReader technologies for textbooks illustrated the weakness of these devices to accomplish the needed function (Martinez, 2010; Thayer et al., 2011). Although these studies used Amazon's Kindle readers, the two most common specialized readers, Amazon's Kindle and Barnes and Noble's Nook, faced similar challenges regarding meeting academic needs. Students in these studies agreed that these devices worked well for linear activities such as pleasure reading, but lacked the general functionality needed in a study aid (Hane, 2010; Lardinois, 2009). These devices were too slow for random flipping through pages and did not effectively support note taking and annotation. A number of companies have

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[2] The Comparison of e-book formats as provided at http://en.wikipedia.org/wiki/Comparison_of_e-book_formats, by its nature is in flux and changeable. As such, this information has not been included as an Appendix to this work.

attempted to create devices targeted specifically for students, and some experts argue for devices specifically suited to academic needs (Schuetze, 2011).

One promising prospect was the KNO tablet (Ganapati, 2010a; 2010b). This Ubuntu-based device offered students a workstation with the specialized functionality needed to support textbook reading and annotation on specialized single or dual tablets. In 2011, KNO leadership recognized that specialized hardware devices were not competitive and that students needed full-function devices (Schonfeld, 2011). As such, KNO leadership decided to abandon their specialized hardware platform, and port their application to multi-function platforms such as MS Windows, Apple's iPad, Google's Android, and the Internet (KNO, 2013).

Armstrong (2008) noted that past definitions of "books" have concentrated on the physical attributes of books, and that the definition of eBooks remains in flux. Armstrong proposed that a true understanding of books, specifically eBooks, is not possible without an in-context understanding of the nature of books. In recognizing the differentiation between the content and the media, books become information and knowledge (content) with storage and delivery systems (media). Watson et al. (2002) recognized information as a valuable service and that the delivery of information is a marketing problem. As such, providers of digital content need to recognize the basics of successful information systems. The basic purpose of information systems is to improve organizations' performance (Watson & Straub, 2007). Information systems units create

> value by facilitating the organization's achievement of its central goals relative to each stakeholder… the stakeholder perspective is the proposition that: The value of [information systems] to an organization is determined by who it can reach, how it can reach them, and where it can reach them. While reach is not the only determinant of

value (e.g. …to provide the right information in the right format), reach is an essential

element of value because it determines who gets information access (p. 17),

and how well the information serves the stakeholders' needs. Students and faculty found the

most valued features of eBooks were universal anytime, anywhere access, and ease of searching

(ebrary, 2007; ebrary, 2008). Using digital technology, "students can choose" where, when and

how to learn; students can take control and own their educational experience (Španović, 2010).

Textbooks are still widely read on paper (Schuetze, 2011). Mark Majurey of Taylor &

Francis, a textbook publisher in Britain, said that "textbooks as eBooks ought to be seen as a

stepping stone to the future" (para. 4). Students continue to equate digital textbooks with "PDF

replica versions of printed textbooks" (Paxhia, 2011, p. 324). Students who were given premium

alternatives "were more likely to prefer them over printed books, particularly if the economics

are comparable… Next-generation digital learning products have tremendous potential to offer

students individualized solutions to their learning challenges. Their levels of customizability and

interactivity are appealing to both students and instructors" (p. 324-326).

Although the current generation of devices does not include the next generation of color

E Ink displays, providers have begun to deliver some digital textbook content for use on the

latest backlit devices. Alexander (2009) suggested that the lack of a common interface standard

has hindered adoption and the acceptance of digital textbooks, and Armstrong (2008) argued that

the lack of a common vision of digital textbooks and a lack of a common understanding of the

capabilities available hinder agreement and adoption. Although manufacturers are making some

concessions, the most popular digital book formats remain difficult to use on competitors'

devices (Pouge, 2012). DRM protections continue to limit the transparent portability of content

between user's devices. Although Apple's (2014b) iBooks Textbooks initiative rely on the open

IDPF's (2014) open ePub standard, Apple's special implementation limits the authorship, portability, and utility of iBooks Textbooks (Alexander, 2009; Gillooly, 2012; Wineman, 2012). BYOD forces push for open and transparent access to all content; content and device suppliers continue to limit and control the device and distribution model. Although some devices offer greater interface flexibility and functionality, cooperation between providers would allow for effective BYOD models in the academic environment without artificially limiting access to educational material.

Moore's Chasm Model

Moore's (2006) chasm crossing model considered adoption of disruptive technology from a marketing perspective in which providers of the technology need to recognize and act in accordance with the current state of the technology in the technology model. This model works by matching practice to the state of the technology while recognizing the importance of customer attitudes.

Textbooks are different from other products in that the end users do not select the product (Ancey, 2011; Driscoll, 2011; Koch, 2006). Institutions and to a lesser extent individual educators, select the textbooks used in the classroom. This creates a captive market condition. Silver et al. (2011) found that although institutions mandate cost reduction as a consideration in the textbook selection process, selection continues to focus on available content and that a large publishing industry markets directly and indirectly to the decision makers. In considering the digital textbook adoption problem, bringing digital textbooks into the mainstream markets demands the cooperation of a variety of stakeholders working together for the success of the endeavor. Technology acceptance demands understanding of the underlying needs and motivations of all stakeholders. Individual stakeholders also need to recognize that not all

parties seek the same goal. Stakeholders were warned that some opponents would seek to subvert the process (Cavusoglu, Hu, Li, & Ma, 2010).

Early diffusion models explaining technology diffusion patterns assumed that there is a single homogeneous segment of potential adopters. It was later shown that a two-segment model considering two groups of adopters explains variations in diffusion patterns better than the existing one-segment models. While the two-segment model considers a group of adopters promoting adoption by exerting a positive influence on prospective adopters, it does not consider the members of society who aim to inhibit the adoption process by exerting a negative influence on prospective adopters… Opponents play a crucial role in determining the diffusion path of an innovation [There is a need to] identify the segments of adopters correctly (Abstract).

Conclusion

Digital technology has transformed all aspects of human endeavor. To succeed, this generation of digital natives will need digital tools that abstract the details of the technology into the background in serving their educational experience. The above review indicated that technology continues to drive change in the educational landscape and the alternative of retaining past or existing models was unrealistic. Digital textbooks will play a vital role in the new educational paradigm. However, many of the specifics remain in question. The consideration of digital textbook implications required stakeholders to reevaluate some basic concepts, and consider the implications of digital textbooks in an increasingly technology-structured digital learning environment. Previous studies have not taken a holistic approach to the problem of digital textbook adoption. For the purposes of this study, the following questions provided the context for transforming the digital textbook:

- What is the definition and role of the digital textbook in the academic environment?

  - What is the function of textbooks in academia?

    Selection of the correct textbook model depends on the context. Textbook needs differ based on the type, goals, level, and complexity of the course; skills and intellectual level of the students; and the instruction or instructor's style.

  - What are the valid sources and the nature of textbook content?

    In addition to text and images, multimedia enhancements such as audio, video, tutorials, and other interactive elements provide an enhanced learning experience.

    Textbooks provide an authoritative voice to deliver accurate information in an effective manner, and to frame the context of the subject under consideration. As such, new open content models, that include alternative sources, require validation. Wiki models include self-policing and validation models as an alternative to traditional peer review.

    Open content and links to external sources on Internet provides a wider scope and a voice for alternative perspectives.

  - What are the implications of the textbook selection process?

    Textbook selection alternatives include selections by instructors, institutional committees, or other professional, commercial, or government bodies.

    The selection process considers the importance of commonality and continuity across classes, sections, and institutions.

The curriculum and textbook selection process enhances or limits the instructor's ability to promote independent critical thinking.

- o How do textbooks integrate into a digital learning environment? Digital textbooks and learning materials provide reference, direction and guidance, and when integrated into a digital learning environment, tools to support communications and feedback.

  Integration into the environment provides the flexibility to create customized assignments, review questions, and quizzes. Through integration and intelligence built into the digital learning environment, progress results and feedback, allow for the individual tailoring of content to the student's needs. Digital technology allows instructors to use alternative resources or work without a textbook. Instructors will need to exert the additional effort required by these models.

- What are attributes of an effective digital textbook interface?
  - o Standardization allows for a consistent experience in using content. Utility requires that application interfaces support users needs. Portability and consistency support seamless, ubiquitous access to digital textbooks without regard to location or device.

  - o BYOD is the ruling model in post-secondary education. Although physical device attributes dictate attributes of the user interface, basic functionality, and support of a variety of independent user-supplied devices is essential. Custom or specialty devices designed for an educational environment offer an alternative to general-purpose devices.

- What are the attributes of a viable and effective business and financial model?

  o Constantly increasing students' costs, increased availability of low cost or free textbook content, and substantially lower digital textbook profitability require a new business and financial model.

  o Established publishers have substantial inventories of content and agreements with authors and institutions, which define how this content is used. Publishers have a well-established distribution model, agreements, and strong connections with academic institutions. Technology-centric innovators bring fresh perspectives and alternatives to digital textbook distribution, but lack depth and breadth in their content catalogs. These innovators lack the connections or funding needed to create effective relationships with institutions.

  o Technology companies and online bookstores have established effective new marketing and distribution models for digital multimedia products such as music, video, and eBooks. These companies provide the device, own the marketplace, and share in the income generated by each sale. Although open alternatives provide equivalent free content, these companies provide simplicity and convenience through standardization.

  o Individuals and institutional players have cooperated in the creation of alternative open content and distribution channels. Service and subscription models provide an alternate funding model in support of free content creation, management, and distribution.

The above questions comprised the basis for this study's panel discussion topics, instructions, and questions.

Summary

Textbooks have a special place in the academic toolkit and differ from other book types. Unlike other book types, students do not read textbooks linearly. In addition to text, textbooks contain additional content such as illustrations, graphics, multimedia, questions, and exercises that support the learning experience. To add value to the educational experience, digital textbooks need to be more than a PDF representation of a traditional paper book. Digital textbooks and their interfaces need to support learners' access and operational needs with flexible, seamless interfaces that allow users to forget about the interface and concentrate on their educational tasks. Abstraction of interface complexity requires simple common interfaces that allow ubiquitous access to content from a variety of user devices.

Although authors have used creative commons licensing to release vast amounts of educational content for open and free use, textbook costs continue to increase at a critical rate. Educators and institutions are experimenting with alternatives in effort to serve students' needs. Faced with reduced profits and an ineffective digital textbook model, the traditional publishing industry is shrinking and becoming increasingly irrelevant. The publishing industry is in flux and needs a new operational paradigm and financial model that adds value to the educational marketplace.

The digital textbook is at the core of the new educational paradigm. The stakeholders in this area need to communicate and understand each other's needs. Such understanding allows these stakeholder communities to define a new and effective digital textbook model that abstracts

the technology into the background and allows users to concentrate on their educational needs. Only then will digital textbooks cross the chasm into mainstream acceptance.

Chapter 3 explores the significance of this study, the appropriateness of the study's design, methods, population, procedures, rationale, and explains the analysis and safeguards employed to assure validity.

Chapter 3: Methodology

The purpose of this qualitative modified Delphi study, which incorporates dialogue-based inquiry approaches to work with stakeholders from technology, education, publishing, printing, and end-user communities, was to investigate digital textbook adoption issues. Dialogue-based inquiry approaches allowed stakeholders to discuss and cooperate in the accomplishment of a specific goal: removing the barriers that have prevented digital textbooks from becoming a viable and acceptable alternative to traditional paper-based textbooks, and in doing so, transform digital textbooks into an integrated part of the digital education environment.

The stakeholders worked to identify specific factors hindering the general adoption of digital textbooks, suggested mitigation strategies, and tested the effectiveness of these mitigations. In an effort at fostering mainstream adoption, this study established a direct dialogue between those with the day-to-day hands-on experience and knowledge. Clarifying the state of digital textbook adoption and the functional and esthetic needs of mainstream users provided the context for removing adoption barriers.

A structured and well-controlled online discussion environment allowed all stakeholder representatives a forum for the expression of their views and concerns. Schirr (2012) looked at available group-based research methods and found that traditional methods that allow face-to-face interaction are ineffective tools for innovation. "Especially for more innovative product development, uncovering customer needs and problems is hampered by their contextual knowledge and inability to express or understand the needs away from the context" (Schirr, 2012, p. 475). As an alternative to face-to-face interaction, Schirr proposed the concept of "alone nominal groups" (p. 438) that supports the concept of individual ideation. Virtual, online, pseudo-group and other non-face-to-face methods are suggested when innovation is required

(Schirr, 2012). Girotra, Terwiesch, and Ulrich (2010) examined hybrid methods for idea generation in which individuals initially worked independently and then worked together as a group. Girotra et al. found that when compared to traditional groups,

> groups organized in the hybrid structure are able to generate more ideas, to generate better ideas, and to better discern the quality of the ideas they generate. Moreover, we find that the frequently recommended brainstorming technique of building on others' ideas is counterproductive; teams exhibiting such buildup neither create more ideas, nor are the ideas that build on previous ideas better (abstract).

These studies suggested that individuals working asynchronously in an online environment are better able to perform innovative discussion that leads to productive idea generation.

For this research study, qualified panelists included subject matter experts and interested parties who have written or expressed, preferably strong, opinions on the subject of digital textbooks, those individuals who appeared in literature or the media as authorities on this subject, and individuals working directly in post-secondary education, publishing, or in related fields. Panelists also suggested other panel members based on their ability to add insight, value, and alternate perspectives to the discussion. This study's design included anticipation that up to 20 subject matter expert panelists would participate. The nature of the selection process assured that each panelist had the ability to represent more than one constituency. Although, the selection process favored participants from the United States, this study took place online in a virtual meeting place. As such, the specific physical or geographical location of the panelists was unknown and it was possible for participants to post from any location.

Chapter 3 includes a description of the methodology used in this research study and a justification for the appropriateness of using dialogue-based inquiry approaches in combination

with the Delphi method. Combining consensus-building techniques provides increased effectiveness in achieving the study's goals of identifying the state of digital textbook adoption and in identifying the functional and esthetic needs of mainstream users as part of the process of fostering mainstream adoption. Chapter 3 explores the significance of this study, the appropriateness of the study's design, methods, population, procedures, rationale, and explains the analysis and safeguards employed to assure validity. The study included three parts: an initial moderated panel discussion in which the panelists expressed their views and recommendations; a public comment process that was open for general feedback; and a panel review and reconsideration process. Additionally, Chapter 3 describes the criteria used for panel selection, lists the themes and issues intended for the panel discussion, and explains the rules for the discussion.

Significance to Information Technology and Educational Leadership

Previous work has created a general understanding of the practical, sociological, environmental, and financial advantages of digital textbooks (Kingsbury, 2008). Digital textbook technology holds the potential to revolutionize the dissemination of knowledge to anyone, anywhere (Nelson, 2006). The identification of effective, consistent strategies that foster the general adoption of this technology provides the critical understanding needed to reach a new digital paradigm that includes tools consistent with the needs of a new generation of educators and students. The findings of this study may help refine the function, structure, and role of the textbook in the educational system, and thereby align the tools used in education with expressed educational goals.

The process of conducting this study using a virtual online environment has the potential of defining effective and alternative consensus-building strategies for use in exploring the

underlying causes of poor technology adoption. Understanding cooperative problem solving in a virtual environment provides an alternative model for inclusive decision-making that allows stakeholders representing diverse interests to express their needs and concerns as part of an innovative cooperative process.

Research Method

A qualitative modified Delphi study, which incorporates dialogue-based inquiry approaches, was appropriate for gaining an understanding of the existing situation, the stakeholders' needs, and as a tool in identifying the strategies needed to overcome the existing digital textbook adoption barriers. Kanuka (2010), Asif and Klein (2009), and Landeta, Barrutia, and Lertxundi (2011) demonstrated the effectiveness of combining consensus building techniques such as Delphi and nominal group in overcoming the inherent weaknesses of each individual technique. Medical and other professionals have effectively used Delphi, nominal group and other consensus-based methods in problem solving and decision-making (Van Teijlingen, Pitchforth, Bishop, & Russell, 2006; Landeta et al., 2011).

The Delphi process allows experts to express their opinions on a subject in a tightly controlled environment, and allows experts to contribute asynchronously through the moderator (Simon, & Goes, 2013); the nominal group technique aims to bring experts into a common space and have the experts cooperatively interact in a face-to-face environment. Both these forms of interaction are valuable in building consensus. Deliberative inquiry effectively combines Delphi and the nominal group technique into a methodology that is able to take advantage of the strengths of both techniques by reducing the weaknesses inherent in each (Van Teijlingen et al., 2006). "Most contemporary deliberative democrats contend that deliberation is the group activity that transforms individual preferences and behavior into mutual understanding,

agreement and collective action" (Ralston, 2010, p. 236). Mainstream users continue to reject the available digital textbook offerings, and show a preference for traditional paper-based textbooks (Schmidt, 2010). This appears to reflect:

- the providers' lack of understanding of users' wants, needs, decision-making processes, and methods of interaction;

- the users' lack of understanding of what is possible;

- a weak or mixed message coming from other stakeholders such as educational institutions and booksellers; and

- a general lack of understanding or concern, by all parties, of the positions of other stakeholders.

As such, the basis of this study includes the recognition that weak digital textbook adoption is not a technical problem, but a problem in understanding. The needed standards and viable technologies existed, but the models in use have not addressed the conflicting needs of often diverse and possibly polarized constituencies of stakeholders. This understanding provided an alternative view of the underlying problem and an opportunity for problem solving through dialogue and consensus building. The stakeholders did not appear to be effectively communicating their preferences, needs, and abilities. In this situation, success in crossing the technology adoption chasm occurs when stakeholders recognize the present adoption stage and create the stakeholder relationships appropriate to this reality. Successful technology adoption results from a cautious, well-handled building of unity, understanding, and the creation of a perceived common vision or standard (Moore, 2006). This study's approach required a holistic view of the stakeholder communities and endeavored to identify their positions and needs. This approach required the recognition that the solution was not a simple question of identifying a

single critical factor to fostering adoption, but that a myriad of differing stakeholder concerns needed to be considered, and addressed by all stakeholders, as part of a shared dialogue.

Appropriateness of Design

This qualitative modified Delphi study, which incorporated dialogue-based inquiry approaches, established the foundation for such a dialogue between multiple stakeholders who were seeking a shared understanding of a common problem, and worked together to identify possible solutions. The methodology used in this study sought to take advantage of the subject area knowledge of each individual stakeholder, distill this knowledge into actionable requirements, and include the same stakeholders in defining solutions that would meet the needs of all stakeholders. This deliberative inquiry-based model included an online asynchronous design to help foster an inclusive, cooperative, consultative, private, safe environment that included provisions for general public feedback and the participation of industry leadership. In this environment, subject matter experts (SMEs), and interested parties representing stakeholders participated in a contemplative, recursive process that allowed for sharing of perspectives and concerns.

The CDC (2006) listed the disadvantages of the nominal group technique as "requiring preparation [being] regimented and lending itself only to a single-purpose, single-topic meeting [and] minimizing discussion, and thus does not allow for the full development of ideas, and therefore can be a less stimulating group process than other techniques" (p. 2) and the advantages as

> generating a greater number of ideas than traditional group discussions. Balancing the influence of individuals by limiting the power of opinion makers (particularly advantageous for use with teenagers, where peer leaders may have an exaggerated effect

over group decisions, or in meetings of collaboratives, where established leaders tend to dominate the discussion). Diminishing competition and pressure to conform, based on status within the group. Encouraging participants to confront issues through constructive problem solving. Allowing the group to prioritize ideas democratically. [and] Typically providing a greater sense of closure than can be obtained through group discussion (p. 2). The non-face-to-face online environment provides space for innovation as part of "alone nominal groups" (Schirr 2012, p. 438) that supports the concept of individual ideation. Virtual, online, and pseudo-group methods support innovation (Girotra et al., 2010). This hybrid structure gave participants the space to contemplate and a forum in which to interact by providing a structured framework for capturing stakeholders' concerns, opinions, and ideas. Individually both Delphi and nominal group techniques are well suited to the technically supported virtual environments (Stough, Eom, & Buckenmyer, 2000).

Van Teijlingen et al. (2006) made the case that the hybrid of Delphi with dialogue-based inquiry approaches provided participants with the flexibility to change their opinions in response to new information presented in the course of the discussion. Kulczycki and Shewchuk (2008) recommended consensus building using virtual nominal group techniques [NGTs] in an online environment. "A 'virtual NGT' can pull in experts from diverse geographical areas via the Internet and can effectively be conducted in person. [Kulczycki and Shewchuk] believe such an approach is more efficient and parsimonious than either the Delphi or conventional NGT methods" (p. 228). Whited (2007) noted in his Delphi study that the lack of a shared virtual communications space hindered the natural discussion needed to generate new ideas. Many studies have reported on the effectiveness of using hybrids of dialogue-based inquiry approaches, including nominal group and deliberative inquiry, separately and as part of Delphi studies

(Linker, 2011; Kakabadse, Kakabadse, Lee-Davies, & Johnson, 2011; Kelland & Kanuka, 2007).

