TABLET PROCUREMENT WITHIN K12 EDUCATIONAL ENVIRONMENTS. AN ANALYSIS OF THE POLITICAL INFLUENCES, PERCEIVED DEVICE ADVANTAGES, AND HARDWARE PREFERENCES

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Chapter 1

Introduction

School reform has been a topic of continual discussion since the origins of the American public education system. Today's schools are a clear reflection of the vision of Horace Mann and his efforts to usher in the common school era. However, the tools and resources available to today's K12 institutions are vast and often divergent from the core curriculum of Mann's time when only writing and reading were required to be taught (Hinsdale, 1898). The role of technology within public education has been a topic of continuing discussion as well. Since their introduction, the promise of technological innovations within the classroom have gone largely unfulfilled despite most communities making their largest educational investments in state-of-the-art technology (Oppenheimer, 2007). Educators have too often found been subject to following trends without fully understanding the true motivations, costs, and outcomes of their efforts. The rapid pace of ever-changing technology exaggerates this phenomenon. Often, the emphasis on e-learning has led educators to place far too much emphasis on the "e" and not upon the actual learning which we are attempting to foster (Imel, 2002). As technology is adopted, it is imperative that educators have a comprehensive knowledge of both the technology being adopted, and where it fits into the pedagogical process.

The evolution of the personal computer led to the creation of the notebook computer and eventually, after years of searching, experimenting and tinkering, educators have encountered a device that many feel will change the educational landscape. This device, generically known as tablet computing devices, or tablets for short, have been introduced by a number of manufacturers in many differing sizes and capabilities. As a result of this diverse and highly competitive marketplace, a social buzz has rapidly developed that surrounds these devices. This social interest has shed light on possible uses for these products and cause many within the technology arena to believe that they will soon dominate the technology marketplace (Korkmaz, Christian, & Jean-Hubert, 2012). Following such market trends, tablet computing devices have been widely implemented in schools across Indiana. Implementations range from use within one to one environments where every student has their own tablet to the devices simply serving as value added technology within classrooms.

The future adoption and subsequent implementation of tablet devices within the K12 public education environment is undeniable. By the year 2017, mobile data traffic generated by tablet devices alone will exceed the total amount of data transmitted in 2012 by the entire global mobile network (Index, C.V.N, 2013). Acknowledging that schools will follow suit in the rapid expansion of these devices, it is important to more fully understand the factors that are leading educational technology leaders to follow, and often lead, this trend. The purpose of this research was to gain a better understanding of the social/political influences, the individuals driving these decisions, and the technological traits that have been driving the adoption process of tablet devices within the K12 landscape of public schools located in the state of Indiana. The intent was to better pinpoint the groups and individuals who have been influencing educational technology leaders to adopt tablet devices and to better understand the scope of influence in which each of these groups actually holds during the adoption process.

Statement of the Problem

Advocates of technology integration within public education have long strived to implement new technologies into the classroom. However, few are able to fully quantify the factors that are influencing these efforts. Historically, educators have followed trends without spending adequate time and effort examining the forces motivating and powering these movements (Fullan & Miles, 1992). The drive to create one to one learning environments leveraging tablet computing devices is no exception. Simply put, educators need to completely understand the factors that are influencing these purchase decisions beyond their obvious desire to expose students to the latest and greatest technologies.

Purpose of the Study

The purpose of this study was to examine factors that may have influenced the decision to implement tablet technologies within classroom environments. These factors were grouped and limited to three distinct areas: social and political influences, perceived benefits of implementation, and influence of varying types of hardware, software and operating systems.

Significance of the Study

Public education within the state of Indiana is currently grappling with the continued effects of the constitutional amendment that places caps on property taxes (Merrick, 2010). This has served to create disproportionate pockets of well and inadequately funded school districts. Given this, it is imperative that the available funds leveraged in favor of educational technology be used in the most prudent manner possible. The current trend toward mobile computing and tablet devices is a major shift in the historical manners in which educational technology has been implemented and leveraged within Indiana public school educational environments. Providing for a better understanding of the factors that have motivated this change can provide additional insight into the prudence of the overall movement. This study was intended to serve as an initial attempt to identify these factors to allow other researchers the opportunity to expand and evaluate the overall value of tablet devices within our public schools.

Research Design

To complete this study, a descriptive quantitative method was selected. According to Roberts (2010), the quantitative method tends to offer the ability to generalize, be explanatory in nature and often leverages large samples. Accepting that the fundamental credence of quantitative research is that we live in a coherent world that we can understand and generalize about (Gay, Mills, & Airasian, 2006), this research was intended to better understand the influences stirring the growth of tablet acquisitions within K12 environments. To acquire the necessary data, a survey instrument was created to offer technology leaders from all Indiana public school corporations the opportunity to provide input.

Research Questions

1. What are the social and political factors influencing the decision to implement tablet technologies by district level decision makers?
2. What are the perceived benefits of implementing tablet technologies that are positively influencing the purchasing decisions of district level decision makers?
3. What are the preferred hardware characteristics of district level decision makers when selecting tablet technologies?

Dependent Variable: The decision by K12 schools to implement tablet technologies.

Independent Variables: The social and political influences, perceived educational benefits, and preferred hardware characteristics motivating the decision listed by the dependent variable. All three items will be determined through the use of a survey instrument which will target educational technology decision makers serving public school corporations within the state of Indiana.

Listing of Null Hypotheses

$H_0$1 There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies.

$H_0$2 There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies when compared to corporation enrollment size.

$H_0$3 There is no significant difference between the attributes listed as educational reasons being cited as benefits of tablet technologies.

$H_0$4 There is no significant difference between the attributes listed as educational reasons being cited as the benefits of tablet technologies when compared to corporation enrollment size.

$H_0$5 There is no significant difference between the types of preferred hardware attributes listed.

$H_0$6 There is no significant difference between the types of preferred hardware attributes listed when compared to corporation enrollment size.

Definition of Terms

1. Android - Operating system developed by Google to power mobile devices including smartphones and tablets (Perenson, 2012).
2. App - Common term given to software that can be installed on tablet devices to enhance their functionality (Jeng, Wu, Huang, Tan, & Yang, 2010).
3. Cloud Computing - Refers to set of services that are delivered over the Internet to expand and enhance a user's and device's capabilities (Mell & Grance, 2011).
4. HTML5 - A web markup language used for structuring and presenting content for display on the Internet (Botelho, 2012).
5. IOS - Operating system developed by Apple to power mobile devices including smartphones and tablets (Moren, Caldwell, Frakes, & Friedman, 2012).
6. iPhone/iPod - A line of smartphones and intelligent music players designed and marketed by Apple Inc. Both are powered by Apple's iOS mobile operating system.(Ostashewski & Reid, 20100629)
7. LMS - Learning management systems where students and instructors use a common software application to collaborate, distribute content, discuss and collect assignments (Hall, 2004).
8. Mobile Learning - The term m-learning or "mobile learning", offers differing meanings among educators, however, they generally refer to a subset of e-learning, educational technology and distance education that focuses on learning spanning multiple contexts leveraging mobile devices (Wu et al., 2012).
9. PDA - Acronym standing for personal data assistant were a group of devices that served as a simple calendar, contact and sometimes web browsing devices. These

devices often lacked the ability to be expanded through software as is common with modern smartphones (Latamore, 2006).

10. SMS – Abbreviation for short message service which is commonly referred to as text messaging. (Ayabe, Chander, & Mizikovsky, 2000)
11. Tablet - An electronic device that offers a touchscreen interface, onscreen keyboard and has the ability to be expanded through the installation of additional software applications (Cromity, 2011).

Chapter 2-Literature Review

Vision of a 21st Century Educational Environment

It has been argued that for today's students to successfully develop and become tomorrow's workforce, they will need to be prepared to function within an ever changing world where the ability to consume and process information is the key to success. Furthermore, researchers have stated that students must develop the ability to become "expert thinkers" (Levy & Murnane, 2004, p. 1) where they must demonstrate the ability to critically interpret information from multiple sources. Advocates of 21st century learning environments have proposed that students who fail to learn these skills may find themselves falling to the bottom of the employment ladder, greatly limiting their career options and lifetime earnings. Additionally, limitations upon their career options will be a result of interconnectedness of our international economy that will demand that tomorrow's workforce possess the skills and competencies necessary to collaborate with coworkers bridging disciplines and geographic locations. Educational scholars have maintained that this will require students to have a deep understanding of their content areas, a commitment to interpersonal relationships, and the dedication necessary to tie the two together in a meaningful, productive manner (Sparks, 2012).

It is believed that to foster such learning environments, students will need unhindered access to the Internet as a research and productivity tool. It has been shown that developing the ability to validate the creditability of information, detect bias in arguments, and draw rational conclusions are primary skills to foster in such environments (Bjerede, Atkins, & Dede, 2010). Collaboration with peers has been promoted to be a chief component of acquiring such 21st century skills. To facilitate such collaboration, instructors attempt to leverage tools like Edmodo[1] or My Big Campus[2], websites that leverage a social media design similar to that found in the popular site Facebook.[3] These web services allow educators to provide students with learning channels that permitted them a secure place to collaborate, connect, and share content with one another. Instructors who have employed such environments have been able to post grades, assignments, and offered quizzes to students. Such environments allowed students to submit their homework assignments, view their grades, and participate in polls, discussion boards, and blogs. Having leveraged such tools, students are offered the opportunity to engage in peer critiques and publicly revise peers' projects in digital environments that are representative of the types of environments students will be asked to participate when they join the workforce. In other words, educators must teach a "remix of multiple literacies that fuse with tech tools and critical thinking skills to stimulate authentic, relevant learning opportunities for all learners anywhere, anytime" (River, 2010, p. 11).

Given these environments, it has been alleged that curriculum must evolve from static forms like textbooks, worksheets, and handouts into more immersive and interactive digital formats. Assertions have been made that a live curriculum offers the advantage of being updated continually, and that these new environments will allow for the hyperlinking of broad forms of information that will allow learners to dive deep into the topics in a non-linear approach that encourages individual exploration (Bjerede et al.,

[1] For additional information please visit http://www.edmodo.com/about/
[2] For additional information please visit http://www.mybigcampus.com/tour
[3] For additional information please visit http://www.facebook.com/facebook#!/facebook/info

2010). Proponents have maintained that these environments will require less direct student to teacher interaction as much of the basic levels of instruction will be driven by the digital curriculum. It has been asserted that instructors in such environments will be afforded the opportunity to work closely with students, despite possible geographic separation, to help foster higher-order skills that are often missed due to the time spent laying the groundwork for the base level of instruction.

Research has suggested that students often have a high level of support for the use of technology to supplement their learning. A survey of 2,000 first-year college students indicated that students were overwhelmingly supportive of the use of educational technologies (Gregor, Terry, Anna Churchward, Kathleen, & Kerri-Lee, 2008). In addition to directly stated support for technology integration, a study detailing motivation within a project based middle school science classroom revealed that students reported that their motivation levels were increased through the use of media rich curriculum and technology (Liu, Horton, Olmanson, & Toprac, 2011).

