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Abstract

As an innovation, the e-book purports to replace the printed book. However, students continue to indicate a preference for using printed books. Nevertheless, many academic libraries report e-book use rates equal to or greater than that of the printed book. In this study, eight factors were investigated as potential reasons undergraduate students chose to use an e-book. A quantitative research design using a convenience sampling method and chi-square analyses was employed in the study. The population of interest was undergraduate students attending a small, traditional, liberal arts institution. Participants indicated leisure reading, conducting research, forced adoption, and convenience were positive factors in their choice to use an e-book. In-class reading was a negative factor in their choice to use an e-book. The availability of the printed book also proved to be a negative factor in the use of e-books. Textbook use and reading assigned readings were unrelated to their choice to use an e-book. When available, students chose to use the printed book; however, when the e-book was the only format available, they used it.

Keywords

Convenience, diffusion of innovations, e-books, forced adoption, undergraduate students

Introduction

From the inception of the e-book, academic libraries have chosen to integrate them into their information content. Many academic librarians assumed that e-books would become a viable and affordable alternative to printed books and naively assumed students would embrace and readily adopt their use (Armstrong and Lonsdale, 2003; Walton, 2007). In the past five years, growth in the e-book market has exploded. In the academic publishing industry, most major publishers offer significant portions of their printed books in e-book format (Quinn, 2011). In response to the availability of academic quality e-books, most academic libraries provide access to some level of content in e-book format. In 2011, 95% of academic libraries reported that they were providing access to e-books (Miller, 2011).

Students' perception of e-books indicates that they possess a strong preference for using printed books (Abdullah and Gibb, 2008a, 2008b; Croft and Bedi, 2004; Ismail and Zainab, 2005; Jamali et al., 2009; Lonsdale and Armstrong, 2001; Paxhia, 2011; Perry, 2005; Shelburne, 2009; Walton, 2006). Despite this preference, academic libraries that provide access to e-books found the use rate of their e-book collection was equal to or greater than that of their printed book collection (Bailey, 2006; Christianson and Aucoin, 2005; Littman and Connaway, 2004; Rose and Li, 2007;

Safley, 2006; Walton, 2007). The proliferation of e-book systems combined with the high use rate of e-books by students in academic libraries indicate students are using e-books; however, student practice of using e-books is contradictory to their preference for using printed books. The dissonance between students' preference and practice is the genesis of this research. If students prefer to use printed books, why do academic libraries that provide access to e-books find they are used at a high rate?

The purpose of this study was to examine whether or not one or more of eight factors were related to students' decision to use an e-book within the context of the traditional undergraduate experience. The study sought to determine whether or not a relationship existed between students' decision to use an e-book and one or more of the following factors:

1. using an e-book for leisure reading;
2. using an e-book as a textbook;

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3. using an e-book to conduct research for a class assignment;
4. using an e-book for an assigned reading outside of class;
5. using an e-book to read aloud in a class;
6. using an e-book or printed book because it is accessible;
7. using an e-book because of forced adoption; and/or
8. using an e-book because of convenience.

The first five factors are functions normally associated with using printed books by students. These factors were selected to determine whether students have embraced the use of e-books for tasks that traditionally have been fulfilled by printed books. This use is related to the diffusion of innovations theory's concept of compelling advantage (Rogers, 2003). Does the e-book have a compelling advantage over the printed book that would entice students to choose the innovation (e-book) over the ingrained practice (printed book)? The other three factors were selected to examine whether the use of e-books is related to accessibility, forced adoption, or convenience, which correspond to the diffusion of innovations theory's concept of forced adoption. Forced adoption is the use of external force to ensure a population chooses to use an innovation over the preferred practice (Rogers, 2003).

Literature review

The body of literature on e-book research has grown significantly over the past few years. In general, research on e-books in academia can be separated into six distinct categories, which include the impact of e-books on academic libraries, desired features and/or technical issues impacting e-book adoption, impact of e-books on student learning, use rates of e-books in academic libraries, purpose for which students were using e-books, and students' preference for printed books versus e-books. An exploration of the breadth of this literature is not possible within the space limits of this article. Two areas of research are of particular interest for this study: students' preference for using printed books versus e-books and e-book use rate studies in academic libraries.

