EXPLORING TABLETS FOR UNDERGRADUATE SCHOOLWORK

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Abstract

Electronic reading (e-reading) device has been available for decades and there are many studies that have been published based on those devices. However with continuously changing tablet marketplace, there is a lack of studies looking at current devices. In order to understand the effect of tablets on undergraduate students, we conducted a consumer study to: 1) Determine the most beneficial tablet size for college students in their academic pursuits and 2) Determine the necessary types of support from academic libraries for college students conducting schoolwork using a tablet. An initial focus group study guided a consumer survey of 121 undergraduate students. The focus group study identified reading and note taking as key academic activities for tablet users. The participants were also interested in receiving quick help from the library and using electronic journal articles available from the library. A consumer survey took place at a university campus a month later. Each survey respondent answered a set of questionnaires using both large and small tablets of either Android or iOS operating system. The survey data showed that overall, larger tablet was preferred for academic use. Tablet size was not an important factor in reading or note taking ($P \geq 0.05$) but perceived portability of a tablet size increased preference for that tablet size ($P = 0.0078$). In addition, the library's instant messaging feature was found to be equally successful in both full and mobile website when viewed on a tablet ($P \geq 0.05$). Many students who use HTML only or both HTML and PDF formats to view electronic journal articles when on a computer switched to PDF only when on a tablet. Our findings can assist tablet manufacturers in making a suitable tablet targeted for higher education uses. This study can also guide academic libraries in improving accessibility to resource for a growing number of undergraduate tablet users.

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Chapter 1 - Literature Review

A form of electronic reading (e-reading) device has been available for decades now and there are many studies that have been published based on those devices. However those are very dissimilar to devices currently available. Even some of those devices that are recognized as immediate precursors to the current devices are far lacking in features compared with current devices. E-reading devices changed quite rapidly and thus, this literature review will focus on studies that were published in 2010 or later to maintain relevancy of facts.

History of Tablets

Tablets may be a 21st century invention in many consumers' minds, but the forerunner to modern tablets were being produced in the 1980s (Morse 2011; Schedeen 2010; Bort 2013).[1, 2, 3] In the late 1980s, tablets such as the Linus Write-Top and the GridPad were portable yet awkwardly heavy with rudimentary handwriting-recognition system. (Schedeen 2010; Bort 2013).[2, 3] In the early 90s, Personal Digital Assistants (PDAs) became popular. It is interesting in hindsight to note that Apple's first tablet-like device, Newton MessagePad was developed around this time to enter the tablet market but instead changed course to the PDA market (Schedeen 2010; Bort 2013).[2,3] Until the early 21st century, PDAs were very popular but with rising dominance of smartphones, they slowly disappeared and were eventually replaced by smartphones (Schedeen 2010).[2]

By the year 2001, recognizably modern tablets came into being in the form of Windows XP Tablet Edition (Schedeen 2010).[2] It was portable, had a touch screen, and operated using Microsoft Windows. Within the next few years, several variations of tablets entered the market: traditional slate tablet, convertible tablet where essentially a laptop computer with a rotating screen allowed the computer to be used as a slate personal computer, and hybrid tablet where the screen of a laptop can be detached to be used as a tablet (Schedeen 2010).[2] At this time all three forms of tablets were still prohibitively expensive for an average consumer. At the same time, smartphones were becoming increasingly popular and were rapidly advancing due to highly competitive market. One of the biggest players in the smartphone arena was Apple's iPhone. Through Apple iPhone and Apple iPod Touch, a device similar to iPhone but without telephone

capabilities, Apple was already familiar with incorporating many technologies that were ideal for tablets such as touch screen navigation (Schedeen 2010).[2] In 2010, Apple released its first tablet, iPad, which brought tablets into the mainstream of devices available for US consumers.

According to Morse (2011),[1] a tablet can now be defined as a "medium-sized portable personal computer where a pen or touchscreen is used as the primary interface." More importantly, Morse defined the niche purpose of tablets to be stand-ins for laptop and desktop computers in instances when they are impractical due to their size and weight.

Until recently, Apple's iPad was the clear choice for consumers looking to purchase a tablet but with increasing popularity of tablets, a number of promising competitors have entered the market. They include Samsung Galaxy Tab running on Android operating system, particularly affordable Amazon Kindle Fire, and the Microsoft Surface tablet that promises superior functions (Bort 2013).[3]

Tablet Ownership in the United States

In May of 2011, comScore (2011), a company that measures various digital practices, collected data on digital traffic of non-computer devices in select countries.[4] Their analysis found that among non-computer device digital traffic in the US, tablet traffic was 22% compared to 68% for mobile phone devices. This suggested that tablets are accounting for a substantial amount of non-computer digital traffic despite having been widely used only since 2010. comScore further analyzed the digital traffic of tablets per operating system type and the result showed that Apple iPAD accounted for approximately 97% of tablet traffic in the US. Looking broadly, iPAD is the dominant tablet in most other markets too with approximately 89% of tablet digital traffic stemming from iPad across all markets as measured by comScore (Table 1.1). This is an impressive digital traffic share given that iPad was introduced only in April 2010. It is highly likely that there has been some shift in division of digital traffic both in terms of device type and operating system type since 2011. In comScore's report, e-reader digital traffic pales in comparison to that of tablet and contributes "only a very modest percentage."[4] E-readers are electronic mobile devices that are designed to be primarily used for reading e-books.

Table 1.1 Share of Tablet Traffic among Non-Computer Device Traffic for Selected Countries*

Country	iPad	Android	Other Tablet
Canada	33.5%	0.4%	1.3%
Brazil	31.8%	1.6%	0.0%
Germany	29.4%	0.9%	0.0%
Spain	27.4%	0.8%	0.0%
France	26.9%	0.6%	0.0%
Singapore	26.2%	1.4%	0.1%
Australia	25.9%	0.5%	0.0%
USA	21.8%	0.6%	0.1%
UK	21.3%	0.3%	0.0%
Chile	12.9%	0.6%	0.0%
Argentina	12.4%	0.4%	0.0%
Japan	11.3%	0.0%	0.0%
India	4.0%	0.5%	0.0%

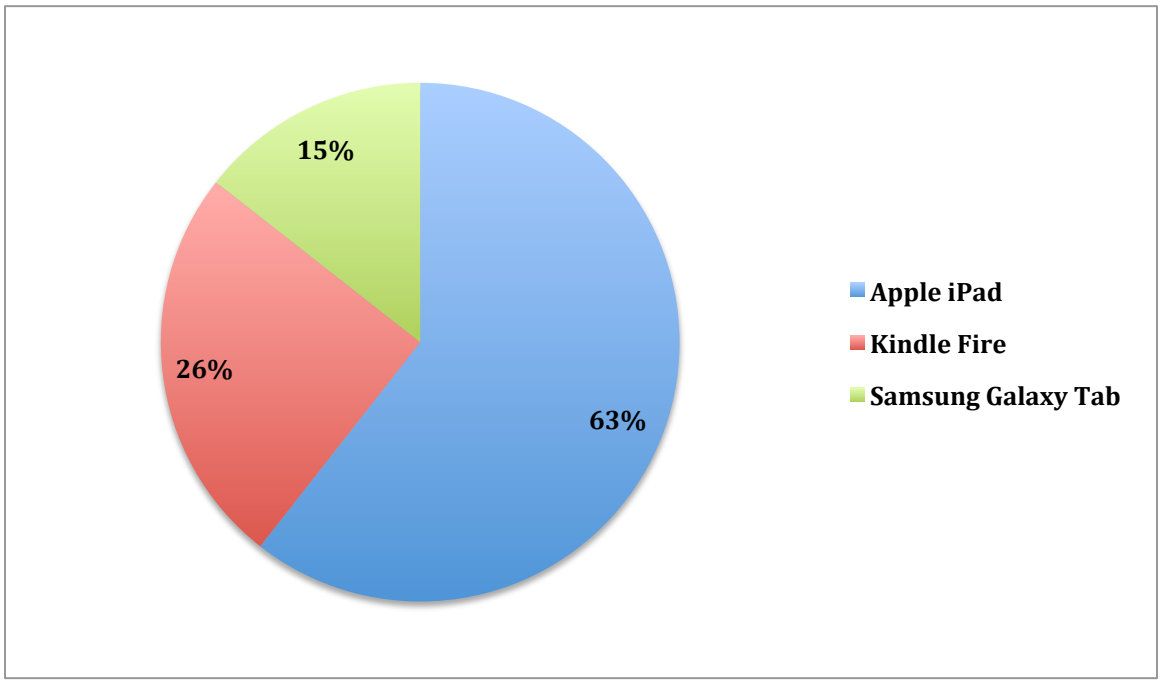
*Adapted from comScore (2011)[4]

In June of 2011, Dahlstrom *et al.* (2011) with EDUCAUSE Center for Applied Research (ECAR) conducted a national survey of 3,000 undergraduate students from 1,179 colleges and universities.[5] They looked at the respondents' use and perception of information technology. The study showed that students have a strong preference for mobile technology with almost 90% owning laptops, more than 50% owning smartphones, and 10% owning tablets. Of the 10% tablet owners, approximately 80% owned an Apple iPad. The study also noted that 67% of tablet owners used their device for academic activities, suggesting that there is a market for tablet use in undergraduate academia. In addition, ECAR found that e-book and e-textbook usage rate among students are relatively high at 57% although some of that usage may be for recreational purposes. Although the ECAR's report did not note the percentage of students who own e-readers, it asked how valuable each device type is for academic success when used by either the respondent or the respondent's instructor. Students' response indicated that both e-readers and tablets have an important place in students' academic arsenal with 33%, 26%, and 24% of

respondents selecting e-reader, non-iPad tablet, and iPad respectively as "extremely valuable for academic success."[5]

In January of 2012, the Pearson Foundation (2012) conducted a second annual national survey of student tablet usage with 1,206 college students and 204 college-bound high school seniors.[6] The survey found a sharp increase of tablet ownership since 2011 among the respondents – college students and high school seniors – from 7% to 25% and 4% to 17% respectively. This number is poised to grow with 63% of college students and 69% of high school seniors believing that textbooks will be replaced with tablets within the next five years (Pearson Foundation 2012).[6] The survey also noted that 36% of college students and 26% of high school seniors had an intention to purchase a tablet within the next six months. According to the Pearson Foundation's report, Apple iPad was the most popular tablet by a significant margin (63%) among the college student and high school senior owners of tablets. Amazon Kindle Fire and Samsung Galaxy Tab had a smaller market share at 26% and 15% respectively (Figure 1.1). Among the college student owners, 94% believed in tablet's value for educational purposes and three-quarters and three in five used tablets daily and multiple times a day respectively for activities related to school.[6]

Figure 1.1 College Students and High School Seniors Ownership of Tablets by Model*



*Adapted from Pearson Foundation (2012)[6]

More recently in May, 2013, International Data Corp. (IDC), the owner of IDC Worldwide Quarterly Tablet Tracker that tracks shifting tablet market, announced that "tablet shipments are expected to grow 58.7% year-over-year in 2013" (IDC 2013a).[7] The forecast also noted that lower-cost Android devices are primarily responsible for the market expansion rather than Apple iPads that have been at the forefront of the tablet market. Year-over-year data from IDC (2013b)[8] for the first quarter of 2013 supported that with three digit growth from Android devices including tablets from Samsung and ASUS (Table 1.2). The report indicated that further increase in consumer adoption of tablets will be fueled by declining tablet prices in the future. IDC's Research Analyst Ubrani also noted that Apple's iPad proved that tablets can be tools for education instead of being used only for games or content consumption (IDC 2013a).[7] Another relatively recent change to the tablet market is the size of the device. With introduction of 7-inch Android-based tablets followed by Apple iPad mini, IDC mentioned that the category of tablets that are less than 8 inches has overtaken larger tablets in terms of total units being shipped (2013a).[7] This is one of the areas that requires further investigation because larger tablets – Apple's first generation iPad had 9.7 inch display – may be more suitable for academic purposes of undergraduate students despite its declining popularity.

Table 1.2 Market Share of Top Five Tablet Vendors, 2013 First Quarter (Shipments in Millions)*

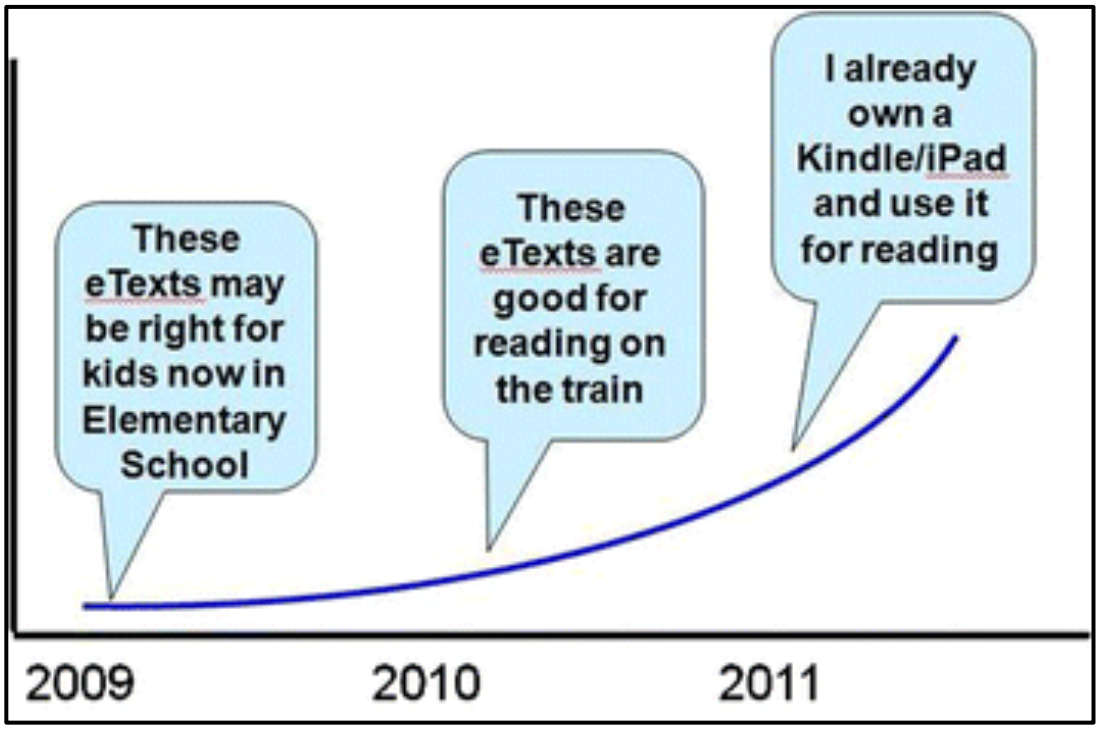
Vendor	1Q13 Unit Shipments	1Q13 Market Share	1Q12 Unit Shipments	1Q12 Market Share	Year-over-Year Growth
Apple	19.5	39.6%	11.8	58.1%	65.3%
Samsung	8.8	17.9%	2.3	11.3%	282.6%
ASUS	2.7	5.5%	0.6	3.1%	350.0%
Amazon	1.8	3.7%	0.7	3.6%	157.1%
Microsoft	0.9	1.8%	0.0	N/A	N/A
Others	15.5	31.5%	4.9	24.1%	216.3%
Total	***49.2***	***100.0%***	***20.3***	***100.0%***	***142.4%***

*Adapted from IDC press release (2013b)[8]

Weisberg (2011) was part of the team at the Sawyer Business School of Suffolk University that conducted a two-year longitudinal study on student attitudes toward the use of

electronic textbooks (e-textbooks) in the classroom.[9] The study began in 2009 and at the time of his publication, the study was ongoing. Weisberg's study discovered a shift towards e-reading devices, devices including tablets and e-readers, in terms of student readiness and use. In the beginning of the study in 2009, students noted that e-readers were not yet ready for higher education, but that elementary school students may be the right cohort for eventually using e-textbooks. By the middle of the study in 2010, the students were much more aware of e-reading devices and the devices came with some basic helpful features such as highlighting and annotation abilities. These students believed that e-reading devices were a great portable solution for a textbook. Towards the end of the study in 2011, students were even more aware of e-readers and additionally, tablets. The devices too had advanced to accommodate students' need for various interactive reading functions including note taking, note sharing, and note searching. By this time, many students had a preference for an e-reading device and several were owners of an e-reading device (Figure 1.2).