Assertions have been made that the digitalization of curriculum delivery also allows for a more personalized experience for the learner. Such personalization is thought to allow for formative assessments and learner growth that can be updated in real time providing educators with a data dashboard that accurately depicts student progress. Additionally, it has been emphasized that parents and guardians can have access to this information, strengthening the school to home ties (Bjerede et al., 2010). It is alleged that universal access to the curriculum will allow the school to extend the home environment allowing for parental involvement in the learning process. Through the use of new technologies, the extension of the school to home has been demonstrated to be a realistic goal. Yet, without the proper curriculum and a method of delivering it to the appropriate devices, such ties have been marginally or completely ineffective (Oppenheimer, 2007). It is believed that to help prepare students for tomorrow's realities, educators must equip them with learning tools that will foster the development of tomorrow's skills while leveraging the resources available within their home environments. To accomplish this, at the most basic level it is necessary to provide students with devices that will facilitate the delivery of curriculum, enable collaborative communication, and help them develop the familiarity with technology necessary to be competitive in the workforce. Despite their relatively recent introduction to the marketplace, many educational technology decision makers have elected to introduce tablet computers to satisfy the hardware requirements necessary to facilitate 21st century learning environments. The implementation of such devices creates the necessity to examine the overarching topic of mobile learning (M-Learning) and the role tablets may possibly serve when introduced into such environments. Additionally, it is believed to be prudent to examine the underlying reasons for adopting such technologies, the key individuals who are actually involved in the decision making processes, and the selection and acquisition methods being employed to justify these purchasing and curricular decisions.

Mobile Learning

Mobile learning, or M-Learning, is a term that has been coined to describe a derivation of E-Learning that is facilitated through the use of a mobile device. As such, mobile learning has been defined as the transfer of information, knowledge, content and skills through the use of mobile devices that replace other forms of print and digital media to facilitate the learning process. Mobile devices typically have included, but were not limited to, personal data assistants, tablet computers (Apple iPad, Google Android devices & Windows 8) and cellular phones, all running a gamut of operating systems.

Despite the diversity of manufacturers and versions of operating systems, mobile devices all share the ability to access content, either stored locally on the device or by way of a networked service. Additionally, a common attribute typically shared by these devices allow for learners to communicate and collaborate regardless of the students' physical locations. The two-way sharing of information and ideas while supporting each other within the learning environment have been thought to be a chief aspect of mobile learning environments. Research has asserted that utilizing mobile devices, M-Learning has generally been characterized as an unobtrusive and autonomous method of instruction since the mobile devices already play integral roles in the learner's everyday lives (Trifonova & Ronchetti, 2003). The area of mobile computing has been rapidly evolving due to the advancements made by the manufacturers of the mobile devices and the explosion of software, commonly referred to as "apps" which, while available on prior types of devices like the Palm Pilot and Windows CE personal data assistants, became front and center to the mobile marketplace with the introduction of the iPhone in 2007. Almost instantly, the expansion of the devices functions and the perceived value to the consumers purchasing them became intertwined with the availability of third-party software applications. To place this in perspective Trifonova and Ronchetti wrote that using a cell phone to read a book is a laughable idea. A decade later, such actions became common place with users being provided a wide selection of choices of reading materials available to view on their phones and mobile devices. Google Play and

Amazon have emerged as the two primary sources of e-books each offering a seemingly endless list of books, magazines and other publications. However, e-books alone do not allow for mobile devices to be leveraged as mobile learning devices. Historically, educators and courseware designers have lacked a comprehensive understanding of best practices that enable mobile courseware to be leveraged efficiently. Elias (2011) proposed a set of eight recommendations for universal instructional design in such mobile learning environments. These simple overarching principles include:

- Equitable use: Leveraging cloud-based storage for content delivery and resource management.
- Flexible use: Instructors must be willing to leverage unconventional assignment methodology and delivery options for learners to submit their assignments.
- Simple and intuitive: Through the use of minimalistic, user-centered open source software applications usability issues can be avoided and licensing errors will not invade the learning environment.
- Perceptible information: Ensuring that mobile learning environments offer multiple methods of reading key information due to device size limitations.
- Tolerance for error: Allowing students the freedom to post to community forums without the fear of losing credit due to spelling or typing errors commonly spawning from the input methods of mobile devices.
- Low physical and technical effort: Leveraging websites and software applications which have been authored to be easily accessed by mobile devices catering to the unique nature of these device's screens and input methods.
- Community of learners and support: Creating communities based upon a variety of factors including technical abilities and content knowledge.

Blending these areas will allow for cross support from each type of learner to others within the community.

- Instructional climate: Instructors of such hybrid learning environments must be available to learners through a number of methods. Text messaging, email, Skype, and others are prime examples of methods suited to mobile environments.

With an understanding of a few basic principles of mobile learning, it is possible to scaffold existing learning theories into the realm of this new technologically driven arena to attempt to better understand the power and potential of these learning environments.

Current Theories Applied to Mobile Learning

Regardless of the philosophy of the educator, mobile learning can be molded to fit the theoretical forces driving the educational intent. For example, behaviorist theory, which included such researchers as Ivan Pavlov, Edward Thorndike, John Watson, and B.F. Skinner, holds that learning is the acquisition of new behaviors through conditioning (Mergel, 1998). Using operant conditioning as a model, mobile learners can practice skills and acquire knowledge through electronic feedback applications, also known as mobile response systems, where students can compete against one another in a simulated game show format. When leveraging electronic response systems, students are offered the opportunity to demonstrate their knowledge and depending upon their responses, either be reinforced or, conversely, punished through the loss of points or lowered status within the simulation (Fies & Marshall, 2006, p. 102).

Cognitivist theory, whose major influence came by way of Jean Piaget (McLeod, 2009), attempted to look beyond behavior as the primary method of learning. In doing so, it offered that the individual learner is critical to the learning process. Learner capacity is expanded through the use of internal mental processes including insight, memory, perception, etc. to build upon existing knowledge and expand cognitive development. Within a mobile learning environment, learners may be asked to participate in collaborative online research that allows for the individual learners to make active choices regarding the articles and assignments in which they read and complete. Additionally, through collaborative group experiences they can construct a shared exploration of the purpose and meaning of the assigned tasks.

Connectivitism, advocated by Stephen Downs and George Siemens, at times parallels that of a digital age computer network, holds that knowledge is distributed across a number of networked nodes of knowledge. Here the learner is asked to navigate multiple information sources while simultaneously creating, maintaining, and nurturing connections to foster a decision making process that is contextual to time and environmental shifts (Siemens, 2005). A simple example of this idea applied to mobile learning is the use of a wiki to allow students to expand upon topics through rich discussion and the sharing of drill down data links to support their assertions.

Some researchers have offered the suggestion that mobile devices allow non-geographic specific access to their instructors and learning materials (Rosell-Aguilar, 2007) while simultaneously allowing for the implementation of location based learning strategies. With location based learning, the learner is provided relevant information based upon the learner’s physical proximity. Leveraging the global positioning technology available in most modern mobile devices, learners can be provided with information that enriches the learning experience of an independent field trip by providing available historical, environmental, social, or other form of information based upon the learner's location in a just in time format as the learner changes locations.

This application of theory to mobile learning could continue to touch nearly all methods of instructional theory. However, in the interest of brevity to allow for a better understanding of mobile learning, Table 1 contains a sampling of educational theories, associated descriptions and an example of implementation within the context of mobile learning

Table 1
Learning Theories and Associated Mobile Learning Adaptations

Theory	Description	Mobile Learning Example
Behaviorist	Learning that is shaped by reinforcement between a stimulus and a response (Mergel, 1998)	The use of drill and feedback applications or mobile response systems (Quizdom, Promethean, Poll Anywhere, etc)
Cognitivist	Information-processing theory serves as a useful model to describe the act of learning as an internal process that comprises of several stages (Hew, Hur, Jang, & Tian, 2004)	Collaborative online research and learning designed to allow learners to make choices as to the articles they read and conduct a shared exploration of the articles meaning (Ashcraft, Treadwell, & Kumar, 2008)
Constructive	Learners engage in constructing products, ideas, or concepts that are personally meaningful to themselves or to others around them based upon past knowledge (Shaikh & Khoja, 2012)	The use of collaborative interactive simulations allowing the creation of simulated communities, towns, or even worlds which allow students to explore the interconnected nature of their choices during the simulations
Problem Based Learning	Learners are presented with reflective problems to work to a collaborative solution (van der Veen, van Riemsdijk, Jones, & Collis, 2000)	Collaborative social interaction through SMS and social media systems to work to a collaborative solution

Context Awareness	Learning is mediated by the context of the learner. This may include the surrounding environment or the computing interface being presented (Zheng, Li, Hiroaki, & Yano, 2005)	The use of an interactive museum tour that leverages location aware software to present the learner with information to enhance their understanding of their surroundings
Collaborative	Learning is generally depicted when groups of students work together to search for understanding, meaning, or solutions or to create an artifact or product of their learning (Warschauer, 1997)	Using tablet computers to create a shared environment for educators to interact solving mathematical problems (Hunger & Hodges, 2009)
Conversational	Defined by how teachers and students engage in a dialog over a given concept and identify differences in how they understand it (Thomas, 1994)	The implementation of question and answer sessions through the use of an electronic fieldtrip
Informal	Learning that occurs autonomously and occasionally without the presence of directed instruction (Straub, 2009)	Students watching YouTube videos relating to their personal interests
Connectivism	Stems from the idea that knowledge is distributed across a network of connections and, therefore, that learning consists of the ability to construct and bridge those networked information sources (Siemens, 2005)	The use of a wiki for students to expand upon topics through rich discussion and collaborative learning
Location Based	Just in time learning that is initiated by the use of the learner's physical location (Brown et al., 2010)	Using GPS information from cellular phones or other mobile devices to provide learners with on demand lessons during a field trip (Sagers, Kasliwal, Vila, & Lim, 2010)

As demonstrated by reviewing existing theory, it is possible for educators to find adaptations for their existing methods and theoretical preferences to adapt their classrooms to encompass a mobile learning environment. However, there appeared to be gaps in the literature regarding educational technology leaders' reasons for rapidly adopting mobile learning and tablet technologies. Additionally, while reviewing existing literature, there appeared to be a lack of a comprehensive rationale behind this shift in educational pedagogy. Despite the absence of a comprehensive rationale, the move to adopt mobile devices has moved forward rapidly. As such a review of the new forms of software and content which have been made available for these devices and environments is necessitated.