In a study of educational technologies, Kelland and Kanuka reported that

> a deliberative inquiry is a unique kind of group interview that combines the structure of a
> focus group with the purpose of the Delphi Technique, in a manner that draws data from
> a number of people that is non-quantitative. The deliberative inquiry process necessitates
> that participants talk not just about the issues but also carefully weigh the alternative
> possibilities posed by others and the consequences of those alternatives. The moderator
> was key to eliciting meaningful information from each participant in a way that remained
> respectful and safe when divergence arose. Unlike other consensus methods (e.g.,
> Nominal Group Technique) deliberative inquiry was not aimed at forcing a consensus…
> Rather the aim was to deliberate about [the topic] as perceived by diverse stakeholders,
> and to provide an opportunity for challenging ideas, revealing misconceptions and
> establishing where mutual understandings exist. The main assumption embedded in the
> deliberative inquiry method is a belief that the decisions are socially constructed and
> grow out of discussion.
>
> …Deliberative inquiries have the capacity to garner rich and credible qualitative
> data about the most important topics and issues, and to assess the extent to which
> relatively consistent, shared views exist among participants—as well as identifying
> inconsistent views. A distinct advantage of the deliberative inquiry used in this study
> was that it allowed our participants to react to, and build on, responses. The result was a
> synergistic and dynamic effect, resulting in data or ideas that might not have been
> collected in individual interviews. Moreover, because the deliberative inquiry tended to
> provide checks and balances that eliminated false or extreme views, it was fairly easy to

assess the extent of consistent and shared views. Given these advantages, the deliberative

inquiry was a powerful way to collect data (Methodology, para. 1-2).[3]

They concluded: "the diversity of opinions that currently exist does not make one view more

correct, or superior [to] another" (Conclusions, para. 1).

A pure quantitative study was not appropriate to understanding the underlying factors

hindering the mainstream adoption of digital textbooks. The results of existing market research,

surveys, and studies indicate that students continued to prefer traditional printed textbooks

(ebrary, 2008; Schmidt, 2010). However, these pure quantitative studies were not able to

uncover the reasons behind this preference and the reasons why new and alternative digital

textbook products have not been able to gain mainstream acceptance. "So far, much of the

literature about user attitudes towards eBooks has consisted of surveys and focus groups gauging

the opinions of the academic community and library professionals" (Berg, Hoffmann, &

Dawson, 2010, p. 2). In conducting this study, I went directly to the stakeholders, sought their

direct input, and allowed the varied stakeholder groups to comment on the issues that were

important to them and to other groups.

Asif & Klein (2009) defined "Deliberative Inquiry's hallmark [as] the elimination of

artificially imposed constraints through rational discourse…[and its power to employ] positive

critique to unmask barriers to change and arrive at morally, ethically and pragmatically sound

decisions by mutual and authentic agreement" (2009, p. 1). The modified Delphi method used in

this study fits well within the parameters for Delphi and group decision-making methods as

described by Delbecq, Van de Ven, and Gustafson (1975).

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[3] Included with permission under creative commons licensing.

Population

The research population is vast and consists of anyone who interacts with post secondary education. This study required the cooperation and active participation of subject matter experts and interested parties representing stakeholder groups or communities, specifically:

- authors,

- campus and online booksellers,

- decision makers at universities and colleges,

- device and application providers,

- educators,

- publishers,

- students and other users,

- technologists,

- visionaries, and

- the public.

The criteria used to identify qualified subject matter experts and interested parties included a preference for people who had written or expressed, preferably strong, opinions on the subject of digital textbooks, those individuals who appeared in literature or the media as authorities on this subject, and individuals working directly in the field. The selection goal was to include as wide a range of perspectives and experiences as possible. Whenever possible, more than one panelist was chosen to represent a given stakeholder group. The possibility of multiple panelists representing the same stakeholder group did not necessitate a common perspective. Finding viable alternatives, that foster digital textbook adoption, depended on the active cooperation of a sufficient number of suitable candidates representing all of the identified

stakeholder communities; however, not all individuals accepted the invitation to participate on this panel. LinkedIn and other social and professional networks were possible resources for identifying members to represent any missing stakeholder communities.

Ideally, this study would attract the active participation of between 10 and 20 panelists. This purposeful selection process anticipated attracting one or more subject matter experts to represent each stakeholder community, and those experts would be knowledgeable in more than one area of concern. Although this study used an online venue, the nature of the selection process depended on the identifying participants who work in the field, or have expressed their views and concerns in online publications. The process to identify potential panelists did not included non-English publications. As such, the selection favored English-speaking participants. The actual participants in this study consisted of those candidates who met the qualifications, agreed to participate, and completed the recruitment and intake process.

Informed Consent

The design of this online-hosted study required the active participation of the persons serving on the panel. Based on their association to the topic, selected participants received personal invitations that explained the goals of the study and the reasons for their selection. The invitation explained the timeline and the level of individual effort needed. Only participants who agreed to serve were included. All panelists were required to accept a standard University of Phoenix informed consent document as per the attached template (see Appendix E). The panelist registration process assured that consent documents were on file.

During the panel discussion, the platform used for the moderated process assured the anonymity of each panel member. All comments made in the discussion space remained unsigned and posted without attribution to individual panel members. The panel members were

to refrain from using identifying information such as their affiliation to the topic or the stakeholder group they represented. As moderator, I masked any such information prior to posting any comments and made every effort to avoid reinterpreting or changing the meaning or intent of any posting when masking out this information. When in doubt, I asked the writer to approve any changes prior to the posting. This level of anonymity served a dual purpose, as it allowed the participants to voice their personal and professional views without the need to consider professional repercussions, and it allowed the individual panel members to change their stand on the issues in the process of the discussion without needing to defend their previously held positions. As stated above, anonymity in an online environment fosters free expression of views and independence from external or authoritative influence (Spears et al., 2002). Anonymity allows participants to bond with each other and form group alliances in pursuit of the group's goals while reducing consideration of outside influences.

The second part of the study included the asynchronous online, blog-based solicitation of comments from the public. The window for public comment was initially set at one week, but was extended to allow for further input. This decision was based on the public discussion remaining active with new information emerging. The details and timing of the public comments process depended on the panel's ability to reach a set of recommendations.

The number of expected participants was difficult to estimate with any certainty. Participants for the discussion volunteered and located the study using social media and via electronic word-of-mouth "advertising." As such, it was expected that the participants would tend to reflect a younger, possibly college-age, tech-savvy demographic that participates heavily in these technologies. In this part of the study, the rules of the blog stated that all participant comments made were voluntarily and are part of this study. Since participation was voluntary

and uncontrolled, as moderator, I expected and enforced only a basic code of conduct. In using an asynchronous online environment for all interactions, participants were able to interact from virtually anywhere. All blog sites required the participants to log in before they could post a comment.

Data Collection Procedures and Rationale

This research project used a structured panel discussion process that proceeded based on the issues and areas of concern identified by the literature review process. As stated earlier, the design of this study anticipated the participation of up to 20 subject matter expert panelists. The nature of the selection process assured that each panelist had the ability to represent more than one constituency. Since the list was not exhaustive, panel members were allowed to introduce additional issues for consideration and discussion.

In the first pass, as moderator, I asked the panel to consider the stated issues and comment on each issue. I reviewed the panel members' comments, published these results, and asked the panel members to consider and comment on the newly published comments. This process continued until agreement occurred in each of the areas under consideration, or until it became apparent that agreement was not possible.

As moderator, I was responsible for distilling the results thematically into specific recommendations and action items, and solicited the panel for additional comments and input. Once this review process was completed, the results formed the starting point of an online discussion that was open to the public. I posted the panel's results and recommendations to an online blog and invited the public to comment and discuss these findings and recommendations. Members of the public were given the opportunity to accept, reject, and comment on each recommended item. This public input process helped to assure the validity of the study, allowed

for the identification of overlooked issues and concerns, and identified where the formal panel process did not sufficiently consider possible alternatives. It was expected that the public comment process could reject the panel's suggestions and findings, or introduce previously overlooked new ideas. After the conclusion of the public comment process, I asked the panel to review the public input. Panel members had the opportunity to incorporate the new information into their recommendations, start over, or reject the public comments.

Ideally, all panel members were expected to provide continuity by actively participating in all parts of this study. Panelists participated voluntarily and had the option to withdraw at any time. As such, faced with the possibility of one or more panelists withdrawing due to personal or professional expediencies, the design included inherent redundancy by having multiple panel members represent each constituency, and helping the panel in forming a common cooperative community based on the early establishment of a common vision and set of goals. Community membership allows panelists to palace personal interests behind those of the whole.

Instrumentation

The panel discussion began with a thematically presented set of issues and areas of concern as identified in the literature review process. The panel needed to evaluate the validity of these issues and concerns as part of the initial review process. The identified themes were

- the definition and role of digital textbooks in the academic environment;
- the educational technology and interfaces; and
- the underlying business and financial model.

See Appendix F for specific questions and considerations.

The panel members preserved their anonymity by communicating through a firewall that limited direct interaction. During the discussion, I acted as a go-between and as an editor who

removed identifying information, maintained a professional tone, asked panel members for

clarification, and kept the discussion moving. My main role was to redact any identifying

information, and to post comments to the discussion space. All panelists' comments appeared as

those of a common alias. The online discussion environment included a confidential master

archival log of comments that included identifying information. The introduction of each of

these themes included the concerns and perspectives of the various stakeholders as expressed in

literature.

Both the Delphi method and the nominal group technique rely on a multi-step interactive

cycles in which panel members present their positions and give feedback to others in an effort to

move towards a common goal. Each panel member was expected to give an importance and

validity rank to each item on the list and provide comments to justify the ranking. As the

moderator, I would use the rankings to select the items for discussion on any particular day. The

panel continued discussion until the panel agreed on one or more recommendations or

conclusions on each expressed issue or theme. In some cases, the panel would split by reaching

opposing recommendations. The discussion process was appropriate to this problem, as this

process allowed stakeholders to express diverse, and possibly unpopular, viewpoints and

multiple perspectives directly to other stakeholders, and in doing so, gain an understanding of the

complexities of this problem. The online environment provided a safe forum for all stakeholders

to express their perspectives, and for ideas to emerge based on a mutual understanding of each

other's concerns.

At the end of the first round of discussions, a panel member presented a summary of the

discussion in the form of findings and recommendations to the panel for final comment. Once

the panel reached agreement, I posted the findings and recommendations for public comment and

feedback. After the conclusion of the public comment process, the original panel reconvened to review the public comments. The panel members had the opportunity to incorporate the new information into their recommendations.

Data Analysis, Validity, and Reliability

The opinions and perspectives of stakeholders potentially represented diverse and possibly polarized constituencies with conflicting needs. As such, a simple "counting" of opinions or ranking of perspectives would not yield a valid understanding of the true nature of the problem, nor would a democratic process favoring a majority yield agreement on a solution (University of Phoenix, 2002). As moderator, I reviewed the discussion, tracked themes, and looked for convergent trends in each area using simplified grounded theory techniques. The level and passion shown towards a specific issue or theme reflected its importance in the eyes of the panel. Issues that showed little discussion or rapid agreement provided background and formed a foundation to the subsequent discussion.

Just as this process was collaborative in the identification of stakeholder concerns and recommendations for mitigation, the analysis of the findings relied on the input and cooperation of the panel. The panel continued discussion until they agreed on one or more recommendations or conclusions on each expressed issue or theme. In some cases, the panel had the opportunity to split by reaching opposing recommendations. The public comment process identified the strengths and weaknesses of, and acted as a "cross-check" to, the panel's findings and recommendations. The panel used these results to support or update their findings as part of the search for resonance and actionable alternatives. In this collaborative process, the true measure of success and reliability was the degree to which the panel members were able to agree and unite behind a set of recommendations that help digital textbooks cross the mainstream adoption

chasm. By using similar deliberative inquiry techniques, Kelland, and Kanuka (2007) were able to achieve their goals of gaining a better understanding of a complex and decisive issue and "to get a broader picture of where there is consensus and divergence" (para. 15).

This study's methodology employed a modified Delphi method based on Crisp, Pelletier, Duffield, Adams, and Nagy (1997) description of "Policy Delphi…[in which] the aim is not consensus; it is a clearer understanding of the plurality of standpoints" (para. 6) and included the anonymity of responses inherent in the classical and policy Delphi methods. This study's methodology relied on technology to support and maintain the anonymity required by a traditional the policy Delphi method. This methodology departs from traditional Delphi studies in that there were no artificial limits to discussion or set cycles of voting. The panel of SMEs continued the discussion on topics for as long as they wished. In this application of the Delphi method, the moderator needed to look for emergent themes, summarize and present these ideas to the panel and ask the panel to consider these summaries. Once again, the panel could continue the discussion for as long as they wished. This methodology also allowed for feedback by incorporating a public comment process and gave the panel the opportunity to incorporate and revise their findings and recommendations based on the public feedback.

Summary

A goal of this study was to understand the anemic adoption rate for digital textbooks. From understanding comes action. In seeking the input and active participation of the stakeholders, this study's methodology required a direct approach that did not rely on the opinions of any specific stakeholder constituency. The modified Delphi methods proposed in this study provided an effective structured environment that created an incisive, cooperative, consultative, private, safe environment that fosters free expression, innovation, and the creation

of a shared vision. The deliberative inquiry process "is the group activity that transforms individual preferences and behavior into mutual understanding, agreement, and collective action" (Ralston, 2010, p. 236). Only through true understanding and open communications will the divergent stakeholder communities begin to understand and consider each other's needs. Chapter 4 includes a detailed analysis and the consolidated results of this Delphi study.

Chapter 4: Results

Previous chapters included background information, identified the research questions, reviewed the literature related to the digital textbook landscape, defined the specific questions for discussion, developed the theoretical foundation and methodology, and defined the criteria for panel selection. The aim of this qualitative modified Delphi was to understand and improve the anemic adoption rate of digital textbooks in higher education. Chapter 4 includes a detailed description of recruiting subject matter expert (SME) panelists, the discussion processes, the design, and creation of the discussion space. This chapter presents the initial conclusions of SMEs' discussions, a summary of the public comments, and the SMEs' final recommendations based on the public comments.

The SMEs' recommendations and conclusions provide a starting point and strategy to understanding the issues associated with digital textbook adoption in higher education. The framework created for this study allowed panelists to interact in a heavily moderated discussion. This framework leverages technology-supported interaction models to provide an open environment where real interaction may take place. Steurer (2011) lists the advantages of this environment in that "…experts from all over the world today can participate via electronic communication and …the anonymous response format, …allows experts to express opinions or beliefs without being influenced or governed by other experts" (p. 959). This framework provided the panelists anonymity and support, which gave panelist the freedom to share their opinions and experiences. A detailed description of the study's results follows.

Study Timeline

The following list includes the objectives scheduled during the first four to five months based on the initial design of the study:

- creating the study's website in two months;

- identifying candidate contact information and recruiting candidates in no more than six weeks;

- completing the SMEs' initial discussion in two weeks;

- advertising and completing the public comments process in two weeks; and

- completing the SMEs' final discussion in one to two weeks.

See Table 1.

Table 1

Study Timeline

Task	Pre-Study Preparation	2013 Nov.	Dec.	Jan.	Feb.	2014 Mar.	Apr.	May
Identify SMEs for panel	Most SMEs were identified as part of the research process in 2011-2012. Some substitutes and alternates were identified during recruiting in 2014.							
Gather contact information	As part of preparation. Additional research as part of the recruiting process.							
Setup discussion space website		Nov. 2013 - Feb. 2014						
Recruiting: Invitations & follow-up						Feb. 10th - Mar. 12th		
First SME discussion						Mar. 13th - Apr. 9th		
Public comments						Apr. 9th - May 25th		
Final SME discussion						May 25th - May 31st		

Note: The original schedule estimated the study beginning in February 2013.

The entire process took about one month longer than anticipated with setbacks at every step. Recruiting could not start until the discussion space was ready. Approval delays necessitated redesigning and scaling back the website due to limitations in the availability of external resources. In setting the dates for the discussion sessions, as moderator, I needed to include and avoid the busiest times of year for students and academics. Once the discussions

started, the study's SMEs were not as responsive as anticipated, but with the approval of the SMEs, I was able to allocate additional time to the discussion schedule.

Recruiting Participants

The research needed to complete the literature review process identified many qualified panelists. The list of qualified panelists and candidates included SMEs and interested parties who have written or expressed, preferably strong, opinions on the subject of digital textbooks, those individuals who have appeared in literature or the media as authorities on this subject, and individuals working directly in post-secondary education, publishing, or in related fields. The identification of potential panelists included the understanding that the success of the study depended on the degree of panelists' motivation (Landeta, 2006). The candidate list included over 50 highly qualified individuals representing a wide cross-section of disciplines and interests. Unexpected delays in obtaining permission from University of Phoenix to proceed with the study added additional barriers and complications to the recruiting process.

With the passage of time, obtaining contact information for some of these individuals proved difficult. Some of the previously identified candidates could not be contacted, changed interests or careers, retired, moved, or died. Candidates received personal invitations via email, LinkedIn, and telephone. These invitations included an introduction to the study and asked the candidate to review a more detailed description of the study and links to the discussion topics posted publicly on a LinkedIn forum.

Of the 47 candidates initially invited, only six completed the entire intake process and participated in the panel discussion. About one third of the candidates invited, declined citing a lack of available time or scheduling conflicts. Some of these individuals suggested alternates or associates who could represent their perspectives. A second set of invitations asked candidates

to reconsider. Some candidates from the first wave of invitations did not reply. Additional searches produced corrected contact information. Even so, some candidates could not be reached. Some candidates initially showed interest, but subsequently declined. Others preferred to discuss their views on the telephone during the recruiting process, but then declined to join the panel.

A few candidates from private publishing and printing organizations stated that their organizations were undertaking similar studies using focus groups and other techniques, but declined to share their findings, progress, or results. Some candidates sent in their organizations' position papers or links to public statements. These documents were included as background material in the panel discussion space's library. The six panelists who participated in the discussion were all highly motivated and committed to improving the post-secondary academic environment. The study proceeded with these individuals as these individuals were highly qualified, represented a broad spectrum of experiences, backgrounds, and expertise.

Discussion Site Design

While waiting for panelists to accept their invitations and complete the intake process, I worked to develop and fine-tune a purpose-built online discussion space. Due to the extended delays in obtaining permission from University of Phoenix to proceed with the study, the contracted company creating the study's specialty purpose-built discussion space withdrew, citing unacceptable delays and resource constraints. As such, I perused alternative solutions.