Figure 1.2 Acceleration of Student Readiness and Use*



*Adapted from Weisberg (2011)[9]

Undergraduate Students' Perception of Electronic Literature

Electronic literature has been available for many years now. In academia, one of the key areas of focus has been textbooks. E-textbooks are now, more than ever, available on all different subject areas and easily obtainable. It is possible that students are gaining more positive attitude towards e-textbooks with increase in their availability and ubiquity.

Weisberg (2011) reported from a two-year longitudinal study that began in 2009 that college students are becoming more receptive to e-textbooks and have a more positive attitude and behavior towards them.[9] Revelle *et al.* (2012) conducted a survey in 2009 that showed that graduate students and in particular, undergraduate students, were more likely to be receptive towards electronic literature than the faculty.[10] It is possible that the age difference between students and faculty is one of the causes behind the gap and like Weisberg noted, students are more welcoming of electronic literature. Weisberg noted that students saw value in having an e-textbook, but that the platform, e.g. laptop vs. e-reader, would determine whether the e-textbook would be used as a primary or secondary form of textbook.[9] In addition, Weisberg looked at student test scores based on various e-reading devices and reported that the devices were equivalent to printed texts in terms of students' learning of the course material – they neither improved nor hindered the learning. Weisberg's study also listed several key reasons why e-textbooks are helpful or unhelpful to students. Pros included convenience and portability, lower cost compared with print textbook, content search function, and the e-textbook being an appropriate media for the current generation. A study by Shrimplin *et al.* (2011) recognized the "searchability" function in particular as being helpful in academic work.[11] Cons included possibility of distraction – for example from a multitude of functions and apps on a tablet, greater comprehension opportunity from a print textbook, and personal preference of print textbook. Nonetheless, the student respondents from Weisberg's study felt that overall, e-textbooks provided them with increased efficiency.

Angeletaki conducted a pilot study using e-readers and tablets in 2010 at Norwegian University of Science and Technology (2011).[12] The author reported that in the beginning of the test, 94.4% of students preferred printed text to digital text from an e-reading device. Similarly to Weisberg's study (2011), some students were not "comfortable" with the technology.[12] However by the end of the semester long test, 80% of the students who used e-readers during the semester stated that they preferred digital texts on e-reading device over printed text. The author

added that students view accessibility and portability as the most important feature of digital texts on e-reading devices. This view is repeated in many studies including in a survey by Dahlstrom *et al.* (2011)[12, 5]

According to Li *et al.* (2011) who conducted an e-book academic usage survey among University of California academic community in 2010, regardless of the respondent's preference for print book or e-book, the ability to search an e-book content, one of the pros of e-textbooks according to Weisberg's study (2011) and the study by Shrimplin *et al.* (2011), was noted as the primary advantage of e-books over print books.[13, 9, 11] Furthermore, annotating and highlighting ability within the e-book platform was a key feature for the respondents, with those who prefer print books citing these two features as a hurdle in their adoption of e-books. Among undergraduate students, graduate students, postdoctoral researchers, and faculty and lecturers, Li *et al.* found that undergraduate students had the highest preference for print books.[13] This may be in opposition to Weisberg's study (2011) that stated that college students are becoming more inclined to use e-textbooks.[9] Li *et al.* conjectured that this could be due to the difficulties of reading online for an extended time as undergraduate students "commented on the difficulty they have learning, retaining, and concentrating while in front of a computer."[13] Another factor in preference of e-books over print books was the respondents' area of study or research. Respondents in the area of arts and humanities indicated highest preference for print books over e-books, followed by "social sciences, physical sciences and engineering, life and health sciences, and business and law.[13] This is similar to findings by Revelle *et al.* (2012).[10] In terms of e-book features, the respondents of the survey by Li *et al.* indicated that the ability to read on a mobile device or a dedicated e-book reader was not very important with only 36% and 32% rating those features as very or somewhat important respectively. This is in contrast to other features that were deemed more important such as the ability to download the e-book to a device for later use that garnered 93% of the respondents rating the feature as very or somewhat important.[13]

More recently according to Sloan (2012) who conducted a pilot test in 2011 with e-textbook and Apple iPad, college students preferred e-textbook to printed textbook.[14] During the pilot program, the students' perception of positive traits such as usefulness, ease of use, and enjoyment in use increased for the e-textbook. In addition, Sloan's students reported that it was

easier to learn with an e-textbook than a printed textbook while no students complained that e-textbooks made it more difficult to learn than a printed textbook.

In 2012, Rockinson-Szapkiw *et al.* (2013) conducted a study with undergraduate and graduate students on e-textbooks vs. print textbooks.[15] In their study, the authors found that the students who decided to use the e-textbook format primarily adopted that format because of portability and its lower cost compared to print textbook as did the respondents in studies by Weisberg (2011) and Li *et al.* (2011).[9, 13] The authors observed that there was no difference in cognitive learning and grades between e-textbook users and printed textbook users echoing the result from Weisberg's study (2011). Despite this, the e-textbook users had higher perception of skill acquisition compared with the print textbook users. Rockinson-Szapkiw *et al.* reported that the students "want to learn anytime, anywhere."[15] They added that although the students are ready to learn in a digital environment, the course content is hindering the students' desire because the course content is not yet ready to be fully integrated into a digital environment.[15]

Limitations of E-Readers

Since 2007 when e-readers became widely available, many studies have been conducted to evaluate effectiveness of e-readers in academic setting. Due to continual evolution, e-readers that were introduced in later years have more features that enrich their use in higher education settings. Studies that have been recently completed concluded that despite the additional features, e-readers are largely inadequate for use in higher learning, particularly against more powerful tablets as will be discussed later in this chapter.

In 2009, Princeton University conducted a pilot program using Amazon Kindle DX, an e-reader, involving 51 students (Princeton University 2010).[16] When asked to rank their reading experience, the majority of the students noted that print text and e-text were providing a comparable reading experience in terms of quality, quantity, speed, retention, and learning and comprehension. However in focus group discussions, participants noted that their retention was worse with Kindle DX due to its limitations on comparing documents and flipping and skimming through them. Kindle DX was criticized for several inadequacies including ability to highlight and annotate PDF files, lacking an organization system for storing similar readings together, and navigation within and between Kindle documents. Reed College conducted a similar study in

the same year (Marmarelli and Ringle 2009).[17] The same issues faced by Princeton University were also in play at Reed College and Marmarelli and Ringle (2009) remarked that the college community found Kindle DX "unable to meet their academic needs" particularly in the areas of highlighting, annotating, and interaction with text.[17]

In 2009 and 2010, Thayer *et al.* (2011) conducted a study to answer the question of how "students integrate e-readers into their academic reading practice."[18] The authors' location, University of Washington, was another one of several schools in the Amazon Kindle DX pilot program. From their research, Thayer *et al.* was familiar with various challenges facing e-readers including usability, navigation, and poor legibility. Perhaps confirming their initial concerns, towards the end of the program, only 36% of the students consistently integrated Kindle DX in their academic reading. This suggested that Amazon Kindle DX was insufficient for use in college setting. Thayer *et al.* looked further into e-reader's inadequacies and described three key issues regarding e-readers and academic use. The first issue was that the tested devices were not "designed to support responsive reading tasks" including annotating, commenting, underlining, and highlighting.[18] The study noted that students occasionally combined note-taking techniques such as using a notebook to take notes while using the e-reader to read, but the authors found such compromise problematic in part because the students could not easily make notes on the original document. Kindle DX supported some basic annotation capabilities, but these were far from being sufficient. The second issue was the importance of e-readers supporting switches in reading techniques, e.g. skimming to responsive reading, in the future. The third issue was a lack of user-friendly navigation. Thayer *et al.* stated that e-readers must have improved navigation capabilities so that students may complete tasks such as creating multiple simultaneous bookmarks and switching between reference lists.

Echoing earlier studies, Weisberg's study (2011) noted that student respondents reported Amazon Kindle and Sony eReader Touch to be not quite equipped for class use.[9] Angeletaki's study (2011) added that Amazon Kindle's lack of ability to interact with PDF documents induced negative comments from the students participants.[12] Amazon Kindle is another e-reader in the Amazon Kindle lineup of products that includes Kindle DX.

In 2010, Martinez-Estrada and Conaway (2012) conducted a study on e-books using Kindle at Tecnológico de Monterrey, a large university system in Mexico.[19] The authors used survey method to investigate whether e-book "increases student learning and engagement."[19]

This study shed a more positive light on Amazon Kindle contrary to previous studies. They reported that e-books did enhance student learning and engagement in classrooms. Almost three fourths of the respondents stated that using e-books with Amazon Kindle improved their classroom learning experience and 94% stated that they would recommend Kindle to other students for classwork. In addition, they reported that 94.3% of students indicated that Kindle made their learning experience better. Students made these positive remarks despite the previously cited Amazon Kindle's shortcomings. Furthermore, nearly three fourths of the respondents reported that they preferred the e-textbooks to printed textbooks. Martinez-Estrada and Conaway conjectured that possible reasons might include portability, novelty, and built-in dictionary. Although the authors found a substantial evidence of Amazon Kindle's capability in classroom, it is important to note that the focus of the study was narrow and only on e-textbook instead of incorporating features beyond e-textbook reading such as e-journal article reading or use of other media that may benefit students' academic environment.[19]

In 2010, Pollock (2012) conducted a pilot study at the Technical Library at Sandia National Laboratories evaluating e-readers (Amazon Kindle 2, Amazon Kindle DX, Sony Reader PRS300 Pocket Edition, Sony Reader PRS900 Daily Edition, Barnes & Noble Nook) and a tablet (Apple iPad) to examine how well the devices work with the library's collection and to compare the devices' usability and usefulness for Sandia employees.[20] The study uncovered various limitations of electronic readers. Sandia employees rated Kindle 2's small manual keyboard and the five-way control button to be possibly problematic. The study added that despite Kindle 2, Kindle DX, and Nook having numerous features supporting active reading such as highlighting and annotating, many of the features were unavailable for use with PDF documents. In the meantime, Sony Reader PRS300 was rated even more unsuitable for reading scientific documents due in part to its inability to support active reading features such as highlighting or annotating in any document format. As mentioned in previous studies, it is critical for college students to be able to interact with the text and e-readers greatly limit their usefulness by failing that.

Tees (2010) looked at several studies and came to the conclusion that e-readers are not suitable for college coursework.[21] The author echoed other authors and reported that e-readers are suitable as a fiction-reading device. Tees concluded that in order for e-readers to be helpful in an academic setting, they needed to allow for more interactive reading by including features

such as highlighting and annotating for a variety of documents. The author added that texts with graphs and color images did not function properly. This is a significant limiting factor because many textbooks and other student study materials include such figures. It is necessary for students to have an easy access to them.

In Huthwaite's study (2011) conducted at Queensland University of Technology, Amazon Kindle's navigation was again rated unfavorably due to its difficulty of use.[22] In contrast, Kindle was reviewed favorably for features such as text searching, text highlighting, bookmarking, annotation, wireless connectivity, and the built-in dictionary. Although the above features were rated positively in this study, it is important to note that such features were not satisfactorily working on different types of documents that students would regularly be exposed to. Additionally, some students appreciated the availability of the qwerty keyboard while simultaneously being critical of its small size.

In Foasberg's study (2011) that was conducted in 2010 at Queens College, students were vocal about many drawbacks, but not about benefits, of e-readers.[23] The negative comments included e-readers' limited highlighting function, battery life, and the small size of the screen. They also noted price as one of the most important drawbacks. At the time of the study, both Amazon Kindle and Barnes and Noble Nook cost close to $300. Foasberg also reported that students determined portability, convenience, and storage as the particularly important traits for a device such as an e-reader.

In a study comparing Amazon Kindle 3 to Apple iPad, Bayliss *et al.* (2012) found further evidence that corroborated the limitations e-readers face in a higher learning environment: participating college students who were exposed to Kindle had higher desire to purchase an e-book reader for recreational reading, but not for academic reading.[24] The reasons are unknown, but supports a similar claim made by Tees (2010) who stated that e-readers are suitable as a fiction-reading device.[24, 21]

In Support of Tablet Use

Since the introduction of Apple iPad in 2010, there have been a number of studies looking at effectiveness of iPad in college classroom settings. The studies generally indicated that iPads have value in higher learning despite a number of necessary improvements. Many

authors stated that students are particularly satisfied with usability, functionality, and portability of iPad while there was criticism of its high price and some confusion over the best use of all its capabilities.

Before Apple iPads were introduced in the market, Alvarez *et al.* (2011) conducted a study in 2009 with graduate students in Chile comparing netbooks and low-cost tablets.[25] The study utilized several lesser-known tablets that are no longer widely available. The authors incorporated in the study several capabilities including drawing using the devices and hence a standard e-reader would not have been adequate. Alvarez *et al.* also evaluated the physical forms of netbooks and tablets and how they affect student communication in a group setting. They reported that tablets and netbooks used in a slate format promoted "fluid physical and verbal interaction between students, stimulating person-to-group dialogue and integrating all group members in group discussions."[25] Currently popular tablets are almost all based on slate format, so this possibly suggests that tablets are filling in a niche need in a higher learning environment that are not met by more cumbersome laptops.

Huthwaite (2011) at Queensland University of Technology compared several e-readers, Apple iPad, and Apple iPhone for usability and functionality for use with the university library's collection.[22] The author noted that the university's Ebook Reference Group (ERG) felt that Apple iPad's larger screen made reading more enjoyable whether using a mobile application (app) or the Safari web-browser for reading. ERG also commented that iPad felt somewhat too large to be considered as a pure e-reading device. In the study, student focus groups were conducted to evaluate usability, functionality, accessibility, and compatibility with the university library's e-book collection. Regarding usability, students cited many positive aspects of iPad such as the color screen and the ease of navigation. Students also reported several negative aspects including that iPad was too heavy and was prone to having glare on the screen which made reading difficult. Apple iPad scored high on functionality with color touch screen, processing speed, internet access, printing capabilities, and other useful functions.

Marmarelli and Ringle (2011) at Reed College repeated their 2009 Kindle DX pilot study with Apple iPad in 2010.[26] Their aim was to evaluate the applicability of tablets for learning and teaching activities and to assess whether iPad had solved issues that were present in the Kindle pilot study. The participants noted many positive aspects of iPad including legibility supported by iPad's LCD screen, suitability of the shape for not disrupting group work – by creating a

barrier similar to conclusion from the study by Alvarez *et al.* (2011), and the battery life.[26, 25] The respondents also reported a couple of weaknesses including keyboard that is not suitable for efficient typing and a lack of centralized file management system that can assist in organization. However, the students were optimistic in view of Apple iPad and stated their plans to continue using iPad in their academic work and to recommend iPad to their friends for schoolwork. The authors were surprised that all participants decided to purchase the iPad they used throughout the course even given the 50% price discount that were offered to the participants at the end of the study.[26]

Sloan (2012) studied college students' reception of Apple iPad and e-textbook.[14] The overall responses from the students were very positive. Some of the most popular capabilities of iPad were ones that supported interacting with e-textbook such as "highlighting, annotating, note-taking, and search features."[14] Several physical features of iPad including portability and handiness were also found to be popular with the students. However, the students also reported several negative aspects about Apple iPads. Sloan (2012) stated that some of her students found iPad to be "not as functional as a personal computer and yet not as simple as some of the other e-readers" and therefore contributed to the difficulties of justifying the high cost.[14] Angeletaki (2011) reported similar account where the students stated that Apple iPads are too expensive.[12] Currently, with an influx of tablets available for purchase, the price of a non-Apple iPad tablets have become highly competitive.