Early Technologies Leveraged for Mobile Learning

Since the introduction of the personal data assistant (PDA), many forward thinking educators have dreamed of universal access to affordable electronic instructional devices. Chief among the devices that offered a glimpse into the next decade of development was the Apple Newton Messagepad 2100 first introduced in 1993 and discontinued four years later (Jensen Schau & Muñiz, 2006). This device offered the promise of inkwell technology that converted a user's handwriting into a method of text input. Unfortunately, the technology was very early in the design stage and rarely functioned as intended. However, the model of handheld mobile computing devices that easily provided for human computer interaction was a powerful concept for many educators. Following the Newton, various incarnations emerged, each having unique features and differing ranges of success. Examples of such include the Palm Pilot and the Compaq iPaq, which offered an early version of the Windows Mobile operating system. As these devices continued to develop and evolve, features such as device to computer synchronization, infrared data exchange, Wi-Fi data transfer, and cellular connectivity were added to augment the devices features.

In contrast to PDA development, e-readers were initially designed to serve the singular function of simply offering the user a method to read digitalized text on a portable electronic device. These devices followed behind the introduction of the first PDA devices initially introduced in 1998. Despite various incarnations, they did not achieve widespread popularity until the release of the Amazon Kindle in 2007 and later reinforced by the release of the Barnes and Noble Nook in 2009 (Kolakowski, 2009). These devices provided the opportunity for the user to purchase titles and have them delivered wirelessly to the devices. This allowed for the devices to serve as on demand libraries enabling the user to carry an unprecedented amount of reading material while also allowing access to a seemingly unlimited on demand library.

Enter the Apple iPod Touch and iPhone

The iPhone was first made available for purchase on June 29, 2007 (Hamblen, 2008) and the subsequent release of the iPod Touch during September of 2007 (Oehler, Smith, & Toney, 2010) offered a glimpse into the future of human device interaction. While prior devices depended upon physical buttons for interaction with the underlying software, these two devices ushered in a new era leveraging onscreen input via touching and multi-touching the virtual display screen. Unlike the Blackberry, the leading smartphone of the time that utilized a physical keyboard, these devices presented the user with an onscreen virtual keyboard and offered haptic[4] and audible feedback. The multi-

[4] Haptic technology is a tactile feedback technology which takes advantage of the sense of touch by applying forces, generally vibrations to enhance the user experience.

touch screen also enabled the implementation of gestures including pinching, flicking, and stretching (Murray & Olcese, 2011). These gestures quickly ushered in a new set of expectations and skills for users. The novelty of the actions, such as flicking to scroll through a menu, coupled with the enhanced functionality they offer for a mobile environment laid the groundwork for wide spread user acceptance. Once in place, the stage was set for other devices to follow and expand upon this model of human device interaction.

The introduction of the iPhone and iPod Touch also brought about a revolution regarding expanding the devices through the installation of applications. Certainly, the older Palm PDA's and Blackberry devices had the ability to install additional software, yet they still required a computer attached to the device to do so. The introduction of the Apple App Store in July of 2008 rushed in the era of on demand expandability delivered wirelessly to the device (Young, 2011). Hosting a combination of free and paid applications, users quickly became enthralled with discovering the new capabilities their devices could accomplish.

Evolution of Mobile Software and Content

Due to the relatively new nature of tablet devices, most of the information available focuses upon smaller handheld devices such as iPods and cell phones. As such, the focus of many early pieces of literature addressing the topics were more focused upon the consumption of content rather than the full nature of a rich interactive mobile environment. It is necessary to remember the rapid development and refinement mobile devices have undergone in just six years since the initial release. Mobile browsers have become increasingly sophisticated and productivity applications have been authored, greatly extending the devices potential as productivity devices. Early education articles generally discussed the methods of pod casting (using either audio or video presentations for purpose of instruction) and how to best implement such practices into the classroom (Rosell-Aguilar, 2007).

Regardless, these early articles addressed the immediate concern of providing content to mobile devices. Due to the early nature of the format and limited number of devices in which content was being authored, early articles omitted the idea of authoring to leverage the strengths of mobile devices. Early authors of multimedia content were simply focused upon being able to provide some form of content to the device. As such, they were not concerned with providing for underlying navigation, varying screen sizes, creating custom players, or any other aspect of usability outside of simply creating a multimedia content product. Regardless, pod casting and other presentation methods are still relevant to today's learners and educators, yet they are typically non-interactive presentation formats. As time has passed, more thought has been given to providing a comprehensive environment for mobile learning. Hassan, Hamdan and Al-Sadi (2012) offered three areas necessary for the comprehensive creation of mobile learning environments. Pod-casts served as an example of the first area of a three part mobile learning environment being non-interactive presentations that provide for the distribution of information, lectures, and ideas to mobile learners. The second area provided for the offering of collaborative learning activities in which SMS[5], email, and social media outlets can be leveraged to enable learners to collaborate and share information. The third area was the need to offer quizzes and assessments that are closely tied to the

[5] SMS is often referred to as "text messaging"

learning objectives for the specific lesson and are designed and implemented in a method that allows for effective access and use on mobile devices (Hassan, Hamdan, & Al-Sadi, 2012). Throughout the literature offered, there has been relatively little attention paid to the use of mobile devices for completing assigned tasks (Ting, 2012). Certainly, Hassan, Hamdan and Al-Sadi (2012) illustrated the need for a multifaceted mobile learning environment, however, they failed to directly address the specifics of how to accomplish these tasks or offer best practices for educators working in classrooms attempting to implement the devices authentically into their curriculum and daily lessons.

Here was the first illustration of the need for instructors to be afforded the opportunity to develop a mobile mindset and, in doing so, begin to understand the strengths of mobile learning and mobile devices as well as the limitations of mobile devices when attempting to incorporate them into traditional learning activities. Additionally, after being afforded such experiences, it is unclear if these educators participate in the procurement of technology or if such training is simply an afterthought of the acquisition process.

Few studies focused primarily upon the devices themselves, ignoring the need for a comprehensive pedagogy guiding their use. The argument was offered that, if the focus of course design centered around the limitations of the devices, "the devices themselves only offer the advantages of anytime anywhere communication" (Ting, 2012). While the limitations of the devices may had led to the tendency to ignore the larger pedagogical structure, their existence was too influential upon the process to be ignored (Jeng et al., 2010). Screen size limitations, processing abilities, and the usability of the device all place limitations upon the learners' experiences. Yet, they simultaneously enhance the ability of students in other areas of learning. Leveraging mobile devices, learners no longer need to be in front of televisions organized in orderly rows to consume video content. Modern mobile devices have demonstrated the ability to provide each learner with an independent media stream which is customized to their independent learning paths (Geist, 2011). This type of learning need not be confined to a specific classroom or contiguous geographic area. The processing requirements for tablet devices appear to be less than their heavier full featured predecessors. Tablets lend themselves very well to accessing cloud based services and thus expand their capabilities accordingly. Leveraging services, such as Google Drive, the learning process can be strengthened through communication and collaboration (Finkel, 2011).

Impact of the Cloud

According to the National Institute of Standards and Technology, cloud computing has been defined as a “model for enabling ubiquitous, convenient, on-demand network access to a shared pool of configurable computing resources (e.g., networks, servers, storage, applications, and services) that can be rapidly provisioned and released with minimal management effort or service provider interaction” (Mell & Grance, 2011, p. 2). Depending upon the perspective of the reader or technical advisor, this definition of cloud computing can take a number of forms. Regardless, for the purpose of this discussion, the focus will remain on the communal resources of a shared, collective group of Internet services known collectively as cloud services which enable educators to further extend the bounds of mobile computing within the K12 educational environment. Eric Schmidt, Google’s former CEO, once stated in an interview “that if you don’t have a mobile strategy, you are no longer relevant.” (Manyika, 2008) This can be extended to the need to leverage cloud resources to successfully implement mobile computing initiatives. The concept of the cloud takes two simple forms. First, the cloud offers a number of services including shared storage, access to documents and files, methods to sort, organize and locate educational content, learning management systems (LMS), and a host of other items. The second concept is the portal in which the user leverages to gain access to the collection of cloud resources and services.

The smartphone has become the go to device that provides the most convenient untethered access to the cloud due to portable size and cellular data streams. However, tablets are also making a strong case as the device of choice for universal portal (cloud) access. Since many within the educational scene have grown accustomed to larger screen sizes, and the concept of a touch screen is highly intuitive, tablets are believed to be easier to input data and commands (Koulopoulos, 2012) and as such, perform better than smaller cellular counterparts serving as portal clients.

The cloud offers many avenues to serve as the placeholder for content that is delivered to learners in a just in time format. Leveraging disruptive patterns that were pioneered in the realm of higher education by institutions like The University of Phoenix, Kaplan University, Walden University and a host of others, learners can build understanding of the content to be mastered by drawing upon resources held within digital lockers while simultaneously providing for a deeper exploration of the topic and ideas being presented by leveraging device agnostic delivery to a multitude of portal devices (Koulopoulos, 2012).

The concept of the cloud offers educators with an infinite campus of ever-changing services to better reach students in a highly individualized fashion. Leveraging cloud services, schools have begun to move beyond the traditional Macintosh versus Windows operating and hardware issues that have historically dominated technology adoption discussions. The cloud offers the promise of ubiquitous delivery of learning materials to any device that has the ability to connect to cloud services. The key to the success of the cloud concept is the continued standardization of cloud resources allowing equal access across any device. Standardized web languages may hold a key for this continued convergence. The HTML5 standard, when fully adopted by the Worldwide Web Consortium[6] in 2014, will be the first upgrade to the hypertext markup language (the scripting language in which web pages are created) since 1999. Historically, for developers to offer rich web experiences like Facebook or YouTube, it has been necessary to leverage technologies like Flash, JavaScript, and Java which are not native HTML to accomplish the task. HTML5 offers a chance to make such secondary technologies obsolete. Secondary technologies generally involved the installation of plugins to the standard web browser which often caused compatibility issues as the website was viewed across various operating systems and browsing platforms. Removing device dependent intermediaries that depend upon these technologies and allowing devices to natively understand the content being presented holds a great deal of promise and potential. Such environments enable developers to create one version of a website or application that will natively perform equally well across all platforms without the need for multiple device and operating system dependent versions. Table 2 provides a listing of a number of cloud computing terms and acronyms to help provide a better understanding of services which are available to schools, businesses and any other party

[6] For more information please visit http://www.w3.org/Consortium/

willing to leverage such offerings.

Table 2
Listing and Description of Common Cloud Computing Terminology

Cloud Resource Term	Description of Service
Infrastructure as a service (IaaS)	Provides for a basic cloud service model that delivers computers, either physical or virtual, and other resources necessary for a basic datacenter environment.
Platform as a service (PasS)	These providers typically deliver packaged services including operating system, programming language execution environment, database, and web server networks, servers, storage and other services. Generally, tools and automation supplied to the consumer are more robust than with the IaaS model. Many organizations use Amazon Web Services as a PasS provider to enable a saleable infrastructure without the initial capital outlay of establishing a corporation owned datacenter.
Software as a service (Saas)	Providers install and operate application software in the cloud and cloud users access the software from cloud clients. The cloud users do not manage the cloud infrastructure and platform on which the application is running and generally the service is delivered via a browser based medium. Google Docs for Education is an excellent example of such a service.
Network as a service (NaaS)	A category of cloud services where the capability provided to the cloud service user is to use network/transport connectivity services. The use of Amazon Web Services by NetFlix to leverage high bandwidth is a working example of such a service.
Desktop as a service (Daas)	Users of this service can subscribe to a virtual desktop system with an operating

	system and software of their choice. The virtual machine is hosted in a datacenter and is accessed remotely by the subscriber.
Storage as a service (STaaS)	Model in which the service provider rents space in their storage infrastructure on a subscription basis.