The first draft of the discussion space design included automated notification, extended search capabilities, and multimedia support. The proof of concept site created did not perform as expected and did not meet the needs of this study. I subsequently created a less automated alternative workspace using a generic blog-space template. See Figure 1. I tested the site's

functionality in terms of presentation, layout, visibility, privacy, and posting moderation. This new space allowed for complete posting anonymity and allowed full control over the all postings, but lacked the integrated automated communications paths that were part of the original design. The new design required active moderator intervention and alternate communication paths. As such, in addition to in-site communications, at times, I needed to use e-mail as a direct and private communication channel with individual panelists. In preparing the site, I created a small reference library that included relevant background articles and study papers. See Table 2. Each panelist who had completed the intake process gained access as an "Author." The "Author" user type permits posting that are only visible to the site moderator and identified with a status of "Pending." The study's discussions proceeded in three parts: panel discussion, public comments, and panel review and reconsideration.
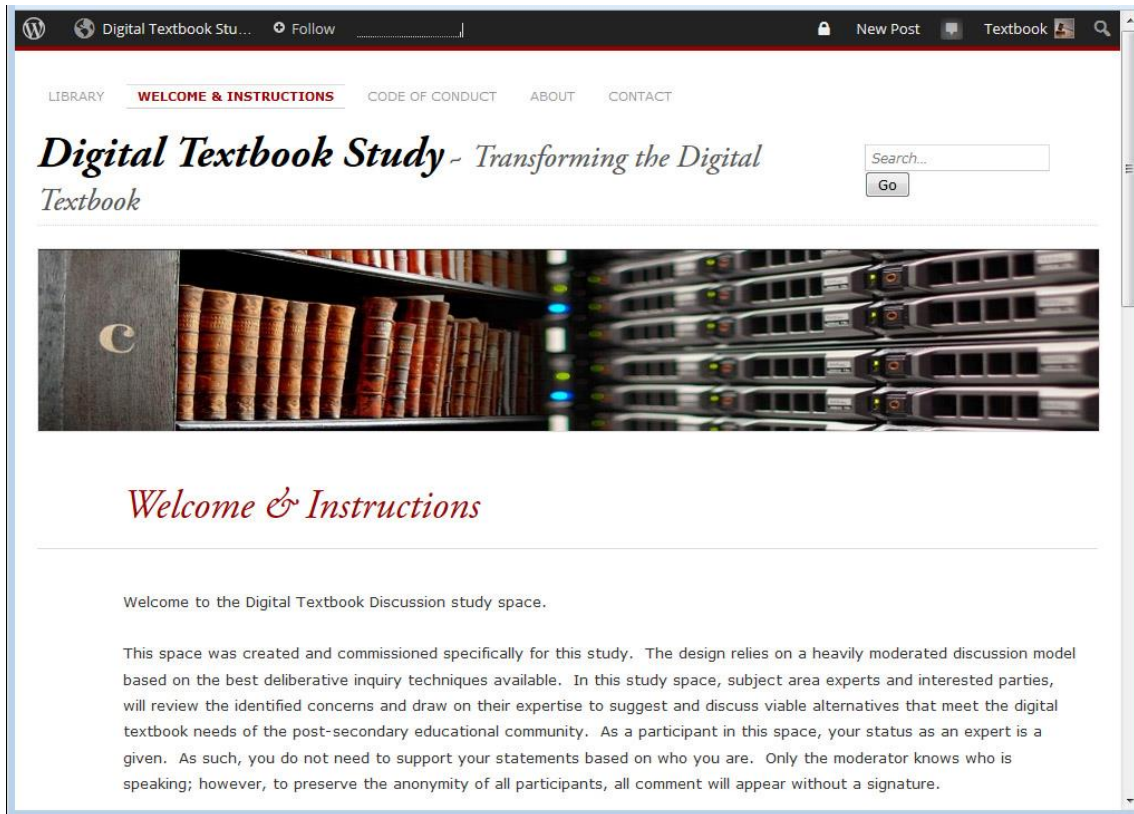
Figure 1. Digital Textbook Study website: Welcome and instructions screen. From original

work by Louay Chebib. Reprinted with permission.

Table 2

List of Background Articles Included on the Study's Website

Article Title/Description
Adapted from: 2010: EBook Buyer's Guide to EBook Privacy
Apple and the digital textbook counter-revolution
Comparison of eBook formats
Confronting opportunities and hurdles in the digital transformation of college textbooks
Converge: Funding and professional development
Converge: The textbook reformation & digital content
Disruptive Technology Adoption Life Cycle
EBooks or textbooks: Students prefer textbooks
Evaluating and Choosing Textbooks
Extract from: EBONI Electronic Textbook Design Guidelines
Extract from: NCSET Typology of Resources for Supported eText
Fixing Broken Textbooks Report
Google adopts Adobe eBook DRM.
Google Effects on Memory Cognitive Consequences of Having Information at Our Fingertips
Graphic Presentation Graphic Novel textbook format
New Media Books: the effect of interactivity on consumer response to digital information.
PDF in 2109?
Reconsidering the Textbook
The imposition and superimposition of digital reading technology: the academic potential of e-readers
Why aren't students using eBooks?

Data Collection

Panel discussion process. This study used a modified Delphi method that combined

what Crisp et al. (1997) described as "Policy Delphi… [in which] the aim is not consensus; it is a

clearer understanding of the plurality of standpoints" (para. 6) and included the anonymity of

responses inherent in the classical and policy Delphi methods. The panel discussion process

required my active involvement and participation. As moderator, I frequently needed to remind

panelists to review new material and invite panelists to remain engaged. As moderator, I helped

panelists shape their ideas, provided examples, and summarized and rephrased the ideas

expressed. If needed, I removed identifying information, contacted the panelists for clarification,

and suggested alternative wording. I also added "moderator notes" that helped elaborate the posing and referenced available literature. When each posting was ready, I changed the posting's author such that all postings appeared to be the work of a generic panelist. To the reader, all content either appeared as the work of the "Textbook Moderator" or of a generic panelist identified as "Textbook Panelist." The availability of an online environment supported the discussion process by providing anonymity, real-time communications, and access to supporting material in a shared private forum (Hartman & Baldwin, 1995). See Appendix G for an unedited transcript of the study panel's discussions.

The initial panel discussion proceeded based on three discussion topics: definition and role of the digital textbook in the academic environment, attributes of an effective digital textbook interface, and the attributes of a viable and effective business and financial model. Each main topic included a set of sub-topics and considerations that helped to frame the discussion. The full text of the discussion topics appears at the end of Chapter 2 and in Appendix F. As panelists responded, I reviewed the responses and worked with the individual panelists to fine tune the responses. As moderator, I offered supporting literature to help the panelist illustrate and support their comments. At each critical stage of the discussion, I summarized the comments and asked the panelist to review and amend the summaries. The modified Delphi method required assessing the activity and stage of each discussion. All discussion subjects remained open, but I created a summary whenever enough information was available to indicate an emerging theme. These thematic summaries became new subjects for additional discussion. Once the panelists had reviewed and agreed to all the discussion summaries, I asked the panel to wait for the public comment process to complete.

Panel discussion process results: Initial panel conclusions. At the end of the first panel discussion process, the panel approved of the following summary as the panel's initial findings:

1) In response to consideration of the "definition and role of the digital textbook in the academic environment," specifically:

"What is the function of textbooks in academia?"

"What is the nature and what are valid sources of textbook content?"

"What are the implications of the textbook selection process?"

"How do textbooks integrate into digital learning environments?"

A textbook is an educational resource or tool that provides definitive knowledge, and defines and bounds the scope of discussion and learning as set forth in the curriculum for a specific class. This resource helps assure that the stated learning goals are met.

Based on the premise that a textbook is an educational resource and may contain other educational resources, then the textbook functions as an educational workspace. A digital textbook needs to function as the principal resource in an online or interactive educational workspace that supports a mix of materials regardless of and including multiple media formats.

A fully functional digital textbook needs to encapsulate seamlessly the educational materials and resources needed by the specific course.

It is the responsibility of the instructor (or syllabus/course design group) to examine and vouch for the credibility of included educational material (textbook or other content).

Virtual textbooks may and should include material from a variety of academic and less formal sources.

An effective textbook selection process requires due diligence in balancing academic freedom with institutional goals and requires standards, oversight, and/or standardized processes help to keep the process from becoming dysfunctional. Maintaining higher education's goals of academic integrity while maintaining some degree of standardization allows a space to be given for creative liberties.

2) In response to consideration of "the attributes of an effective digital textbook interface," the panel concluded that new tools (digital textbooks or educational platforms) need to support student study needs in a seamless manner while allowing students to choose how to use the available educational material without limiting access. The presentation needs to be tailored to the device and include tools to display related content when needed. The tools need to allow users to choose and customize the interface based on their preferences.

3) In response to consideration of "the attributes of a viable and effective business and financial model," the panel concluded that this situation needs to play out in the marketplace until a handful of models remain. The existing choices are:

- Publisher generated aggregations and traditional paper textbooks along with associated digital content created by handful of publishers; sold by bookstores; resold or rented out by companies and individuals;

- Publisher generated PDFs of the traditional paper textbooks or created on Apple's iAuthor platform; sold/licensed for limited use;

- Open content models shared on an exchange for "free" or for a small fee that allow aggregation of materials in building a course materials pack; and

- A variety of independent and Web-based content and formats created by individuals and educational start-ups.

Public comment process. As moderator, I posted the panel's initial findings in a public space and asked for public comments. The inclusion of a public comment process helped assure reliability. The public comment process acted as an external validation that helped the panel avoid "groupthink" by identifying the strengths and weaknesses of the panel's initial findings and recommendations. I invited the public to make their comments directly to me via a study specific email address. Some people chose to show their agreement by using the like option available in the public comment space. All public comments were positive and showed agreement, while some individuals added additional information and requested that the panel highlight and expand some issues.

Public comment process results: Public comment summary. At the end of the public comments period, I posted the following summary of the public comments and concerns:

- Identify strategies for saving students money.

- The presentation will need to be much more flexible and responsive. PDF is not acceptable. The functions of the interface need to include what students expect in traditional paper books such as table of contents, index, highlighting, mark-up, and writing notes along with the search and dynamic formatting and presentation capabilities associated with the Internet, e.g. float over, pop-out, etc. and the inclusion of a mix of media formats.

- Emphasize integration of the digital textbook into the educational workspace.

- Control the scope and boundaries of the material included. In this environment, the instructor needs to work at filtering relevant material. Open content has the potential to expand the scope of a topic outside of academia, but the instructor would need to take

care that students understand the advantages and shortcomings of information from less authoritative sources.

- Provide options: Not all students want the latest technology or to be trapped in a single "best" option. Textbooks providers and institutions need to offer choices in material presentation and interface.

Panel review and reconsideration process. In the third stage of the study, I published the public comment summary (above) on the panel's discussion space and sent a copy via email to the panel members for individual consideration. After some additional debate, the panelists added their final comments and replied via email. The panelists agreed with the public comments and elaborated on the initial results.

Panel review and reconsideration process results: Final comments summary. As moderator, I published the following summary of the final comments in the panel's discussion space and asked for comment.

- Cost is always a big issue and the public comments included concern over cost. There were several comments about making textbooks more affordable for students, but no one really looked at the pricing model in terms of who is requiring the books, who setting the prices, and who is paying.

- A future study should be done to compare pricing models in terms of payers' acceptance and attitudes. [4] The study should be designed to compare the existing per book, per class buy, resale, or rental model, with other models such as "free" (included in tuition), open and shared sources, or as a resource fee to see what is the most acceptable. Which model is most effective in avoiding sticker shock? Students whose scholarships allocated

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[4] Payers are students, parents, or grant providers who pay for the textbooks. In this captive market, the decision makers who select the textbooks, and often the consumers (students), are not paying for the product.

specific funds to textbook purchases are more likely to purchase the required textbooks (Dean Dad, 2009; Florida Distance Learning Consortium, 2011). These students are less sensitive to textbook cost.

- Digital textbooks must support accommodations for students with disabilities. Content-supported functionality improves accessibility. Adding alternatives and choices in how content is presented and used can provide functionality and flexibility for all students. Such requirements are already mandated, but implementation has been problematic. Many existing technologies have developed independently of accessibility considerations; the "born accessible" concept for new technology requires developers to build-in the accessibility features from the start rather than adding them on later as an afterthought. The current adoption state of digital textbooks makes this uniquely possible, which is not possible for printed text.

- Some students will still require a hard copy they can markup and write on.

Summary

Although the entire process took longer than anticipated and panelists were not as engaged as predicted in the study's design, the SMEs were able to work together and add insight into the digital textbook adoption problem. Occasional reminders helped keep the panelists focused on the task; the panelists were very generous with their time and all panelists committed to remaining with the study despite the delays. The public process also took longer than expected primarily due to needing to give members of the public an opportunity to find the posted information. Even so, all of the six SME panelists who started the study remained committed to the study and participated in all phases of this work.

Chapter 5 incorporates a discussion of the results reported in this chapter. The next chapter expands these results into conclusions and recommendations based on the three subject areas discussed. The implications of this study's findings provide an understanding of the issues surrounding the adoption and acceptance of digital textbooks in higher education. Chapter 5 also includes a review and consideration of the study's methods as a model for group cooperation in idea formation and decision-making. These conclusions provide a foundation for future action and research.

Chapter 5: Conclusions and Recommendations

Chapter 5 incorporates and expands the discussion of the results reported in Chapter 4. This chapter includes a discussion of the study's findings, leadership implications, limitations, suggestions for future action and research, and the researcher's reflections. The study's findings and panel recommendations provide a foundation for future action and research that will help improve the adoption and acceptance of digital textbooks in higher education. In addition to the study's direct findings, a review of the effectiveness of the research method and strategy provides insight and recommendations that may help future researchers who wish to use this modified Delphi method.

Discussion of Findings

The fundamental research question for this study was how should digital textbooks transform into a viable and acceptable alternative to traditional paper-based textbooks and thereby foster effective adoption and acceptance in higher education? In the context of removing the adoption barriers that have prevented digital textbooks from becoming a viable and acceptable alternative to traditional paper-based textbooks, the following research questions served as a guide for this study:

1. What is the definition and role of digital textbooks in higher education?

2. What, if any, factors hinder the general adoption of digital textbooks?

3. What are the possible mitigation strategies addressing the factors hindering the general adoption of digital textbooks?

4. What is the practical effectiveness of each of these identified mitigation strategies in transforming the digital textbook into a viable and acceptable alternative to traditional paper-based textbooks?

To explore these questions, the study's panel of subject area experts (SMEs) considered the discussion topics presented in Appendix F.

Definition of a textbook, its content, and its role. The first of these topics explored the definition of a textbook, its contents, its role in education, and how the needs of the digital environment alter this role. The panel also considered the implications of the textbook selection process. The panel's principal finding, that the textbook remains central to the postsecondary learning experience, allowed the panel to define the textbook as a basic educational resource that:

- provides definitive knowledge,

- defines and bounds the scope of discussion and learning, and

- helps assure that the stated learning goals are met.

Based on this understanding, the panel agreed that a textbook is an educational resource and may contain other educational resources, such as:

- the textbook functions as an educational workspace,

- a digital textbook needs to function as the principal resource in an online or interactive educational workspace that supports a mix of materials regardless of and including multiple media formats, and

- a fully functional digital textbook needs to encapsulate seamlessly the educational materials and resources needed by the specific course.

These findings are consistent with Bierman et al.'s (2006) statement that "the textbook, whether printed or electronic, will be the organizing hub of an integrated learning environment where the student experience is key" (p. 306) and with President Obama's vision that

digital textbooks… will come in an ever-evolving variety of technological and instructional variations to meet diverse educational needs and interests. But they will all have in common digital devices with access to rich, interactive, and personalized content that will encompass the primary toolset in digital learning… (The Digital Textbook Collaborative, 2012, p. 7).

The panel also agreed that:

- It is the responsibility of the instructor and course design team to examine and vouch for the credibility of included educational material (textbook or other content),

- textbooks may and should include material from a variety of academic and less formal sources, and

- an effective textbook selection process requires due diligence in balancing academic freedom with institutional goals and requires standards, oversight, and/or standardized processes help to keep the process from becoming dysfunctional. Maintaining the academic integrity that is higher education's goal, while maintaining some degree of standardization, allows a space to be given for creative liberties.

The public comments expanded the definition by recognizing alternative sources of content and the expanded role of the instructor. Specifically the instructor needs to:

- include open content that has the potential to expand the scope of a topic outside of academia,

- work at filtering relevant material,

- control the scope and boundaries of the included material, and

- ensure that students understand the advantages and shortcomings of information from less authoritative sources.

Just as traditional educational resources depend on academic peer review to give an authoritative voice, open media model depend on a community of contributors and users to assure the validity of the work (The Glasgow School of Art, 2012). These definitions and understanding helped the panel frame subsequent discussions by providing the panelists a common vision. This common vision supported clear communication towards a common goal.

Attributes of an effective digital textbook interface. In the second part of the discussion, the study's panel of SMEs explored the attributes of an effective digital textbook interface. The panel recognized the essential difference between textbooks and books read for entertainment. Readers reading for entertainment generally read books linearly from beginning to end (Hane, 2010; Lardinois, 2009). Nielsen (2008) described linear, author-driven narratives as the style used in traditional storytelling and made the case that this form of narrative is best-suited to affect "deep learning of new concepts" (para. 16). Thayer et al. (2011) reported linear reading as "receptive reading [which is a] sequential process where the student reads the text without interruption or analysis" (p. 2918). This observation supports the findings of previous studies in which students agreed that tablet devices worked well for linear activities such as pleasure reading, but lacked the general functionality needed in a study aid (Hane, 2010; Lardinois, 2009). See Figures 2 and 3.
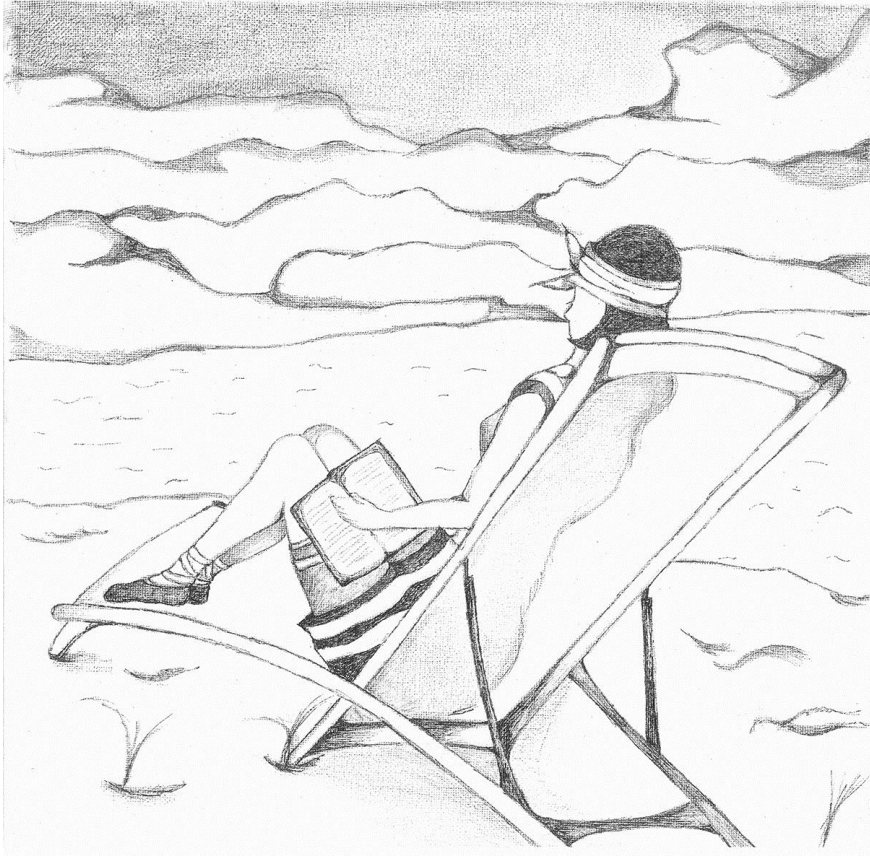
Figure 2. Linear Reading: Reading a paperback book for pleasure. From original artwork,

commissioned by Louay Chebib. Reprinted with permission.
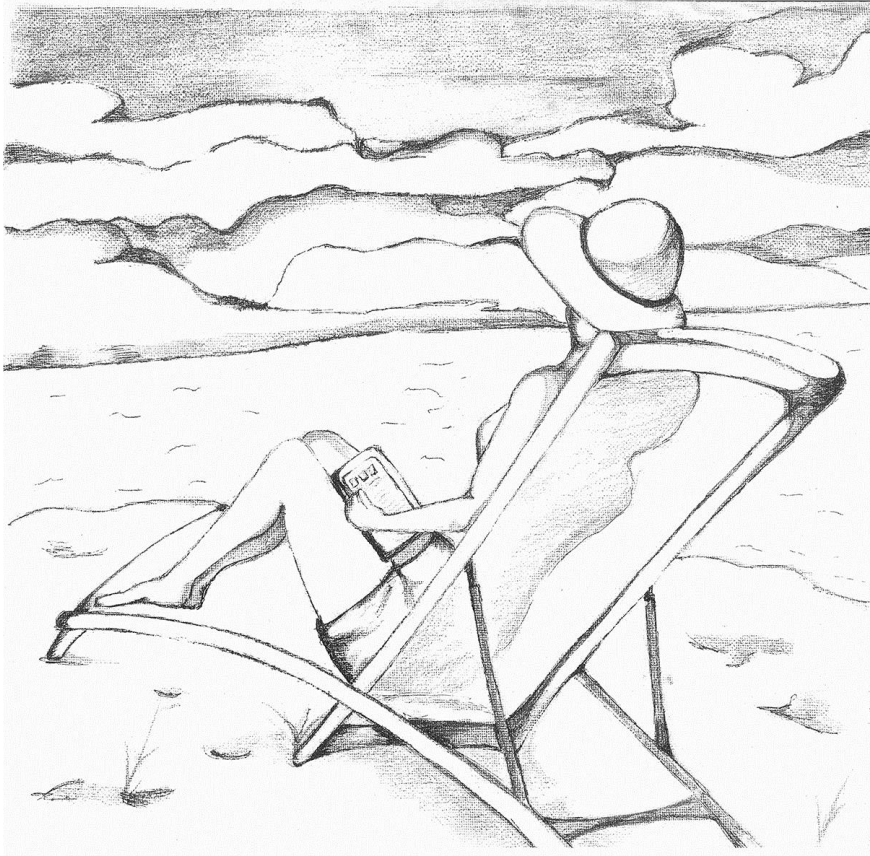
Figure 3. Linear Reading: Reading a book for pleasure on a tablet. From original artwork, commissioned by Louay Chebib. Reprinted with permission.