In the study conducted at Sandia National Laboratories, Pollock (2012) reported that Apple iPad ranked higher than e-readers for ease of use as well as probable use in the work setting involving reading scientific documents.[20] Features such as color display, auto-rotation ability, and touch screen made the tablet more preferable. Findings by Bayliss *et al.* (2012) further confirmed consumers' perception of tablet as a useful device in a higher learning environment.[24] The study participants who were exposed to Apple iPad had increased desire to purchase a tablet for academic reading as well as for recreational reading.

Miller (2012) was a part of the iPad Faculty Learning Communities (FLC) at Indiana University-Purdue University Indianapolis (IUPUI).[27] The University Information Technology Services at Indiana University worked with faculty at IUPUI to pilot a study integrating iPads into class instruction in various disciplines. As part of the program, faculty members would each get an iPad for teaching and up to 40 more iPads for student use. In the department of Computer,

Information, and Leadership Technology, Organizational Leadership and Supervision program, one of the faculty members of the FLC attempted to implement iPads into a fully online class. Miller reported that this class was enriched through use of audio and visual media enabled by iPads. The author concluded that using iPad just as an e-reader "taps only a small part of its potential, limiting the iPad to a consumption rather than a production device."[27] He added that for iPads to become more useful and integrated into higher education, "the device must transcend information consumption and show its potential as a producer of the artifacts of learning."[27] At the conclusion of IUPUI's study, Miller reported that students found iPads to be a contributing component of their learning and engagement. However, several students described difficulties they had with iPad including time wasted when iPad did not function properly, difficulties of taking full advantage of everything that iPad had to offer, and opportunities for distraction provided by iPads.

In a recent study by Dodds *et al.* (2013) that was conducted in 2011, iPad was noted as being a "suitable device for use in the classroom."[28] The authors further confirmed that the size of an iPad was an advantage while the lack of keyboard and the price were disadvantages.

Tablets Versus E-Readers

Both e-readers and tablets have pros and cons when under consideration for use by college students. However, in several studies that compared the devices, tablets are consistently at least as good as, or better than e-readers. In view of additional capabilities present in tablets that are yet to be thoroughly explored, tablets become an even more attractive candidate to support student learning.

Marmarelli and Ringle (2009 and 2011) were able to conduct pilot studies with Amazon Kindle DX and then Apple iPad.[17, 26] In their study, they made several comparisons, most of which were in iPad's favor. One such comparison was on navigation where iPad was praised for user-friendly touch screen that allowed for rapid navigation between texts while Kindle DX was criticized for its "barely adequate" joystick approach. Students reported no difference in durability or portability between iPad and Kindle DX despite iPad being 0.3 lb heavier. The authors stated that although it was slightly too awkward to quickly switch applications due to updated operating system not being available at the time, it was still quick enough to be helpful

in a classroom when students had to rapidly search for information. The participants did note the possibility of distraction from coursework similar to the respondents in Weisberg's study (2011).[9] Compared with students that used Kindle DX, Marmarelli and Ringle found that students that used iPad were not printing as much reading materials. The students who used Kindle DX reported that they needed to have a printed text to annotate effectively.

Huthwaite (2011) with Queensland University of Technology's Ebook Reference Group (ERG) found that compared with the grayscale e-reader screens, the high-resolution LED-backlit color screens on Apple iPads were considered more enjoyable.[22] At the same time, other members of the ERG found LED-backlit screens to be more tiring on the eyes. Apple iPads were also noted as having occasional glare problems. Additionally, Huthwaite noted that compared with intuitive buttons and menus on Apple iPads, e-readers in general had a more cumbersome navigation. An exception to that was the Sony Reader Touch and Pocket Editions which operated with touch screens. In the university's student focus group, students preferred the Amazon Kindle the most followed by Apple iPad in their rating. However the focus group's discussion suggested that students actually preferred the Apple iPad. In general, the group also viewed e-reader as having slow processing speed while iPad was much faster.

In a study conducted by Weisberg (2011), college students answered questions on when they would use e-textbook as a primary or a secondary textbook.[9] Secondary textbook would be useful in instances such as researching a specific topic for an assignment or looking at selected portion in order to study for a test. Weisberg reported that 71% of students would use e-textbook on their computer as a secondary textbook, but with e-readers and tablets, 26% and 29% respectively would use the device as a primary textbook and 65% and 54% respectively would use the device as a secondary textbook. This may be representative of the student attitude that e-reader and tablet will suffice equally if they are to be used only for reading an e-textbook.

Bayliss *et al.* (2012) compared Amazon Kindle 3 e-book reader with Apple iPad and found that participants read more slowly from an iPad than a print copy while their reading speed for Kindle 3 was similar to a print copy.[24] Despite this, the respondents rated iPad as the easiest to use followed by Kindle 3, then the printout. Also of note is that exposure to Kindle 3 did not increase the participants' desire to purchase an e-book reader for academic reading while exposure to iPad increased the participants' desire to purchase a tablet for academic reading as well as for recreational reading. This may be suggesting that e-readers are failing to present

practical utility in an academic setting despite providing portability and accessibility for current consumers.

Martinez-Estrada and Conaway (2012) cited several reasons for why they chose to conduct the study using Amazon Kindle instead of Apple iPad.[19] They determined that Kindle offered a variety of e-textbooks at lowest prices. This was an important consideration because the authors were primarily focused on e-textbook use. Furthermore, the cost of a Kindle was substantially lower than the cost of an iPad and the faculty with experience using Kindle found the device to be a "good, basic reader."[19] This supported the conclusion from other studies that described similar preference for tablet and e-reader when the chief goal is to use the device with e-textbooks. In recent times, the market for e-readers and tablets has changed drastically. There are now many more affordable tablets that compete with costly Apple iPad that may still be suitable for college student use (Table 1.2 and Table 1.3).

Table 1.3 Cost of Available E-Readers at Best Buy Manhattan, KS on June 5th, 2013

E-Reader Models	Cost ($)
Amazon Kindle WiFi Paperwhite	119.99
Amazon Kindle Paperwhite	69.99
Barnes and Noble Nook Glowlight Simpletouch	119.99

Table 1.4 Cost of Selected Tablets at Best Buy Manhattan, KS on June 5th, 2013

Tablet Models	Cost ($)
Samsung Galaxy Tab 2 7.0	179.99
Samsung Galaxy Tab 2 10.1	349.99
Samsung Note 8.0	399.99
Samsung Galaxy Note 10.1 Tablet	449.99
Amazon Kindle Fire 7”	159.99
Amazon Kindle Fire HD 7”	199.99
Amazon Kindle Fire HD 8.9”	269.99
Acer iConia Tab A110	249.99
Barnes and Noble Nook HD	199.99
Lenovo ideaTab A2107	129.99
Lenovo IdeaTab A2109	249.99
Lenovo Ideatab Lynx Tablet	499.99
ASUS Memo Pad Smart 10.1 Tablet	299.99
ASUS Vivo Tab Smart Tablet	399.99
ASUS Vivotab RT	539.99
Microsoft Surface RT	599.99
Microsoft Surface Pro	899.99
Apple iPad Mini WiFi 16 GB	329.99
Apple iPad Mini WiFi and Cellular 16 GB	459.99
Apple iPad with Retina Display Wi-Fi 16 GB*	499.99
Apple iPad Mini WiFi and Cellular 64 GB	659.99

* Price for this model was taken from www.bestbuy.com on July 9th, 2013.

Mobile Applications

A mobile application (mobile app or app) is an important element when discussing tablet capabilities. Apps are software applications that can operate on tablets as well as other mobile devices. Apps can greatly enhance a student’s tablet experience by providing them with

additional capabilities, similar for example to how Microsoft PowerPoint allows computer users to create complex slideshows for presentations.

According to Sloan (2012), students liked the utility of apps used in conjunction with e-textbooks. Apps improved student experience with note taking and communication among other features.[14] In a study conducted by Pollock (2012), apps contributed to increased preference for Apple iPads.[20] Apple iPads were able to use several helpful apps designed for reading PDFs including GoodReader, iAnnotate, and PDF Reader Pro Edition that allowed the reader to annotate, highlight, and complete other functions, optimizing user's PDF document reading experience. Even if the device itself does not fully support a certain document, wide availability of various apps make it possible for students to use that document with a tablet, which increases tablet's appeal to students.

Tees (2010) reported that universities working with e-textbooks found apps such as CourseSmart effective and beneficial.[21] Weisberg (2011) noted that apps such as CourseSmart are helpful to students too in accessing their e-textbooks.[9] Huthwaite (2011) reported that Queensland University of Technology's student focus groups viewed Apple iPad apps as highly valuable.[22] Marmarelli and Ringle (2011) noted that availability of apps such as iAnnotate PDF allowed students to switch between documents as well as search within text along with help from iPad's faster processing speed.[26] Such apps were also helpful in highlighting and annotating, which is one of the key activities students feel are important for academic reading. The authors added that there is still room for further development of apps as the available apps at the time of study could not optimally manage document in terms of file transfer and synchronization that would ensure that students have access to their marked-up texts.

Impact of Size

Previous studies have touched on the issue of e-reading device size. These studies generally looked at either the size of e-readers, which tended to be small, or the size of tablets, which tended to be large. However none of these studies have carefully looked at different sizes of tablets. With growing consumer interest in tablets, many manufacturers have released smaller tablets that are still larger than e-readers. It remains to be seen what the most beneficial size of tablets are for college students.

As mentioned earlier, IDC (2013a) reported that larger tablets – first generation Apple iPad had 9.7 inch display – that used to be considered optimal is now being outsold by tablets that have smaller – under 8 inches – displays.[7] It is unclear whether consumer preference for size is due to price, function, appearance, or some combination thereof. In particular, college students' preference in regards to size should be studied to verify the optimal size for academic use.

In the study conducted by Pollock (2012), participants had a mixed opinion of the size of the 6 inch electronic screen of Kindle 2, an e-reader.[20] Several participants noted that Kindle 2's small screen caused a problem when the font size could not be changed. PDF documents in particular were an issue because they often contained columns or captions and zoom feature was too cumbersome for use. Further along the size scale, Sony Reader PRS300, an e-reader with 5 inch screen, was noted as having too small a text to read even at the largest text size setting. Comparatively, Kindle DX, with its 9.7 inch screen, was reviewed more favorably because the large screen made viewing PDF documents easier. Similarly in Foasberg's pilot survey (2011), students criticized e-readers for their small screen.[23]

Impact of Tablet Operating System

Tablets can run on one of several Operating Systems (OS) including iOS for Apple iPads; Android for a variety of brands such as Amazon Kindle Fire, Samsung Galaxy, and Asus Nexus; and Windows 8 or Windows RT for Microsoft Surfaces. It is possible for an app to be compatible with only one OS and not operate on other OSs (Marmarelli and Ringle 2011).[26] The type of OS is one of the most important considerations when buying a tablet mostly due to availability of apps (Consumer Electronics Association 2012).[29] However with the emergence of two top OSs, app producers have begun to cater to both OS and many apps are now available on both iOS and Android OS. Studying the effect of tablet OS in an academic setting is a complex process due to the issue being a very personal choice complicated by brand loyalty and compatibility with existing devices among other concerns.

Earlier in 2013, IDC released data on market share of each OS (2013b).[8] The report suggested that Android OS grew at a much faster pace than iOS and now has the top market

share (Table 1.5). Windows OS for Microsoft Surface, which was introduced late last year, also had an impressive year-over-year growth but so far has a very small market share.

Table 1.5 Market Share of Tablet Operating Systems, 2013 First Quarter (Shipments in Millions)*

Vendor	1Q13 Unit Shipments	1Q13 Market Share	1Q12 Unit Shipments	1Q12 Market Share	Year-over-Year Growth
Android	27.8	56.5%	8.0	39.4%	247.5%
iOS	19.5	39.6%	11.8	58.1%	65.3%
Windows	1.6	3.3%	0.2	1.0%	700.0%
Windows RT	0.2	0.4%	0.0	N/A	N/A
Others	0.1	0.2%	0.2	1.0%	-50.0%
Total	***49.2***	***100.0%***	***20.3***	***100.0%***	***142.4%***

*Adapted from IDC press release (2013b)[8]

Role of Academic Libraries

For the most part, academic libraries have not been able to keep pace with rapidly rising use of tablets. It is unclear what type of support the students want from their library besides a more extensive list of materials. It would be helpful to be able to prioritize the types of material students want in addition to other types of support. Additionally, several studies below comment on the difficulty of creating a lending system that can handle particular challenges of tablets due to licensing and formatting issues. All interested parties including students, academic libraries, publishers, and distributors must work together to find a solution.

In Princeton's study (2010), students commented that they would like to have more course readings available for their Kindle.[16] In 2010, Foasberg (2011) included an e-reader portion at Queens College's Student Technology Survey.[23] He found that 86% of the students who own e-readers purchased the e-reading materials through the e-reader's vendor, e.g. Amazon. Foasberg stated that one possible reason might be that libraries do not have enough materials for e-readers. Despite owning a significant e-book collection, technical and legal issues prevent libraries from being able to lend the material out to owners of e-readers.

For libraries, the rising popularity of tablets may be particularly welcome. Unlike e-readers, tablets can more fluidly work with different document formats through apps. For example, Dewan (2012) at Wilfrid Laurier University Library in Canada stated that electronic journals are tremendously popular with students and that their ease of access is making print journals obsolete.[30] Although electronic journal articles may be difficult to use with e-readers due to its frequent PDF format, tablets have been able to bypass this issue through the use of applications in Pollock's study (2012) and in Marmarelli and Ringle's study (2011).[20,26] In another example, Walters (2013) echoed the same concerns that many others have voiced: that commonly used e-book formats are not compatible with any e-readers.[31] Apps may help resolve the issue in this instance.

Cassidy *et al.* (2012) conducted a survey in 2011 with 322 graduate students and faculty members focusing on both the user and the non-user of library e-books and e-books in general.[32] Although the study did not focus on undergraduate students, it nonetheless shed light on possible issues libraries may face. They found that 40% of graduate students and 37% of faculty have used e-books from the library while 68% of graduate student non-users and 47% of faculty non-users indicated that they would probably or definitely use e-books in the future. Among the users, 28% preferred e-books and 31% preferred print books with a main reason being tangibility. The authors reported that despite 53% of users and 51% of non-users owning an e-reading device, 82% of non-users indicated that they were more likely to use e-books from library if they had access to an e-reading device.

Directly relevant to libraries' support of future undergraduate students, Cassidy *et al.* (2012) found that 75% of faculty were willing to recommend e-books to their undergraduate students.[32] In such instances, students may want libraries to offer several copies of course e-books that they can check out as a reference material. The authors reported that irrespective of their preference for electronic or print books, 74% of faculty users and 76% of faculty non-users would like the library to purchase more e-books in their field of study. Despite such high percentage of respondents desiring additional e-books, Cassidy *et al.* found that 62% of respondents had either not used e-books from the library at all or not used the non-reference and largely single-subject works. The authors mentioned this fact as particularly surprising because libraries are spending a large portion of their resources on these works. Of the 38% of respondents who were users, 54% reported their dislike of library e-books specifically or dislike

of all e-books in general. Cassidy *et al.* did not provide concrete reasons for the dislike, but they specified several issues that were important to the graduate student and faculty respondents including e-book features – highlighting and annotating – and accessibility and portability. These are the same concerns undergraduate students expressed in previously mentioned studies. Among the issues, the one that is particularly relevant to libraries is single versus multiple user access. Oftentimes, e-books are accessibly by only one e-reader at a time. This is a problem that needs to be discussed with participation from libraries, vendors, and publishers toward the goal of developing user-friendlier licensing terms.[32]

In college and university libraries, students can access numerous e-journals as well as academic books, video recording, sound recording, etc. It would be beneficial to understand whether the provided academic electronic resources are adequate for undergraduate students and whether tablets may aid in accessing such information.