Within the educational environment, software as a service has emerged as the most prominently leveraged option. Within that category, the use of Google Docs for Education has become very pervasive within both K12 and colleges (Speelman, Gore, & Catarino, 2012). This software is available free of charge and offers tools to create spreadsheets, word processing, and slide show presentations. Additional features include the ability to collaborate with a nearly unlimited number of people while simultaneously editing a shared document, shared calendar services, and a generous amount of storage for documents, photos, and other files which the user decides to archive. Another recent offering was launched by Adobe titled The Creative Cloud. Here, Adobe has made an effort to remove its presence completely from independent desktops and now offers subscriptions to their popular software titles (Illustrator, Dreamweaver, Photoshop, and Illustrator). This move allowed for users to leverage the software regardless of the device in which they find themselves using. Microsoft Office 365 is another offering within the world of SaaS provided by the Microsoft Corporation. Like Google Apps for Education, Office 365 offers rich collaboration and cooperation tools; however, in contrast to Google's offering, Office 365 is a feature rich package that more closely resembles the rich experience users have been accustomed to from using software packages that are locally installed to their individual machines (Kroenke & Nilson, 2011). As software as a service (SaaS) offerings become more feature rich and deeply integrated into mobile devices, the mobile cloud stands to become the ultimate utility within our daily lives. Scholars have stated that just as users have come to expect their cellular phones to work nearly everywhere they travel, they will eventually expect the same of our applications, data, and documents (Koulopoulos, 2012). Leveraging such cloud resources, tablets stand to be the ultimate portal of choice for educators seeking high portability and geographically diverse delivery of services.

Tablet Impacts and Considerations

Since the release of the Apple iPad in early 2010, manufacturers introduced a host of Android and Windows 8 tablets that provided users with a multitude of device and platform options. As these devices continued to evolve, a convergence of features transpired that previously required multiple mobile devices for users to enjoy. The extensive software stores available for these devices have allowed for them to be customized allowing a wide array of tasks. As of the third quarter of 2012, both Google Play and the Apple App store offered over 600,000 applications (Fingas, 2012) . The number of software titles is impressive and, as stated previously, they expand the devices capabilities to almost unimaginable tasks. Applications leverage the devices' built in resources like global positioning system, Wi-Fi, camera, Bluetooth, accelerometer, and touch screen to allow for the device to complete tasks which the devices were not originally intended. For example, using geometric principles and the built in camera, in combination with the accelerometer, an application can allow for the device to accurately measure the distance or height of a nearby object. Due to the expansion of device capabilities, applications have emerged for nearly every level of education from primary to post-secondary and continue to expand into a wide range of curricular topics.

After being inundated for years with devices that find themselves limited in one fashion or another, many educators and technology specialists now believe that mobile computing has come of age and has become fully ready to emerge as a powerful influence in the K12 educational arena (Rapp, 2011). Other factors that have been driving educators to desire these tools include multi-touch displays, lower acquisition cost than full notebook computers, and nearly double the battery life of netbooks (McLester, 2012). Mobile devices are now not only a reality but are also beginning to replace iconic educational supplies such as textbooks and pens. Recently, South Korea announced that by 2015 no paper-based textbooks will be utilized by their students. This announcement proclaimed that all learners will have access to mobile devices that will present the necessary content to them (Norris & Soloway, 2011). A report issued by Cisco Systems Visual Networking Index Global Mobile Data Traffic Forecast, stated that by 2017 network traffic from wireless devices will exceed the traffic generated by wired devices (Index, C.V.N, 2013). This report also stated that by the same year, mobile connected tablets will generate more mobile traffic than the entire global mobile network did in 2012. Additionally, by 2017 two-thirds of the world's mobile data traffic will be consumed by video applications. Clearly, mobile devices have gained a strong foothold with today's consumers and will dominate the landscape in the years to come. It is critical that educators understand these trends and evaluate such devices' implementation into daily educational processes in a clear, defined, and planned manner.

As each generation of mobile device has increased the features and capabilities of the devices (Wi-Fi, Bluetooth, email, global positioning systems, sound recording, video recording, music playback and productivity software) educational researchers have been prompted to begin examining the pedagogical aspects required to develop curriculum offerings to leverage these devices (Wu et al., 2012). Researchers have coined terms to help quantify the concepts including mobile computing, ubiquitous learning, mobile learning, distance learning and a host of others. While each of these has offered a perspective regarding the use of tablet computers, they often fall short of describing exactly where tablet devices such as the iPad and Galaxy Tab fit within the educational technology spectrum. In *Technology and Education Reform,* Means proposed that educational technologies can take one of four forms: tutor, method for exploration, tool, and communicate (Means, 1994). Many educators have grown hopeful that tablets will be able to fill all four roles.

Tablet devices fall into a spot within the educational technology arena which is difficult to quantify. Given many of their features, they can easily serve as mobile learning devices. Mobile learning can be defined as any sort of learning that transpires when a learner is not at a static, predetermined location, and leverages the opportunities offered by mobile technologies. However, given their larger screen size (generally from seven to slightly over ten inches diagonally), expandability, and vast software libraries, they can also be thought of as nearly the same class as notebook computers which serve in the E-Learning continuum. Unlike their smaller cellular phone counterparts, tablets are a secondary device. Given their size, tablets have been demonstrated to be slightly less desirable than cellular phones as a carry everywhere device (Norris & Soloway, 2011). As such, adoption of these tablets ranges from classroom usage to completely autonomous learning settings but may not be the preferred device to leverage in either setting. Since mobile learning has moved beyond fantasy and has become a viable platform for learning that bridges both formal and informal environments (Cochrane, 2010), tablets seem to fill the middle ground between both arenas. Many see tablets as the first practical device to grow beyond the limitations of handsets (cellular phones) and offer themselves as true mobile learning tools (Galagan, 2012). For the purpose of this literature review, the devices will be primarily examined utilizing a mobile learning perspective.

The deployment of new technologies has historically required a great deal of time and effort regarding the training of users. Tablet computers, whether Apple or Android based, leverage the prior experiences of the users. Given that students have grown to be familiar with mobile technology in the form of a cellular phone, many of these skills help to eliminate traditional technological barriers during adopting new devices (Norman, 2011).

Given the multitude of changes within the educational technology spectrum, it is imperative that educational technology decision makers completely understand the nuances that are associated with the implementation of notebooks and tablet devices. The following section examines the similarities and differences between tablets and laptop computers and attempt to offer a beginning knowledge as to why tablet expenditures are growing rapidly.

Tablets Compared to Notebook Computers

To begin, notebooks (also commonly referred to as laptops), and tablet devices generally use two dramatically different interfaces to interact with the user. Tablets use multi-touch screens to allow the user to touch, type, select, and manipulate items on the screen with a pen or stylus. Notebook computers leverage more traditional operating systems that usually involve a mouse, trackball or touchpad to move a pointer to select and manipulate items. Additionally, notebooks use traditional physical keyboards. In contrast, tablet users must either type using a virtual on screen keyboard or use voice dictation software to compose on tablet devices. Many tablets also offer expandable options such as a keyboard dock, Bluetooth keyboard, or USB keyboard. However, these are generally secondary to the device and viewed as accessories and not standard equipment. Notebooks also boast larger screens, an internal hard drive that allows it to store more data locally than tablets, and have the ability to run full versions of desktop software. Many tablets have utilized cloud services like Google Drive or Office 365 to store documents. Cloud-based storage for tablets does present the limitation of requiring an Internet connection to access stored documents.

In contrast to notebooks, tablets have been demonstrated to be highly portable devices (Meister, Kaganer, & Von Feldt, 2011) . Their weight is generally listed in ounces or grams rather than in pounds or kilograms. Their physical size and lack of weight make them as portable as a single book. Mobile operating systems which power tablet devices offer an instant on/off feature that allows them to be turned on with just a few seconds notice rather than spending a full minute or more during the booting cycle of traditional notebook computers. Tablets also boast long battery lives that generally last for ten or more hours of continuous usage (Cromity, 2011). This long battery life, ease of transport, and instant on functionality[7] make the devices desirable for classroom usage.

[7] Instant on functionality is the ability of the device to appear to power up instantly without displaying a prolonged boot cycle

In addition, the literature revealed that most tablets also host built-in features such as global position systems and have video, voice, and image capturing abilities which make them to be very versatile devices in and out of the classroom environment (Marie & Tzaddi, 2012).

One advantage offered by tablets is that they have access to tens of thousands of free applications that are easily located in various application stores. Having these applications located in large repositories readily available for download makes finding them simple and installing them trouble free. Researchers have asserted that while many of these applications offer similar services or functionality, they allow for the users to pick the style of application that best suit their usage style for little or no cost (Nooriafshar, 2011). While these applications are not as robust as traditional software packages offered for personal computers, they are often very lightweight and target a specific skill or task at hand. Often, tablet users find themselves leveraging multiple applications to replace a single desktop application.

Depending upon the implementation method, arguments can be made in favor of either class of device. Regardless, it is safe to assume that over time, as hardware and software continue to evolve, the functionality gap between the two types of devices will continue to close. As that happens, trends favoring tablets will continue to accelerate. In fact, according to US News and World Report, sales of Apple's iPad sales were roughly double the sales of its MacBook for the second quarter of 2012 (Lytle, 2012). With schools rapidly embracing tablet technology, there is little doubt that the quantity and quality of software applications will continue to improve while further enhancing the allure of the technologies. Despite the projected increase in tablet adoptions, questions remain regarding the specific comprehensive factors that are luring educators into selecting tablets over other traditional means.

Android Tablets: An Affordable and Viable Cloud Portal?