The first area of literature examines students' preference for reading books versus e-books. This area of research has interested scholars since e-readers were marketed. Two basic trends in students' preference have been identified. First, students overwhelmingly prefer to read printed books (Abdullah and Gibb, 2008a, 2008b; Croft and Bedi, 2004; Ismail and Zainab, 2005; Jamali et al., 2009; Perry, 2005; Shelburne, 2009; Walton, 2007). While the e-book has been lauded as the replacement for the printed book, students continue to indicate a preference for using the printed book. Second, students were willing to read e-books when the amount of text to be read was limited (Letchumanan and

Tarmizi, 2011; Levine-Clark, 2006; Nicholas et al., 2008). This idea lends credence to the usefulness of e-books for research; however, students are not interested in extensive reading of the e-book.

The second area of literature examines e-book use rates by academic libraries. Many academic libraries have conducted use rate studies to examine whether their investment in e-books was successful in terms of student use. Overall, when academic libraries provide access to e-books, students use them at a rate equal to or higher than the printed books (Dillon, 2001b; Gibbons, 2001; Grudzien and Casey, 2008; Kimball et al., 2010; Lamothe, 2010; Langston, 2003; Littman, 2002; Littman and Connaway, 2004; Rose and Li, 2007; Safley, 2006; Ugaz and Resnick, 2008; Walton, 2006). In addition, business, economic, mathematical, scientific, and technology disciplines generated the highest e-book use rates, whereas the humanities and social science disciplines generated the lowest e-book use rates (Bailey, 2006; Christianson, 2005; Connaway and Snyder, 2005; Dillon, 2001a; Gibbons, 2001; Langston, 2003). Thus, while students are using e-books provided by academic libraries at rates equivalent to or greater than printed books, they routinely indicate a preference for using the printed book when it is available.

Methodology

The population of interest was traditional, undergraduate students enrolled at Southwest Baptist University in Bolivar, Missouri. Southwest Baptist University is a small, private, liberal arts institution located in southwest Missouri that offers associate's, bachelor's, master's, specialist's, and doctoral degrees. In June 2002, the University Libraries system at Southwest Baptist University purchased its first e-book collection. In 2012, at the time of the survey, undergraduate students had access to 95,415 e-books versus 191,608 printed books. Thus, 33.2% of the books provided to students through the library were in e-book format.

The traditional undergraduate population was selected to understand factors affecting the adoption of e-books by students in the traditional, face-to-face, academic setting where they have access to an academic library with both a strong printed book and e-book collection. Graduate and distance education students were excluded because they might be reliant on e-books, as distance to the library inhibits easy access to printed books. The undergraduate student population was primarily traditional students with 96.4% of students in the 18 to 25 year-old age range. The number of students in each classification was fairly typical of a small college or university with a similar number of students in each classification. The gender breakdown of the student population was equitable with 51.9% female and 48.1% male. Minority populations were significantly underrepresented with minority groups comprising 6.5% of the student population.

The convenience sampling method was used to collect data. The data collected was counting data; therefore, statistical analyses were conducted with non-parametric tests. Random sampling and the normal assumptions of parametric tests were not factors in the data analysis. Undergraduate students attending a university-wide chapel service who agreed to participate in the study constituted the sample population. Data were collected via a survey. Students entering the chapel were given a survey. At the beginning of the chapel, the informed consent and instructions for completing the survey were discussed. Students willing to participate in the study completed the survey and immediately submitted it to a survey collector. A total of 264 surveys were completed. One survey was discarded due to the participant not reporting his/her age; therefore, the sample size was 263, which is 18.7% of the population. The survey instrument was adapted from the Rowlands et al. (2007) survey on faculty and student perspectives of using e-books at University College London in the United Kingdom. Data analyses were run with SPSS software, version 20.