The panel recognized that students use textbooks as educational tools and looked at digital textbooks in the context of Thayer et al.'s (2011) five specific reading types as listed in Chapter 2. Students do not use textbooks and other educational resources linearly and often need to switch back and forth within the same textbook or to other resources. The panel agreed that new tools, digital textbooks, or educational platforms need to support students' study needs in a seamless manner while allowing students to choose how to use the available educational material without limiting access (see Figures 4 and 5).

The presentation and interface need to consider the specific device's attributes and adapt dynamically to each device. An effective interface needs to support tools to display included and

related content when needed. The interface must provide the flexibility and functionality that

allows users to choose and customize the experience based on their individual preferences.

Although the study's panel of SMEs did not explicitly say so, after deep consideration and a

review of the discussions, it is apparent that the non-linear activities students use to support their

study activities imply larger physical or virtual desktops. The observations that:

- students spread out their resources for quick access and cross reference, and

- "…many office workers have adopted the practice of using two display screens
  simultaneously as they find this more convenient for processing a large amount
  of information or viewing more than one document at a time" (Szeto, Chan,
  Chan, Lai, & Lau, 2014, p. 461)

support this conclusion. Additional research will need to prove this understanding and explore

possibilities of using available technology to provide the equivalent of larger virtual desktops.

Figure 4. Non-Linear Activity: Studying in a library. From original artwork, commissioned by Louay Chebib. Reprinted with permission.
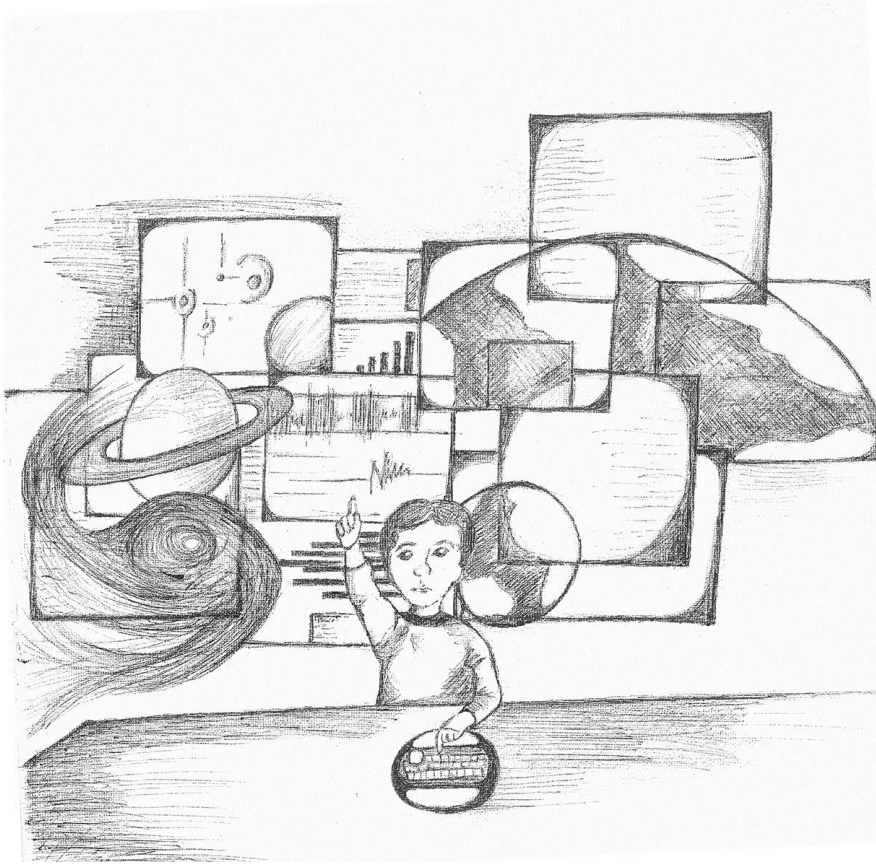
Figure 5. Non-Linear Activity: Studying in a virtual educational space. From original artwork, commissioned by Louay Chebib. Reprinted with permission.

Public comments submitted reinforced that the presentation and interface will need to be much more flexible and responsive. PDF is not acceptable. The functions of the interface must include what students expect in traditional paper books such as table of contents, index, highlighting, mark-up, and writing notes along with the search and dynamic formatting and presentation capabilities associated with the Internet, e.g. float over, pop-out, etc. and the inclusion of a mix of media formats. Several of the notes received during the public comments process showed that in the public eye, digital textbooks are synonymous with PDFs (Anonymous, personal communications, May 2014). When these individuals commented, the comments indicated dissatisfaction with the PDF textbook format and that they had not

considered other alternatives. This situation supports the existence of a de facto standard or

paradigm that limits or acts as a barrier to the creation of the radically different technologies

needed to meet the needs and requirements of today and tomorrow's digital native students

(Kuhn, 2007). The public comments also stated that the interface needs to provide a variety of

user selectable options; not all students want the latest technology or want to "be trapped" in a

single "best" option. Textbooks providers and institutions need to offer an array of choices in

material presentation and interface.

The panel's final review expanded on these ideas:

- Digital textbooks must support accommodations for students with disabilities. Content
  supported functionality improves accessibility. Adding alternatives and choices in how
  content is presented and used can to provide functionality and flexibility for all students.
  Such requirements are already mandated, but implementation has been problematic.
  Many existing technologies have developed independently of accessibility
  considerations; the "born accessible" concept for new technology requires developers to
  build-in the accessibility features from the start, rather than adding them on as an
  afterthought. The current adoption state of digital textbooks makes this uniquely
  possible, which is not possible for printed text.

- Some students still require a hard copy they can markup and write on.

Technology supported "open content makes it possible for teachers to differentiate instruction

based on students' individual reading levels, interests, or learning styles" (Ramaswami, 2010,

p. 2). Effective communication technologies help both students and instructors. Students benefit

by being able to shape the environment to meet their needs and instructors are able to provide

specific help based on individual student's needs.

The recommendations from the panel of SMEs for an effective digital textbook interface were consistent with Landoni and Wilson's (2002a) EBONI Electronic Textbook Design Guidelines (see Appendix A), and Anderson-Inman and Horney's (2007) work with supported eText (see Appendix B). Where the study's panel of SMEs differed from EBONI was that the EBONI specified in Guideline 5, the need to "treat the book as a closed environment" (p. 15) and the panel envisioned an open-ended environment that included educational materials from a mix of formal and less-formal sources. The study's panel of SMEs also took a BYOD or open hardware approach and did not consider the physical attributes of a digital textbook device.

Competing business and financial models. The study identified the existence of competing technical, business, and financial models including options by existing publishers, new technology supported rental and resale models, experimental interfaces, open textbook alternatives, and resource fee models. When considering alternatives for implementation in terms of viable and effective business and financial models, the panel agreed that the marketplace would ultimately decide what models should succeed. To date, marketplace forces have resulted in the creation of independently created alternative digital textbook models that have little cross-standardization in functionality and interface (CampusGrotto, 2011).

TRAM measures technology readiness (TR) using an index of "four sub-dimensions: optimism, innovativeness, discomfort, and insecurity" (Lin et al., 2007, p. 643). TRAM helps to identify the critical chasm between the early adopters and the early majority. "The chasm is signaled when the adopters' mean TR index decreases dramatically" (p. 653). Technology adoption models consider that user or consumer attitudes have a significant influence on the ultimate adoption of innovative and potentially disruptive technology.

The current and next generations of students are ready and comfortable with disruptive technologies and demand effective technology alternatives (Brindley, 2009; Evans, 2007; Horovitz, 2012; Rehm et al., 2012). The discomfort and insecurity associated with previous technologies' adoption cycles have become rarer as stakeholders increasingly understand the importance of embracing disruptive technologies (Christensen, Bohmer, & Kenagy, 2000; Psotka, 2013). "…disruptive technologies have been one of the fundamental mechanisms through which the quality of our lives has improved. In each of these cases, the disruption left consumers far better off than they had been" (2000, para. 14). Consumers are ready for technology supported innovative textbook alternatives, but none of the available options has the benefits, in terms of functionality and cost, needed to excite the consumer.

The public comment process showed that cost savings was the principal concern of those providing comments. Driscoll (2011) and Koch (2006) have described the textbook marketplace in terms of a captive market where those who pay for the service have little or no control over product selection or pricing. In such a market, decision makers tend to overlook the financial needs of the end users and act pragmatically while working within the organizational model and policies provided by the institution (GAO, 2013). Since many institutions have contractual agreements with publishers, the textbook selection models and policies favor those created by the specific publishers (Germano, 2008). Until students perceive the value of digital textbooks in terms of functionality and usefulness, students will continue to prefer traditional paper textbooks as these "work best for how they study" (Watters, 2011, para. 10). For the consumer, the primary consideration remains cost.

Implications for Leadership

Digital textbooks continue to hold the potential to revolutionize the dissemination of knowledge to anyone, anywhere (Nelson, 2006). The identification of effective, consistent strategies that foster the general adoption of this technology provides the critical understanding needed to reach a new digital paradigm that includes tools consistent with the needs of a new generation of educators and students. The findings of this study provide a foundation that defines the function, structure, and role of the textbook in the higher educational system. In this context, the most important result of this study was the agreement on the definition and role of textbooks and of digital textbooks in higher education, and the attributes of effective digital textbooks and educational workspaces. These definitions provide a common starting point in the development of effective digital textbook strategies and educational systems.

Additionally this study has explained why current PDF-based digital textbooks are inadequate, and has presented a list of functional considerations that need to be part of the next generation of digital textbooks. The marketplace will identify which technologies will succeed. Technological leaders help create alternatives and choices, but ultimately the consumer and market forces will decide on success of each product model.

"Collaborative creativity promises to be a key business skill in upcoming years…" (Parker & Chao, 2007, p. 67). This study's cooperative problem-solving design presents an alternative group or virtual team ideation model based on the value of anonymity in removing barriers to cooperation and communication. In this model, the moderator acted as discussion leader, coach, or manager who provides a safe space for open discourse. This study used technology-supported indirect communication as an alternative to face-to-face interaction. The anonymity inherent in this discussion model allowed all members an equal voice. This removed

barriers to idea generation and allowed the participants to form a team and build on each other's postings. Schirr (2012) proposed the concept of "alone nominal groups" (p. 438) that supports the concept of individual ideation. Virtual, online, pseudo-group and other non-face-to-face methods are preferred when innovation is required (Schirr, 2012). Girotra, Terwiesch, and Ulrich (2010) examined hybrid methods for idea generation in which individuals initially worked independently and then worked together as a group. Girotra et al. found that when compared to traditional groups,

> groups organized in the hybrid structure are able to generate more ideas, to generate better ideas, and to better discern the quality of the ideas they generate. Moreover, we find that the frequently recommended brainstorming technique of building on others' ideas is counterproductive; teams exhibiting such buildup neither create more ideas, nor are the ideas that build on previous ideas better (abstract).

This study benefited and applied these group ideation methods and leveraged these concepts into a highly effective discussion forum. This modified Delphi study's discussion model allows leaders to created ad hoc expert teams, where experts interact towards a common goal, that are able to build on each other's ideas and expertise, while avoiding many of the deficiencies inherent in traditional team structures. This study's problem-solving discussion model, by using a virtual environment, provided for inclusive decision-making that allowed stakeholders representing diverse interests to express their needs and concerns as part of the decision-making process without the need to consider the individual's role, background, or credentials. In applying this discussion model, it is the moderator's responsibility to provide a safe anonymous discussion space and to support the individual participants by filtering, seeking clarification, elaborating, and providing background.

Students recognize the ever-increasing worth of higher education (Budig & Heaps, 2014). College enrollment continues to climb as students from all social and financial backgrounds and from different countries recognize the need for a university (Yang & McCall, 2014). University graduates have significant social and financial advantages over those who have associate or high school degrees (McGuire, 2011). Leaders of industry and society need to demand that universities provide effective results by graduating students who are ready and have the skills needed to succeed in an ever-demanding work and social environment. Higher education leaders need to support their institutional goals by demanding the disruptive educational technologies and tools that support student success. This study serves as a guide to identifying the attributes of effective digital textbook and learning technologies that are able to abstract the complexities of the technological tools into the background thereby allowing the student to concentrate on mastering the educational skills and content needed to succeed.

Review of Assumptions

The design of this study included the understanding and consideration of several assumptions about the recruitment process and the subject matter experts who would form the panel. First, that this project would be of sufficient interest as to motivate and attract the needed population of subject matter experts to act as panelists. This proved to be the case and although fewer than expected, the drive, quality, and credentials of the participants exceeded expectations. Second, that these panelists would have the time and dedication to follow through the discussion process and the ability to make meaningful contributions. This proved to be the case and although the process took longer than expected, all panelists stayed with the study to its conclusion. Third, that the method used provided a safe environment in which panelists would be free to discuss and seek viable alternatives. This proved to be the case as the design of the

environment, with its focus on availability and anonymity, gave the participants a safe setting that fostered open discussion. Fourth, that the mix of panelists participating would be sufficiently diverse to facilitate true discussion. This proved to be the case as the mix of panelist backgrounds and experience fostered a meaningful discussion that revealed multiple and often competing concerns and priorities. Fifth, that the panel would be able to identify and mitigate the effects of hidden agendas. This proved to be the case as all members of the panel were able to concur and agree on the conclusions and recommendations.

Additional assumptions dealing with the nature of the problem included the assumption that the problem, although complex, is fundamentally that of incomplete communication, miscommunication, or a lack of understanding between stakeholders that has led to incomplete and inadequate functionality that does not align the available technology with the true stakeholder needs. The panel agreed that the existing PDF-based paradigm does not adequately serve the needs of digital textbook users, and that the providers did not sufficiently understand, articulate, or meet the real needs in their existing digital textbook offerings. An additional assumption in this study was that Moore's (1999; 2006) frameworks and methods for bringing disruptive technology to the mainstream applied to this problem. As such, understanding the problem and the stakeholders' concerns would lead to effective alignment between the technology and the underlying stakeholder needs. The panel discussions identified the underlying stakeholder needs and proceeded to make recommendations based on this understanding. The final assumption in this study was that industry leaders would be willing to embrace the recommendations that come from this study. This assumption remains unproven.

Limitations

The consideration and the understanding of the validity of this study needs to include an understanding of how willing the participants were to dedicate the time and effort needed to focus on this discussion and to be open and honest during the discussion process. Although the perspectives of some of the participants who declined to participate could have changed the shape of the discussion, the study was able to attract a balanced panel whose members showed consistent agreement and were willing to engage and work though differences. The addition of the public comment and final review processes helped focus the results by adding independent perspectives and bringing these to the attention of the panel.

The privacy implication of digital textbooks and other educational technologies was one area that could have benefited from the participation of subject area experts. Although preparatory research indicated that technology users are concerned with the privacy issues inherent with many technology products including eBooks (Alter, 2012; Cohn, 2010), the panel did not consider the privacy implications of digital textbooks or educational platforms. Alter (2012) warned readers that, "your EBook is reading you" (title) and shows how eBook providers collected data about readers' specific habits. Cohn (2010) cataloged privacy concerns over what information eBook providers may collect and how providers use this information (see Appendix C).

Although I attempted to include panelists working in the technology privacy field, none of the identified potential candidates were willing to participate in this study. Recent studies indicate that although people are concerned about their privacy, they find it necessary to give up some personal information as a cost of accessing the technology (Brownstein, 2013; Solove,

2013). A consideration of privacy concerns needs to be implicit in the design of all technologies including digital textbooks and educational platforms.

Prior to performing the study, one of the concerns was that panel members would assume the status-quo definition of digital textbooks as PDF-based textbooks and that, this vocabulary would limit the discussion to a comparison of de facto objects: PDF or traditional textbooks. Such an assumption precludes a conceptual exploration of potential, yet undeveloped, future digital textbook alternatives (Kuhn, 2007; Kirk, 2010). By first exploring a new definition of textbooks and digital textbook in particular, the panel avoided this concern. The newly established definition created a common framework for the remainder of the discussion.

Although University of Phoenix is a leader in digital textbook use, the university's Committee on Research (COR) did not grant permission for university staff or students to participate as SMEs in this study. In 2011, the University of Phoenix, Online Campus had the largest student population of any university in the United States (NCES, 2013), has a digital first policy, and uses a resource fee model that allows students and staff access to a vast digital library (Hughes, 2012; Jackson, 2010). The committee stated that:

> The Committee does not believe that [this] study focus should be on subject matter experts from University of Phoenix because there are other individuals not associated with the University in this field who can be very viable subjects. The University's subject matter experts may not be the best source of data for you with this particular study. The Committee suggests [exploring] other subject groups not affiliated with the University… (COR, personal communication, January 30, 2013).

Prior to starting this study, discussions with numerous University of Phoenix instructors and doctoral students (at least 20 individuals) at University of Phoenix residencies in April 2011

indicated that the users of the university's PDF-based digital textbook offerings understood the inherent limitations of these digital representations of paper textbooks and were mostly willing and able to use these textbooks. Most doctoral students agreed that additional out-of-pocket costs were not justified and were willing to work through the inherent shortcomings. Only one student said that she was unwilling to use these and was purchasing physical textbooks for her classes (Anonymous, personal communication, April, 2011). The instructors and doctoral students voiced one major concern in that the DRM protections used by the university prohibited the opening of the digital textbook when not connected to the Internet. Some users suggested tools that would allow users to save unlocked version of the PDF files and thereby defeat the DRM protections. COR's refusal eliminated the potential insight of at least three very knowledgeable SMEs who had worked directly with the university's digital textbook offerings, publishers, educational materials, and digital learning environment.

In preparing for this study, I contacted several publishers, printers, and their representatives to discuss background and possible participation in the study. In a telephone interview with one representative of a major publishing company, the representative indicated that the company has also been looking into digital textbook alternatives (Anonymous, personal communication, March 4, 2014). The company has recognized the limitations of PDF-based digital textbooks and is actively exploring options that allowed for reflowable text that allows the content to adapt the available viewing surface. The company was experimenting with XML and IDPF's (2014) ePub standard as an alternative to PDF for digital textbooks. The company had done focus group research with various alternatives. The representative was unable to give additional details or share the focus group results. This information could have provided additional facets and perspectives to the problem, but I was unable to access this and other

publishers' proprietary studies and focus groups results. This information could have provided

additional facets and perspectives to the problem. Conversations with other individuals working

in textbook printing, and publishing indicated that those in the industry recognized the

limitations of static PDF-based textbooks and were working on acceptable alternatives

(Anonymous, personal communication, 2012- 2014).

Suggestions for Future Action and Research

As noted earlier, the current PDF-based digital representation of paper textbooks standard

is workable, but does not provide the needed functionality indentified in this study. Ever rising

textbook costs is a major concern for students (GAO, 2013). Some students find alternatives to

reduce the cost of textbooks (Follett Higher Education Group, 2010; Reynolds, 2011a; Reynolds,

2011b). Students buy and trade used textbooks, rent textbooks, share textbooks, borrow

textbooks from the library, use older or international versions, and resell their books at the end of

class. Other students forgo purchasing textbooks altogether and depend on online and other

resources (Allen, 2011; Gorski, 2010; Hasberry, 2010). Some models include access to digital

textbooks as part of a flat resource fee. Some institutions and faculty are experimenting with low

cost or free models based on open source content (Baker et al., 2009). Students whose

scholarships allocated specific funds to textbook purchase are more likely to purchase the

required textbooks (Dean Dad, 2009; Florida Distance Learning Consortium, 2011). In this

context, future studies need to look at how paying directly for a product (e.g. a digital textbook)

influences the user's acceptance of technology shortfalls. As suggested by the panel, part of this

study should compare pricing models in terms of payers' acceptance and attitudes. [5] The study

should be designed to compare the existing per book, per class buy and resell, or rent model,

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[5] Payers are students, parents, or grant providers who pay for the textbooks. In this captive market, the decision makers who select the textbooks, and often the consumers (students), are not paying for the product.

with other models such as "free" (included in tuition), open and shared sources, or as a resource fee to see what is the most acceptable. Which model is most effective in avoiding sticker shock?