Research Objectives

From past studies, it is apparent that tablets can be helpful and are desirable to college students. However due to the rapidly changing market, it is largely unclear which of the current lineup of tablets is the most suitable option for college students. As previously stated, it is also unclear what type of support college students require from their school libraries. In order to clarify these problems, this study will attempt to accomplish the following objectives. 1) Determine the most beneficial tablet size for college students in their academic pursuits, and 2) Determine the necessary types of support from academic libraries for college students conducting academic work using a tablet.

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Chapter 2 - Evaluation of Tablets for Undergraduate Schoolwork

Abstract

To understand the utility of tablets, we conducted a consumer study of undergraduate students to: 1) Determine the most beneficial tablet size for students in their academic pursuits and 2) Determine the necessary type of support from academic libraries for student tablet users. Overall, students preferred larger tablets for academic use. The library's instant messaging feature was found to be equally successful in both full and mobile website when used with a tablet. Many students who use HTML only or both HTML and PDF formats to view e-journal articles on a computer switched to PDF only when on a tablet.

Introduction

A form of electronic reading (e-reading) device has been available for decades and there are many studies on that subject. We understand from these studies that such devices may be helpful to college students. However these devices are very dissimilar to devices currently available. Even some devices that are recognized as immediate precursors to the current devices are far lacking in features compared with current devices. At present time, it is largely unclear which of the current lineup of tablets is the most suitable option for college students and how academic libraries can best assist these tablet users. In order to answer these questions, we conducted a consumer study of undergraduate students to determine the most beneficial tablet size for college students in their academic pursuits and necessary types of support from academic libraries for college students conducting academic work using a tablet.

Literature Review

In 2010, Apple released its first tablet, iPad, and brought tablets into the mainstream of devices available for US consumers. According to Morse (2011),[1] a tablet is a "medium-sized portable personal computer where a pen or touchscreen is used as the primary interface." Until recently, Apple's iPad had dominated the market but with increasing popularity of tablets, a number of promising competitors have entered the market. They include Samsung Galaxy Tab running on Android operating system, particularly affordable Amazon Kindle Fire, and the

Microsoft Surface tablet that promises superior functions (Bort 2013).[2] In May of 2011, comScore (2011) reported that among non-computer device digital traffic in the US, tablet traffic was 22% compared to 68% for mobile phone devices suggesting that tablets play a substantial role despite having been widely used since only about 2010.[3]

Dahlstrom *et al.* (2011) and the Pearson Foundation (2012) found that tablets have educational value for undergraduate students.[4, 5] More recently, International Data Corp. (IDC), announced that the category of tablets that are less than 8 inches has overtaken larger tablets in terms of total units being shipped (2013).[6] This is one of the areas that requires further investigation because larger tablets may be more suitable for academic purposes of undergraduate students despite its declining popularity. Weisberg (2011), Revelle *et al.* (2012), and Sloan (2012) showed that undergraduate students are receptive towards electronic literature.[7, 8, 9] Weisberg's study noted that pros of e-textbook included convenience and portability, lower cost compared with print textbook, content search function, and the e-textbook being an appropriate media for the current generation. A study by Shrimplin *et al.* (2011) recognized the "searchability" function in particular as being helpful in academic work.[10] Dahlstrom *et al.* (2011) and Angeletaki's study (2011) found that students view accessibility and portability as the most important feature of digital text on e-reading devices.[4, 11]

Since 2007 when electronic readers became widely available, many studies have been conducted to evaluate effectiveness of e-readers in an academic setting. Studies that have been recently completed concluded that e-readers are largely inadequate for use in higher learning, particularly against more powerful tablets (Weisberg 2011; Angeletaki 2011; Princeton University 2010; Marmarelli and Ringle 2009; Thayer *et al.* 2011; Pollock 2012; Bayliss *et al.* 2012).[7, 11, 12, 13, 14, 15, 16] In contrast, studies by Sloan (2012), Huthwaite (2011), Marmarelli and Ringle (2011), Miller (2012), and Dodds *et al.* (2013) found Apple iPad to be helpful to students in conducting academic work due to reasons such as large LCD screen, color touch screen, processing speed, internet access, printing capabilities, and the ability to interact with e-texts via annotations, highlights, and search functions.[9, 17, 18, 19, 20] A mobile application (app) is an important element when discussing tablet capabilities because they can provide users with many additional capabilities. According to Weisberg (2011), Sloan (2012), Pollock (2012), and Tees (2010), apps played an important role in increasing students' preference for tablets.[7, 9, 15, 21]

Previous studies have touched on the issue of e-reading device size. These studies generally looked at either the size of e-readers, which tended to be small, or the size of tablets, which tended to be large. However none of these studies have carefully looked at different sizes of tablets. It is unclear whether consumer preference for size is due to price, function, appearance, or some combination thereof. In particular, college students' preference in regards to size should be studied to verify the optimal size for academic use. In Pollock's study (2012) and in Foasberg's study (2011), the participants criticized e-readers for having small screens.[15, 22]

For the most part, academic libraries have not been able to keep pace with rapidly rising use of tablets. It is unclear what type of support students want from their libraries although they generally want a library to provide more material (Princeton 2010).[12] Foasberg (2011) found that 86% of the students who own e-readers purchased the e-reading materials through the e-reader's vendor, e.g. Amazon, possibly because libraries do not have enough materials for e-readers.[22] For libraries, the rising popularity of tablets may be particularly welcome. Unlike e-readers, tablets can more fluidly work with different document formats through apps. For example, Dewan (2012) stated that e-journals are tremendously popular with students and that their ease of access is making print journals obsolete.[23] Although e-journal articles may be difficult to use with e-readers due to its frequent PDF format, tablets have been able to bypass this issue through the use of apps in Pollock's study (2012) and in Marmarelli and Ringle's study (2011).[15, 18] Furthermore, Cassidy *et al.* (2012) found that 75% of faculty were willing to recommend e-books to their undergraduate students.[24] In such instance, students may utilize library to gain access to e-books. It would be beneficial to understand whether tablets may aid in accessing library's academic electronic resources.

Research Objectives

From past studies, it is apparent that tablets can be helpful and are desirable to college students. To find out which of the current lineup of tablets is the most suitable option for college students and to understand what type of support college students require from their school libraries, this study will attempt to accomplish the following objectives. 1) Determine the most beneficial tablet size for college students in their academic pursuits, and 2) Determine the necessary types of support from academic libraries for college students conducting academic work using a tablet.

Materials and Methods

Focus Groups

Panelists

Nineteen undergraduate students from Kansas State University in Manhattan, KS participated in three focus groups of 5-8 persons per group. Each focus group was evenly split in terms of gender with a 5-person group consisting of 3 males and 2 females. The participants were recruited via a posting on the daily university e-newsletter. The participants were screened to be owners of a tablet or a tablet-like electronic mobile device, including a touchscreen based smartphone, who have used the device within the past week and were willing to bring the device to the focus group meeting.

Setting

Focus group discussions took place in a well-lit room in Human Ecology building of Kansas State University in September 2013. The room shared a wall with another room where a researcher took notes and videotaped the sessions behind a two-way mirror. The focus group room contained a large round table in the center of the room. The participants and the moderator sat around the table with the moderator's back to the two-way mirror. A dry-erase board was set up a few feet away from the table to the right of the moderator. The participants were served snacks and water.

Test Design and Group Discussion

A moderator with training from RIVA Training Institute (Rockville, MD, USA) moderated all three focus groups and participated in refining of the moderator's guide. Focus groups lasted approximately 80-90 minutes. The participants signed an informed consent form prior to the discussion and received payment and debriefing statement at the end of the discussion. The group discussion topics closely followed moderator's guide and all three focus groups were able to discuss all main topics of interest per moderator's guide. Main topics covered by the moderator's guide included what undergraduate students consider academic work, why some materials are better suited for tablets, pros and cons of different tablet sizes, other academic materials wanted by undergraduate students, and how the library can better support the undergraduate tablet users. For the portion on improving the library support,

participants were encouraged to use their own device. Throughout the focus group portion of the study, small tablet size referred approximately to the size of an Apple iPhone, medium tablet size referred approximately to the size of an Apple iPad Mini, and the large tablet size referred approximately to the size of an Apple iPad.

The researcher behind the two-way mirror took extensive field notes during the discussion. The participants were aware that they were being audio and video recorded and that a researcher was observing the group discussion. At the completion of each focus group, the moderator and the researcher compared notes on overall and specifics of the group discussion.

Data Analysis

Immediately following each focus group discussion, the moderator and the researcher reviewed the session to ensure that both parties are in agreement as to what transpired and what insights were gained from that group discussion. Within several days of the completion of the three focus groups, the researcher pooled data from all three group discussions and derived main themes and specific insights from them. The participants were not asked for feedback on the analyzed data.

Consumer Survey

Samples

Eight tablets were obtained from various retail outlets that were available in Kansas. The eight tablets comprised of two titanium silver Samsung Galaxy Tab 2 (10.1) tablets, two titanium silver Samsung Galaxy Tab 2 (7.0) tablets, two white Apple iPad 2 tablets, and two white Apple iPad Mini tablets. Physical properties of tablets are listed in Table 2.1

Table 2.1 Physical Properties of 4 Types of Tablets*

Tablet Type	Body Height (in)	Body Width (in)	Body Depth (in)	Display Size (diagonal in.)	Weight (lb)
Galaxy 10.1	6.9	10.1	0.38	10.1	1.28
Galaxy 7.0	7.6	4.8	0.41	7.0	0.76
iPad 2	9.50	7.31	0.34	9.7	1.33
iPad Mini	7.87	5.30	0.28	7.9	0.69

*Data compiled from www.samsung.com and support.apple.com.[25, 26, 27, 28]

Sample Preparation

In order to maintain homogeneity of the home screen's appearance within the constraints of operating system, only the essential apps and shortcut icons used in the study were visible. The shortcut icons for the study were a shortcut to the book used for the reading section, note taking app Evernote (Evernote, Redwood City, California, USA) for the note taking section, shortcut to a journal article for the e-journal article format section, and a web browser. Additionally, iOS tablets needed an app, Skitch (Evernote, Redwood City, California, USA), on the home screen because unlike the Android tablets that allowed users to use Skitch through Evernote, iOS tablet users needed to access Skitch separately from Evernote. Both shortcut icons opened their content on the web browser. To ensure that every consumer received tablets in the same condition, a member of the research team closed the browser, cleared the notes, and wiped off fingerprints on tablets prior to distribution. Tablets were charged in between usage. Tablets were connected to the Internet via Wi-Fi.

Consumers

One hundred twenty-one undergraduate students from Kansas State University in Manhattan, KS participated in the study over seven weekdays. The participants were recruited via a posting on the daily university e-newsletter, flyers in the student union and the main library of the university campus, business cards that were handed out in the library by a researcher, and chalk announcements written on the sidewalk immediately surrounding the library. Recruiting materials indicated the times and the location of the study. The students took part in the study in the order that they arrived at the study location. Up to four participants were able to complete the questionnaire at the same time.

Setting

In October 2013, the consumer survey took place in a small study room at the main library, Hale library, of Kansas State University. The well-lit room contained a desk that can comfortably sit six students. The room was enclosed in the building with windows looking out to the library study area. At any given time, a maximum of four participants and two researchers sat in the room.

Test Design

An alternating set of two sizes of Android OS tablets and a set of two sizes of iOS tablets were given to consumers in the order of entrance to the testing room. Depending on the availability of tablets, a set out of alternate order was also given to participants. Four of the six sections of the questionnaire required the participants to use one or both sizes of tablets in a particular order. There were eight combinations of tablet size viewing order for each OS for a total of sixteen different viewing order and device combinations. The presentation order of sixteen questionnaire (each containing a specific viewing order and device assignment) were completely randomized and that random order was repeated.

Sample Evaluation

After signing the informed consent form, a consumer was provided with a survey questionnaire, two different sizes of tablets, a pen, and one page instruction sheet on how to use a particular tablet and its applications. In addition, a member of the research team verbally explained important contents of the instruction sheet. A respondent returned all material to the research team upon completion of the questionnaire then was paid $10 and given a debriefing statement.

The survey questionnaire had six sections. The first section consisted of demographic and technology usage questions. The second section evaluated tablets' reading function. In this section, pages 5 and 17 of the book *Financial Crisis and Free Market Cure* by John Allison was provided as a reading material (Allison 2012).[29] The book was chosen because of its availability through the website CourseSmart. CourseSmart is "the world's largest library of eTextbooks and digital course materials that instructors could access instantly" and therefore was an appropriate way to evaluate how an undergraduate student may use tablet for reading course material (CourseSmart 2013).[30] Through the website, consumers were given the option to use its table of contents to quickly navigate the book. The particular pages 5 and 17 of the book were chosen because they were of similar length between 1250 and 1350 characters and of similar mean syllables per word at 1.58 and 1.49 mean syllables per word.

The third section looked at tablet's note taking function. This section required consumers to use Evernote/Skitch. These apps were chosen because they were free, available on both operating systems and were widely regarded as one of the best note taking app (Casabona 2013; Kazmucha 2013; Ochs 2013).[31, 32, 33] The fourth section explored consumers' use of the library

website's feature that lets patrons instant message a librarian. The fifth section investigated undergraduate students' preference for an e-journal article format. For this section, the participants were directed to use the article *Celebrity Endorsement, Brand Credibility and Brand Equity* by Spry *et al.* (2011).[34] This article was chosen because it was an article that offered both PDF and HTML formats and available to the Kansas State University undergraduate students. The sixth section requested comments from consumers on portability and general preference for a tablet size.

Data Analysis

Microsoft Excel, Version 14.0 (Microsoft Incorporation), a part of Microsoft Office Professional Plus 2010 was used to determine sums, means, and percentages of the raw data. To determine differences in various response variables, analysis of variance (ANOVA) and t-tests were performed at 5% significance level. When appropriate, post-hoc means separation was conducted using Fisher's protected Least Significant Difference (LSD). In order to evaluate relationships between variables, chi-squared test of independence was performed at 5% significance level. When the requirement for chi-squared test could not be met, Fisher's exact test was conducted at 5% significance level. Analyses were completed using SAS® statistical software (version 9.3, SAS Institute Inc.) in addition to Microsoft Excel.

Results

Focus Groups

What Students Classify as "Schoolwork"

When asked about what constitutes as schoolwork, focus group participants included activities that are directly and indirectly related to school. School assignments and study methods such as taking notes and reading were mentioned alongside more unconventional tasks such as breaks between studying, and watching and listening to motivational speeches for their positive effect. A great portion of the schoolwork required technology. Technology-related schoolwork as described in the focus group discussions can be divided into two categories: school-assigned and student-initiated. School-assigned activities included downloading e-textbooks, taking online exams, watching online lectures, preparing PowerPoint presentation,

reading e-textbooks, and using Dropbox. Student-initiated activities included accessing the school's academic website, checking e-mail, setting up assignment reminders, recording audio, using apps such as StudyBlue to make flashcards, using the World Wide Web to research projects or any topic of curiosity, and watching educational videos. Additionally, the participants often noted technology-related activities that allowed them to share items and thoughts with others such as using apps for setting up group meetings, accessing Facebook for afterschool activities, and sharing notes with multiple students by taking photos of notes.