There were four research questions investigated:

1. How often is students' use of e-books related to (a) reading for leisure; (b) using as a textbook; (c) using to conduct research for a class assignment; (d) reading an assigned reading for class; or (e) reading an assigned reading in class?
2. How often is students' use of the printed book and e-book related to which format is accessible?
3. How often is forced adoption related to students' choice to use an e-book?
4. How often is convenience related to students' choice to use an e-book?

Results

In general, 74.1% of participants had used an e-book prior to the study. A breakdown of e-book use by student classification found that 60.9% of freshmen, 73.1% of sophomores, 88.6% of juniors, and 82.1% of seniors had used an e-book. In summary, a majority of participants had used an e-book prior to the study. As might be expected, the longer a participant attended school, the more likely it was that he or she had used an e-book.

A two-way chi-square analysis was conducted for research questions 1 and 2. A one-way chi-square analysis was conducted for research questions 3 and 4. For each question, the alpha level of .05 was used. For research question 1, the critical value of χ^2 (χ^2_{cv}) with 16 degrees of freedom is 7.96, $\chi^2_{cv} = 7.96$ (Hinkle et al., 2003). For research questions 2, 3 and 4, the critical value of χ^2 (χ^2_{cv}) with four degrees of freedom is .711, $\chi^2_{cv} = .711$ (Hinkle et al., 2003). The null-hypothesis was rejected for each question; therefore, the standardized residual value was calculated to determine which cells (categories) contribute to the χ^2 value.

Research question 1

The null hypothesis for Research question 1 was: there is no difference in the frequency of students' use of e-books for leisure reading, textbook use, conducting research, assigned reading, and in-class reading. The calculated χ^2 value was 143.54, which exceeded the χ^2_{cv} , 7.96, with a p -value < .00; therefore, the null hypothesis was rejected. A relationship between the frequency of students' use of e-books and one or more of the variables was found to exist.

For leisure reading, the never used ($R_{11} = -2.4$), rarely used ($R_{12} = 3.1$), and always used ($R_{15} = 2.2$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the χ^2 value. The negative value in the never used category and the positive values in the rarely and always used categories indicate that students' use of e-books was positively related to leisure reading. Thus, while some students always chose to use e-books for leisure reading, there are some students who rarely chose to use e-books for this purpose. For textbook use, none of the categories exceeded the absolute value of 2.00; therefore, they were not contributors to the χ^2 value. Thus, students' use of e-books was unrelated to textbook use.

For conducting research, the never used ($R_{31} = -3.2$), occasionally used ($R_{33} = 3.4$), usually used ($R_{34} = 3.5$), and always used ($R_{35} = 2.7$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the χ^2 value. The negative value in the never used category and the positive values in the occasionally, usually, and always used categories indicated that students' use of e-books was positively related to conducting research. Some students occasionally, some usually and some always used e-books for conducting research. For assigned reading, none of the categories exceeded the absolute value of 2.00; therefore, they were not contributors to the χ^2 value. Thus, students' use of e-books was unrelated to reading assigned readings outside of class.

For in-class reading, the never used ($R_{51} = 5.1$), rarely used ($R_{52} = -3.6$), occasionally used ($R_{53} = -4.4$), usually used ($R_{54} = -2.9$), and always used ($R_{55} = -2.2$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the χ^2 value. The positive value in the never used category and the negative values in the rarely, occasionally, usually, and always used categories indicated that students' use of e-books was negatively related to in-class reading. Thus, students were not reading e-books aloud in class. In summary, students' use of e-books was positively related to leisure reading and conducting research, negatively related to reading aloud in class, and unrelated to textbook use and reading assigned readings outside of class.