This question is part of a broader technology and intellectual property question dealing with acceptable price points for virtual property. The music and video industries have demonstrated that some consumers will pay, either directly or via subscriptions for the convenience of accessing media products. Geng and Lee (2013) showed that consumers would pay for a media product when the cost is below the perceived value considered in terms of the product's quality. In the case of digital textbooks, the consumer considers quality in terms of effort and meeting their needs. Klosowski (2013) makes the point that convenience, improved consumer experience, and reduced effort were critical to reducing media piracy.

A future study needs to explore the effectiveness or need for DRM in digital textbook protection. Such a study would consider the experience of the entertainment industry. Schumacher-Rasmussen (2013) credits legal subscription services that provide effective inexpensive access and "relatively frictionless DRM" (para. 7) for the shift away from piracy. This study would consider the effectiveness of ineffective DRM, and the need or usefulness of intrusive DRM in the context of a full access library model.

Considering that students' functional needs change with the type of study activity and that students use textbooks both linearly and non-linearly, the students need a larger physical or virtual workspace when using textbooks in a non-linear mode. The larger workspace allows the student to cross-reference between a multiple resources or educational objects (see Figures 4 and 5). A future study needs to explore how alternative virtual workspace configurations that include multiple screens, heads-up displays, surface displays, display walls, or television screens can provide students alternatives that effectively support non-linear activities. A variation of this

study could look at the experience of gamers and explore the gamers' ability to navigate complex virtual workspaces as a model for non-linear study activities. Another variation could include the use of dynamic icons or other symbols to represent information objects that are available, but not in the current visual context.

Long-term acceptance of any new digital textbook interface will depend on the ease and cost of migration. As noted earlier, many technology-centric companies have developed alternative platforms and interfaces, but lack the deep content libraries that are needed to establish themselves as viable alternatives to traditional publishers. Providers of open content lack consistent tools to effective formatting and presentation. Universities, libraries, and other repositories of educational material hold vast collections stored as PDF documents. From a technological perspective, the success of any new offering will depend on the ability of providers or users to convert existing educational material including digital catalogs and library holdings into any needed format at a minimal cost.

The technology needed to strip existing content and reformat the material into the desired format is available. However, the accuracy of such a conversion depends on the quality of the source material. In past conversions, teams of proofreaders needed to make corrections and adjustments to the product. It may be possible to use automation coupled with crowd sourcing to recognize and adapt the conversion process, thereby mitigating many quality issues. The open source community has pioneered cooperative environments that leverage the power of individuals working together to breakdown and perform huge undertakings (Moore, 2007; Shirky, 2008). Shirky (2010) described such projects in terms of individuals sharing their cognitive surplus in an effort to serve the common good. From a business and industry perspective, this will require the cooperation of intellectual property holders who need to

recognize that granting the rights to convert their work into an alternate format serves their interests and the interests of the community. A first step could be to prove the viability of this form of migration by creating a functional proof-of-concept model using freely available open content.

Developers hoping to create the next generation of digital textbooks need to learn and incorporate what works in other areas. One possibility is to include functionality into the digital textbook technology that logs user activity and uses this information to allow content developers or the systems themselves to alter and more closely tailor the content to meet students' general and specific needs. The same technology that allows advertisers to gather personal information and drive targeted marketing may be included to create systems that help students by presenting pertinent information for review (Carrascal, Riederer, Erramilli, Cherubini, & deOliveira, 2013).

This study and others (Schirr, 2012; Girotra et al., 2010) considered the value of anonymity in ideation and the exploration of new ideas. This problem-solving model, by using a virtual environment, provided for inclusive decision making that allowed stakeholders representing diverse interests to express their needs and concerns as part of the decision-making process without the need to consider the individual's role, background, or credentials. In applying this model, it is the moderator's responsibility to provide a safe anonymous discussion space and to support the individual participants by filtering, elaborating, seeking clarification, and providing background. Additional studies need to test the effectiveness and limitations of the cooperative model used in this study for cooperative idea generation, problem solving, and virtual team management.

Summary

Taking a holistic approach to understanding and defining the role of textbooks, the differing concerns of stakeholder communities, and the attributes of effective digital textbook designs starts the process of transforming the digital textbook by understanding why students have rejected existing digital textbook models. Bringing together subject matter expert stakeholders into a cooperative problem-solving virtual space where they could express their needs and concerns and work together created a common understanding of the needed solution. The first step was a common definition of the role and attributes of textbooks, both traditional and digital, in higher education.

Defining the textbook as a basic educational resource that provides definitive knowledge classifies the scope of discussion and learning and helps assure that the stated learning goals are met. Based on this understanding, the study panel agreed that a textbook is an educational resource and may contain other educational resources. As such, the textbook functions as an educational workspace, a digital textbook needs to function as the principal resource in an online or interactive educational workspace that supports a mix of materials regardless of and including multiple media formats, and a fully functional digital textbook needs to encapsulate seamlessly the educational materials and resources needed by the specific course.

Based on this definition and functional parameters, the study panel supported by the public input process considered acceptable sources of educational content including traditional textbooks, open media, and the Internet. This required a reevaluation of the vetting processes needed to identify valid educational content, and identified the need to validate less formal content. The panel also looked at the implications of the textbook selection process, and identified the changing roles of academics, instructors, and students in filtering content.

In exploring the functional attributes of an effective digital textbook interface, the study considered linear and non-linear study functions and considered these in terms of existing devices and interfaces. Existing eBook devices and interfaces are well suited to the linear reading activities associated with reading for pleasure (see Figures 2 and 3). Students do not use textbooks and other educational resources linearly and often need to switch back and forth within the same work or to reference other resources. The panel reached agreement that new tools, digital textbooks, or educational platforms need to support student study needs in a seamless manner while allowing students to choose how to use the available educational material without limiting access. Students need larger physical or virtual desktops to support these non-linear activities (see Figures 4 and 5). Students spread out their resources for quick access and cross reference. "…many office workers have adopted the practice of using two display screens simultaneously as they find this more convenient for processing a large amount of information or viewing more than one document at a time" (Szeto, Chan, Chan, Lai, & Lau, 2014, p. 461).

Additionally, the study concluded that PDFs and other equivalent to paper formats are not acceptable, that any interface needs to be flexible and adaptable. Students need to be able to tailor the interface to best suit their individual preferences; the interface needs to provide seamless support of the students' needs. The study's findings emphasized the "born accessible" concept for new technology that requires developers to build in accessibility features from the start, rather than adding them on as an afterthought. Content supported functionality improves accessibility. The inclusion of accessibility features to help students with disabilities empowers all students with the functionality, flexibility, and utility alternatives to best suit their individual preferences and needs.

The study identified the existence of competing technical, business, and financial models including options by existing publishers, new technology supported rental and resale models, experimental interfaces, open textbook alternatives, and resource fee models. The study recognized that this industry is in flux but consumers are ready for an effective digital textbook model. The discomfort and insecurity associated with previous technologies' adoption cycles are rare. Consumers are ready for this technology, but none of the available options has the benefits, in terms of the functionality and savings, needed to excite the consumer. Cost remains the overriding concern of the consumer and in this captive market, the selection process remains in outside the control of the consumer. The panel did not specify preferred alternatives for implementation in terms of viable and effective business and financial models. Instead, the panel agreed that the marketplace would ultimately decide what models should succeed.

Researcher's Reflection

One of the most important observations and lessons learned in working though this doctoral program was outside the formal academic realm. The Doctor of Management in Organizational Leadership program at the University of Phoenix's School of Advanced Studies (2014a; 2014b) relies on a collaborative "Scholar, Practitioner, Leader Model" (para. 5). The underlying philosophy of this leadership program advocates and teaches the best traits of transformational leadership to create leaders who engage individuals and lead teams in complex problem solving in supporting organizational goals.

> The Scholar, Practitioner, Leader Model can be found in all doctoral programs and
> focuses on your development as a scholar-leader who enriches the world, starting with
> your community. This innovative and dynamic model focuses on supporting lifelong
> learning (scholarship), social and workplace contribution (practice), and the ability to

exert positive influence (leadership) in your academic, professional and personal life

(2014a, para. 2).

As in most institutions, the formal academic process contains an inherent disconnect. This disconnect is demonstrated by the dichotomy between the goals of Socratic discourse and inquiry between individuals in order to stimulate critical thinking and the authoritative voice as represented by individual class instructors. For the most part, the instructors in this doctoral program were able to balance these needs effectively and respectfully and thereby stimulate critical thinking in the classroom context. This is in harsh contrast to the process of obtaining approval to perform this study. The independent committee tasked with providing approval failed to communicate clear instructions, answer questions, or explain requirements. Numerous attempts to seek a clear line of communication failed. This committee appeared to be immune from all university policies and oversight. In going through this process, I began to contemplate the leadership and process implications of unaccountable authoritarian structures in modern open, tech-centric organizations.

In my lifetime, I have personally observed the destructive effects of third-world traditional bureaucratic organizations and have been pleased with the ability of technology to help streamline processes by redefining processes into meaningful segments that act in concert to support organizational goals. These technology-supported processes have given knowledge-workers the ability to improve client services within the context of a defined structure. This is an important leadership consideration as unaccountable authoritarian structures have the ability to damage organizations. A similar recent experience in my own professional life reinforced my determination to look further into this situation and explore leadership strategies for dealing with unchecked autocratic structures in techno-centric organizations.

It is difficult to find any area of human endeavor that technological innovation has not fundamentally transformed. As a technologist, I had always considered that technological solutions to problems were self-evident and I always found it strange that others did not adopt these immediately. In undertaking this study, I now understand that technology is only one perspective and that problem solving relies on holistic solutions that include the perspectives and acceptance of all stakeholders. The implications for a technology-focused leader are that the solutions to any problem need to grow organically and that all stakeholders need a voice in the development of the technology-centric solution. This understanding has helped me understand why so many digital tools, systems, methods, and processes are cumbersome to use and do not seamlessly abstract the details of the technology into the background.

I am disheartened to note that in 2014, the best advice for students is to be "a better shopper" (para. 1) by using technology to save on their textbook purchases (Wood, 2014), and that the a recent GAO (2013) report to the United States Congress about college textbooks describe digital books in terms of PDFs and other equivalent to paper formats. This research is incomplete. The goal of this research is to transform the digital textbook. The next step in this process requires that the findings of this study reach the correct audience. This study's audiences are the leaders and decision-makers in the many concerned sectors including university administrators, instructors, authors, publishers, technologists, parents, students, standards writers, and government. Only through a common and shared understanding of what the digital textbook needs to look like will all stakeholders demand products that support their educational goals and seamlessly abstract the details and complexity into the background.

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Appendix A: EBONI Electronic Textbook Design Guidelines

The following is adapted, with permission, from Landoni, and Wilson's (2002) EBONI

Electronic Textbook Design Guidelines.

Guideline	On-screen design guidelines	Notes
1	Cover your book	Although of no practical value in an electronic environment, the inclusion of a textbook "cover" adds to the enjoyment of the reading experience, reinforcing the user's perception that he is reading a unique set of pages which form a cohesive unit, and providing a point of recognition on return visits to the book. Add a link from the cover page to the table of contents.
2	Include a table of contents	Although search facilities provide a powerful method of hunting through an electronic textbook for information, they should not simply replace tables of contents and indexes. Tables of contents are… used by readers to skim the contents of an unfamiliar book to gain an idea of what can be found inside. They also provide the reader with a sense of structure, which can easily be lost in the electronic medium, and can be an important navigation tool where hypertext is used to link from the table of contents to individual chapters. Create hyperlinks from the table of contents to individual chapters and sections. Use meaningful chapter headings.
3	Include an index	An index helps readers to find information on a specific topic within a book. By including hyperlinks from each index item to the relevant section in the book, it can become an important navigation tool, and should be made prominent.
4	Provide a search tool	Provide an intelligent search tool to supplement tables of contents and indexes. Search supports random navigation within a textbook.[6] Offer simple and advanced search options.
5	Treat the book as a closed environment	Do not include external links in the main body of the text. If external links are provided in the reference section or bibliography, these should be clearly labeled as linking to external sources.[7]
6	Use hypertext to enhance navigation and facilitate cross-	Create a strong overt structure. Provide a clear navigation system. Separate references from the main text. Separate glossary from the main text. Use hypertext to link: from the

[6] Google (2014) provides search tools that operate within websites. Studies suggest that the ease and availability of search tools has altered how people catalog and seek out information (Fox, 2012; Sparrow, Liu, & Wegner, 2011)

[7] Open textbook advocates and other studies indicate that the textbook needs to fit seamlessly into the global knowledge environment by seamlessly incorporating outside knowledge and resource (Bierman, Massey, & Manduca, 2006; CampusGrotto, 2014; Cauthen, & Halpin, 2012; Converge, 2012; Vanderlip, 2012; Wukman, 2012).

	referencing	table of contents to individual chapters, from index items to relevant sections of the book and back to the appropriate section of the main text, from the main text to references and back to the appropriate section of the main text, from the main text to the glossary (where available), and between the pages of a book (e.g. "page forward/page back") and from each page to browsing and searching tools (table of contents, index and search engine). Create tables of contents for individual chapters. Use standard link colors. If using icons, make them easy to interpret. Do not rely on the functionality of a browser.
7	Design typographical aspects carefully	Readers expect the typographical sophistication of the printed page, and pagination has to be designed carefully to enhance readability. Line lengths similar to that of the printed page (10 to 15 words) are preferred, punctuated with plenty of white space to give each page a clean, uncluttered appearance. Paragraphs should be left-justified, providing a uniform starting point for each line and enabling the reader to scan the text effectively. The typographical style should be consistent throughout the book.
8	Use short pages	Very long pages (for example, containing an entire chapter) are difficult to scan, and scrolling up and down to refer to different sections of text can be frustrating. Rather, dividing chapters into several pages can increase users' intake of information. However, very short pages with little content which require the reader always to be continually "turning" pages can also be annoying and readers easily become lost. Therefore, consider the paper page as a model for the length of pages in an electronic book. In terms of logical structure, chapters should be divided according to natural breaks in the text (for example, one sub-section per page), and hypertext should be used to provide links between the pages.
9	Provide content clues	Provide content summaries (in the form of abstracts, keywords or tables of contents) or each page. Position content summaries at the top of each page.
10	Provide orientation clues	Readers gain a sense of their place in a printed book via the page numbers and by comparing the thickness and weight of the pages read against the thickness and weight of the pages still to be read. It is important for this "sense of place" also to be present in the electronic medium; therefore, indications of a reader's progress through the book should be accurate and visible. Provide indications of a reader's place in the book. Make these indications accurate and visible
11	Choose a readable font	Fonts should be large enough to read comfortably for long periods of time. If possible, readers would like to choose a

		font style and size to suit their individual preferences, thereby satisfying the needs of those with perfect vision and those with low vision or reading. Choose a color that contrasts sufficiently with the background.[8]
12	Use color to create a consistent style and aid scannability	Careful use of a few colors throughout can create a consistent style and increase the likeability and attractiveness of the book. Use of too many colors, however, can be distracting, and plain backgrounds should be used. Pure white backgrounds can "dazzle" readers, causing eye strain, and should be avoided.[9]
13	Break text into short chunks	Within each page, breaking the text into short chunks improves the scannability of the text. This can be achieved by, for example, interspersing text with images and diagrams and keeping paragraphs short, and by using meaningful sub-headings, indented, bulleted lists, and colour to break the uniformity of the text.
14	Use non-text items with care	Readers expect images, diagrams and formulae to be included and to look as visually sophisticated as they do on the printed page. In scientific and mathematical disciplines, it is often necessary to study diagrams and formulae closely and to make comparisons, and this should be taken into account when positioning these items in the text. In such cases, it is advisable not only to insert images, diagrams and formulae within the main body of the text but also to allow the user to view enlarged versions in a separate window.[10]
15	Use multimedia and interactive elements to engage users	Readers perceive one of the main advantages of presenting educational material in the electronic medium as being the ability to exploit multimedia elements such as video and audio, and interactive elements in the form of experiments and quizzes, all of which provide an effective alternative to print publications. However, multimedia and interactive elements can make it more difficult to scan material in search of specific facts; therefore, textual equivalents for all information conveyed via these means should be provided. Multimedia and interactive elements should be used to supplement and enhance, rather than replace, text.
16	Provide bookmarking and annotating functions	Bookmarking, annotating and highlighting facilities, often supplied by commercial ebook reader software products, can be awkward, difficult or time-consuming to use. If such facilities are provided, they should be as powerful, straightforward and quick to use as possible. Users would

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[8] Guideline 17 supports customizing the user experience. Users need to be able to choose all display attributes including font (typeface, size, color, and stress), and background colors, and allow to users to store their preferences.

[9] See footnote 2 above.

[10] Hover-over or mouseover functionality brings up image, diagram, and formula previews (Yank, 2001). Text reflows around images and other objects and remains visible in the context of the descriptive text.

		also like to perform advanced functions using these features, such as searching across annotations, or generating lists of annotations for use in other applications.
17	Enable customization	Ebook reader software should enable customization of text and background. It should be possible to save customized settings. Customization functions should be visible and simple to implement.
	Hardware design guidelines	
18	Employ high quality display technology	Display technology should be high resolution, with high contrast and minimal glare; lower resolution monitors can cause eye-strain with prolonged use. Backlighting can increase portability, in that it enables text to be read in poor lighting conditions. Color displays should be used. [11]
19	Balance lightness and portability against legibility	Finding the optimum size of ebook hardware is a question of balancing weight, portability and ergonomics against legibility and quantity of text on screen. Small, slim, lightweight devices are easier to hold and more attractive than large and heavy ones; however, users dislike very small screens which restrict the amount of text displayed in any one "page", as they have to turn pages very frequently. Screens should be large enough to contain a quantity of text similar to that of a paper book.
20	Design devices for comfort	Ebook hardware should be designed for comfort (large, heavy devices can be difficult to hold), and the ability to hold a device easily in one hand is considered an advantage. The necessity to use a stylus should be kept to a minimum.[12]
21	Use buttons and dials to improve page turning	Dials or simple buttons should be used for page turning. Buttons should be large.[13]
22	Make devices robust	Devices should be made robust via hard covers and rubber edges

[11] Recently developed E Ink (2012) and other ambient light technologies provide enhanced reading experiences as compared to backlit displays (Alien, 2011; Gillooly, 2012).

[12] The new generation of tablets and other mobile devices uses touch screens and finger control as the primarily interface (Android, 2014; Apple, 2014; Tactus Technology, Inc., 2014).

[13] The new generation of tablets and other mobile devices uses touch screens and finger control as the primarily interface (Android, 2014; Apple, 2014; Tactus Technology, Inc., 2014). These devices have minimized the number of physical controls in favor of touch controlled on-screen buttons and devices.

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Appendix B: NCSET Typology of Resources for Supported eText

The following is adapted, with permission, from Anderson-Inman, and Horney's (2007)

Supported eText: Assistive technology through text transformations.

Resource	Description	Examples
Presentational	Enables the text and accompanying graphics to be presented in varying ways, hence customizable to meet the needs of individual readers.	Font size and style, text and background color, line and page length, page layout and juxtaposition with other pages, graphics in relationship to text.
Navigational	Provides tools that allow the reader to move within a document or between documents.	Within-document links, across-document links, embedded menus, links from other resources such as Table of Contents, Glossary, Bibliography.
Translational	Provides a one-to-one equivalent or simplified version that is more accessible or familiar to the reader. May focus on a word, phrase, paragraph, picture, or whole document. May be of same or different modality or media.	Synonyms, definitions, digitized or synthesized text-tospeech, alternate language equivalents (Spanish), video of American Sign Language translation, simplified version at lower reading level, text descriptions for images, captions for video.
Explanatory	Provides information that seeks to clarify the what, where, how, or why of some concept, object, process, or event.	Clarifications, interpretations, or descriptions that point to causes, operations, components, mechanisms, parts, methods, procedures, context or consequences; list of influencing factors
Illustrative	Provides a visual representation or example of something in the text. Designed to support, supplement, or extend comprehension of the text through illustrations or examples.	Drawings, photos, simulations, video, photos, reenactments, sounds, music, information that something is representative of its type ("...is a typical example of...").
Summarizing	Provides a summarized or condensed way of viewing some feature of the document.	Table of contents, concept map, list of key ideas, chronology, timeline, cast of characters, abstract.
Enrichment	Provides supplementary information that is not strictly needed to comprehend the text, but adds to the readers' appreciation or understanding of its importance or historical context.	Background information, publication history, biography of the author, footnotes, bibliography, influence on other writers.
Instructional	Provides prompts, questions, strategies or instruction designed to teach some aspect of the text or	Tutorials, self-monitoring comprehension questions, annotations, instructional prompts, study guides, embedded study

	how to read and interpret the text.	strategies, online mentoring, tips for effective reading.
Notational	Provides tools for marking or taking notes on the text to enable later retrieval for purposes of studying or completing assignments.	Electronic highlighting, bookmarking, margin notes, outlining, drawing. Ways to gather and group these notes for postreading review.
Collaborative	Provides tools for working or sharing with other readers, the author, or some other audience.	Threaded discussion, online chat, e-mail links, podcasts, blogs
Evaluational	Provides materials, prompts, and assignments designed to assess student learning from the text.	Questions, quizzes, tests, surveys, online interviews, assignments leading to products.