Pros and Cons of Tablets

Focus group participants shared many pros and cons of tablets. The majority of the pros can be categorized as the ability to gather the latest information. Some of the frequently mentioned capabilities of a tablet included sharing information with others through social media, email, etc.; conducting research via many avenues such as dictionaries and Wikipedia that can easily be updated; accessing continuous stream of new versions of various apps; sharing notes with others using screenshots; seeing certain class handouts like graphs in color instead of a black and white photocopy; turning in an assignment right before class; and instantly communicating with professors via online web tools. Another theme of the pros list was the portability of the tablets in terms of its compact physical size. Additionally a few students added that tablets are more engaging than traditional learning methods and that they add entertainment value with a variety of contents such as videos and animations.

The list of cons had three themes. The first theme focused on technology deficiencies including problems that a lack of Internet connectivity would present. Also, the general reliability of tablets compared to physical books, pen, and paper notebooks was perceived as a con. Participants noted that tablets are complex devices while books, pen, and paper notebooks are simple products with minimal required maintenance.

The second theme captured issues with adaptation of technology. Students noted that some people may not learn tablet technology as quickly as others or that note taking or drawing diagrams and figures might more easily be done on paper. Many of the participants also had strong opinions on the ease of using virtual keyboards with some saying that typing on an actual keyboard is easier and more comfortable. Some of those students argued that even portable wireless keyboards connected to tablets are not good enough to alleviate the problem of a small uncomfortable keyboard.

The third and the most frequently mentioned theme dealt with ways to check technology's enormous power. Several participants brought up the issue of tablets allowing copying and pasting of contents too easily along with possibility of promoting student absences in classes because others can easily take notes and share with absent students. On the flipside of the entertainment value added by tablets, participants were wary that tablets are too entertaining and could easily distract students, both the user and the ones around the user, during a class or a study session. The distraction was mentioned as one of the reasons why an instructor might not allow tablets in a class. Several focus group discussion participants also mentioned the possibility of professors not allowing students to video/audio record lectures.

In addition, the focus group participants repeatedly expressed their concerns over the cost. There were two sides to the issue of the cost. On one side, the tablets were presented as being a high cost item. Some students mentioned that because they already have other electronic devices such as a laptop and a smartphone, that they could not justify purchasing a tablet. On the other side, several participants noted that although the initial cost of a tablet is high, that it may help save money in the long run because apps and e-textbooks are cheaper than traditional software and textbooks. Some students also suggested that certain high-priced tablets might replace a computer completely, eliminating a need for a laptop and thus actually saving money.

Comparing Three Sizes of Tablet-Like Mobile Electronic Devices

When asked for reasons to purchase or to avoid a particular size of tablet, participants across all focus groups gave many negative reasons for the small size (~5"), not much negative or positive reasons for the medium size (~7"), and many positive reasons for the large size (~10"). The overarching reasons for the inadequacies of the small size were that the size prevented it from being effectively used in schoolwork. The large size was noted for positive attributes such as its large screen that is suitable for reading, greater portability compared with that of a laptop, and thin profile. However, it was also criticized for being too large for many bags and pockets. When the participants were further probed on how the medium size compared to the large size, they noted that medium has positive qualities such as being small enough to fit in a purse or on a small desk in classrooms. Some of the drawbacks of the medium size were that it is too small for taking notes unless it is used with an external keyboard and that it cannot complete certain functions, like taking calls or viewing videos, as well as the small or the large size respectively due to its in-between size.

How the Library Can Better Support Undergraduate Students

When given a choice of using a library's full website versus mobile website, many focus group participants chose the full site, including several who were using small smartphones. The reasons they gave for preferring the full site over the mobile site included a desire to view the website in the form that it would be in on a computer, additional information provided by the full site, and habit. The reasons the students gave for avoiding the mobile site included a lack of functionality and presence of large lists that are difficult to scroll through. Some participants did note that the mobile site was quicker to load. Additionally, all focus groups mentioned that it is easy to locate the "ask a librarian" feature in the full site. "Ask a librarian" is a website feature that allows the person to connect with one of the librarians quickly via instant message over the Internet. The students who attempted to find the feature using the mobile site reported that the feature was located in a less obvious area of the website.

When asked about the various resources at the library, the focus group participants listed a number of available resources that they found while browsing the website. Despite that, the students did not claim to have used many of those resources besides a few popular ones. One helpful use for electronic mobile devices that students mentioned was finding a new book immediately when the original book they found was not adequate. When probed about electronic articles, the participants said that they normally view them on a computer because they can quickly switch among tabs and windows, copy and paste information from the article to their personal file, and effortlessly save the article.

Undergraduate Students' Wish List for the Library

When asked about reasons for visiting the library, the participants listed activities including reading various materials, group projects, printing, studying, and homework. The participants were then asked what they would wish for from their school library. Several wishes were repeated throughout focus groups. The students requested a library app that would be superior to the mobile site because an app is designed with a specific device in mind and works seamlessly while loading quickly. The participants also requested a location/map services that would allow them to pinpoint their location in the library on their mobile electronic devices. Lastly, some students requested an e-textbook check out where a person may check out the e-textbook for an hour to make copies of necessary pages.

Consumer Survey

One hundred nine respondents met the screening criteria and completed the survey questionnaire. Respondents completed fifty-eight questionnaires using Apple tablets and fifty-one questionnaires using Samsung tablets.

Demographics

Out of one hundred nine responses, eight respondents were over 25 years old. The undergraduate students were evenly divided in terms of gender with 54 females and 55 males. Almost all participants were full time students. A majority of respondents used technology frequently in their lives and owned a variety of devices that mostly operated on either Apple, Android, or Windows operating system (Table 2.2, Sections A and C). Most respondents used the Apple operating system for mobile devices while a minority of participants used the same for computers. Many more students used smartphones and laptops compared to tablets and desktop computers regardless of ownership and the percentage of time spent on devices reflects that trend (Table 2.2, Sections B and D).

Which Tablet Size is Preferred for Reading?

Focus group discussions pointed out reading as one of the main schoolwork activities for a tablet. Survey results indicated that there is no significant difference between the two tablet sizes in terms of consumers' likelihood of using a tablet for reading ($P \geq 0.05$). Furthermore, there was no significant difference in consumers' likelihood of using a tablet for reading for owners vs. non-owners of a tablet ($P \geq 0.05$). Similarly, there was no significant difference in consumers' likelihood of using a tablet for reading among participants who use varying amounts of technology for work or for personal reasons ($P \geq 0.05$).

We also examined whether the likelihood of using a tablet for reading might be different based on the percentage of time a consumer spends on a particular device. For all four devices (smartphone, tablet, laptop, and desktop), there was no significant difference among three groups representing consumers that were unlikely, neutral, and likely to use a tablet for reading ($P \geq 0.05$). However for the desktop users, the mean percentage of time spent for those unlikely to use tablets for reading was 14.1 compared to 6.1 for those who were likely to use tablets for reading. The p-value for this difference was $P = 0.051$ suggesting a potential for difference.

Table 2.2 Demographics

Section A. Frequency of Technology Usage*		
Frequency of Usage	***For Work Reasons***	***For Personal Reasons***
Infrequently	25.7%	20.2%
Neither Infrequently nor Frequently	2.8%	0%
Frequently	57.8%	79.8%
Section B. Device Ownership		
Non-smartphone cellphone – 17.4%	Mini-Sized Tablet – 5.5%	
Smartphone – 81.7%	Laptop – 98.2%	
Standard-Sized Tablet – 33.0%	Desktop – 25.9%	
Section C. Operating System (OS) of Devices		
Device	***Apple OS***	***Android OS***	***Windows OS***
Smartphone	58.9%	38.9%	2.2%
Standard-sized Tablet	62.9%	31.4%	2.9%
Mini-sized Tablet	85.7%	0%	0%
Laptop	26.0%	n/a	74.0%
Desktop	7.7%	n/a	88.5%
Section D. Usage of Devices**		
Device	***Number of Users (%)***	***Average % Time Spent on Device******
Smartphone	84.9%	56.2%
Tablet	38.3%	19.8%
Laptop	97.1%	37.8%
Desktop	37.4%	20.4%

*13.8% responded that they do not have a job.

**Includes devices the respondents use without ownership.

***Total time spent for the four listed devices is 100%.

Which Tablet Size is Preferred for Note Taking?

Focus group discussion pointed to note taking as a schoolwork activity that many students may want to perform using a tablet. Unlike reading, results indicated a significant difference in consumers' likelihood of using a tablet for note taking in regards to the two tablet

sizes ($P < 0.05$). The group who disliked both the 7" and 10" tablet sizes were significantly less likely to take notes on a tablet than the groups who liked one or both sizes ($P < 0.05$) (Table 2.3).

Table 2.3 Mean Likelihood of Note Taking Using Tablets Instead of Other Methods

Preferred Tablet Size for Note Taking	N	Mean	Standard Deviation
Larger	61	4.61	1.97
Smaller	35	4.20	1.92
Both	10	5.20	1.62
Neither	3	1.33	0.58

* Mean values were calculated using a 7-point scale with 1 point = very unlikely to take notes using a tablet and 7 point = very likely to take notes using a tablet.

As with reading, there was no significant difference in consumers' likelihood of using a tablet for note taking for owners vs. non-owners of a tablet ($P \geq 0.05$). Additionally, there was no significant difference in the likelihood of using tablet for note taking among students who use varying amounts of technology for work and for personal reasons ($P \geq 0.05$). There also was no significant difference ($P \geq 0.05$) when comparing how students who spend varying percentages of time on four devices (smartphone, tablet, laptop, desktop) differ in likelihood of using a tablet for note taking.

Other Factors Affecting Tablet Size Preference

Comments from a question regarding overall preference for a tablet size for schoolwork yielded 99 responses (10 respondents did not answer the question) with 62, 33, 3, and 1 preferring larger size, smaller size, both sizes, and neither sizes respectively. Because it is necessary for most purchasers to choose one of the sizes, analyses included only the data from 95 respondents with a specific size preference. Overall tablet size preference was not significantly different for varying percentage use of four devices, smartphone, tablet, laptop, and desktop ($P \geq 0.05$).

During the focus group discussions, the participants repeatedly mentioned the issue of portability, indicating its importance. The consumer survey found that the smaller tablet was perceived as more portable than the larger tablet. It also found that there was a relationship

between overall preferred tablet size and the portability of tablet sizes ($P < 0.01$). Although the larger size was preferred overall, there was a trend of increasing preference for smaller size with increased perceived portability of the smaller size over the larger size.

Focus group discussion indicated a possible gender difference in overall tablet size preference. The consumer survey found a significant relationship between gender and overall tablet size preference ($P < 0.05$) with phi coefficient of 0.24, indicating a moderately strong relationship. The results showed that a greater portion of females prefer larger size than males.

User Experience with Library Website

One of the frequently mentioned aspects of the library website was its "Ask a Librarian" feature that allowed library patrons to instant message questions to a librarian. It is a popular feature that needs to be easy to use and easy to find. During the evaluation, consumers were asked to send to and receive from a library staff a short message. Of the respondents, 88.1% reported being able to use the feature and 82.6% noted that they received a response back. 58.3% of consumers, used full website to access this feature. Majority of the students thought the instant message feature was easy to use. Similarly, 71.4% indicated a satisfactory experience using the feature with a tablet. The results indicated no significant main effects or interaction effect of tablet size or full vs. mobile website on student satisfaction with the instant message feature ($P \geq 0.05$). Additionally, the consumers' level of experience with the library's website did not have a significant effect on their satisfaction with the instant message feature ($P \geq 0.05$).

Viewing E-Journal Articles on a Tablet

Focus group discussion found that students read electronic articles, particularly on a computer, to complete schoolwork. Access to electronic articles is one of the main offerings of academic libraries and it is necessary to understand student preference for viewing electronic article to provide them with a seamless service. From the survey, we found that a majority of the students use PDF format to view e-journal articles on a computer and a tablet. When using a tablet to view an e-journal article, there was no significant relationship between the tablet size and the article format ($P \geq 0.05$). However there was a strong relationship between preferred article format and the device choice – tablet or a computer ($P < 0.05$, Cramer's V value = 0.28). Table 2.4 shows that there were many respondents who use HTML only or both HTML and PDF formats on computers who switched to using PDF only on tablets.

Table 2.4 Relationship between E-Journal Article Formats Used on a Computer and on a Tablet

% of Participants *N = 104*		Format Used on a Computer			
		HTML	**PDF**	**Both**	**Total**
Format Used on a Tablet	**HTML**	6.73%	9.62%	4.81%	*21.15%*
	PDF	6.73%	53.85%	18.27%	*78.85%*
	Total	*13.46%*	*63.46%*	*23.08%*	*100.00%*

Effect of Tablet Operating System

Although this study did not focus on operating systems of tablets, we analyzed the related data to rule out any possible effects. There was no significant difference in likelihood of reading or note taking with a tablet between the iOS testers and the Android OS testers ($P \geq 0.05$). However the p-value for the note taking t-test was 0.06 suggesting that there may be a difference where Apple tablet users, with a mean of 4.8 ± 1.9, are more likely to take notes using a tablet than Samsung tablet users who had a mean of 4.1 ± 2.0. We also found that a tablet OS did not have a significant relationship with overall tablet size preference ($P \geq 0.05$). Additionally, there was a moderately strong relationship between preferred e-journal article format and operating system ($P < 0.05$, Phi coefficient = 0.22). More iOS testers preferred PDF format than Android testers.

Discussion

Focus group discussions supported the idea that a tablet can be an essential tool for undergraduate students. Many activities that students classified as schoolwork were technology driven. Additionally, we found that students demanded immediate access to schoolwork materials in agreement with studies by Angeletaki (2011) and Dahlstrom *et al.* (2011)[11, 4] Technology and accessibility are two of the main features of a tablet (Huthwaite 2011; Sloan 2012; Pollock 2012; Miller 2012).[17, 9, 15, 19] It is also important to note that schoolwork encompassed a lot of content consumption, a task in which tablets are particularly suited for (Pogue 2010).[35] Although tablets have a great potential in assisting students with schoolwork,

they were still considered as an addition, instead of replacement, in the current lineup of devices. This is apparent in demographic data from the consumer survey where respondents spent less time on tablets than on smartphones or computers. The focus group participants criticized tablets on several occasion but many of these issues can be resolved with increasing student adaptation to tablet technology. It is important to observe whether tablet adaptation trend will be similar to the positive e-reading device adaptation trend seen in Weisberg's paper (2011).[7]

In examining the two tablet sizes (~7" and ~10"), focus group participants discussed that the larger size would be better for reading and note taking than the smaller size. However the consumer survey result indicated that this is not the case. Even though there was a significance difference in likelihood of using tablet for note taking, it may be prudent to discount this because the group driving that difference liked neither sizes of tablet for note taking. Tablet size may not have affected the likelihood of reading because undergraduate students read different sized books and as long as the display and the format is clear, smaller font is generally not an issue for the college-age group. Perhaps conducting a similar study on a group of older undergraduates will yield different results. It is less clear why the tablet size did not have any significant effect on the likelihood of note taking. It is possible the trend will change if the participants are asked to write notes with fingers or a stylus. In this study, participants were given free rein to create notes in any format and thus may have resulted in most consumers typing words instead of writing them.

When looking at other factors that influence overall tablet size preference for schoolwork, it is important to address the issue of portability and gender. Portability is an important factor in students' choice of mobile electronic devices (Angeletaki 2011; Dahlstrom and others 2011).[11, 4]. Because portability has many facets in addition to size such as durability, this study asked consumers which tablet size, the larger (~10") or the smaller (~7"), was more portable. The responses indicated that students were mostly only focused on size and weight and therefore the smaller tablet was chosen as the more portable tablet. Despite this, a majority of consumers preferred the larger size overall for schoolwork. This suggests that function and capability of a larger screen is more important to undergraduates than portability.