Research question 2

The null hypothesis for Research question 2 was: there is no difference in the frequency of students' use of e-books and printed books when both the printed book and the

e-book are accessible. The calculated X^2 value was 233.251, which exceeded the X^2_{cv} , .711, with a p -value $< .00$; therefore, the null hypothesis was rejected. A relationship was found to exist between the available format and the frequency with which students chose to use the printed book or e-book. For printed books, the never used ($R_{11} = -6.8$), rarely used ($R_{12} = -3.0$), usually used ($R_{14} = 4.1$), and always used ($R_{15} = 6.6$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the X^2 value. The negative values in the never used and rarely used categories and the positive values in the usually and always used categories indicate that when both the e-book and printed book were available, some students usually and some students always chose to use the printed book. For e-book use, the rarely used ($R_{21} = 6.8$), occasionally used ($R_{23} = 3.1$), usually used ($R_{24} = -4.1$), and always used ($R_{25} = -6.7$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the X^2 value. Converse to the printed book outcome, the positive values in the never used and rarely used categories versus the negative values in the usually and always used categories indicate that when both the e-book and printed book were available, some students usually and some students always chose not to use the e-book. In summary, when both the e-book and printed book were available, students usually or always chose to use the printed book and never or rarely chose to use the e-book.

Research question 3

The null hypothesis for Research question 3 was: there is no difference in the frequency of students' use of e-books when the printed book was not available. The calculated X^2 value was 106.146, which exceeded the X^2_{cv} , .711, with a p -value $< .00$; therefore, the null hypothesis was rejected. A relationship was found to exist in the frequency of students' choice to use an e-book when the printed book was not available.

For e-book use, the never used ($R_{11} = -37.2$), rarely used ($R_{12} = -29.2$), usually used ($R_{14} = 8.8$), and always used ($R_{15} = 56.8$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the X^2 value. The negative value of the never used and rarely used categories and the positive values of the usually used and always used categories indicate that when the printed book was not available, some students usually and some students always chose to use the e-book. Thus, the non-availability of the printed book and the availability of the e-book impacted students' choice to use an e-book. In effect, forced adoption was a factor in students' choice to use an e-book.

Research question 4

The null hypothesis for Research question 4 was: there is no difference in the frequency of students' use of e-books

and using e-books due to convenience. The term convenience might bring to mind different scenarios for each participant. One participant might think of convenience as not being required to visit the library to get a printed book. Another participant might envision convenience as being able to access a book that was not available in print. Still another participant might consider convenience as the ability to search for keyword terms within the text. For this reason, the term was not narrowly defined to limit students' concept of what convenience might be. The calculated X^2 value was 62.798, which exceeded the X^2_{cv} , .711, with a p -value $< .00$; therefore, the null hypothesis was rejected. The frequency of students' use of e-books was related to convenience.

For convenience, the never used ($R_{11} = -30.6$), rarely used ($R_{12} = -8.6$), occasionally used ($R_{13} = 6.6$), and always used ($R_{15} = 47.4$) categories were greater than the absolute value of 2.00; therefore, they were contributors to the X^2 value. The negative values of the never used and rarely used categories and the positive values of the occasionally used and always used categories indicate students' use of e-books was positively related to convenience. Some students occasionally used and some students always used e-books when it was convenient.

Summary

In each of the four research questions, the null hypotheses were rejected. A relationship was found to exist between the frequency of students' use of e-books and one or more variables. A relationship was found to exist between the frequency of students' use of e-books and leisure reading, conducting research, and in-class reading. The use of e-books or printed books was found to be related to the availability of the format, forced adoption, and convenience. Finally, students' use of e-books was unrelated to using a course textbook or for reading aloud inside the classroom.

Discussion

As an innovation, e-books have been commercially available for academic libraries to acquire since the 1980s; however, it was not until the late 1990s that e-books became a viable format to acquire and lend. Many academic libraries were early adopters of e-books, providing e-book access for students' use. Today, approximately 95% of academic libraries provide access to e-books to support student-learning. However, students continue to express a preference for using printed books and a hesitance to embrace e-books as a replacement. Despite this reluctance, academic libraries that have studied their e-book collection's use rates find that students are using e-books at a rate equal to or greater than that of printed books.

The diffusion of innovations theory recognizes that an innovation must have a compelling advantage or sufficient

external motivation to influence adopters to choose the innovation over the current technology or practice. While students express a preference for using printed books, when academic libraries provide access to e-books, students are using them. Therefore, there must be either a compelling advantage or a significant external motivation influencing students to use e-books instead of their preferred choice. This leads to the simple question: What are the factors affecting the adoption of e-books by undergraduate students? Of the eight factors investigated in this study, six were identified as positively or negatively affecting undergraduate students' decision to use e-books and two were non-factors.