Appendix B - References

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Appendix C: 2010: EBook Buyer's Guide to EBook Privacy

The following is adapted, under the Electronic Frontier Foundation's creative commons

licensing, from Cohn's (2010) 2010: EBook buyer's guide to eBook privacy.

Can providers keep track of book searches, either on their website or on the website of other eBook sources?

Google Books	Yes/Not applicable	Logs all search data with IP address. Will also associate searches with user's Google Account if logged in. Will not associate searches with users account if not logged in.
Amazon Kindle	Yes/Unknown	Logs data on products viewed and/or searched for on the device, and associates info with Amazon account. Searches inside book require login to account which associates with credit card information. It is unknown whether searches for books done at locations other than Amazon are also reported back to Amazon, but the Privacy Policy does not exclude this possibility.
B&N Nook	Yes/Unknown	The privacy policy is unclear about whether searches made on the Nook are recorded, but B&N generally logs data on searches made and pages viewed on B&N website. B&N does not disclose whether it associates book searches with a user's account if logged in. It is unknown whether searches for books done at locations other than B&N are also reported back, but the Privacy Policy does not exclude this possibility
Sony Reader	Yes/Unknown	The privacy policy is unclear, but if a customer uses the Reader Store, Sony will log IP address and message information on the Store website, and can associate data with the Reader Store account (you must be logged in to browse store). It is unknown whether searches for books done at locations other than Sony Reader Store are also reported back to Sony, but the Privacy Policy does not exclude this possibility
FBReader	No	FBReader does not collect data about book searches.
Internet Archive	No	The Archive does not collect IP addresses/user-identifiable data about book searches
iPad	Yes/No	Yes if purchased from iBookstore or other Apple applications; otherwise no.
Adobe Content Server	No	The Adobe Content Server software cannot monitor what a user reads.

Can providers monitor what you're reading and how you're reading it after purchase and link that information back to you? Can providers do that when the eBook is obtained elsewhere?

Google Books	Yes/Not applicable	Logs specific book and page viewed on website. They may also track annotations.
Amazon Kindle	Yes	Exact parameters of information logged is unclear, but includes books and pages read. May also keep track of annotations, with some user settings.
B&N Nook	Unkown	It does not appear that B&N can monitor reading after purchase, but the Privacy Policy and various applicable terms of use are unclear.
Sony Reader	No	Sony does not record info about content on device.
FBReader	No	FBReader does not collect information from users.
Internet Archive	No	The Archive does not collect user-specific information (including IP addresses) about what is read/downloaded. If, however, a user makes use of the Archive's bookmark feature, it will by definition associate that item with the user's account. A forthcoming lending library of modern books will retain some user information for a time to implement the system – the extent of information to be collected and the duration over which it will be stored are yet to be determined.
Adobe Content Server	No	The Adobe Content Server software cannot monitor what a user reads.
iPad	No	The Terms of Use claim that any information gathered is non-identifiable.
Adobe Content Server	No	The Adobe Content Server software cannot monitor what a user reads.

Does the device have limited compatibility with books not purchased from an associated eBook store?

Google Books	N/A	The Google Books service is not a reading device, but does allow downloads of public domain books in unprotected PDF or EPUB. Other books must be read online through Google's web interface.
Amazon Kindle	Yes	Only Amazon's proprietary AZW and unprotected TXT, MOBI, PRC files are directly compatible with Kindle. Kindles also have PDF support. Amazon also allows publishers to offer books without DRM.
B&N Nook	No	Supports popular eBook formats like EPUB and PDF from other sources (if Adobe DRM or non-DRM), BUT they will not be compatible with many Nook features. Does not support AZW.
Sony Reader	No	Supports books in multiple DRM formats including EPUB (Adobe), PDF (Adobe), and BBeB book (PRS) in addition to non-DRM formats. Does not support AZW.
FBReader	No	Supports a wide variety of open, non-DRM versions of

		formats like EPUB, FB2, MOBI, PRC, OEB, etc. Does not support PDF or AZW.
Internet Archive	N/A	Internet Archive's text collection is not a reading device, but is compatible with many different devices. Among the formats offered are PDF, EPUB, MOBI, Daisy (for sight-impaired/print-disabled), DJVU and OCR-generated txt formats.
iPad	No	Supports EPUB and PDFs. Supports AZW with additional software.
Adobe Content Server	No	The Adobe Content Server is compatible with many different devices and books in many different formats, but also can be used to restrict formats.

Can providers keep track of book purchases? Can providers track book purchases or acquisitions made from other sources?

Google Books	Yes	All book purchases must be associated with a Google Account.
Amazon Kindle	Yes/Unknown	Amazon will compile a purchase history for users from Amazon. It is unclear whether Amazon will include in that history books purchased or obtained elsewhere but read on the Kindle
B&N Nook	Yes/No	For purchases from the B&N eBook Store, the privacy policy is unclear. B&N says it will associate book purchases with the user when he or she enrolls in a membership loyalty program, but it is silent as to whether purchases are associated with a B&N online account. B&N does not keep track of books obtained elsewhere that are read on the device.
Sony Reader	Yes/No	While the privacy policy is unclear, Sony appears to keep track of purchases from the Reader Store since the user must log in to purchase books and Sony assigns a identification cookie to users for licensing purposes. Sony does not keep track of books obtained elsewhere that are read on the device.
FBReader	No	FBReader does not collect data about book purchases.
Internet Archive	N/A	The Archive does not sell books, but some of its associated sites (e.g., www.openlibrary.org) link to bookstores.
iPad	Yes/No	Yes if searched on iBookstore or other Apple applications; otherwise no.
Adobe Content Server	No	The Adobe Content Server software does not obtain information about what users read.

With whom can providers share the information collected in non-aggregated form?

Google Books	Law enforcement, civil litigants and within Google's own products.
Amazon Kindle	Law enforcement, civil litigants and within Amazon's own products.

B&N Nook	For information collected through the B&N eBook Store: law enforcement, civil litigants and within B&N's own products.
Sony Reader	For information collected through the Reader Store: law enforcement, civil litigants, within Sony's own products, and with Borders, its Reader Store partner.
FBReader	No information is collected.
Internet Archive	The Archive does not collect user-specific information (including IP address) about the searching, reading, or downloading of texts, and so cannot provide it. Books, bookmarks, reviews, and forum postings are publicly available.
iPad	Law enforcement or civil litigants as required by law, Apple's service providers, vendors and strategic partners within Apple Group.
Adobe Content Server	The Adobe Content Server software does not collect user-identifying information and so cannot share it.

Can providers share information outside the company without the customer's consent?

Google Books	No	User must opt-in to have personal info shared outside Google.
Amazon Kindle	Yes	Users may opt-out of use of information only for certain promotional and marketing purposes.
B&N Nook	Yes	Users may opt-out of use of information only for certain promotional and marketing purposes or for certain analytic uses of info by third parties.
Sony Reader	Yes	For information collected through the Reader Store: User may refuse to share information (on either an opt-out or opt-in basis) only for promotional or marketing purposes. To opt-out of further sharing of information by Borders, which operates the Reader Store, user must contact Borders directly.
FBReader	No	No information is collected so nothing can be shared.
Internet Archive	No	The Archive does not collect user-specific information (including IP address) about the searching, reading, or downloading of texts, so nothing can be shared. Books, bookmarks, reviews, and forum postings are publicly available.
iPad	Yes	Users may opt out of use of information only for certain marketing and personalized advertising uses.
Adobe Content Server	No	No information about users is collected so nothing can be shared.

Do providers lack mechanisms for customers to access, correct, or delete the information?

Google Books	No	User may delete or disassociate book titles with account, but may lose ability to read them. Users can delete their

		search history.
Amazon Kindle	Somewhat	Users may access and update info in account profile, but Amazon may retain prior versions for its records. There is no right to access or delete search and purchase history.
B&N Nook	Somewhat	Users may access, correct, and change info in account profile at any time. There is no right to access or delete search and purchase history.
Sony Reader	Somewhat	For information collected through the Reader Store: Users may send a request to have certain personal information updated and it will be done in a reasonable time. There is no right to access or delete search and purchase history.
FBReader	No	No information is collected.
Internet Archive	No	No user info/IP addresses on searches/reading/downloads are collected. Bookmarks may be deleted.
iPad	Somewhat	Users may delete book titles within personal account but will likely lose ability to read them. There is no right to access or delete search and purchase history.
Adobe Content Server	No	No information about users is collected.

See original article at: https://www.eff.org/deeplinks/2010/12/2010-eBook-buyers-guide-eBook-privacy

Appendix C - References

Cohn, C. (2010). 2010: EBook buyer's guide to eBook privacy. *Deeplinks*. Electronic Frontier

Foundation. Retrieved from https://www.eff.org/deeplinks/2010/12/2010-eBook-buyers-

guide-eBook-privacy

Appendix D: Introduction Letter Template

Contact: person@address

Subject: Your views and perspectives on digital textbooks.

Hello name,

My name is Louay Chebib. I am a doctoral candidate at the University of Phoenix.

I was [following/reading/…] your [comments/article/book] regarding [digital textbooks/eBooks/educational technologies/…] [on/in/at] [publication/website]. Your views helped me understand part of the problem I am studying.

I am conducting a research study entitled, Transforming the Digital Textbook: A Modified Delphi Study. In this study, a panel of subject matter experts, such as yourself, will discuss digital textbooks and what is needed to make these more common in the colleges and universities.

It is my hope that by bringing together people representing differing perspectives and needs, we can create a space in which dialog will lead to a true understanding of the needs of the different communities that are part of this technology and in doing so, we can together chart a path to the future of digital textbooks.

This discussion will take place on-line using a private, anonymous, moderator controlled discussion space. In the discussion, your identity and the identity of the remaining panelist will be protected so that all panel members will feel comfortable enough to speak freely.

This discussion process will require you to check-in several times a day, if possible, and post your comments. The study is structured in three parts:

1) Initial panel discussion – this discussion will last no longer than two weeks,

2) Public comment period – you will not be required to participate in this part, and

3) Panel review of public comments – I expect this session to be much less intense and should not exceed one week (maximum two weeks).

Please contact me with any questions you may have regarding your participation in this study.

Although I do not yet have a specific date, I anticipate that we will begin on ?????

University of Phoenix requires that all participants consent to participation in any study.

Once you confirm your willingness to participate, I will send you additional instructions on accessing the study's discussion space.

Thank you in advance for your help with this research.

Appendix E: Informed Consent Form

University of Phoenix®

Informed Consent for Participants 18 years of age and older

My name is Louay Chebib and I am a student at the University of Phoenix working on a Doctor of Management in Organizational Leadership with a Specialization in Information Systems and Technology degree. I am conducting a research study entitled Transforming the Digital Textbook: A Delphi Study. The purpose of the research study is to identify, and discuss the factors hindering the general acceptance of digital textbooks and to recommend strategies to mitigate these factors. You will be part of an online panel of subject matter experts, and other interested parties, representing the varied stakeholder communities who will discuss this topic.

Your participation will involve actively participating in two moderated private online discussions, each lasting no more than two weeks. Your participation in this study is voluntary. If you choose not to participate or to withdraw from the study at any time, you can do so without penalty or loss of benefit to yourself. The results of the research study may be published, but your identity will remain confidential and your name will not be disclosed to any outside party.

In this research, there are no foreseeable risks to you and in an effort to support an open dialogue, all participant comments will be posted without attribution by the moderator.

Although there may be no direct benefit to you, a possible benefit of your participation is that this work may lead to better understanding of digital textbooks in our emerging technology-based educational environment and a better experience for all stakeholders. You are welcome to use any findings in your own personal or professional endeavors. If you have any questions concerning the research study, please call me at (number removed) (Mobile) or use the following email: (email removed)

As a participant in this study, you should understand the following:

1. You may decline to participate or withdraw from participation at any time without consequences. To withdraw formally, please send an email to: (email removed)
2. Your identity will be kept confidential.
3. Louay Chebib, the researcher, has thoroughly explained the parameters of the research study and all of your questions and concerns have been addressed.
4. Data will be stored in a secure and locked area. The data will be held for a period of three years, and then destroyed.
5. The research results will be used for publication.

"By signing this form, you agree that you understand the nature of the study, the possible risks to you as a participant, and how your identity will be kept confidential. When you sign this form, this means that you are 18 years old or older and that you give your permission to volunteer as a participant in the study that is described here."

(☐) I accept the above terms.   (☐) I do not accept the above terms.   (CHECK ONE)

Signature of the interviewee _____ Date _____

Signature of the researcher _____ Date _____

Please print and sign this form. You may then photograph or scan this form and return it by email.
Please contact me if you need to send this form by FAX or regular mail.

Appendix F: Discussion Topics

Definition and role of the digital textbook in the academic environment

      o What is the function of textbooks in academia?

      Selection of the correct textbook model depends on the context. Textbook needs differ based on the type, goals, level, and complexity of the course; skills and intellectual level of the students; and the instruction or instructor's style.

      o What is the nature and what are valid sources of textbook content?

      In addition to text, and images, multimedia enhancements such as audio, video, tutorials, and other interactive elements provide an enhanced learning experience.

      Textbooks provide an authoritative voice to deliver accurate information in an effective manner, and to frame the context of the subject under consideration. As such, new open content models, that include alternative sources, require validation. Wiki models include self-policing and validation models as an alternative to traditional peer review.

      Open content and links to external sources on Internet provides a wider scope and a voice for alternative perspectives.

      o What are the implications of the textbook selection process?

      Textbook selection alternatives include selection by the instructor, institutional committees, or in compliance with other professional, commercial, or government bodies.

      The selection process considers the importance of commonality and continuity across classes, sections, and institutions.

      The curriculum and textbook selection process enhances or limits the instructor's ability to promote independent critical thinking.

      o How do textbooks integrate into digital learning environment?

Digital textbooks and learning materials provide reference, direction and guidance, and when integrated into a digital learning environment, tools to support communications and feedback.

Integration into environment provides the flexibility to create customized assignments, review questions, and quizzes. Through integration and intelligence built into the digital learning environment, progress results and feedback, allow for the individual tailoring of content to the student's needs.

Digital technology allows instructors to use alternative resources or work without a textbook. Instructors will need to exert the additional effort required by these models.

Explore the attributes of an effective digital textbook interface?

o Standardization allows for a consistent experience in using content. Utility requires that application interfaces support users needs. Portability and consistency support seamless, ubiquitous access to digital textbooks without regard to location or device.

o BYOD is ruling model in post-secondary education. Although physical device attributes dictate attributes of the user interface, device independence support of basic functionality is essential. Custom or specialty devices designed for an educational environment offer an alternative to general-purpose devices.

Search for a viable and effective business and financial model?

o Constantly increasing students' costs, increased availability of low cost or free textbook content, and substantially lower digital textbook profitability require a new business and financial model.

o Established publishers have substantial inventories of content and agreements with authors and institutions, which define how this content is used. Publishers have a well-established distribution model and agreements and strong connections with academic institutions. Innovative technology-centric innovators bring fresh perspectives and alternatives to digital textbook distribution, but lack depth and breadth in their content catalogs. These innovators lack the connections or funding needed to create the needed relationships with institutions.

o Technology companies and online bookstores have established effective new marketing and distribution models for digital multimedia products such as music, video, and eBooks. These companies provide the device, own the marketplace, and share in the income generated by each sale. Although open alternatives provide equivalent free content, these companies provide simplicity and convenience through standardization.

o Individuals and institutional players are cooperating in the creation of alternative open content and distribution channels. Service and subscription models provide an alternate funding model in support of free content creation, management, and distribution.

Appendix G: Panel Discussion Transcript

The following is a transcript of the study's subject matter expert panel discussion. Note that some hyperlinks are not available or have been modified to remove the site name. These links refer to material that is cataloged inside the private discussion space.

Digital Textbook Study ~ Transforming the Digital Textbook

DAY 1 – 5: First Discussion: Please consider and respond to the following

Posted by Textbook Moderator

March 13, 2014

Definition and role of the digital textbook in the academic environment

- What is the function of textbooks in academia?

Selection of the correct textbook model depends on the context. Textbook needs differ based on the type, goals, level, and complexity of the course; skills and intellectual level of the students; and the instruction or instructor's style.

- What is the nature and what are valid sources of textbook content?

In addition to text, and images, multimedia enhancements such as audio, video, tutorials, and other interactive elements provide an enhanced learning experience.

Textbooks provide an authoritative voice to deliver accurate information in an effective manner, and to frame the context of the subject under consideration. As such, new open content models, that include alternative sources, require validation. Wiki models include self-policing and validation models as an alternative to traditional peer review.

Open content and links to external sources on Internet provides a wider scope and a voice for alternative perspectives.

- What are the implications of the textbook selection process?

Textbook selection alternatives include selection by the instructor, institutional committees, or in compliance with other professional, commercial, or government bodies.

The selection process considers the importance of commonality and continuity across classes, sections, and institutions.

The curriculum and textbook selection process enhances or limits the instructor's ability to promote independent critical thinking.

- How do textbooks integrate into digital learning environment?

Digital textbooks and learning materials provide reference, direction and guidance, and when integrated into a digital learning environment, tools to support communications and feedback.

Integration into environment provides the flexibility to create customized assignments, review questions, and quizzes. Through integration and intelligence built into the digital learning environment, progress results and feedback, allow for the individual tailoring of content to the student's needs.

Digital technology allows instructors to use alternative resources or work without a textbook. Instructors will need to exert the additional effort required by these models.

1. **Textbook Panelist**

   March 14, 2014 at 9:26 am

   The function of textbooks is hard to determine. Sometimes, textbooks fill a genuine instructional need by providing foundational knowledge in a digestible format. in other cases, textbooks are assigned simply for the sake of a textbook without much thought as to the instructional purposes they will serve.

   Textbook content will vary. In introductory courses, content is commodity, so the textbook that conveys foundational knowledge in the most effective and lowest priced manner will often be the optimal choice. In graduate level courses, the author's authority may matter more, so it may be more appropriate to pay a premium for a certain theoretical perspective.

   The textbook selection process is flawed and fraught with potential conflicts of interest. ~~Authors~~ ?Instructors? may be inclined to adopt their own textbooks, those of their colleagues, or those sold by the same company that publishes their own books. A centralized textbook adoption process can reduce the potential for conflicts of interest but can also diminish academic freedom.

   Digital textbooks can more readily incorporate multimedia elements. They can also be more readily customized to include content from multiple titles. The main challenge with digital textbooks is to enable distribution via the format, medium, and device of the user's choice. If too few options are offered, readership will be low. If too many options are supported, the technical support burden and development workload will be unsustainable.

2. **Textbook Panelist**

March 16, 2014 at 8:44 am

"Selection of the correct textbook model depends on the context. Textbook needs differ based on the type, goals, level, and complexity of the course; skills and intellectual level of the students; and the instruction or instructor's style."

I'd like to make a distinction between "The Textbook" and "A Textbook." Certainly all of the textbook characteristics as listed above are certainly important. However, I think we are now at a time where students are not limited in their choices to just that textbook selected for them by a teacher. Students can often access many appropriate textbooks, use several of them simultaneously, and concentrate on those that they find most appropriate and useful. They are not limited to The textbook.

One argument for digital textbooks is that they can be many textbooks merged together.

3. **Textbook Panelist**

March 18, 2014 at 1:36 am

Textbooks could be selected not only for their content but also for the extras they provide in terms of suggested exercises and activities for students, links to external material, availability of a web site with updates and presentations to be used in class. Digital textbooks, and in particular enhanced textbooks and hybrid textbooks are ways to add flexibility to this tool for both tutors and students, so that they could tailor it to fit their needs and preferences in teaching/learning.

3.1 Textbook Panelist

March 19, 2014 at 1:44 pm

What if the textbook were nothing but the links? That is, an index to primary and secondary materials, all provided elsewhere?