Focus groups suggested that females might be more interested in a smaller tablet compared to males for reasons including that a smaller tablet is more suitable for carrying in a purse. However the consumer survey indicated that females more strongly preferred a larger

tablet than males. This problem warrants a further research because females generally prefer a smaller tablet (Drinkwater 2013).[36]

This study showed that ownership of a tablet or frequent use of technology does not make a student more likely to read or take notes using a tablet. This suggests that there is no hidden benefit of tablet that becomes apparent with ownership or greater experience with technology. It could be that tablets are intuitively designed to be easy to use and therefore do not need users to be greatly experienced for activities within the context of this study.

When examining the instant message with a librarian feature, we determined that neither tablet size nor mobile vs. full website had any effect on users' satisfactory experience using the feature. This is helpful for the library because it suggests that this feature can be used equally well on full and mobile sites even though most students prefer the full site. The scope of this study did not encompass which library website, mobile or full, is more helpful to students. It is generally understood from the focus group discussion that the mobile site needs to be improved.

E-journal article format was evaluated in conjunction with tablet use because e-journal articles are important components of library offerings and this has not yet been fully studied for tablet users. The consumer survey showed that most students preferred the PDF format and especially so when using a tablet and particularly for the iOS tablets. This suggests that perhaps unlike when viewed from a computer, HTML formats are not yet designed to support tablet users. This is one of the areas where the library can better meet student needs by discussing the issue with publishers. This also shows a possible bias in the study, which was that the PDF format automatically opened on iOS devices but required several action from the Android users before they were able to view the article. In addition to improving the HTML format for tablet users, the library should also consider a few of the popular ideas presented during the focus group discussions. One of the ideas was an app for the library which focus group participants preferred over the mobile website. Another idea was to have a tracking map system that will let electronic mobile device users know immediately where they are in the library and where they can find the material they are looking for.

This study showed that students prefer larger tablet size. This study also gave insights on what the library is doing well currently and what it should consider going forward to better assist the increasing number of tablet-using patrons. To gain a more comprehensive understanding of student tablet users, a future study could look into the issue of tablet cost as suggested by focus

groups. It would be helpful to understand what are must-have features of a tablet vs. optional features for students. Tablet manufacturers can act on information from such a study to customize tablets for undergraduate students.

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Appendix A - Focus Group Screener

1. Are you currently an undergraduate student at Kansas State University?
    a. Yes
    b. No (terminate)

2. Do you own a tablet or an electronic mobile device like a tablet such as an ipad or an iphone?
    a. Yes
    b. No (terminate)

3. When was the last time you used your tablet or a tablet-like device for schoolwork?
    a. Within the last week
    b. Greater than 1 week, but less than 1 month (terminate)
    c. Greater than 1 month (terminate)
    d. Never (terminate)

4. Would you be willing to bring your tablet or a tablet-like device to the focus group discussion on Monday (9/23) or Tuesday (9/24)?
    a. Yes
    b. No (terminate)

Appendix B - Focus Group: Moderator's Guide

Focus Group Moderator Guide (85 min total)

Topic: Undergraduate Students' Attitudes Toward Tablet PCs in Academic Setting

Objective:

1. What are the types of academic e-contents KSU undergraduates use with their tablet?
2. What size and features of tablet would work best with those e-contents?
3. What type of e-resources from the KSU library are students aware of?
4. What type of support from the KSU library would be helpful to student tablet users?

Reminder for the moderator:

1. There may be "experts" in the focus group. Must ensure that they do not dominate the discussion.
2. Moderator should not identify his relationship with the library (e.g. I'm with the Sensory Analysis Center instead of I work at Hale)

Font Decoder:

- ***Bold Italic:*** Instructions for the moderator
- *Underlined Italic*: Expected answers
- **Bold Underline**: Items to be filled-in by the moderator

Material (YC will prepare): Dry erase board/marker/eraser, 4 sheets each of 2 different colored papers, 7 Tablet-Size worksheets, 7 orange square post-it pads, 7 green square post-it pads, 7 pencils, water, napkin, snacks.

Purpose/Introduction/Warm up/Ground Rules (0:00 - 0:07)

- Hello everyone! My name is ___ and I want to thank everyone for participating in this focus group today.
- I very much look forward to hearing what everyone has to say. Please remember that there are no wrong answers and that once again, I am interested in everyone's opinion. If you have a completely different opinion than the rest of the group, I would love to hear it since I'm sure that there are many people out there not in our group today who share your opinion.
- Let's discuss the basic rules for today.

- Please turn off your cellphones and any devices that you brought for today's discussion. We will have a chance to use them later on.
- One person should speak at a time. This also means that you should avoid talking to your neighbors because we all want to hear what you are saying.
- Please be respectful towards others. Once again, there are no wrong answers and I want to hear everyone's opinions.
- We are video recording this session and there are researchers behind the mirror who will be taking notes on our discussion today. To ensure that the microphone can catch what you are saying, please speak at least as loudly as me.
- This discussion will last approximately 1.5 hours.

- The purpose of today's focus group is to explore your thoughts on using tablet or other tablet-like mobile electronics for school and how we can improve your experience.
- Icebreaker: Let's introduce ourselves. We will go around the room and say our name, mention what device we brought today, and what we use the device for. I'll go first. My name is ___. I have an iphone and I use it to make phone calls, face time, play games, and check emails. (*expected answers: play games, take phone calls, check email, read stuff, skype.)*

Understanding the types of academic work material students use with their tablets (0:07 – 0:15)

- I understand that some of you use your devices to do schoolwork. What kind of activities fall under schoolwork?
  - ***OR> If no one mentions any type of schoolwork***, I understand that some of the popular activities are **playing games and checking emails**. But what sort of schoolwork activities can you imagine using your device for? (*expected answer: reading books, checking email, group meetings, etc.* ***If*** *"what do you mean by schoolwork?"* ***then "what kinds of activities do you think fall under schoolwork?***)
- ***Write down the answers on a dry-erase board***

Understanding reasons why some materials are better with tablets (0:15 – 0:30)

- To better understand how you feel towards using tablet or tablet-like devices for schoolwork, let's split up into two sides for a few minutes and do a short activity. ***Divide the panel into 2 halves.*** This side, please brainstorm reasons why tablets should be used for different types schoolwork (***point to the dry-erase board)*** we have discussed so far. This side, please brainstorm reasons why tablets should not be used for these schoolwork. ***While passing out one set of colored paper to one side and the other set to the other***

side**,** please write down all your ideas individually on the colored sheets that I just handed out.

- ***When sides stop writing,*** It looks like both sides are just about done.
    - ***OR> after about 3 minutes,*** Let's now come together to share what we came up with.
- Pro side, would you please share with us what you have? (*expected answer: convenience, easy to transport, easy access to e-books, cheaper textbooks, easy to do stuff on bed.)* Thank you for sharing. Now, Con side, would you please share with us what you have? (*expected answers: books are easier to read, computer is more powerful, tablets are expensive.)* Thank you for sharing.
- ***Probe further as necessary if there are any questionable responses, e.g., unclear responses, conflicting responses from the sides where one side states that tablets are convenient, while the other side says that it's inconvenient.***
    - ***Probing Example:*** From your response, it sounds like **e-textbooks** can be considered to be **convenient or inconvenient**. Would you please share with me what features make **e-textbooks convenient or inconvenient**?
    - ***Probing Example:*** Regardless of the side you were in, would you please share with us what factors make you consider a tablet as being **cheap or expensive**?

Pros/cons of different tablet sizes (0:30 – 0:50)

- Now that we understand some advantages and disadvantages of using a tablet for schoolwork, let's talk about some features of a tablet that affects your schoolwork. Let's pretend that your best friend is looking to buy a tablet for schoolwork. I want to understand what tablet size you would recommend to your best friend. ***While passing out the worksheet***, using this table that I'm passing out, please take a few minutes and write down how a particular tablet size relates to a various types of schoolwork that we discussed. **While pointing at the tablets on the lazy Susan**, Please feel free to briefly take a look or hold these tablets to get a better sense of their medium and large sizes. Let's say small is about the size of an iphone like this ***Show them an iphone.*** *(Expected answers: large for watching video clips, small for checking email, small and medium is not good for taking notes, etc.)*
- ***While waiting, clean the dry-erase board and divide the board into 3 columns labeled small medium and large. After about 3 minutes or when the group stops writing***, is everyone just about done? ***After verbally or visually confirming that everyone is ready,*** Now, let's imagine that your best friend just wants a short and sweet list of reasons. Please write 3 of your reasons for a particular size on 3 separate green post-its and 3 of your reasons against a particular size on 3 separate orange post-it notes in front of you. The reasons can be for any of the sizes. Once you have your 6 post-its, please come up and put each post-it in the column that matches the tablet size for your reason. ***Once***

everyone has put up their post-it notes, try to find a pattern of pros/cons that are repeatedly mentioned.

- ***Probing Example***: Looking at the post-its, it looks like many of you put **easy to carry** as being important.
  - What are some of the reasons for this feature being important?
  - What makes a tablet **easy to carry**? (*expected answer: thickness of tablet, surface size of tablet, durability of tablet, etc.)*
- ***Probing Example***: Looking at the post-its, it looks like many of you thought the **small** size has many cons. How do you think the **small** size compares with medium and large sizes? *(expected answer: medium or large would be better for someone buying a separate tablet)*
- ***Repeat as necessary to understand***
  - ***How several popular reasons are beneficial/detrimental in schoolwork.***
  - ***What particular function/apps/etc. defines a tablet as having a particular characteristic (ex. Easy to carry is defined by durability and surface size).***

Understanding what additional academic materials are wanted (0:50 – 1:08)

- ***Transition***
  - Earlier, you mentioned that you can access the library website using these devices.
  - ***OR>*** Earlier, you mentioned that you can access internet with your devices.
  - ***OR>*** **Any other necessary transition.**
- Please turn on your device and let's take 5 minutes to explore some of the resources available through the KSU library. ***If necessary, write the website (www.lib.ksu.edu) on the dry-erase board.***
- ***Clean the dry-erase board while waiting. After about 5 minutes***, How was your experience looking up the KSU library resources? *(expected answers: hard to search for books, can easily access journal articles, didn't know where to look, I've used it before so it was easy, etc.)* ***Probe to determine what KSU library resources were difficult/easy to access and why.***
- So I just heard that you **easily OR with difficulty** found **books** and **journal articles** that are provided by the library. Did you find any other electronic resources offered by the library?
- ***List books and journal articles from before and any other resources on dry-erase board as people mention them.*** *(expected answers: RefWorks, video recording, sound recording, etc.)*

- What role do you think mobile electronic devices play in accessing these resources from the library? ***Ask participants for reasons supporting why tablets would be or would not be helpful.***
    - ***If tablets are at least somewhat helpful AND if tablet size is not mentioned,*** what sizes of tablets do you think would be useful for accessing these resources from the library?

Understanding how the library can better support undergraduates who use tablet (1:08 - 1:20)

- ***Pointing at the dry*-erase board**, in addition to these resources that we just discussed, are there any other resources that you wish the KSU library provided for use with tablets or tablet-like devices? *(expected answer: textbook, etc.)*
- Looking beyond these resources, are there any other way the KSU library can help you with your schoolwork? (expected answer: lending period, more types of material, collaboration with professors to have more class materials available through KSU library's e-collection, etc.)

Summary/Questions/Wrap-Up (1:20 - 1:25)

- Great, our discussion has been very helpful! I now understand how you are currently using mobile electronic devices for schoolwork, pros and cons of particular sizes of such devices, and how our library can assist. Was there anything missing from our discussion that you would like to share with me?
- Do you have any questions that I can answer for you right now?
- Thank you for your participation. You have been tremendously helpful. **Pointing to Yoona who just entered,** my colleague Yoona will help you with checking out.

How do different types of schoolwork relate to tablet size?

Schoolwork (list each type of schoolwork here)	Small Tablet (how does small size affect schoolwork?)	Medium Tablet (how does medium size affect schoolwork?)	Large Tablet (how does large size affect schoolwork?)

Appendix C - Focus Group: Informed Consent Form

Informed Consent Statement
Sensory Analysis Center
Kansas State University
Justin Hall 139
Manhattan, KS 66506

1. I, (print) _____, agree to participate as a panelist in research for the Sensory Analysis Center at Kansas State University.

2. I understand that the purpose of this research is to understand through a focus group discussion how tablets are used in an academic setting. The research will benefit everyone in the tablet community.

3. I understand that I will be participating in this research project on September 24, 2013.

4. For this test, I will receive $25 when I complete the 90 minute session.

5. I understand that this focus group discussion will be video recorded and the recording will be treated as research data where my performance and response will remain confidential.

6. I understand that my performance as an individual will be treated as research data and will in no way be associated with me for other than identification purposes, thereby assuring confidentiality of my performance and responses.

7. I understand that I do not have to participate in research, and that if I choose not to participate there will be no penalty.

8. I understand that I may withdraw from this research at any time.

9. If I have any questions concerning this study, I understand that I may contact Dr. Delores Chambers, Justin 143F, Kansas State University, Manhattan, KS at 785-532-0162.

10. If I have questions about my rights as a consumer or about the manner in which this research was conducted, I may contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, at 203 Fairchild Hall (785-532-3224).

_____

Signature **Date**

Appendix D - Focus Group: Debriefing Statement

Debriefing Statement

Thank you for your participation in my study. The purpose of this study was to examine tablet use in academic setting. What you have shared in this focus group study is confidential. No part of the discussion that includes names or other identifying information will be used in any reports, displays, or other publicly accessible media coming from this research.

If you would like to know final results, or if you have any questions or additional concerns, you can contact me through e-mail at ychung@ksu.edu.

If you have any questions concerning this study, you can also contact Dr. Delores Chambers, Justin 143F, Kansas State University, Manhattan, KS at 785-532-0162.