With the sales of Apple's iPad now outpacing the sales of Apple's Macintosh sales to schools and students, it is clear that the landscape of the educational sales market is dramatically changing (Kerr, 2012). However, since the introduction of the original iPad in April of 2010, competitors have emerged offering many choices to the once irrefutable king of the tablet market. Google Android operating system was originally designed for use on cellular handsets. Early Android tablets were simply little more than marginally modified phones with large screens. However, with the release of the Honeycomb (Android version 3.1), Ice Cream Sandwich (Android version 4.0) and Jelly Bean (Android version 4.1) the operating system has evolved dramatically and now has the sophistication and maturity to compete feature for feature with Apple's products (Vaughan-Nichols, 2012).[8] Apple has historically dominated the K12 marketplace. However, the evolution of the Android operating system and the increased number of manufacturers competing for market shares have led to a growing number of tablets entering the marketplace in the $150 - $250 price range. Such devices that have recently appeared on the market within this range include the Amazon Kindle, Nook, Nexus 7, Galaxy Tab II 7, and a host of others too numerous to mention. A cursory search of the online retailer Newegg.com revealed forty-six Android tablets offered between the ranges of $150 - $300. With the price of the iPad starting at $399 and ranging to nearly $800, it

[8] Google has assigned each version of the Android operating system build names that correspond to varying types of food treats.

takes little imagination to believe that the potential sales of Android devices could be anticipated to grow rapidly within the K12 marketplace.

As previously discussed, cloud services are changing the nature of human to technology interaction. Access to cloud services enables lightweight devices to accomplish a number of tasks which have historically required a full featured computer to accomplish. The literature suggested that as these services continue to evolve and become more device agnostic, inexpensive devices like the Amazon Kindle and others should become more attractive to institutions seeking to maximize their educational technology investments. However, without a better understanding of the motivation and processes driving education decision makers, such statements are simply conjecture. To better understand the educational technology market forces at work, more research is needed to help better quantify hardware related purchasing decisions including form factor, screen size and resolution, operating system, device management, vendor/manufacturer loyalty, and others.

Teacher Acceptance and Other Barriers

Teacher acceptance of new technologies has historically hinged upon a number of factors. Many of these factors have been found to be intrinsic to the technology itself and others have stemmed from the vantage point of the user themselves. To begin to explore this relationship, researchers often conduct what are termed usability studies upon a given technology. In describing usability in devices, such as tablets, there are a number of standardized methods in which to gage such usability. While such studies are commonplace within the technology business arena to help refine and enhance products for the marketplace, the use of such frameworks is relatively rare within K12 educational environments.

The Technology Acceptance Model (TAM) was introduced as an early theoretical framework to help understand how users come to accept, adopt, and utilize a given technology (Bagozzi, Davis, & Warshaw, 1992). Within this framework, the TAM attempted to measure the fit between the human and device interaction through four separate scores. These included the perceived usefulness of the device in question, specifically the degree to which the subject believes that using the technology would enhance his or her productivity. Next, the perceived ease of use was defined as the degree in which a person feels that using the technology will be free from effort or require as little effort as possible depending upon the given task or purpose of the device. Lastly, the user’s attitudes towards using the device and the behavioral intention of the user to adopt and use such technologies in the future are also recorded. Typically, these indicators are measured through formal usability tests in which users are asked to complete a number of tasks while researchers note issues that are encountered by the subjects. It is necessary to note that during these tests, it is the device or technology that is being evaluated and not the user’s ability to use it. Researchers carefully create the required tasks and simulations to ensure the focus on the testing remains honed steadfast upon the technology. Understandably, researchers have asserted that usability is of great importance within educational settings (Holden & Rada, 2011). The differing ages, backgrounds, and skill levels of students, staff and instructors demand that technology acquisitions be as intuitive as possible.

Regardless of the needs of the educational technology community, the Technology Acceptance Model was not designed to address a multitude of user-based psychological variables including personality, learning styles, demographics, and other related items. As researchers have discovered, these items are also strong indicators of users' acceptance of new technologies (Alavi & Joachimsthaler, 1992). Scholars assert that schools would be well-served to utilize such strategies to conduct structured research regarding potential technologies prior to purchase and to follow up with attempts to calculate or at least quantify the return on technology investments after purchases (Holden & Rada, 2011, p. 364). Unfortunately, within the arena of public education, there is often little time to plan, study, and craft strategic decisions regarding the future course of information technology acquisitions. Too often, educational leaders have found themselves to be accidental technology stewards where technology is knocking down their doors rather than simply knocking on them (White, 2007). Additionally, educators do very little advance planning to understand and determine the software needs of our classroom teachers and the students which they serve (Middleton, Flores, & Knaupp, 1997). To allow for new technologies, like that of tablet computers, to be successful academically, technologically, socially, and politically, we need to begin to better examine the intentions and objectives driving technology purchases. Additionally, despite the claims of software publishers, software titles have often been found to be non-instructive and fall short of classroom curricular objectives (Lovell & Phillips, 2009). Clearly, the extension of the Technology Acceptance Model could serve to enhance the adoption of educational technologies across the learning and implementation spectrum. Application of such models could serve to enhance the selection of learning management systems, curricular software, computing devices, mobile learning processes and a multitude of other technologies that can be utilized to support the learning and instructional processes.

Despite the popularity of the devices, one has to question how tablets would score if they were subjected to a variation of the TAM model focusing on the device, the teachers' current skillsets, and the instructional needs of the classroom setting. Often, educators are lured into the adoption cycle by the marketing efforts of technology manufacturers which leads to a profound disconnect between the acquisition of the devices and their authentic use within the classroom. Offering a clear rationale for the purchase of such devices and ensuring a match between their capabilities, the state of mobile learning and the skill levels of the instructors attempting to leverage the devices appear to be an area necessary of more time, attention, and purposeful study.

Hew and Brush (2007) also acknowledged that teachers' attitudes and beliefs are major obstacles to the success of a given technology within the classroom. These authors also described a number of other barriers that oppose the successful adoption and implementation of new technologies. The most obvious barrier described cited is that resources or lack of them can be a major obstacle to technology adoption. When considering the adoption of new technologies, it is imperative for assessments to be made regarding support and sustainability. However, depending upon the technology, such assessments are often neglected. Having reviewed the available research, there appears to be a lack of research regarding the sustainability regarding tablet computing devices. It has been asserted that as many schools rush towards one-to-one implementations there is the risk that such initiatives will become $1,000 pencil programs (November, 2013). Clearly, additional research is warranted.

The lack of specific knowledge and technological skills has also served as an impediment to the use of technology (Hew & Brush, 2007). Simply put, teachers have demonstrated a reluctance to integrate devices into their curriculum when they do not feel a high degree of confidence in their personal ability to use and leverage the devices' capabilities. The possession of an adequate to high degree of technical knowledge serves to foster positive teacher beliefs and encourages confidence in the devices themselves. It has been argued that the final decision whether to implement a given technology into a classroom environment ultimately depends upon the teachers themselves and their beliefs regarding the technology in question (Ertmer, 2005). Given the power that teachers hold in the final decision to implement technology and the nexus between technological skills and competency leads to an appreciation of the importance of teacher attitudes, beliefs and technology skills when adopting new technologies. However, evidence of teachers' roles in the selection and purchase of technology is limited. Here is where the need for a shared vision becomes evident. Educational technology advocates have stated that teachers, administrators and technology staff members need to possess a shared vision regarding technology and how to forge a symbiotic relationship between technology and the classroom curriculum (Staples, Pugach, & Himes, 2005). Realistically speaking, for technology to successfully enhance the curriculum and have a positive impact on student achievement, this vision must be a shared vision crafted and believed by all stakeholders. Again, a key ingredient of wide-scale technology implementations is the involvement and active participation of teachers. Given the prolific infusion of tablet technologies into schools at all levels, researching the level of input solicited from teachers' prior to the purchase of such devices may glean insight into creating more purposeful technology procurement programs and could serve as an indicator as to the relative success of such purchases.

Regardless of how inclusive the procurement process has been for teachers, there will always be a population of educators that require a high level of professional development to influence their attitudes and beliefs towards technology. Effective professional development focusing on technology adoption and integration must focus on content that provides skills, pedagogy, and classroom management strategies. Academics have indicated that teachers must be afforded opportunities for hands on experiences that are clearly consistent with their classroom goals, objectives, and curricular needs (Hew & Brush, 2007). While researching the potential of any form of technology, a plan for professional development should also accompany such plans. However, it is clear that additional study would be beneficial to better understand if the linkages between procurement and professional development are being made at the time of technology selection or if professional development is being implemented after the purchase as what could be termed an obligatory exercise. It has been asserted that educational institutions should strive to recognize the value of innovation and adopt staff development strategies that put staff first by actively linking technological training to content and curriculum (Mainka, 2007). Researchers have emphasized that without such clearly defined expectations, technologies like tablet computers could be thought of as very expensive machines serving only rudimentary tasks such as games and note taking (Hubbell, 2011). Given this, it has been proposed that the acquisition of technology be treated not as another initiative, but as an integral component that serves to enhance and augment the curriculum (November, 2013). The importance of technology acquisitions, like tablet devices, is the added benefits which they bring to the culture of teaching and learning. When selecting such devices, there is a need for a clear vision that embeds staff development focused upon pedagogy and technology. In order to properly build broad based support for such implementations, the need for educator involvement in the selection of such devices is clear. However, little evidence is available that indicates that this is the practice within school districts.

Indiana's Pending Technology Bubble

In 2010, Public Question 1 was approved by voters by a vote of 72% in favor and 28% against. With the passing of this constitutional amendment, the property tax rate for real property was capped at a maximum of 1% for an owner occupied residence, 2% for residential property that was not owner occupied and agricultural land. All remaining property, primarily business properties holdings, was set at a maximum of 3% of the properties assessed valuation[9]. As a result of this legislation, many schools and other local government agencies found themselves in competition for limited tax revenue. School corporations which had undertaken building projects and were carrying a high debt load prior to the implementation of the legislation found their other funds, capital projects, transportation, and bus replacement funds being squeezed due to these existing debt obligations. The revenue ceiling that was imposed due to the property tax caps forced many of these districts to dramatically alter their services and expenditures

[9] For additional information please visit http://www.in.gov/dlgf/files/101202-_Fact_Sheet-_2010_Circuit_Breaker_Caps.pdf

causing potential inequities in educational expenditures (Stokes, 2012). A report issued recently by the Indiana Association of Public School Superintendents indicated that approximately 47 school corporations will lose local funding greater than 20% up to as high as 100% as a result of the current taxing environment[10]. As a singular example Clark-Pleasant Community School Corporation, located in Johnson County Indiana, is projected to lose a total of $3,076,380 or 48.2% of its revenue within the capital projects, transportation and bus replacement funds. Since the capital projects fund is the primary, and often only, source of funding for educational technology, the impacts of the property tax caps will be profound for corporations with similar fiscal demographics. Conversely, Center Grove Community School Corporation, also located in Johnson County Indiana, is projected to experience a total loss of $398,702 or 4.7%[11]. It is believed that the disproportional impact of the constitutional amendment will serve to create disproportional levels of spending on educational technology by local educational agencies (Stokes, 2012).