3.1.1 Textbook Moderator

March 26, 2014 at 11:49 am

You are describing a Wiki like structure or the structure proposed by the EBONI Electronic Textbook Design Guidelines http://........./2014/03/eboni-electronic-textbook-design-guidelines.pdf or Sample: http://ebooks.strath.ac.uk/eboni/guidelines/contents.html

Please continue this topic in the second discussion: the attributes of an effective digital textbook interface

4. **Textbook Panelist**

March 18, 2014 at 6:23 pm

In regards to what the function of a text book is in the world of academia, I have a few answers.

-a resource for students. It is an accumulation of works to support course lectures and content for daily discussions. It is a visual reference as well as a supporting tool for class rigor and level or academic development. What is the nature and what are the valid sources of text book content?

The nature of the textbooks assigned currently are for vocabulary, application, and content clarification (psychology courses) They traditionally include literary reviewed sources and experimental studies. Something that is becoming more common in my textbook structures are story applications, which I am not truly a fan of, mainly because I find this lacking in validity, but the students seam to appreciate the application to what they see as "real world possibility"

What are the implications of the textbook selection process?

The textbooks selected support course objectives and dictates the direction the course can take. I emphasize **can**, because there are always opportunities to deviate from the text, but honestly, students do not appreciate buying text books they aren't using as a strong resource. Text books also produce an incentive to learn. In the traditional academic field, students need direction, and textbook readings are a requirement in many course structures. Hopefully you select a text that is a pleasure to read and not a deterrent from the topic at hand.

How do textbooks integrate into digital learning environment?

This is a great question. I would like to say in the traditional structure, that the digital learning environment is welcome with open arms, but it isn't in all it's facets. It's dependent on many things. The instructor themselves play a huge role on the use of digital learning environments and if that environment is not provided, it is not possible. It is truly a frustration. I appreciate the online textbook structure, although I do appreciate a good paperback book in most my lectures, I use a blended method so both are possible. Students appreciate the digital text book, but struggle with time-frames to rent and are only able to rent for specific classes and specific instructors due to instructor qualifications for technologies. Like I said, Frustrations.

4.1 **Textbook Panelist**

March 19, 2014 at 1:49 pm

Is there research to suggest how students actually use their textbooks?

I heard a presentation at NCTM two years ago reporting that few algebra students in courses examined made any effort to use their textbooks, despite specific incentives to do so.

Moderator's Note: I will check my notes and post the info… try:

http://........./2014/03 /e-booksortextbooksstudentsprefertextbooks.pdf
http://........./2014/03/lee_the-imposition-and-superimpositionof-digital-reading.pdf

(I will post a summary below)

I will add more as I find them.

4.1.1 **Textbook Moderator**

March 19, 2014 at 5:33 pm

From my research: How students use Textbooks:

Thayer, Lee, Hwang, Sales, Sen, and Dalal (2011) make the case that students read in a variety of ways depending on the specific academic goals. Student use five specific reading types:

1) Scanning for specific information based on a know word or phrase;
2) Search reading based on identifying a topic;
3) Skimming, which helps students identify the flow or structure of the material and ideas;
4) Receptive reading is sequential. The student reads the text without interruption or analysis; and
5) Responsive (active or close) "reading is the process of developing new knowledge or modifying existing knowledge by engaging with the ideas presented in a text. Students often engage in responsive reading, as when they annotate parts of a text" (p. 2918).

Of the students interviewed by Thayer, et al.,

quote

75% included the task of marking up texts as part of their academic reading practice… any marks made on, or while reading, a text: annotations, highlights, notes and comments, underlined passages, and so on. Producing markup is a defining aspect of responsive reading, or using a text to develop ideas or modify existing knowledge (p. 2921).

end quote

Thayer, et al. (2011) reviewed students' experiences when using Kindle (Amazon, 2012) readers. This study found that students found using the Kindle awkward in supporting their educational workflow. The students in this study

quote

struggled, and sometimes succeeded, at integrating the eReader into their academic reading practices. Rather than focusing on the low rate of adoption as an endpoint, we explored the larger context around e-reader "pain points" of creating markup, using references and illustrations, and building cognitive maps. Our data revealed that students routinely switched back and forth between reading techniques, and that different techniques engendered different ways of using text (p. 2925).

end quote

Foasberg (2011) reports similar results from a survey of students' attitudes towards e-readers at Queens College, at the City University of New York. In the Foasberg survey students reported the use of e-readers primarily for leisure reading and traditional paper for academic reading. The Florida Distance Learning Consortium (2011) reported that students'

quote

most frequently mentioned reasons [for not wanting to use digital textbooks] were a desire to have a printed copy to write in and highlight (78%), the inconvenience of reading electronic books (47%), the difficulty of moving to different pages and sections of the book (35.4%), and the lack of access to the necessary technology (11.7%) (p. 24).

end quote

Students find the intellectual property and digital rights management protocols included on digital textbooks cumbersome (Foasberg, 2011; Nelson, 2008). These technologies complicate and tend to detract from the user's experience. These protection protocols close down products to the level that users gain little value from the digital format. An International Digital Publishing Forum (2006) eBook user survey found that users are concerned with limits placed on their ability to move content between devices and to lend digital books to others. Digital textbook technology requires a new unobtrusive business and technical model that provides the needed protections without detracting from the user experience. "The challenge here is finding the appropriate balance between usability and

[intellectual property] protection. Until that happens, e-books may continue to languish"
(Nelson, 2008, p. 48).

References & links:

Thayer, A., Lee, C. P., Hwang, L. H., Sales, H., Sen, P., & Dalal, N. (2011). The
imposition and superimposition of digital reading technology: the academic potential of e-
readers. Proceedings of the 2011 annual conference on Human factors in computing
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Tallahassee, FL: Author.

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International Digital Publishing Forum (IDPF). (2006). eBook user survey 2006.
Retrieved from http://......... /2009/04/rep-ebook-user-survey-2006-idfp-2006.pdf

4.1.1.1 Textbook Panelist

March 21, 2014 at 9:30 am

From my experience, even the most avid e-readers seem to want a paper version of the e-
textbook. I am not sure if this is an old habit that is hard to break or if there is something
else to this. I wonder if you have come across this dilemma in your research.

Moderator's note:

This is one of the main reasons that undertook this study. The fact that student prefer
paper lead me to say that there is something that is not working in the current, mostly
PDF based, model.

I first looked at the possibility that this is an "old habit." Although this may have been
true ten or more years ago, the latest generation of post secondary student grew up with
technology and this is not new to them. They do not have the same educational habits.

Prensky (2001a, 2001b, 2005) argues that the current generation of students thinks and
acts differently than their predecessors. These students represent a generation of digital

natives who "are native speakers of technology, fluent in the digital language of computers, video games, and the Internet" (2005, p. 9).

As such, as noted above in "How students use Textbooks…" that the exiting models do effectively support he students' needs.

References and links:

Prensky, M. (2001a). Digital natives, digital immigrants (part 1). On the Horizon, MCB University Press, Vol. 9 No. 5. Retrieved from http://www.marcprensky.com/writing/prensky%20-%20digital%20natives,%20digital%20immigrants%20-%20part1.pdf

Prensky, M. (2001b). Digital natives, digital immigrants (part 2). On the Horizon, MCB University Press, Vol. 9 No. 6. Retrieved from http://www.marcprensky.com/writing/prensky%20-%20digital%20natives,%20digital%20immigrants%20-%20part2.pdf

Prensky, M. (2005). Listen to the natives. Educational Leadership, 63(4), 8-13. Retrieved from http://www2.siprep.org/prodev/documents/Prensky.pdf

4.1.1.2 Textbook Panelist

March 24, 2014 at 6:34 am

I also believe that the context of the course could dictate the technological needs. I know that the students in our industrial techs department actually "look down" upon hard copies of text books, where as my psychology students and those in humanities who place different intrinsic value in text have a different purpose. Just food for thought in regards to judgment of need for a textbook.

5. **Textbook Panelist**

March 19, 2014 at 1:34 pm

Textbooks are a vehicle by which students can teach themselves. If we accept the commonly expressed notion that "…everyone should be able to learn anything, anytime, anywhere…." We must assume that almost all of this learning will be self actuated, self directed, and based on available learning materials. I.e. "textbooks" in some form or other.

What is the origin of textbooks? One story I've heard is that they began as lecture notes taken by medieval students, which were then circulated. I know that at not so many years ago this was a service offered at my university by enterprising college dropouts. Perhaps it still is.

6. **Textbook Panelist**

I favor the broadest possible definition. Textbooks are no longer limited to text, and no

longer

necessarily presented as text. I think that anything students draw upon to learn would

qualify…. … and I'm happy to throw lecturers into that pot. (consider lectures that are video

taped and this isn't such a stretch)

7. **Textbook Panelist**

Textbooks can be seen as a means to communicate a body of knowledge. I see textbooks, for
educational purposes, as differing depending on the grade level. In K-12 education a
textbook is used to assure that the basic components of a curriculum are met. When designed
effectively, they reflect the consensus of professionals and the communities they serve. When
information changes, a traditional paper textbook is unable to adjust or adapt to the change.
This is one of the reasons why so many 'versions' of a textbook are created. The benefit of
e-textbooks is the rapidity to make changes and the ability to do JIT (just in time) printing.

8. **Textbook Panelist**

I think that "textbooks" will eventually become obsolete, much the same as film has become
obsolete. Not just paper texts, but also digital texts. With so much information online, the
role of the instructor will be to provide some sort of "roadmap" to help organize the material.
This can and will ultimately become the digital textbook. That said, some fields that are less
dynamic (i.e. algebra, Latin) may always use an organized "text," however other fields such
as high-tech business are so dynamic that any text, even a digital one, will become obsolete as
fast as it is written. Hence the role of the instructor to keep the digital information in sync
with the syllabus.

Summary: First Discussion: Please review and Discuss

Posted by Textbook Moderator

<u>March 26, 2014</u>

Definition and role of the digital textbook in the academic environment

- **What is the function of textbooks in academia?**
    - providing foundational knowledge in a digestible format
    - a resource for students
    - an accumulation of works to support course lectures and content for daily discussions
    - produce an incentive to learn
    - provide students direction
    - provide readings that support course structure
    - a visual reference as well as a supporting tool for class rigor and level or academic development
    - a vehicle by which students can teach themselves supporting self actuated, self directed, and based on available learning materials
    - lecture notes taken, which were then circulated
    - a means to communicate a body of knowledge
    - textbook is used to assure that the basic components of a curriculum are met
    - they reflect the consensus of professionals and the communities they serve

What you seem to be saying is that:

A textbook is an educational resource or tool that provides definitive knowledge and defines the scope (limits the scope?) of discussion and learning as set forth in the curriculum for specific class. This resource helps assure that the stated learning goals are met.

- **What is the nature and what are valid sources of textbook content?**
    - content is a commodity
    - foundational knowledge
    - include literary/peer reviewed sources and experimental studies
    - author's authority
    - story applications (Real world or Fictitious Scenarios?) that help students frame the knowledge in a real world context
    - In some subjects "The Textbook" (e.g. Gray's Anatomy of the Human Body) is the definitive authority on the subject and contains all "accepted" knowledge of the subject.
    - In other subjects, many sources are accepted and available: students are not limited in their choices to "The textbook," and many appropriate textbooks may be used.

- Hybrid or merged/enhanced textbooks combine the knowledge from several books. These add flexibility to this tool for both tutors and students, so that they could tailor it to fit their needs and preferences in teaching/learning.
- Value in Extras: suggested exercises & quizzes, activities for students, links to external material, availability of a web site with updates and other resources such as presentations to be used in class
- anything students draw upon to learn would qualify
- Multimedia content allows for the inclusion of lecturers (Podcasts? YouTube? Other?)
- What about Blogs and Social Media?

Do you agree that:

If we accept the premise that a textbook is an educational resource and may contain other educational resources, then the textbook becomes an educational workspace? Can we separate the digital textbook from an online educational workspace?

Do we need to discuss what defines the authority/validity of the content?

- **What are the implications of the textbook selection process?**
  - textbooks are assigned simply for the sake of a textbook without much thought as to the instructional purposes they will serve
  - the textbook selection process is flawed and fraught with potential conflicts of interest
  - a centralized textbook adoption process can reduce the potential for conflicts of interest but can also diminish academic freedom
  - open models allow a change the choice paradigm that supports academic freedom and student choice. Students can often access many appropriate textbooks
  - selected not only for their content but also for the extras they provide
  - do not appreciate buying text books they aren't using as a strong resource

Do you agree that:

The textbook selection process is often dysfunctional. Conflicts exist between: financial (institutions, authors, publishers) and academic goals; the administration's (society's?) needs for standardization of instructional content and academic freedom.

Moderator's Note: The traditional textbook market has been compared to healthcare delivery. In both cases a captive market exists in which the end client has little control over the product selection process or costs. In a captive market, the persons who make the textbook choices are not the ones who buy or pay for them.

- **How do textbooks integrate into digital learning environment?**
  - digital textbooks readily incorporate multimedia elements
  - can be more readily customized to include content from multiple titles
  - need to be distributable via the format, medium, and device of the user's choice

- option (standardization?) issues: If too few options are offered, readership will be low. If too many options are supported, the technical support burden and development workload will be unsustainable.
- The instructor plays a huge role in the digital learning environment
- benefit/advantage to mixed or blended environments

From above "a textbook is an educational resource and may contain other educational resources." In a real sense, the digital textbook becomes the principal resource in the digital learning environment. A fully functional digital textbook needs to seamlessly encapsulate the educational materials/resources needed by the specific course.

1. **Textbook Panelist**

   March 27, 2014 at 12:05 am

   I guess different features of textbooks are suitable for different disciplines and students. In my experience students do read only what is necessary and explicitly asked by their teachers. This why reading a textbooks starts from teachers selecting the chapters of interest and defining a path to take students through the topic via reading, discussion, experiments, examples and exercises. Reading is only part of it, the process becomes very interactive and this way students become essential part of it. It is up to the teacher to motivate. select, measure out and administer the right amount of information at the right time to each student or at least each student cohort. A digital textbook can provide higher levels of interaction and personalization via a careful design process inspired by good teaching practice. Of course a digital textbook space include extra readings for interested students a minority worth catering for but should primarily focus on providing access to the essential content of the course.

   1.1 Textbook Panelist

   March 31, 2014 at 9:22 am

   There is some evidence to suggest that in Mathematics, students rarely read their textbook, and that their instructors rarely expect them to.

   1.1.1 Textbook Panelist

   April 2, 2014 at 2:30 am

   Funny, I would expect these students to used them as the content is more static (the field

doesn't change that much).

2. **Textbook Panelist**

March 28, 2014 at 4:22 pm

In response to the question, "Do we need to discuss what defines the authority/validity of the content?"

I'd say that's a good topic. As I noted in the week 1 discussion, we have graduate level courses in which a known author's perspective is considered essential. There are other situations in which content is commodity and any author with basic subject knowledge will do.

New models of textbook production may take that to the next level via crowd-sourcing from multiple authors, some of whom may not have the credentials a traditional publisher would seek in an author.

Will those books attain the same credibility as traditional textbooks. Is that even necessary?

2.1 Textbook Moderator

March 30, 2014 at 9:51 am

The validity of knowledge (information, facts, scientific laws, history, news, etc.) is increasingly under attack and threat from many elements of society. In academic writing, the peer review process provides checks and balances and assures a sense of authority/validity to the information being expressed. In technical areas, such as engineering or IT, knowledge is accepted as "fact" when it is demonstrated to work and is, ideally, just as quickly abandoned when it fails. Although the internet allows anyone to publish anything without regard for accuracy or validity, the social nature of the internet also provides the equivalent of the peer review process. e.g. Wikipedia depends on this level of peer review coupled with the expertise of professional moderators to assure validity.

2.2 Textbook Panelist

March 31, 2014 at 9:24 am

Is it not the responsibility of the instructor to examine and vouch for the credibility of the textbook?

2.2.1 Textbook Panelist

<u>April 2, 2014 at 2:33 am</u>

I agree. Ultimately the instructor's role is to build the syllabus and teach the topics in the syllabus. By creating their own virtual "textbook" this can become a customized textbook based on what is current knowledge at the time.

2. Textbook Panelist

<u>March 31, 2014 at 8:23 am</u>

I am not a fan of the comment " text book selection process is often dysfunctional." In my experience selecting text books for my course, I put forth great effort analyzing the content ~~against~~ ?in meeting? the university objective and higher learning committee requirements for the course outlines. This is not a hap-hazard process. I do agree with a process of standardization being helpful in mainstream education such as state school or universal education systems, but it is dependent on the institution.

Moderator's Note: Would you agree that: An effective textbook selection process requires due diligence in balancing academic freedom and institutional goals? Standards, oversight, and/or standardized processes help to keep the process from becoming dysfunctional?

3.1 Textbook Panelist

<u>March 31, 2014 at 8:49 am</u>

Yes, that sounds more agreeable. In keeping balance and maintaining the academic integrity that higher education strives for, some degree of standards are typically maintained, but there is still that space given for creative liberties.

Second Discussion: Please consider and respond to the following

Posted by Textbook Moderator

March 20, 2014

Explore the attributes of an effective digital textbook interface

- Standardization allows for a consistent experience in using content. Utility requires that application interfaces support users needs. Portability and consistency support seamless, ubiquitous access to digital textbooks without regard to location or device.

- Bring Your Own Device (BYOD) is the prevailing model in post-secondary education. Although physical device attributes dictate attributes of the user interface, device independence and support of basic functionality is essential. Custom or specialty devices designed for an educational environment offer an alternative to general-purpose devices.

Additional Material:

The most commonly prevalent form of digital textbooks uses Adobe Systems Incorporated's Portable Document Format (PDF) based representation of the paper book with little added functionality. The simplicity of producing these PDF representations has made them ubiquitous. PDF remains the de facto standard for digital textbooks; publishers produce PDF versions of textbooks as a byproduct of the printing process. For may users these PDF based digital textbooks have become synonymous with Digital Textbooks.

Students find reading of PDF formatted digital textbooks cumbersome, and DRM limits the ability for students to access the material when not connected to the web. The PDF model fails to meet students' need for an effective, integrated, digital textbook and interface. (see first discussion).

1. **Textbook Panelist**

   March 21, 2014 at 10:30 am

   I agree that we need something beyond plain PDF, and this post illustrates the tension between creating a universal standard for all students and supporting student preferences for a variety of devices. XML and/or HTML5 may still offer the best possibility of creating a basic document that can then be rendered in any number of devices and applications. For a popular device, publishers might enable a rich format, for a more obscure device, the book might display in a plainer, but still readable format.

   Moderator's Note: Portability and the ability for readers to control how the information is presented is a critical component. See: http://........./2014/03/ncset-typology-of-resources-for-supported-etext.pdf

1.1 **Textbook Panelist**

April 10, 2014 at 8:43 am

The more interactive we can make the textbooks the more involved students will be. This is in line with Dewey's theory of experiential learning.

2. **Textbook Panelist**

March 26, 2014 at 11:50 am

From the first discussion: What if the textbook were nothing but the links? That is, an index to primary and secondary materials, all provided elsewhere?

Moderator's Note: You are describing a Wiki like structure or the structure proposed by the EBONI Electronic Textbook Design Guidelines http://........../2014/03/eboni-electronic-textbookdesign-guidelines.pdf or Sample: http://ebooks.strath.ac.uk/eboni/guidelines/contents.html

3. **Textbook Panelist**

March 31, 2014 at 9:42 am

To my mind, PDFs hardly qualify as digital textbooks. EPUB3 documents such as you find on Kindles and tables are hardly any better. Such texts do not compare favorably to printed books in their functionality for studying, as opposed to just linear reading. If you examine the ergonomics of studying a text, you find huge deficits: Skimming and scanning are next to impossible, navigation is restricted, inter-textual reference is inhibited, etc.

Consider this description. How do you do this efficiently on a Kindle:

"He had been going at it all wrong, he said, his eyes bright with excitement. He had wanted to read Freud. That had been his mistake. Freud had to be studied, not read. He had to be studied like a page of Talmud. And he had to be studied with a commentary.

But Danny didn't know of any commentaries on Freud, so he had settled for the next best thing. He had needed something that would explain Freud's technical terminology, that would clarify the various shades of meaning the German words had and he had found this dictionary of psychological terms. He was reading Freud now sentence by sentence. He didn't go on to the next sentence until the prior sentence was perfectly clear in his mind. If he came across a German word he did not know, he looked up its English meaning in the Cassell's. If the Cassell's gave him a translation he didn't understand, one that wouldn't fit the meaning of the sentence, he looked the English word up in the psychology dictionary. That psychological dictionary was his commentary. (The Chosen, Potok, pg. 171)

Moderator's Note: Are you saying that the tools are not available electronically (not easy to use/effective?) or that study requires the student to learn how to use the available tools?

e.g. the Potok quote describes a learning process that requires accessing multiple resources on demand and being able to continue where you left off. Do students need to learn how to do this in the digital environment?