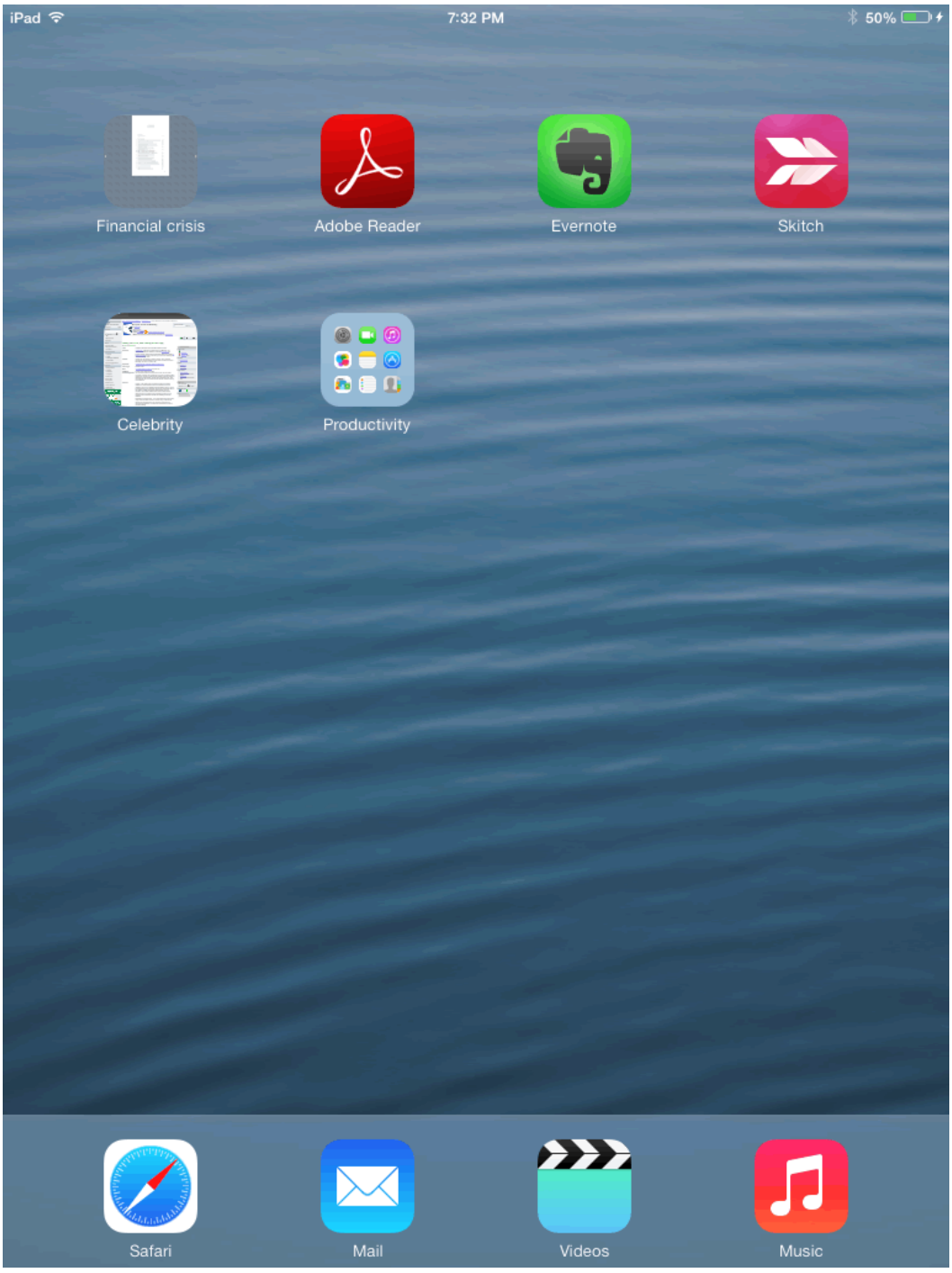
If you have questions about your rights as a consumer or about the manner in which this research was conducted, you may contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, at 203 Fairchild Hall (785-532-3224).

Again, thank you,
Yoona Chung

Appendix E - Consumer Survey: Tablet Home Screen

Figure E.1 An Example Home Screen of a Samsung Device

Figure E.2 An Example of Home Screen of an Apple Device



Appendix F - Consumer Survey: Questionnaire

Section 1

Q1. Are you an undergraduate student at Kansas State University? Please circle one.

a. Yes
b. No

Q2. What is your age? Please circle one.

a. 17 or younger
b. 18-24
c. 25-39
d. 40 or older

Q3. Please circle your gender.

a. Male
b. Female

Q4. Are you a part-time or a full-time student? Please circle one.

a. Part-time
b. Full-time

Q5. What is your major?

_____

Q6. How frequently do you use technology for work reasons?

a. Very infrequently
b. Infrequently
c. Somewhat infrequently
d. Neither infrequently or frequently
e. Somewhat frequently
f. Frequently
g. Very frequently
h. Not applicable, I do not have a job

Q7. How frequently do you use technology for personal reasons?

a. Very infrequently
b. Infrequently
c. Somewhat infrequently
d. Neither infrequently or frequently
e. Somewhat frequently
f. Frequently
g. Very frequently

Q8. Which of the following electronic device(s) do you own? Please choose all that apply.

a. Basic cellphone (non-smartphone)
b. Smartphone (e.g. iphone)
c. Standard-sized Tablet (e.g. Samsung Galaxy Tab, iPad)

d. Mini-sized Tablet (e.g. iPad Mini)
e. Laptop (portable computer with attached keyboard)
f. Desktop (non-portable computer)
g. None of the above (skip to question 11)

Q9. For each device that you own, please circle the description underneath that matches it. If you do not own any of these devices, please skip to question 11.

Smartphone	Standard-sized Tablet	Mini-sized Tablet	Laptop	Desktop
Android	Android	Android	Apple Mac	Apple Mac
Apple iOS	Apple iOS	Apple iOS	Windows	Windows
Windows	Windows	Windows	Linux	Linux
Other_____	Other_____	Other_____	Other_____	Other_____

Q10. What activities do you use your device(s) for? Please check all applicable boxes.

Activities	Smart-phone	Standard-Sized Tablet	Mini-Sized Tablet	Laptop	Desktop
Make phone calls					
Video chat					
Receive or send texts					
Receive or send email					
Browse webpages (not for school or work)					
Browse webpages for school or work					
Use social media (e.g. Facebook, Twitter, Blogs)					
Read news					
Read books					
Watch video					
Listen to audio					
Take notes for school or work					
Use word processing					
Make slides (e.g. PowerPoint)					
Take pictures					
Play games					
Other: _____					
Other: _____					
Other: _____					
Other: _____					
Other: _____					

Q11. What percentage of your time is spent using each device including any devices that you may not own? Please only take into account the time you spend on these 4 devices and not your entire day, i.e. the total should add up to 100%

a. Smartphone (e.g. iphone) _____%
b. Tablet _____%
c. Laptop _____%
d. Desktop _____%

TOTAL: 100 %

Q12. How experienced are you in using the KSU library's website (http://www.lib.k-state.edu/)? Please circle one.

a. Very inexperienced
b. Inexperienced
c. Somewhat inexperienced
d. Neither inexperienced nor experienced
e. Somewhat experienced
f. Experienced
g. Very experienced

Section 2

Please use the **SMALLER** tablet and tap on the "Financial Crisis" shortcut icon on your home screen. Please read page 17 of the book The Financial Crisis…. At the end of the reading, there will be a couple questions on what you have read.

Do not turn to the next page until you have read page 17 of The Financial Crisis….

Please answer the following questions after reading page 17.

Q13. According to The Financial Crisis…, who caused problems in the US monetary system? Please circle one.

a. US citizens
b. State government
c. Federal government/Federal Reserve
d. No one

Q14. According to The Financial Crisis…, if interstate highway bridges were falling down, the problem was essentially caused by _____ decisions. Please circle one.

a. Resident
b. Government
c. Contractors'
d. No one's

Q15. How would you rate your experience using this tablet to read page 17? Please check one per row a-f (and row g-i as necessary).

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Font size							
b. Selecting apps/functions							
c. Finding pages							
d. Tablet positioning (holding it up/laying it down, etc.)							
e. Screen size							
f. Resolution							
g. other _____							
h. other _____							
i. other _____							

Please use the **LARGER** tablet and tap on the "Financial Crisis" shortcut icon on your home screen. Please read page 5 of the book The Financial Crisis…. At the end of the reading, there will be a couple questions on what you have read.

Do not turn to the next page until you have read page 5 of The Financial Crisis….

Please answer the following questions after reading page 5.

Q16. According to The Financial Crisis…, what is the primary cause of the financial crisis? Please circle one.

a. Technology
b. Government Policy
c. FDIC
d. None of the above

Q17. According to The Financial Crisis…, financial services is _____ regulated industry. Please circle one.

a. A very highly
b. A somewhat
c. A very lowly
d. Not a

Q18. How would you rate your experience using this tablet to read page 5? Please check one per row a-f (and row g-i as necessary).

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Font size							
b. Selecting apps/functions							
c. Finding pages							
d. Tablet positioning (holding it up/laying it down, etc.)							
e. Screen size							
f. Resolution							
g. other _____							
h. other _____							
i. other _____							

Q19. Which tablet size do you prefer for reading? Please circle one.

a. Larger Size
b. Smaller Size
c. Like both the Larger and the Smaller Sizes equally
d. Dislike both the Large and the Smaller Sizes equally

Q20. If you were the owner of these two tablets, how likely are you to read using these tablets instead of other methods such as a laptop or a print book? Please circle one.

a. Very unlikely to read using a tablet
b. Unlikely to read using a tablet
c. Somewhat unlikely to read using a tablet
d. Neither likely nor unlikely to read using a tablet
e. Somewhat likely to read using a tablet
f. Likely to read using a tablet
g. Very likely to read using a tablet

Section 3

Please use the **SMALLER** tablet and access Evernote App. Please take a couple minutes and create a short note describing Kansas State University's Manhattan Campus.

Please answer the following questions after creating the note.

Q21. How would you rate your experience using this tablet to take note? Please check one per row a-g (and row h-j as necessary).

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Typed or written word size							
b. Drawing (please write n/a if you did not use this feature)							
c. Selecting apps/functions							
d. Navigation to create a note							
e. Tablet positioning (holding it up/laying it down, etc.)							
f. Screen size							
g. Resolution							
h. other _____							
i. other _____							
j. other _____							

Please use the **LARGER** tablet and access Evernote App. Please take couple minutes and create a short note describing the town of Manhattan, Kansas.

Please answer the following questions after creating the note.

Q22. How would you rate your experience using this tablet to take note? Please check one per row a-g (and row h-j as necessary).

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Typed or written word size							
b. Drawing (please write n/a if you did not use this feature)							
c. Selecting apps/functions							
d. Navigation to create a note							
e. Tablet positioning (holding it up/laying it down, etc.)							
f. Screen size							
g. Resolution							
h. other _____							
i. other _____							
j. other _____							

Q23. Which tablet size do you prefer for note taking? Please circle one.

a. Larger Size
b. Smaller Size
c. Like both the Larger and the Smaller Sizes equally
d. Dislike both the Large and the Smaller Sizes equally

Q24. If you were the owner of one of these two tablets, how likely are you to take notes using the tablet instead of other methods such as pen and paper, a laptop or a notebook computer? Please circle one.

a. Very unlikely to take notes using a tablet
b. Unlikely to take notes using a tablet
c. Somewhat unlikely to take notes using a tablet
d. Neither likely nor unlikely to take notes using a tablet
e. Somewhat likely to take notes using a tablet
f. Likely to take notes using a tablet
g. Very likely to take notes using a tablet

Section 4

Please use the **SMALLER** tablet to access the web browser and go to the KSU library webpage (http://www.lib.k-state.edu/). Please choose one of the offered site selections (mobile or regular) and then find a feature where you can instant message (not text) a librarian. Please instant message the following to a librarian: "tablet study – please just respond hi." Afterwards, please wait for a librarian's response to ensure that the question went through.

Q25. Were you able to use the instant message feature?

a. Yes
b. No

Q26. Did you receive a response from the librarian?

c. Yes
d. No

Q27. Which site did you use? Please choose one.

a. Mobile site
b. Regular site

Q28. How would you rate your experience finding the feature that lets you instant message a librarian? Please circle one.

a. Very difficult
b. Difficult
c. Somewhat difficult
d. Neither difficult nor easy
e. Somewhat easy
f. Easy
g. Very easy

Q29. How was your experience using the instant message feature with a tablet?

a. Very unsatisfactory
b. Unsatisfactory
c. Somewhat unsatisfactory
d. Neither unsatisfactory nor satisfactory
e. Somewhat satisfactory
f. Satisfactory
g. Very satisfactory

Section 5

Please use the **LARGER** tablet to access "Celebrity" shortcut Icon from the home page. Please view the full-length article titled "Celebrity endorsement, brand credibility and brand equity" using either "View HTML" or "View PDF" option on the right of the page in the gray pane. Please take a minute or two and glance through the entire article.

Q30. Which format did you use to view the article? Please choose one.

a. HTML
b. PDF
c. Other _____

Q31. Which format do you most often use to view such articles on a computer? Please choose one.

a. HTML
b. PDF
c. Both equally
d. Other _____

Please use the **LARGER** tablet to access the same "Celebrity" shortcut icon from the home page. Please view the full length article again but this time, use the format that you did not choose earlier. Please take a minute or two and glance through the entire article.

Q32. If you were using a tablet, which format would you choose to view an article such as the one you just viewed? Please choose one.

a. HTML
b. PDF
c. Other _____

Q33. Please briefly explain the reason for your answer to Q32.

Section 6 – General Comments

Q34. How would you rate the portability of each tablet size?

a. LARGER tablet is a lot more portable than SMALLER tablet
b. LARGER tablet is more portable than SMALLER tablet
c. LARGER tablet is slightly more portable than SMALLER tablet
d. LARGER and SMALLER tablets are equally portable
e. SMALLER tablet is slightly more portable than LARGER tablet
f. SMALLER tablet is more portable than LARGER tablet
g. SMALLER tablet is a lot more portable than LARGER tablet

Q35. Please briefly explain the reason for your answer to Q34.

Q36. Please comment on your overall preference for tablet size (smaller or larger from this study) for schoolwork.

Appendix G - Consumer Survey: Presentation Order

Order ID	Manufacturer*	Section 2**	Section 3**	Section 4**
1	S	LS	LS	L
2	A	LS	SL	L
3	S	SL	LS	L
4	A	SL	LS	S
5	S	SL	LS	S
6	A	LS	SL	S
7	S	LS	SL	S
8	A	LS	LS	S
9	S	LS	LS	S
10	A	SL	SL	L
11	S	SL	SL	S
12	A	LS	LS	L
13	S	SL	SL	L
14	A	SL	SL	S
15	S	LS	SL	L
16	A	SL	LS	L

*S stands for Samsung and A stands for Apple.

**L stands for larger tablet and S stands for smaller tablet.

Appendix H - Consumer Survey: Informed Consent Form

Informed Consent Statement
Sensory Analysis Center
Kansas State University
Justin Hall 139
Manhattan, KS 66506

1. I agree to participate as a consumer study participant in research for the Sensory Analysis Center at Kansas State University.

2. I understand that the purpose of this research is to understand through a consumer study how tablets are used in an academic setting. The research will benefit everyone in the tablet community.

3. I understand that I will be participating in this research project in October, 2013.

4. For this test, I will receive $10 when I complete the 30 minute session.

5. I understand that my performance as an individual will be treated as research data and will in no way be associated with me for other than identification purposes, thereby assuring confidentiality of my performance and responses.

6. I understand that I do not have to participate in research, and that if I choose not to participate there will be no penalty.

7. I understand that I may withdraw from this research at any time.

8. If I have any questions concerning this study, I understand that I may contact Dr. Delores Chambers, Justin 143F, Kansas State University, Manhattan, KS at 785-532-0162.

9. If I have questions about my rights as a consumer or about the manner in which this research was conducted, I may contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, at 203 Fairchild Hall (785-532-3224).

Signature **Date**

Appendix I - Consumer Survey: Debriefing Statement

Debriefing Statement

Thank you for your participation in my study. The purpose of this study was to examine tablet use in academic setting. What you have shared in this consumer study is confidential. No part of your answer that includes names or other identifying information will be used in any reports, displays, or other publicly accessible media coming from this research.

If you would like to know final results, or if you have any questions or additional concerns, you can contact me through e-mail at ychung@ksu.edu.

If you have any questions concerning this study, you can also contact Dr. Delores Chambers, Justin 143F, Kansas State University, Manhattan, KS at 785-532-0162.

If you have questions about your rights as a consumer or about the manner in which this research was conducted, you may contact Rick Scheidt, Chair, Committee on Research Involving Human Subjects, at 203 Fairchild Hall (785-532-3224).

Again, thank you,

Yoona Chung

Appendix J - Consumer Survey: Tablet Instruction Sheet

Samsung Android Tablet Instruction Sheet

Black

Smaller tablet: The on button is on the right side at the top.

Larger tablet: The on button is on the top at the left side.

You can tap the icon with your finger to start the app.

You can tap the home icon at the bottom of the screen to go back to the home page at any time.

You can zoom in and out by pinching your fingers together or apart on the screen.

Accessing the Book The Financial Crisis…

Tap on the orange Financial Crisis Icon (Larger tablet just says Financial c…).

You can view the table of contents by clicking the paper icon placed 2nd from the left at the top of the screen (blue pane).

You can select the page you wish to see by tapping on it.

Evernote

You can create a new note by tapping on the paper icon in the left pane.

You can type using the keyboard, or use draw using your finger by tapping the + symbol at the top right and then selecting skitch.