Students' use of e-books was positively related to leisure reading and conducting research, which correlates with the findings of studies conducted at other academic libraries in large, public institutions located in Malaysia, the United Kingdom, and the United States (Croft and Davis, 2010; Perry, 2005; Shelburne, 2009). Interestingly, Southwest Baptist University's academic library does not provide access to leisure reading content; therefore, students choosing to use e-books for leisure reading are making a personal investment to enable their choice. Students' use of e-books for leisure reading reflects the pattern of e-book use in the non-academic, commercial market where e-books are being embraced for this purpose (Quinn, 2011). In the commercial market, sales of e-books in the trade publication market increased from \$6m to \$200m during the period of 2002 to 2010 (International Digital Publishing Forum, 2013). In 2012, the Association of American Publishers reported that the adult fiction genre in e-book format eclipsed printed book sales and gained the number one ranking in sales for the first time in its annual rankings of sales in the United States (Sporkin, 2012). The use of e-books for leisure reading in the commercial market rose significantly prior to and during the time of this study and the impact was reflected in the results. The academic library's acquisition of e-books to support student learning fulfills one of the primary roles of an academic library. Students' choice to use e-books for conducting research validates academic libraries' decision to expend limited resources to acquire content in this format. In effect, if the library provides e-book access, students will use them even if the e-book is not the preferred format.

Students' use of e-books was also positively related to convenience. In previous research, anecdotal evidence was used to conclude that convenience might be a reason that students used e-books (Ismail and Zainab, 2005). In this research, students were specifically asked whether convenience was a factor in their choice to use an e-book, and they confirmed that it was. The diffusion of innovations theory identifies trialability as a significant factor in the adoption process. If an innovation is conveniently available (trialability), the adopter is more likely to try the innovation, which increases the likelihood of its adoption. Extrapolating this concept to e-books, academic libraries that provide

convenient e-book access increase the probability of students' choice to use them.

Students' use of e-books was also positively related to forced adoption. The concept of forced adoption was not identified in previous research on e-book use. When given access to printed books and e-books, participants very clearly indicated their desire to use the printed book, thus indicating their preference for this format. However, students' use of e-books was positively related to the non-availability of the printed book. When the preferred choice, the printed book, was not available, students were willing to use the e-book. In essence, the academic library's decision to provide access to the e-book and not the corresponding printed book was a form of forced adoption. If a student wants to use the printed book and access is only provided in e-book format, then the student is forced use the non-preferred innovation.

Ironically, the corollary of forced adoption is the recognition that the availability of the printed book equates to a negative factor in the adoption of e-books. This concept was an unexpected outcome of the research. It was not identified in previous research. When the printed book and the e-book were both available, participants chose to use the printed book. Thus, when the academic library provides access to both formats, the result is the non-use of the e-book. In effect, the availability of the printed book was a negative factor in students' choice to use an e-book.

Another negative factor affecting the adoption of e-books by undergraduate students was reading aloud in the classroom. Students were not using e-books to read aloud in class. In previous research, findings indicated that some students were pleased with reading e-books (McFall, 2005; Trotter, 2008; Sun et al., 2012), while others found it difficult (Appleton, 2004; McGowan et al, 2009). Those who found it difficult were especially displeased with the navigational features of the e-book. In particular, the difficulty of finding one's location in the e-book was frustrating. In this study, participants clearly revealed that e-book use was negatively related to their in-class reading. This finding may be related to the difficulties expressed with e-book use in the classroom or it might be due to the lack of reading taking place in the classroom (Appleton, 2004; Bell et al., 2002; Gutierrez and Wang, 2001; Simon 2002).

Two factors not affecting the adoption of e-books by undergraduate students were textbook use and assigned reading outside of class. Students' choice not to use e-textbooks was a surprise finding of this study. There has been much discussion about the potential benefits of e-textbooks, including lower costs for students, increased portability, access to multiple textbooks on one device, and other positive concepts (Gorski, 2010). Despite the positive attributes of e-textbooks, participants in this study were not using them.