3.1 **Textbook Panelist**

March 31, 2014 at 10:54 am

Yes, students must learn to use the available tools, just as they have spent many years learning to use a printed book. But in addition, effective tools for the required tasks must be available. Our long experience with printed books make their operational components, page numbers for instance, invisible to us. Printed books are a highly optimized technology. Digital books are only beginning this process.

Consider search functions. A printed book has at least 4 components related to searching: Page numbers, TOC, indexes, headings, and their, usually, flexible binding, which facilitates skimming and scanning.

Digital books can certainly contain the TOC, indexes, headings, but they are weak at page numbering, especially when housed in web pages, often have no indexes, and they inhibit skimming and scanning.

They do on the other hand have key word searching (KWS), which is the functional alternative to skimming and scanning (S&K). Consider then, when is KWS better then S&K, and when is it not? The primary advantage of KWS is also its limitation: you can search for any symbol string, but you must specify in advance what that string is.

We are still at the stage of working out how Digital Books should function, and its not clear that at the moment they are better than printed books.

Moderator's Note:

Digital textbooks in one form or another have been available for at least 10 years. The digital book revolution is less than five years old. The digital book revolution was primarily driven by the availability of new devices (tablets), purpose built tablet readers (Kindle), and content. In addition to portability and storage capacity, one of the key advantages of these readers is the ability to re-flow text (re-flowing text reduces the importance of page numbers but keeps

"the page" as a display frame). The digital book revolution has primarily succeeded in the area of narratives/novels that are intended to be read from start to finish.

Will the next generation of digital native students be better prepared to use the available tools or will institutions need to offer/require basic competency testing and classes?

Do you agree that next generation of digital native students has already changed the way they seek information?

Consider: Google Effects on Memory Cognitive Consequences of Having Information at Our Fingertips http://........./2014/03/google-effects-on-memory-cognitive-consequences-of-having-information-at-our-fingertips.pdf

3.1.1 Textbook Panelist

March 31, 2014 at 12:20 pm

"(re-flowing text reduces the importance of page numbers but keeps "the page" as a display frame)"

I'm not sure I agree with this. Re-flowing makes page numbers very difficult to manage, and it doesn't eliminate the need for them. To decide this, we need to consider what function page numbers serve and whether this same function is required, in some form or another, in digital texts.

Moderator's Note: Good point. We can agree that the primary use of page numbers is ordinal (pages do not get out of order and pages may be inserted into the correct location). Secondary purposes include navigational (target of TOC, Index, bookmark…) and framing. In a hyperlinked and searchable digital environment, can the navigational functions be met with hyperlinks and searches? An effective digital environment that supports re-flowing of text supports framing and ideally allows the user to control the display frame attributes (including: frame size, orientation, line length, font attributes, background and foreground colors, etc.).

3.1.2 Textbook Panelist

March 31, 2014 at 12:23 pm

"Do you agree that next generation of digital native students has already changed the way

they seek information?"

I agree that it has, but I don't know that this change is for the better.

3.2 Textbook Panelist

<u>March 31, 2014 at 10:59 am</u>

Yes, I think that when "studying" students almost always engage multiple texts, or multiple parts within a text. A Kindle is good at carrying many, or even many many, texts at the same time, but you are pretty much are required to read them one at a time. Digital Texts conveyed on websites are better at this, but still, there is only so much space on a screen, and only so many windows that can function at once.

3.2.1 **Textbook Panelist**

<u>April 10, 2014 at 8:45 am</u>

In addition sources from journal articles and posts from reputable organizations enhance and supplement the text information.

4. **Textbook Panelist**

<u>April 2, 2014 at 2:13 am</u>

The other issue is the ubiquity of the Internet. If we can assume that in developed countries it is almost everywhere, is there really a need to have a static text? Or is the Internet that ubiquitous? Even when reading I personally expect to be able to drill down on any information I find. So, my only offline reading is strictly casual (magazines, etc.) But this is also contingent on the type of individual (and for that matter the instructor)…where are they in the Technology Adoption Life Cycle? Different people will adopt digital books at different points of the product's lifecycle. I personally don't believe this has been thought about enough by the publishers / instructions.

Summary: Second Discussion: Please review and Discuss

Posted by Textbook Moderator

<u>April 09, 2014</u>

Explore the attributes of an effective digital textbook interface

- Users need something beyond plain PDF representation of a printed book
- Web based alternatives such as a main index to primary and secondary materials provided elsewhere/anywhere
- EPUB3 documents such as you find on Kindles/iPads and other tables are suited to linear reading not to the functions needed by students using textbooks (see description in: http://........./2014/03/ncset-typology-of-resources-for-supported-etext.pdf)
- Printed books are a highly optimized technology. Generations of students learned and grew up using the traditional Paper Textbook based study model and developed study habits based on this model.
- Effective tools that support for the required study related tasks are not yet available. e.g. when "studying" students almost always engage multiple parts within a text, multiple texts, and/or material from external sources (dictionary, websites, videos, journals, workbooks, etc.). Current tools can do this but it is clumsy; the tools need to support this pattern in a seamless manner.
- Different people will adopt digital books at different points of the product's lifecycle. As such, digital textbooks need to be flexible to allow users (students and others) to use these textbook in their own way. i.e. the user needs to be able to control the presentation of the material.

You seem to be saying:

New tools (digital textbooks or educational platforms) need to support student study needs in a seamless manner while allowing students to choose how to use the available educational material without limiting access. The presentation needs to be tailored to the device and include tools to display related content, when needed, as need. The tool needs to allow users to choose/customize the interface based on their preferences.

Comments?

Third Discussion: Please consider and respond to the following

Posted by Textbook Moderator

March 27, 2014

Search for a viable and effective business and financial model

- Constantly increasing students' costs, increased availability of low cost or free textbook content, and substantially lower digital textbook profitability require a new business and financial model.
- Established publishers have substantial inventories of content and agreements with authors and institutions, which define how this content is used. Publishers have a well-established distribution model and agreements and strong connections with academic institutions. Innovative technology-centric innovators bring fresh perspectives and alternatives to digital textbook distribution, but lack depth and breadth in their content catalogs. These innovators lack the connections or funding needed to create the needed relationships with institutions.
- Technology companies and online bookstores have established effective new marketing and distribution models for digital multimedia products such as music, video, and eBooks. These companies provide the device, own the marketplace, and share in the income generated by each sale. Although open alternatives provide equivalent free content, these companies provide simplicity and convenience through standardization.
- Individuals and institutional players are cooperating in the creation of alternative open content and distribution channels. Service and subscription models provide an alternate funding model in support of free content creation, management, and distribution.

In view of these trends, is there a viable, effective business and financial model that will meet the needs/demands of all stakeholders including students, educators, institutions, authors, and publishers?

1. **Textbook Panelist**

March 27, 2014 at 9:01 am

I'm sure there is such a model, but I don't think anyone has invented or discovered it yet. The textbook and course media market is more fractured than I've ever seen it. The upside is that faculty and students have an abundance of choices. The downside is that there is little standardization, and without that standardization, very little in terms of economies of scale and concentrated buying power. The ideal model would allow for micro-payments for small bits of content (e.g. a book chapter) incorporated into digital coursepacks. It would also work across all major platforms and devices, allowing colleges and universities to become bring-your-own-device cultures.

Moderator's Note:

Some institutions, faculty members, instructors, Student advocacy Groups such as SPRIG and others have offered an open content sharing model based on Creative Commons Licensing. In this model, content creators share their material through an exchange. Instructors and students can use the content for free at a low cost. See: http://........./2014/03/fixing-broken-textbooks-report.pdf Some institutions such as University of Phoenix work with publishers to provide students and faculty access to the publishers' textbook catalog based on a resource or media fee that is collected with course fees. However, in this model, students often complain about the limits and barriers associated with the digital rights management protections included in the offering.

1.1 **Textbook Panelist**

March 31, 2014 at 9:48 am

"….allowing colleges and universities to become bring-your-own-device cultures."

I'm always concerned about this. The Digital Divide is ever widening. If universities require digital content, they are there by required to provide access to the necessary devices.

Moderator's Note: Educational institutions lead in the bring you own device (BYOD) area. Education institutions set basic standards for supported devices, but have little control over the devices used or quality of the devices installation (e.g. corrupt software of virus protection). Other types of institutions such as businesses who traditionally control or own every device used to access their networks are rethinking BYOD due to pressure from their staff and customers. e.g. You can not limit the customer to a specific browser.

1.1.1 Textbook Panelist

March 31, 2014 at 10:33 am

Yes, it certainly is the wild wild west. One thing universities could do is to provide a minimum specification for acceptable devices.

3. Textbook Panelist

March 31, 2014 at 9:45 am

"Service and subscription models provide an alternate funding model in support of free content creation, management, and distribution" Nothing is free. It's only a matter of who's paying.

3. **Textbook Panelist**

<u>March 31, 2014 at 9:54 am</u>

The question of accessibility must be addressed as part of any business model. Like any school, universities are required to provide accessibly content to students with disabilities. Consider the case of providing image descriptions for students who are blind. Erlbaum, one of the largest textbook publishers in the world, by their count they publish 3 million images a year.

None of them described. None of them accessible.

3.1 Textbook Moderator

<u>April 8, 2014 at 2:36 pm</u>

In researching this project, I found that many of the technical attributes that help make a textbook accessible, also make a textbook effective for the general population. I recently came across an interview with JP Davidson about audio gaming. <u>http://www.cbc.ca /player/Radio/Spark/ID/2443642969/?page=2</u> the interview describes how intrinsic screen reading audio elements of a video game can be used by a blind player to navigate through a video game. In my own work with document processing, readers and Braille interpreters follow the intrinsic display order used to render the document to a screen or on paper. I have found that unless deliberate care is taken to incorporate reader support into an electronic document, the result is often random and meaningless. In textbooks, images are used to illustrate examples or to render a graphic representation of data. How would these be made accessible? Text or Audio that describes the image would help all users.

4. Textbook Panelist

<u>April 2, 2014 at 2:23 am</u>

Apple reinvented the music business. It formed business arrangements with the major music companies, convinced them to all sell singles at 99 cents apiece, and a new industry was born. What if there were an aggregator that agreed to distribute certain pieces of content at a penny per word (not that that is the right amount, but as an example). Maybe it's a nickel per page or chapter. Whatever the model, there needs to be a central marketplace where all textbook authors can participate. Even better, let the market bid on what each piece of information is worth (eBay for professors).

Moderator's Note: The open textbook movement is already working to setup exchanges/repositories where instructors and institutions would contribute and use content as needed often at little or no charge. See: <u>http://........./2014/04/open-textbook-proof-of-conceptvia-connexions.pdf</u>

http://........./2014/04/the-e-textbook-revolution.pdf
http://........./2014/03/the-textbook-reformationdigitalcontentconverge_cde12_sp_q2_v.pdf

In 2012 Apple announced a new interactive textbook initiative based on its iBooks 2 model (iAuthor). It was expected that such a holistic approach will lead to greater understanding in removing the barriers to adoption. However, critics perceive Apple's execution as an attempt to control the digital textbook marketplace. See:
http://www.washingtonpost.com/business/technology/apple-announces-ibooks-2-ibooks-author-deals-with-publishers/2012/01/19/gIQAcS35AQ_story.html
http://www.universitybusiness.com/article/apple-dives-textbook-game
http://e-dictionaries.blogspot.com/2012/02/opinion-five-things-that-worry-us-about.html
http://hackeducation.com/2012/01/19/apple-and-the-textbook-counter-revolution/

Summary: Third Discussion: Please Review and Discuss

Posted by Textbook Moderator

<u>April 08, 2014</u>

Search for a viable and effective business and financial model

- The textbook and course media market is more fractured with an abundance of choices and little standardization.
- Gather bits of content into course packs allows course/syllabus designers choices
- Provide alternative presentations/formats that can be incorporated into the educational environment.
- Support on BYOD with universities providing a minimum specification for acceptable devices.
- Nothing is free. It's only a matter of who's paying and let the market bid on what each piece of information is worth
- The technical attributes that help make a textbook accessible, also make a textbook effective for the general population

Is this a situation that needs to play out in the marketplace until a handful of models remain?

The existing choices are:

- Publisher generated aggregations and traditional paper textbooks along with associated digital content created by handful of publishers; sold by bookstores; resold or rented out by companies and individuals
- Publisher generated PDFs of the Traditional Paper textbooks or created on Apple's iAuthor platform; sold/licensed for limited use
- Open content models shared on an exchange for "free" or for a small fee that allow aggregation of materials in building a course materials pack
- A variety of independent and web based content and formats created by individuals and educational startups

Did I miss any?

1. **Textbook Panelist**

<u>April 9, 2014 at 10:17 am</u>

It is a situation that needs to play out in the marketplace – not only the textbook marketplace, but also in the higher education marketplace. In other words, it may not be realistic to expect dominant models to emerge in the publishing industry until dominant models are clearly established for higher education. The traditional model has been tested over the past few decades by the rise of non-traditional institutions. Now, many of those

institutions are beginning to falter while there methods are adopted by more established universities.

Finalize: First Discussion: Please Approve/Comment

Posted by Textbook Moderator

<u>April 08, 2014</u>

Please consider the following statements and vote accordingly. Please provide additional comments as needed.

Do you agree with the following responses to:

"What is the function of textbooks in academia?"

"What is the nature and what are valid sources of textbook content?"

"What are the implications of the textbook selection process?"

"How do textbooks integrate into digital learning environment?"

A textbook is an educational resource or tool that provides definitive knowledge and defines and bounds the scope of discussion and learning as set forth in the curriculum for specific class. This resource helps assure that the stated learning goals are met.

Based on the premise that a textbook is an educational resource and may contain other educational resources, then the textbook functions as is an educational workspace. ~~A digital textbook needs to function as the principal resource in an online/interactive educational workspace~~. **A digital textbook needs to function as the principal resource in an online/interactive educational workspace that supports a mix of materials regardless of multiple media format.**

A fully functional digital textbook needs to seamlessly encapsulate the educational materials/resources needed by the specific course.

It is the responsibility of the instructor (or syllabus/course design group) to examine and vouch for the credibility of included educational material (textbook or other content).

Virtual textbooks may/should include material from a variety of academic and less formal sources.

An effective textbook selection process requires due diligence in balancing academic freedom with institutional goals and requires standards, oversight, and/or standardized processes help to keep the process from becoming dysfunctional. Maintaining the academic integrity that is higher education's goal, while maintaining some degree of standardization, allows a space to be given for creative liberties.

Please note: As we are seeking a consensus, I will not reveal your individual votes.

1. **Textbook Panelist**

   April 10, 2014 at 3:11 pm

   This list doesn't mention multi-media content anywhere, or the idea of multi-modal writing. Digital texts allow for this. Perhaps this can be added as a phrase or sentence in the second item on workspaces. i.e "multimedia/multimodal workspaces"

   Moderator's Note:

   How about?

   A digital textbook needs to function as the principal resource in an online/interactive educational workspace that supports a mix of materials regardless of multiple media format.

Week 5: Ending Discussion

Posted by Textbook Moderator

<u>April 09, 2014</u>

Hello All,

Thank you for your help. It looks like we have exhausted the discussion.

At this point, I will be taking the summaries listed here and have these reviewed.

Once the review process is over, I will once again give everyone on the panel an opportunity to make final comments.

Thank you for your help with this study.

Public Feedback

All discussion by email.

Posted by Textbook Moderator

May 25, 2014

Hello All,

It has been almost two months (correction one month) since I presented our work for public comment. All responses were positive.

The comments were:

- Identify strategies for saving students money.
- The presentation will need to be much more flexible and responsive. PDF is not acceptable. The functions of the interface including what students expect in traditional paper books such as table of contents, index, highlighting, mark-up, and writing notes along with the search and dynamic formatting/presentation capabilities associated with the Internet. e.g. float over, pop-out, etc. and the inclusion of a mix of media formats.
- Emphasize integration of the digital textbook into the educational workspace
- Control the scope and boundaries of the material included. In this environment, the instructor needs to work at filtering material that is relevant. Open content has the potential to expand the scope of a topic outside of academia, but the instructor would need to take care that students understand the advantages and shortcomings of information from less authoritative sources.
- Provide options: Not all students want the latest technology or to be trapped in a single "best" option. Textbooks providers and institutions need to offer choices in material presentation and interface.

What do you think? I will endeavor to add this information to our work.

Here are some final comments:

Cost is always a big issue and the public comments included concern over cost. There were several comments about making textbooks more affordable for students, but no one really looked at the pricing model in terms of who is requiring the books, who setting the prices, and who is paying.

A future study should be done to compare pricing models in terms of payer (students' and parents') acceptance/attitudes. The study should be designed to compare: the exiting per book, per class buy/resell, rent model, with other models such as "free" (included in tuition), open and shared sources, or as a resource fee to see what is the most acceptable. Which model is most effective in avoiding sticker shock? Students, whose scholarships allocated specific funds to

textbook purchase, are more likely to purchase the required textbooks (Dean Dad, 2009; Florida Distance Learning Consortium, 2011). These students are less sensitive to textbook cost.

Digital textbooks must support accommodations for students with disabilities. Content supported functionality improves accessibility. Adding alternatives and choices in how content is presented or can be used is sure to provide functionality and flexibility for all students. Such requirements are already mandated, but implementation has been problematic. Many existing technologies have developed independently of accessibility considerations; the "born accessible" concept for new technology requires that developers build-in the accessibility features from the beginning, rather than adding them on later as an afterthought. The current adoption state of digital textbooks makes this uniquely possible, which isn't possible for printed text.

Some students still require a hard copy they can write on.

Appendix H: Figures

All figures included in this work are from original artwork, commissioned by Louay

Chebib for Transforming the Digital Textbook, 2014, by Louay Chebib are licensed under a

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The following titles and supportive text has been included in the images

Figure 1

Title: Digital Textbook Study Website: Welcome and Instructions Screen. From original work, by Louay Chebib. Reprinted with permission.

Supportive text: A screen capture of the Digital Textbook Study Website: Welcome and Instructions Screen.
Top menu text: Digital Textbook Stu…, New Post, Textbook (username)
Study menu links text: Library; Welcome & Instructions; Code of Conduct; About; Contact
Title: Digital Textbook Study ~ Transforming the Digital Textbook
Search Box
A banner: The left side shows a bookshelf in the library of the Trinity College Library in Dublin. Books appear old and well used. The right side shows stacks of shiny servers.
Text follows:
Welcome & Instructions
Welcome to the Digital Textbook Discussion study space.
This space was created and commissioned specifically for this study. The design relies on a heavily moderated discussion model based on the best deliberative inquiry techniques available. In this study space, subject area experts and interested parties, will review the identified concerns and draw on their expertise to suggest and discuss viable alternatives that meet the digital textbook needs of the post-secondary educational community. As a participant in this space, your status as an expert is a given. As such, you do not need to support your statements based on who you are. Only the moderator knows who is speaking; however, to preserve the anonymity of all participants, all comment will appear without a signature.

Banner image used on the website under Creative Commons License: This is a cropped version of an image originally altered by Tobias Berka, Ph.D. The original source is two stock photographs available under the creative common license. The left side shows a bookshelf in the library of the Trinity College Library in Dublin, taken by Nic McPhee and made available under the Creative Commons [Attribution-ShareAlike 3.0 Unported](#) license.

Figure 2

Title: Linear Reading: Reading a Paperback Book for Pleasure. From original artwork, commissioned by Louay Chebib. Reprinted with permission.

Supportive text: A sketch of a girl sitting on a deck chair at the beach reading a book. The girl is dressed in early 20th century bathing attire.

Figure 3

Title: Linear Reading: Reading a Book for Pleasure on a Tablet. From original artwork, commissioned by Louay Chebib. Reprinted with permission.

Supportive text: A sketch of a girl sitting on a deck chair at the beach reading a book on a tablet (ebook reader or tablet PC).

Figure 4

Title: Non-Linear Activity: Studying in a Library. From original artwork, commissioned by Louay Chebib. Reprinted with permission.

Supportive text: A sketch of a boy studying. The boy is sitting at a large table in the library with many books spread out open in front of him. Other books are nearby on the table and the bookshelves in the background are full of books.

Figure 5

Title:. Non-Linear Activity: Studying in a Virtual Educational Space. From original artwork, commissioned by Louay Chebib. Reprinted with permission.

Supportive text: A sketch of a boy studying. The boy is standing at a table using a keyboard-like controller, looking up, and using his hand to manipulate informational images that are floating in the air around him.