You can also record audio using the "record audio" option or take photos using "page camera" option under the + symbol.

Your note can ***be saved by tapping on the check mark*** at the top left corner.

Internet browser

Your **downloaded items** will appear at the top left (for smaller) or at the bottom right (for larger) as a downward arrow with an underline. The shade of the picture will change from white to gray if it is actively downloading and will remain white if download is complete.

Once the download is complete, you can swipe your finger downward (for a smaller tablet) or upward (for a larger tablet) from the arrow icon to see your downloaded item.

To access the item you downloaded, tap on the file name of the item.

Apple iOS Tablet Instruction Sheet

White

The on button is on the top at the right corner.

You can tap the icon with your finger to start the app.

You can press the round home button at the bottom of the tablet to go to the home page at any time.

You can zoom in and out by pinching your fingers together or apart on the screen.

Accessing the Book The Financial Crisis…

Financial Crisis Icon.

You can view the table of contents by clicking the paper icon placed 2nd from the left at the top of the screen (blue pane).

You can select the page you wish to see by tapping on it.

Taking a note

You can create a new note by tapping on the + icon on the upper right corner.

You can type using the keyboard, or record audio using the "audio" option or take photos using "camera" or "document camera" option under the paperclip icon on the top right corner.

You can save the note by tapping on the save button at the top right.

You can add a note writing or drawing by hand using the Skitch app. Once you open the app, you can tap on the square sticky note icon on the upper right corner. You can then tap on the gray arrow icon on the lower right corner which will give you option of writing with a pen, etc. If you tap and hold on the options, some will have additional options (e.g. tap and hold a marker and you get a choice of highlighter).

Skitch note can be incorporated into Evernote by tapping on the square box with an arrow on the upper right corner -> tapping on share -> tapping on Evernote. You can make further changes from Evernote.

Internet browser

Your internet browser is Safari located on the bottom of the tablet homepage.

Appendix K - Consumer Survey: SAS Code

```
proc ttest data=Consumer;
title 'Are tablet owners more likely to use tablet for note taking and/or
reading than non-owners?';
class TabOwn;
var ReadP NoteP;
run;

proc glm data=Consumer;
title 'Which tablet size was preferred for reading?';
class ReadTS;
model ReadP=ReadTS;
means ReadTS;
run;

proc glm data=Consumer;
title 'Which tablet size was better for note taking?';
class NoteTS;
model NoteP=NoteTS;
means NoteTS;
means NoteTS/lsd;
run;

proc glm data=Consumer;
title 'Are people who frequently use technology for work reasons more likely
to use tablet for reading?';
class TechWrk;
model ReadP=TechWrk;
run;

proc glm data=Consumer;
title 'Are people who frequently use technology for personal reasons more
likely to use tablet for reading?';
class TechPer;
model ReadP=TechPer;
run;

proc glm data=Consumer;
title 'Are people who frequently use technology for work reasons more likely
to use tablet for note taking?';
class TechWrk;
model NoteP=TechWrk;
run;

proc glm data=Consumer;
title 'Are people who frequently use technology for personal reasons more
likely to use tablet for note taking?';
class TechPer;
model NoteP=TechPer;
run;

proc freq data=Consumer;
title 'Is there a difference in overall tablet size preference based on
gender?';
```

```
tables TabSP*gender/chisq;
run;

proc glm data=Consumer;
title 'Does tablet size play a role in determining user experience for the
library IM feature on mobile vs. regular site?';
class TabSzFO MobVReg;
model IMSat=TabSzFO MobVReg TabSzFO*MobVReg;
run;

proc ttest data=Consumer;
title 'Do users have different experience with the library IM feature based
on mobile vs. regular site?';
class MobVReg;
var IMSat;
run;

proc glm data=Consumer;
title 'Do users with different levels of experience with the library website
have different experience with the library IM feature?';
class LibExp;
model IMSat=LibExp;
run;

proc freq data=Consumer;
title 'Do students have different preference for PDF/HTML depending on the
tablet size?';
tables TabArtF*TabSzFI/chisq;
run;

proc freq data=Consumer;
title 'Do students have different preference for PDF/HTML depending on the
tablet operating system?';
tables TabArtF*OS/chisq;
run;

proc freq data=Consumer;
title 'Do students have different preference for PDF/HTML depending on the
device?';
tables TabArtF*ComArtF/Fisher;
run;

proc freq data=Consumer;
title 'Does portability affect preference for overall tablet size?';
tables Port*TabSP/Fisher;
run;

proc freq data=Consumer;
title 'Does operating system affect preference for overall tablet size?';
tables OS*TabSP/chisq;
run;

proc ttest data=Consumer;
title 'Does the operating system affect likelihood of using tablets for
reading?';
class OS;
var ReadP;
```

```
run;

proc ttest data=Consumer;
title 'Does the operating system affect likelihood of using tablets for note
taking?';
class OS;
var NoteP;
run;

proc corr data=Consumer;
title 'Is there a difference in the four device usage percent depending on
the likelihood of reading using a tablet?';
proc glm data=consumer;
class ReadPD;
model PrcntP=ReadPD;
proc glm data=consumer;
class ReadPD;
model PrcntT=ReadPD;
proc glm data=consumer;
class ReadPD;
model PrcntL=ReadPD;
proc glm data=consumer;
class ReadPD;
model PrcntD=ReadPD;
run;

proc corr data=Consumer;
title 'Is there a difference in the four device usage percent depending on
the likelihood of note taking using a tablet?';
var PrcntP PrcntT PrcntL PrcntD;
with NoteP;
proc glm data=consumer;
class NotePD;
model PrcntP=NotePD;
proc glm data=consumer;
class NotePD;
model PrcntT=NotePD;
proc glm data=consumer;
class NotePD;
model PrcntL=NotePD;
proc glm data=consumer;
class NotePD;
model PrcntD=NotePD;
run;

proc ttest data=Consumer;
title 'Is there a difference between overall tablet size preference and four
device usage percent?';
Class TabSP;
var PrcntP PrcntT PrcntL PrcntD;
run;

ods rtf close;
quit;
```

Appendix L - Relationship between Overall Preferred Tablet Size and Portability

Percent of Participants *N = 95*		Overall Preferred Tablet Size		
		Larger	**Smaller**	***Total***
Portability	**Larger tablet is a slightly more portable than Smaller tablet**	1.05%	0.00%	*1.05%*
	Larger and Smaller tablets are equally portable	11.58%	0.00%	*11.58%*
	Smaller tablet is slightly more portable than Larger tablet	24.21%	8.42%	*32.63%*
	Smaller tablet is more portable than Larger tablet	18.95%	15.79%	*34.74%*
	Smaller tablet is a lot more portable than Larger tablet	9.47%	10.53%	*20.00%*
	Total	*65.26%*	*34.74%*	*100.00%*

Appendix M - Relationship between Overall Tablet Size Preference and Gender

Percent of Participants N=95		Overall Tablet Size Preference		
		Larger	**Smaller**	***Total***
Gender	**Female**	37.89%	11.58%	*49.47%*
	Male	27.37%	23.16%	*50.53%*
	Total	*65.26%*	*34.74%*	*100.00%*

Appendix N - Relationship between Tablet Operating System and E-Article Format Used on a Tablet

Percent of Participants *N = 105*		Tablet Operating System		
		Android	**iOS**	**Total**
E-Article Format Used on a Tablet	**HTML**	14.29%	6.66%	20.95%
	PDF	32.38%	46.67%	79.05%
	Total	*46.67%*	*53.33%*	*100.00%*

Appendix O - General Results from the Consumer Survey

Q1. Are you an undergraduate student at Kansas State University?

	# of Participants
Yes	109
No	0

Q2. What is your age?

	# of Participants
17 or younger	1
18-24	100
25-39	6
40 or older	2

Q3. Please circle your gender.

	# of Participants
Male	55
Female	54

Q4. Are you a part-time or a full-time student?

	# of Participants
Part-time	9
Full-time	100

Q6. How frequently do you use technology for work reasons?

	# of Participants
Very infrequently to Somewhat infrequently	28
Neither infrequently or frequently	3
Somewhat frequently to Very frequently	63
Not applicable, I do not have a job	15

Q7. How frequently do you use technology for personal reasons?

	# of Participants
Very infrequently to Somewhat infrequently	22
Neither infrequently or frequently	0
Somewhat frequently to Very frequently	87

Q8. Which of the following electronic device(s) do you own?

	# of Participants
Basic cellphone	19
Smartphone	89
Standard-sized tablet	36
Mini-sized tablet	6
Laptop	107
Desktop	28
None of the above	0

Q9. For each device that you own, please circle the description underneath that matches it. (# of Participants)

Smartphone		Standard-sized Tablet		Mini-sized Tablet		Laptop		Desktop	
Android	35	Android	11	Android	0	Apple Mac	27	Apple Mac	2
Apple iOS	53	Apple iOS	22	Apple iOS	6	Windows	77	Windows	23
Windows	2	Windows	1	Windows	0	Linux	0	Linux	1
Other_____	0	Other_____	1	Other_____	1	Other_____	0	Other_____	0

Q10. What activities do you use your device(s) for?

Activities	Smart-phone	Standard-Sized Tablet	Mini-Sized Tablet	Laptop	Desktop
Make phone calls	89	3	1	8	2
Video chat	54	24	4	66	11
Receive or send texts	91	9	2	17	5
Receive or send email	81	25	4	97	22
Browse webpages (not for school or work)	88	32	6	105	22
Browse webpages for school or work	69	32	5	105	19
Use social media (e.g. Facebook, Twitter, Blogs)	85	32	5	97	20
Read news	61	27	3	86	21
Read books	22	21	4	38	9
Watch video	69	29	3	101	22
Listen to audio	78	23	5	92	21
Take notes for school or work	23	18	4	83	9
Use word processing	9	9	2	98	20
Make slides (e.g. PowerPoint)	3	7	1	95	20
Take pictures	88	21	4	29	5
Play games	79	29	4	57	18

Q11. What percentage of your time is spent using each device including any devices that you may not own?

	# of Participants with Greater than 0%	Average % time spent among users
Smartphone	90	56.16%
Tablet	41	19.78%
Laptop	102	37.81%
Desktop	40	20.43%

Q12. How experienced are you in using the KSU library's website (http://www.lib.k-state.edu/)?

	# of Participants
Very inexperienced to Somewhat inexperienced	45
Neither inexperienced nor experienced	5
Somewhat experienced to Very experienced	59

Q13. According to The Financial Crisis…, who caused problems in the US monetary system?

	# of Participants
US citizens	1
State government	2
Federal government/Federal Reserve	105
No one	1

Q14. According to The Financial Crisis…, if interstate highway bridges were falling down, the problem was essentially caused by _____ decisions.

	# of Participants
Resident	0
Government	107
Contractors'	1
No one's	1

Q15. How would you rate your experience using this tablet to read page 17? (# of participants)

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Font size	0	1	4	6	15	43	40
b. Selecting apps/functions	0	4	6	3	22	32	39
c. Finding pages	4	5	15	5	18	33	26
d. Tablet positioning	1	1	3	10	19	36	38
e. Screen size	1	2	2	4	16	45	39
f. Resolution	1	2	4	4	16	33	49

Q16. According to The Financial Crisis…, what is the primary cause of the financial crisis?

	# of Participants
Technology	1
Government Policy	105
FDIC	2
None of the above	0

Q17. According to The Financial Crisis…, financial services is _____ regulated industry.

	# of Participants
A very highly	103
A somewhat	0
A very lowly	4
Not a	1

Q18. How would you rate your experience using this tablet to read page 5? (# of Participants)

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Font size	1	1	3	10	8	39	46
b. Selecting apps/functions	0	2	5	8	7	37	49
c. Finding pages	1	3	5	4	17	37	41
d. Tablet positioning	0	0	2	5	16	41	44
e. Screen size	0	3	3	5	19	33	45
f. Resolution	1	0	4	2	11	36	54

Q19. Which tablet size do you prefer for reading?

	# of Participants
Larger Size	52
Smaller Size	34
Like Both the Larger and the Smaller Sizes Equally	22
Dislike Both the Larger and the Smaller Sizes Equally	1

Q20. If you were the owner of these two tablets, how likely are you to read using these tablets instead of other methods such as a laptop or a print book?

	# of Participants
Very unlikely to read using a tablet	4
Unlikely to read using a tablet	11
Somewhat unlikely to read using a tablet	9
Neither likely nor unlikely to read using a tablet	3
Somewhat likely to read using a tablet	29
Likely to read using a tablet	25
Very likely to read using a tablet	28

Q21. How would you rate your experience using this tablet to take note?

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Typed or written word size	1	3	8	8	19	44	26
b. Drawing	1	2	3	1	10	8	5
c. Selecting apps/functions	0	2	4	9	15	41	38
d. Navigation to create a note	1	5	9	7	18	29	40
e. Tablet positioning	1	6	9	5	19	32	37
f. Screen size	0	3	3	4	14	42	43
g. Resolution	0	3	2	4	7	35	55

Q22. How would you rate your experience using this tablet to take note?

	Very unsatis-factory	Unsatis-factory	Somewhat unsatis-factory	Neither unsatisfactory nor satisfactory	Somewhat satisfactory	Satis-factory	Very satis-factory
a. Typed or written word size	1	1	6	7	15	48	31
b. Drawing	1	1	3	3	7	13	11
c. Selecting apps/functions	0	2	3	2	13	44	45
d. Navigation to create a note	0	3	3	4	15	35	49
e. Tablet positioning	0	2	3	7	19	33	45
f. Screen size	2	1	1	6	16	36	46
g. Resolution	0	1	0	3	11	37	53

Q23. Which tablet size do you prefer for note taking?

	# of Participants
Larger Size	61
Smaller Size	35
Like Both the Larger and the Smaller Sizes Equally	10
Dislike Both the Larger and the Smaller Sizes Equally	3

Q24. If you were the owner of one of these two tablets, how likely are you to take notes using the tablet instead of other methods such as pen and paper, a laptop or a notebook computer?

	# of Participants
Very unlikely to take notes using a tablet	11
Unlikely to take notes using a tablet	13
Somewhat unlikely to take notes using a tablet	15
Neither likely nor unlikely to take notes using a tablet	6
Somewhat likely to take notes using a tablet	25
Likely to take notes using a tablet	20
Very likely to take notes using a tablet	19

Q25. Were you able to use the instant message feature?

	# of Participants
Yes	96
No	13

Q26. Did you receive a response from the librarian?

	# of Participants
Yes	90
No	19

Q27. Which site did you use?

	# of Participants
Mobile Site	45
Regular Site	63

Q28. How would you rate your experience finding the feature that lets you instant message a librarian?

	# of Participants
Very difficult to Somewhat difficult	26
Neither difficult nor easy	13
Somewhat easy to Very easy	69

Q29. How was your experience using the instant message feature with a tablet?

	# of Participants
Very unsatisfactory to Somewhat satisfactory	21
Neither unsatisfactory nor satisfactory	9
Somewhat satisfactory to Very satisfactory	75

Q30. Which format did you use to view the article?

	# of Participants
HTML	39
PDF	65

Q31. Which format do you most often use to view such articles on a computer?

	# of Participants
HTML	14
PDF	66
Both Equally	25

Q32. If you were using a tablet, which format would you choose to view an article such as the one you just viewed?

	# of Participants
HTML	22
PDF	83

Q34. How would you rate the portability of each tablet size?

	# of Participants
Larger tablet is a lot to slightly more portable than Smaller tablet	2
Larger and Smaller tablets are equally portable	13
Smaller tablets is slightly to a lot more portable than Larger tablet	94

Q36. Please comment on your overall preference for tablet size (smaller or larger from this study) for schoolwork.

	# of Participants
Larger	62
Smaller	33
Both	3
Neither	1