Delving deeper into the local budget reveals the impact which this holds for the local district. Examining the budget for technology acquisitions for Clark-Pleasant Community School Corporation, a startling truth is revealed. According to the district's business manager, Mr. Steve Sonntag, the district's total annual budget for technology maintenance, acquisitions, and support was set at a $635,000 (personal communication, October 1, 2013). This number has been decreased $200,000 from past levels to help accommodate circuit breaker issues. Sonntag asserted that the projected costs for simply

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[10] For more information please visit http://www.iapss-in.org
[11] For the complete report, prepared by Legislative Services Agency, please visit http://www.iapss-in.org/subsite/dist/news/2013/03/20/circuit-breaker-loss-report-1307

maintaining the existing equipment and services that Clark-Pleasant offers their staff and students, and assuming a five year replacement cycle for technology equipment, will cost the district $614,700 annually. Currently, the district is leveraging “Rainy Day Funds” to offset some of the circuit breaker impact; however, those funds will be exhausted within three years. Unless additional sources of revenue are found, the district’s current technology funding levels are anticipated to be cut by as much as an additional fifty percent, leaving the district in a position where services will be cut and equipment will be forced to age in place far beyond the projected usable life span for such items.

Across Indiana, many districts are facing similar scenarios. As such, technology directors will find themselves pressured as to why other educators serving within differing school corporations have access to forms of technology that are unavailable to others. Tablet technologies could easily become an item that symbolizes the disproportionate resources between school corporations. As such, it is imperative that decision makers have a clear understanding as to why such technologies are being implemented and why they are indeed worthy of the investment. Shrinking budgets and political pressures are a ruthless combination of influence for the unknowledgeable decision maker.

Summary

Within this chapter the vision of a 21st century learning environment was discussed in detail. To further enhance the understanding of such learning environments, a comprehensive review of mobile learning (m-learning) and its role in today’s electronic classrooms was included. A historical review of the various types of hardware which have been leveraged for mobile learning classroom environments and the current types of tablet technologies emerging into classrooms was explored. To place mobile learning into perspective, a review of the prevalent educational theories matched with corresponding mobile learning applications was illustrated. Additionally, the synergistic impact in which cloud computing is having on the adoption of tablet devices was detailed including a review of cloud computing services which are emerging within educational environments.

The needs for teacher involvement during the selection, evaluation and adoption of technology were included and juxtaposed to a number of common human-centric barriers that are often experienced during technology deployments. Lastly, prevalent financial implications were revealed that serve to further fragment the implementation and development of modern learning environments within the state of Indiana.

Chapter 3-Methodology

Introduction

This chapter describes the overall design of the method which was used to study the factors which influence the proliferation of mobile tablet devices into Indiana K12 public education environments. The overarching research design is discussed including the rationale for the use of the quantitative method, a review of the dependent and independent variables, and the methods utilized to present the results. A discussion of the intended sample population is reviewed at length including the characteristics which define this population as distinct and qualified to provide the information the instrument requests.

A discussion of the instrument is included, complete with the processes employed for its development and examination of its reliability and validity. Following the description of the survey instrument, a detailed section describes the steps undertaken to leverage the instrument and collect the necessary data. Within this section, there are also detailed estimates of anticipated return rates and final respondent totals. This chapter concludes with an explanation of the methods employed for the analysis of the returned data and the overarching limitations of the study.

Research Questions

1. What are the social and political factors influencing the decision to implement tablet technologies by district level decision makers?
2. What are the perceived benefits of implementing tablet technologies that are positively influencing the purchasing decisions of district level decision makers?

3. What are the preferred hardware characteristics of district level decision makers when selecting tablet technologies?

Dependent Variable: The decision by K12 schools to implement tablet technologies.

Independent Variables: The social and political factors, perceived benefits, and preferred hardware characteristics motivating the decision listed by the dependent variable.

Description of Hypothesis

This study sought to determine if there were statistically significant differences between the individual responses to questions contained in the three grouping areas (social and political influence, perceived benefits, hardware/software/operating system). Additionally, due to the differences in school sizes and social economic makeup, this study was conducted utilizing hypotheses that these areas, when combined with the variables of size and social economic makeup (free/reduced lunch percentages), held the potential to also yield statistically significant differences between the school corporations contained in the sample population.

Base Listing of Null Hypotheses

$H_0$1 There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies.

$H_0$2 There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies when compared to corporation enrollment size.

$H_0$3 There is no significant difference between the attributes listed as educational reasons being cited as benefits of tablet technologies.

$H_0$4 There is no significant difference between the attributes listed as educational reasons being cited as the benefits of tablet technologies when compared to corporation enrollment size.

$H_0$5 There is no significant difference between the types of preferred hardware attributes listed.

$H_0$6 There is no significant difference between the types of preferred hardware attributes listed when compared to corporation enrollment size.

Research Design

To complete this study, a descriptive quantitative method was selected. Roberts (2010) argued that the quantitative method tends to offer the ability to generalize, be explanatory in nature, and often leverage large samples. It has been offered that the fundamental credence of quantitative research is that we live in a coherent world that we can understand and generalize about (Gay et al., 2006). This research was intended to better understand the influences stirring the growth of tablet acquisitions within K12 environments. The use of the quantitative method allowed for the rich translation of data into easily quantifiable charts and graphs. Since the measurements of the items being studied were simplistic in nature, e.g. attitudes and beliefs, they imparted themselves well to graphical representations.

To collect the required data, a survey methodology was utilized. As the use of tablet devices within educational environments was relatively new and rapidly expanding, it was necessary to create this custom survey instrument. As such, an expert committee was formed that consisted of eight technology directors from central Indiana. In addition to this highly qualified group of professionals, Candice Dodson, Director of eLearning Technologies for the Indiana Department of Education, also served as a committee member and resource.

The research question assumed that schools have made the decision on some level and scope to purchase tablet technologies for use within their classroom environments. As such, this decision to implement tablets served as the dependent variable within this study. The independent variables studied included the device specific factors (software, hardware, battery life), internal and external social/political influences (pressure from certified staff, administrative staff, parents, vendors), and adoption related influences (book rental, grade level of implementation, funding sources).

Sample

The population that this survey targeted were the individuals who were ultimately responsible for the purchase of educational technology for public school corporations within Indiana. These individuals held a varying range of titles including Chief Information Officer, Director of Technology, Curriculum Director, Assistant Superintendent or even Superintendent. Regardless of the title, the members of the intended target population were those who possessed the final purchasing decision for instructional/educational acquisitions for their respective districts. Regarding this research, it was this group of individuals that appear to possess the most comprehensive knowledge of their district's procurement processes in regards to instructional technology. As such, they were also the individuals who were best suited to describe and rate the independent variables being tested within the survey instrument being offered.

According to the data extraction tool located on the Indiana Department of Education's website, there were 292 public school corporations within the state of

Indiana. This figure excluded charter schools, service centers, educational cooperatives and the Hoosier Academy (virtual pilot school). It was the intention of this study to offer the survey to all 292 schools. Given that achieving a response from all 292 school corporations was highly improbable, a sample size of 73 respondents would have been necessary to achieve a confidence level of 95% with a high confidence interval of +/- 10. To bring the confidence interval into a more desirable +/- 5 margin of error, it would have been necessary to achieve a sample size of 166 respondents.

Instrument

The independent variables which were evaluated emerged from relatively new technologies, therefore existing instruments were found to be unsuitable for the purposes of this study. As a result, it was necessary to create a custom instrument to gather the information unique to this study. To provide for construct validity, an expert panel was assembled to help craft the instrument. This group of experts was selected based upon their experience within the field of educational technology. Included in this group were: Julie Bohnenkamp, Director of Technology for Center Grove Community School Corporation; Matt Sprout, Director of Technology for Franklin Community School Corporation; Rebecca Rinehart, Director of Technology for Greenwood Community School Corporation; Bob Straugh, Director of Technology for Edinburgh Community School Corporation; Chuck Bujarsky, Director of Technology for Shelbyville Central Schools; Greg Rollo, Director of Technology for the MSD of Martinsville; Brandi Rund, Technology Integration Specialist for Clark-Pleasant Community School Corporation and board member for the Hoosier Education Computing Coordinators; and Candice Dodson, Director of eLearning, Indiana Department of Education. This group boasted over ninety years of combined experience implementing, evaluating, purchasing, and managing nearly all aspects of educational technology found within the typical K12 public school environment beginning with the first appearance of the Apple II product line and continuing to the present. As a group, these individuals held a unique perspective regarding educational technology that was tempered by personal successes and failures regarding attempted technology integration into instructional environments. This committee repeatedly reviewed, refined, and modified the content of the instrument to help focus it on the specific factors influencing the adoption and implementation of tablet technologies. After repetitively reviewing the instrument leveraging their perspectives as long-term instructional technology leaders, the validity of this instrument was deemed by the committee to be adequate for the purpose of this study.

To ensure that this instrument was reliable enough for the purpose of this study, a test-retest methodology was utilized. Instead of utilizing the expert group who created the instrument, a collection of their technology assistants were utilized as subjects to perform the reliability testing. This set of individuals was very familiar with the information which was being measured by the survey instrument. Leveraging these individuals held two distinct advantages. First, they were locally available allowing for a rapid return of the results and data. Second, leveraging this population allowed for the instrument to be tested for reliability without exposing it to the limited population in which it was intended. Given that there at the time of this study, there were a total of 292 school districts available to study and that the return rates were expected to be low, preserving as much of this population for study was of paramount importance.

Leveraging the secondary technology decision makers for reliability testing preserved this population while providing a knowledgeable population for testing.

The test population was asked to complete the survey instrument and, two days later, retake the exact same battery of questions. As studies have shown, there is little statistical difference between two days and two weeks regarding test-retest reliability (Marx, Menezes, Horovitz, Jones, & Warren, 2003), as such, the smaller time window was selected in order to move the progress of the project forward. Following the second administration of the instrument, the correlation between the two exams was calculated utilizing the Pearson r method. Since the instrument being examined utilized a response system based upon an interval, being one to ten, the use of the Person r method was appropriate. Additionally, the method allowed for the inclusion of every score in both incarnations of the reliability testing experience. The results of this test are available in the results section (chapter 4) of this document.

In summary, each item analyzed demonstrated a strong correlation of reliability. As such, the instrument was demonstrated to be both valid by way of the expert panel and reliable through the test-retest process.

Data Collection

To collect data for this study, several sequential methods were utilized to maximize the number of completed instruments. To begin, the Hoosier Educational Computing Coordinator’s list server and the Indiana Department of Education’s Learning Connection were utilized to make initial contact with potential participants. The HECC and Learning Connection list servers were leveraged to distribute emails which contained a description of the research, a bit of background information that described the purpose of the study, and the logistical details regarding how and when the survey was to be delivered. The intention was to make as many individuals aware of the pending research as possible. As technology leaders, the target population of this survey has been historically bombarded by requests for sales and other forms of survey data. This initial contact served as an attempt to demonstrate the request for assistance as legitimate, non-commercial, and relevant to the K12 community. At the time of distribution, the HECC database of individuals allowed for instant notification of slightly over 50 percent of Indiana's technology directors and the Department of Education's Learning Connection community approached 100 percent of all target participants. However, given the historical volume of messages that have stemmed from these servers, messages from these sources have been generally overlooked or ignored (Chang, Rizal, & Amin, 2013). Having leveraged both of these resources, a robust method to provide general information regarding the research project was achieved.