In summary, leisure reading, conducting research, and convenience are compelling advantages that enticed students

to adopt the use of e-books over the preferred printed book. An academic library's choice to provide access to e-books and not to printed books is a form of forced adoption that compels students to use e-books. Conversely, an academic library's choice to purchase both the e-book and printed book format of a title will inhibit students' choice to use e-books. However, using e-books as a textbook and for reading assigned outside of class were unrelated to students' choice to use an e-book.

Implications

The academic library is in a quandary. Students have not completely transitioned to the e-book format for all aspects of printed book use. Academic libraries have limited funding available to purchase books. Providing access to both formats for every monograph acquired is not a viable option. This leads to a fundamental question for academic libraries. Does the academic library hold to a traditional ideology and purchase printed books only, cultivate a hybrid collection of printed books and e-books, or make the transition to e-books only? If it holds to the tradition of print only, it will be left behind in the digital age. If it moves to the e-book only format, students' preference for printed books would be overcome by forced adoption and/or convenience. However, this may frustrate students who prefer the printed book format and they may rebel against this coercion. Other issues not related to students' preference may also give pause to the fully digital library, including the concern over the amount of academic quality content available and difficulties with licensing and copyright issues that hamper the ability to provide access to some e-books. It seems the best recourse for academic libraries is to maintain a hybrid collection that supports students' preference for printed books, while enabling students' ability to adopt the use of e-books when it is convenient or necessary.

However, this scenario presents significant challenges for the academic library. The University Libraries at Southwest Baptist University have adopted a hybrid model. The ability to provide sufficient funding to acquire books in both formats is a challenge for any academic library, but especially for a small academic institution. The technical requirements required to integrate e-books into an easily accessible collection is another significant hurdle. The process to acquire and make e-books accessible is vastly different from making printed books accessible. Integrating e-books from disparate vendors into an organized, coherent and accessible system requires technical expertise. Perhaps the most significant challenge belongs to the student. In the process of conducting research, students may face the challenge of using e-books from different vendors, which will require the student to learn navigational methods of each system in order to use the content.

Future research

Students' desire to read and not be hindered by learning multiple e-book systems was a concern identified in the literature (Cox, 2010; Dillon, 2001a; Foote and Rupp-Serrano, 2010). Are students' perceptions of using e-books negatively affected by the presence of disparate systems? Understanding the impact of students' frustration with navigating disparate systems might encourage publishers to adopt a uniform e-book system. Also, the future of e-textbooks is cloudy. Some studies clearly indicate that students enjoy using e-textbooks, while others indicate that students dislike using them. In this study, participants' use of e-books was unrelated to e-textbooks, which adds to the quandary. Additional research on the factors affecting the adoption of e-textbooks is essential to clarify the role e-textbooks may have in higher education. Finally, e-book publishers are implementing restrictive digital rights management protocols on e-readers. For instance, some publishers restrict the library's ability to download e-books to multiple e-readers. The license agreement allows the e-book to be placed on an e-reader owned by the library; however, the e-book cannot be downloaded to a library patron's e-reader. This limitation seems to be a severe handicap to e-book use. A study that assesses the impact of this restriction might enable academic libraries and publishers to understand the need for less restrictive digital rights management.

Limitations

The limitations of this study are related to the population size of the institution, the ethnic makeup of the institution, the use of non-parametric analyses, and the use of a convenience sampling method. Southwest Baptist University is a small academic institution. The small undergraduate population may limit the ability to generalize the results to a broader, larger, general population. In addition to the smaller sample size, ethnic minorities are underrepresented in the population and, as a result, in the sample. The outcome of the research represents the majority view. Ethnic minority views may differ from the majority view and may not be represented in the study's outcomes. The use of non-parametric analyses limits the power of the results. The use of parametric analyses would have enabled the ability to quantify the strength of the relationships found in the study. Non-parametric analyses allow the identification of a relationship but not the strength of the relationship. Finally, the use of convenience sampling rather than a random sampling also limits the ability to generalize the results to other populations.

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