A database of schools was created from an export of information that was available from the Indiana Department of Education's school data website that contained addresses and contact information that allowed for implementing a mass mailing and email campaign. Following shortly behind the initial notification of the two communities, the sample population of technology leaders was emailed directly. This email included a description similar to the initial list server messages and a custom hyperlink to the location of the survey.

It has been asserted that first mailings of surveys result in a return rate of 30 to 50 percent and second mailings often increase those numbers by an additional 20 percent (Gay et al., 2006). It was initially assumed that due to its electronic nature, responses from the direct email campaign would have been below those suggested rates of return. As such a 20 percent return rate on first contact attempts was predicted to produce roughly 59 completed responses, which would have been well short of the minimum goal of 73 to produce a confidence interval of +/- 10%. As a result, a second set of email notifications and reminders were planned to be sent to the districts that failed to respond to the request for information. It was assumed that these numbers would have been comparable to a second mailing and should have increased the response rate by an additional 20%. That would have produced an additional 47 possible responses bringing the total number of responses to 106. At this point, enough responses should have been collected to satisfy a number necessary to produce a +/- 10% confidence interval.

Following the initial email, 83 responses were obtained. The follow-up email produced an additional 55 responses bringing the total responses to 138. This number was believed to be substantial enough to represent the entire population of technology directors. As such, the use of distribution methods beyond electronic methods was not required.

Data Analysis

To begin the review of survey results, parametric statistical techniques were employed to explore the results as the data collected by the survey was based upon an interval scale. Initially, an analysis of the mean and standard deviation for each item was calculated. These basic statistical items provided the information necessary to begin a review of the questions on a variable by variable (question by question) basis. Additionally, this information provided for a base to begin reviewing the data and discovering additional trends and paths to explore further. After reviewing each of the variables independently, it was determined that the only re-coding that was necessary was to modify the breakdown of school corporation size from three to four groups. Many of these results were examined using simple frequency distributions that visually displayed the set of categories and the number of cases in each category. Additionally, the visual review of this data was extended to include percent distributions of each category.

Once the initial analysis was conducted, additional analysis was processed to further explore possible relationships between the reported corporation enrollment and the responses to the battery of questions contained in questions three, four, and five. To accomplish this, an additional data field was coded within SPSS that grouped the responses into four categories, very small, small, medium, and large depending upon the reported corporation enrollment. This allowed for the comparing of means by way of a one way ANOVA process. Once items of significance were detected, the Sheffe' Post Ad Hoc test was implemented to determine the statistical significance between the likely unequal group sizes. This was possible for the items contained within questions three, four, and five on the survey instrument as they were presented as ordinals all with congruent scales of measurement.

Leveraging these methods afforded a simplistic, straightforward method to examine the independent variables in a single and combined format to better understand the information presented. It was believed that such information would serve to assist those purchasing mobile technologies for the K12 environment to make more informed decisions regarding the factors which they may, or may not, be cognizant.

Limitations

The independent variables examined within this study are highly dependent upon the work done by the expert panel in designing the survey instrument. While every effort was made to include all conceivable possibilities, the need for brevity within the survey mandated the need to truncate the original list in favor of those believed to be the most influential in the purchasing process.

The responding population is also a limitation of this study. While effort was made to include all 292 district-level K12 educational technology leaders, it was simply not possible to achieve responses from the entire population. As such, the results, while within the prescribed level of statistical confidence, are not representative of every voice within the research's target sample population.

Summary

In this chapter the design of the study was discussed including the introduction of the study and a description of the quantitative nature of the research. The methods for data collection were introduced and the sample population being targeted by the survey instrument was described including the introduction of the dependent and independent variables associated with this study. A detailed description documenting the creation of the survey instrument and the methods utilized for providing for reliability and validity testing were also documented. Lastly, a discussion of the data analysis methods to be utilized was presented detailing methods to display the resulting data findings.

Chapter 4-Presentation and Analysis of Data

Overview

This chapter provides a detailed review regarding the intent and purpose of this study. Additionally, the results of both the test-retest reliability testing of the survey instrument are detailed. The results of the survey are analyzed in regards to the social/political influences, perceived educational benefits, and hardware preferences as reflected by the survey responses. Additionally, these areas are reexamined based upon corporation size. Lastly, other findings are discussed.

Purpose of Study

The purpose of this study was to explore the social/political pressures, educational potential and hardware preferences of tablet computing devices which have influenced public school officials to purchase such devices. This study explored these factors and compared them with corporation student enrollment in an attempt to expose trends from the resulting data. The intent of this analysis was to provide a better understanding of the influences leading to the purchase of tablet devices and provide this information to assist with future purchases of such mobile technologies.

Results of Survey Reliability Testing

To illustrate the reliability of the survey instrument created for use with this study, a test-retest methodology was utilized. Instead of utilizing the expert group who created the instrument, a collection of their technology assistants were utilized as subjects to perform the reliability testing. This set of individuals each have first-hand experiences regarding the perceived pressures and benefits of tablet technologies which were being measured by the survey instrument. Additionally, these subjects also perceive similar influences as their supervising counterparts. Leveraging these individuals held two distinct advantages. First, they were locally available allowing for a rapid return of the results and data. Second, leveraging this population allowed for the instrument to be tested for reliability without exposing it to the limited population in which it was intended. Given that there were a total of 292 school districts available to study and that the return rates were expected to be low, preserving as much of this population for study was of paramount importance. Removing ten local participants who were assured to provide responses was not in the best interest of the study.

A group of ten such educational technology workers from local districts completed the survey and four days later completed an identical survey. The results of all surveys were then grouped and then compared item by item using the Pearson r method of correlation. Table 3 holds the results of the initial analysis.

Table 3
Full listing of instrument questions and associated Pearson r correlations

Question	*r*	Question	*r*
Corporation Size	1.00	Question 4.11	0.67
USF Discount	1.00	Question 4.12	0.89
Question 3.1	0.97	Question 4.13	0.69
Question 3.2	1.00	Question 4.14	1.00
Question 3.3	0.97	Question 4.15	0.73
Question 3.4	0.93	Question 4.16	0.61
Question 3.5	0.80	Question 4.17	0.80
Question 3.6	0.96	Question 4.18	0.94
Question 3.7	0.89	Question 5.1	0.97
Question 3.8	0.96	Question 5.2	0.87
Question 3.9	0.92	Question 5.3	0.93
Question 3.10	0.96	Question 6.1	0.93
Question 4.1	0.90	Question 6.2	0.89
Question 4.2	0.80	Question 6.3	0.59
Question 4.3	0.87	Question 6.4	1.00

Question 4.4	1.00	Question 6.5	0.97
Question 4.5	0.94	Question 6.6	0.97
Question 4.6	0.94	Question 6.7	0.67
Question 4.7	0.95	Question 6.8	0.20
Question 4.8	0.97	Question 6.9	0.50
Question 4.9	0.88	Question 6.10	0.98
Question 4.10	0.89	Question 6.11	0.59
		Mean Correlation	0.81

While most items displayed very strong test-retest correlations, five items did not yield the anticipated results regarding reliability. Regarding these, questions 4.16, 6.3, and 6.9 each were impacted by a single outlier from one single respondent who appeared to completely reverse their answers from the first to the second survey. Removal of these perceived anomalies allowed each of these questions to produce strong statistical correlations (.80, .71 and .89 respectively).

The final items of question 6, items 8 through 11, were found to be erroneously labeled showing memory size of a device in MB instead of the intended GB. This appeared to cause issues with the reliability of these items. However, despite this issue, the items still produced fairly consistent results. Given the small sample size of this test (n=10), this trial run of the survey was very sensitive to singleton responses which caused the Pearson r values to be out of the range of the desired correlations between the items. To help address the issue and provide for stronger results, questions 6.7 and 6.8 were combined, eliminating one choice for storage size. Additionally, this provided for consistency between the phrasing of the two surviving questions and helped shorten the survey lowering the likelihood of respondent fatigue. However, given the means of the data were very consistent and the strong overall correlation average of (0.88) it was determined that the instrument was capable of providing consistent, reliable responses.

Results of Survey Responses

The survey produced a total of 138 completed responses. This data was subsequently entered into SPSS and a frequency analysis was conducted on each group of questions based upon the three areas listed within the null hypotheses (social/political pressures, educational potential, and hardware preferences). It is important to note that four of the respondents did not provide a total district student enrollment and were omitted when corporation size analyses were completed leaving summative totals of 134 participants.

Method for Data Analysis

To review and process the survey data, each item was examined in terms of mean, standard deviation, and skew. This allowed for a visual representation of each individual question and allowed for the determination of whether it was being positively or negatively skewed. Based on the construction of the survey items, being positively skewed indicates that respondent responses indicate that the item in the question was not a pressure (or factor) which they encountered regarding tablet technologies. Conversely, a negative skew of responses indicates that the item in the question was a pressure (or factor) which they encountered regarding tablet technologies. Understanding that these *z* scores can be compared against values that would be produced simply by chance, a *z* score was calculated (dividing the measure of skewness by the standard error of skewness) in order to assist with the acceptance or rejection of the null hypotheses. Known values for normal distribution indicate that a value (*z* score) greater than the absolute value of 1.96 is significant at $p < .05$. As such, this threshold was adopted as the threshold of significance to accept or reject the null hypotheses.

This methodology was then extended by coding an additional grouping field into the dataset based upon the corporation size. The additional coding allowed for corporations to be grouped into one of four groups consisting of schools reporting less than 1,500 students (very small), 1,500 to 2,999 students (small), 3,000 to 5,999 students (medium) and, lastly, a total student enrollment of 6,000 and over (large). Leveraging these groups, a comparison of the means was conducted using one way ANOVA. If statistical differences between the groups was found, a post-hoc analysis using the Scheffe' test was preformed due to the unequal sizes of the resulting group populations. The results from the ANOVA testing allowed for the null hypotheses to be accepted or rejected accordingly.

Table 4
Breakdown of reporting corporation populations

Name	Size Range	*n*
No Reported Size	N/A	4
Very Small	<1,500	50
Small	1,500 to 2,999	36
Medium	3,000 to 5,999	24
Large	6,000 and over	24

Social/Political Pressures

Reviewing these results, the survey did not determine any definitive source of pressure to purchase tablet devices. The results of the analysis of question 3, illustrated in Table 5, indicated that responses regarding parents as well as the influence of school board members were positively skewed. As such, these items achieved statistical significance as respondents felt that they were not influences on the decision to purchase tablet technologies. Additionally, the influence of students was positively skewed and approached statistical significance (z=1.90). While other items did show measures of being negatively skewed, none of their associated z scores resulted in showing statistical significance. Of all the tested factors, pressure from building administrators was the closest to being demonstrated as a social/political factor of statistical significance with a z score of -1.18. It is important to note that the Likert scale for this question presented respondents with six options including strongly disagree, disagree, somewhat disagree, somewhat agree, agree, and lastly strongly agree.

Table 5

Results of responses from all participants to question 3 regarding perceived pressures influencing tablet purchases displaying or approaching statistical significance

To what degree do you agree with the following statements:	*N*	*M*	*SE M*	*SD*	*Sk*	*SE Sk*	*z*
I perceived pressure from students to implement tablet devices	138	3.01	.12	1.44	.39	.21	1.90
I perceived pressure from parents to implement tablet devices	138	2.58	.11	1.28	.70	.21	3.41
I perceived pressure from school board members to implement tablet devices	138	2.95	.13	1.56	.59	.21	2.84

Null Hypotheses One (H_01) was formulated as follows: There is no significant difference between the attributes being cited as perceived pressure sources regarding the purchase of tablet technologies. Because three items tested achieved statistical significance, the research data supported the rejection of H_01.

The data received in response to question 3 (Social/Political Influences) was then examined based upon four groupings consisting of schools reporting less than 1,500 students (very small corporations), 1,500 to 2,999 students (small corporations), 3,000 to 5,999 students (medium corporations) and, lastly, a total student enrollment of 6,000 and over (large corporations). As indicated in Table 6, the ANOVA and Scheffe' post hoc tests revealed that there were statistically significant differences between groups in questions 3.7 and 3.10 when comparing responses using corporation size as an independent variable.

Table 6
Scheffé post hoc criterion for significance based upon corporation size

To what degree do you agree with the following statements:			Mean Difference (I-J)	*SE*	95% Confidence Interval	
					Lower Bound	Upper Bound
I perceived pressure from school board members to implement tablet devices	Very Small	Small	-0.89	0.32	-1.80	.03
		Medium	-0.36	0.37	-1.41	.69
		Large	0.46	0.38	-.60	1.53
	Small	Very Small	0.89	0.32	-.03	1.80
		Medium	0.53	0.39	-.58	1.63
		Large	1.35*	0.40	.23	2.47
	Medium	Very Small	0.36	0.37	-.69	1.41
		Small	-0.53	0.39	-1.63	.58
		Large	0.82	0.43	-.41	2.06
	Large	Very Small	-0.46	0.38	-1.53	.60
		Small	-1.35*	0.40	-2.47	-.23
		Medium	-0.82	0.43	-2.06	.41
I perceived pressure from my superintendent to implement tablet devices	Very Small	Small	-1.03*	0.34	-2.00	-.05
		Medium	0.21	0.39	-.90	1.32
		Large	0.46	0.40	-.67	1.59
	Small	Very Small	1.03*	0.34	.05	2.00
		Medium	1.24*	0.42	.06	2.41
		Large	1.49*	0.42	.30	2.68
	Medium	Very Small	-0.21	0.39	-1.32	.90
		Small	-1.24*	0.42	-2.41	-.06

		Large	0.25	0.46	-1.06	1.56
	Large	Very Small	-0.46	0.40	-1.59	.67
		Small	-1.49*	0.42	-2.68	-.30
		Medium	-0.25	0.46	-1.56	1.06

* $p < 0.05$

Null Hypotheses Two (*$H_0 2$*) was formulated as follows: There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies when compared to corporation enrollment size. Because three of the items tested achieved statistical significance, the research data supported the rejection of *$H_0 2$*.

Perceived Educational Potential

The contents of question 4 explored the perceived educational benefits of tablet devices as viewed by educational decision makers. A review of the results exposed 11 items of statistical significance with 10 of those providing for negative skew and one being positively skewed indicating that it is statistically illustrated to not be an educational benefit as viewed by information technology professionals. The results of this data are summarized in Table 7. Among the 10 items perceived to be benefits were:

- Improvement to classroom instruction
- Increase in differentiation of instruction
- Lowered printing costs
- Improvement of teacher-student communication
- Enhanced student collaboration
- Better student classroom involvement
- Positive public response to the technologies
- Essential to the adoption of digital textbooks
- Enhancement of student learning outside of school hours
- Devices are well suited to consume media

Table 7

Results of all responses to question 4 perceived educational benefits influencing tablet purchases displaying statistical significance

To what degree do you agree with the following statement:	*N*	*M*	*SE M*	*SD*	*Sk*	*SE Sk*	*z*
Tablet technologies improve classroom instruction	138	4.17	.09	1.00	-.43	.21	-2.09
Tablet technologies increase the differentiation of instruction	138	4.50	.10	1.12	-.64	.21	-3.10
Implementing tablet technologies lowers printing costs	138	4.07	.11	1.30	-.46	.21	-2.25
Implementing tablet technologies improves teacher-student communication	138	4.17	.10	1.16	-.42	.21	-2.02
Implementing tablet technologies improves student collaboration	138	4.45	.10	1.17	-.80	.21	-3.89
Implementing tablet technologies increases student involvement in classroom activities	138	4.50	.09	1.10	-.80	.21	-3.86
Implementing tablet technologies lowers district expenditures on technology	138	2.51	.12	1.36	.86	.21	4.18
Tablet technologies receive positive public responses	138	4.14	.09	1.00	-.87	.21	-4.23
Tablet technologies are essential to the adoption of digital textbooks	138	3.96	.12	1.40	-.42	.21	-2.04
Tablet technologies increase student learning outside of school hours	138	4.05	.10	1.17	-.62	.21	-3.02
Tablet technologies are well suited to student tasks regarding the viewing of media and basic research (examples: watching videos, web browsing)	138	4.73	.10	1.12	-1.33	.21	-6.45

Null Hypotheses Three ($H_0 3$) was formulated as follows: There is no significant difference between the attributes listed as educational reasons being cited as the benefits of tablet technologies. Because nine of the items tested achieved statistical significance, the research data supported the rejection of $H_0 3$.

The data received in response to question 4 (perceived educational benefits) was then examined based upon four groupings consisting of schools reporting less than 1,500 students (very small corporations), 1,500 to 2,999 students (small corporations), 3,000 to 5,999 students (medium corporations) and, lastly, a total student enrollment of 6,000 and over (large corporations). Processing ANOVA tests on the results did not return any items of statistical significance. As such, the Scheffe' post hoc tests were unnecessary as there was no statistical significances found between the four groups.

Null Hypotheses Four ($H_0 4$) was formulated as follows: There is no significant difference between the attributes listed as educational reasons being cited as the benefits of tablet technologies when compared to corporation enrollment size. Because no items tested displayed statistical significance, the research data supported the acceptance of $H_0 4$.

Hardware Preferences

The contents of questions 5 and 6 explored the hardware preferences of educational technology decision makers when selecting tablet devices. Reviewing results from all 138 respondents exposed eight items of statistical significance with six of those providing for negative skew indicating a preference for hardware which are all detailed in Table 8. Additionally, two were positively skewed statistically showing these items to not be hardware preferences of information technology professionals. Among the six items perceived to be preferences were:

- Processor speed
- Battery life between 4-8 hours
- Battery life 8 hours and over
- IOS (Apple) based products
- 32 Gb or more of internal storage
- Screen size of 10 inches or over

Table 8
Results of all responses to questions 5 and 6 hardware preferences influencing tablet purchases displaying statistical significance

Reflecting on the purchasing process, to what degree do you agree with the following statement:	*N*	*M*	*SE M*	*SD*	*Sk*	*SE Sk*	*z*
Public perception of the brand of tablet device influences my purchase decisions	138	2.91	.12	1.38	.44	.21	2.15
Processor speed of the tablet device influences my purchases decisions	138	4.17	.09	1.08	-.53	.21	-2.57
Device's battery life being less 4 hours	138	1.41	.05	.61	1.21	.21	5.85
Device's battery life being between 4-8 hours	138	2.99	.08	.97	-.47	.21	-2.29
Regarding tablet technologies, would you consider purchasing:							
Device's battery life being 8+ hours	138	4.39	.06	.66	-1.25	.21	-6.04
IOS based (Apple) tablets	138	3.64	.09	1.09	-.48	.21	-2.33
Tablets with 32 Gb or more of internal storage	138	3.52	.09	1.02	-.52	.21	-2.52
Tablets with a screen size greater than 10 inches	138	3.64	.09	1.00	-.72	.21	-3.47

Null Hypotheses Five ($H_0 5$) was formulated as follows: There is no significant difference between the types of preferred hardware attributes listed. Because three of the items tested achieved statistical significance, the research data supported the rejection of $H_0 5$.

The data received in response to questions 5 and 6 (Hardware/Software/OS influences) were then examined based upon four groupings consisting of schools reporting less than 1,500 students (very small corporations), 1,500 to 2,999 students (small corporations), 3,000 to 5,999 students (medium corporations) and, lastly, a total student enrollment of 6,000 and over (large corporations). As indicated in Table 9, the ANOVA and Scheffe' post hoc tests revealed that there were statistically significant differences between groups in questions 5.1 and 5.3 when comparing responses using corporation size as an independent variable.

Table 9
Scheffé post hoc criterion for significance comparing hardware preferences and corporation size

Reflecting on the purchasing process, to what degree do you agree with the following statement:			Mean Difference (I-J)	SE	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
Public perception of the brand of tablet device influences my purchase decisions	Very Small	Small	-0.91*	0.29	-1.74	-0.07
		Medium	-0.58	0.34	-1.54	0.37
		Large	-0.41	0.34	-1.38	0.55
	Small	Very Small	0.91*	0.29	0.07	1.74
		Medium	0.32	0.36	-0.68	1.33
		Large	0.49	0.36	-0.53	1.51
	Medium	Very Small	0.58	0.34	-0.37	1.54
		Small	-0.32	0.36	-1.33	0.68
		Large	0.17	0.40	-0.95	1.29
	Large	Very Small	0.41	0.34	-0.55	1.38
		Small	-0.49	0.36	-1.51	0.53
		Medium	-0.17	0.40	-1.29	0.95

* $p < 0.05$

Null Hypotheses Six ($H_0 6$) was formulated as follows: There is no significant difference between the types of preferred hardware attributes listed when compared to corporation enrollment size. Because one item tested achieved statistical significance, the research data supported the rejection of $H_0 6$.

Other Findings

The responses from question 3 were analyzed for bivariate correlations using the Pearson r method of calculation. Question 3.1 examined the level of pressure educational technology professionals experienced to implement tablet devices to keep pace with other school corporations. As displayed in Table 10, all questions within this section displayed correlations to question 3.1 at a .001 significance level.

Table 10
Pearson r correlations identified in question 3

To what degree do you agree with the following statements:	I perceived pressure to "keep up with other corporations" regarding tablet implementation	
	r	*N*
I perceived pressure from certified staff members to implement tablet devices	0.48^{**}	138
I perceived pressure from building administrators to implement tablet devices	0.63^{**}	138
I perceived pressure from the curriculum department to implement tablet devices	0.42^{**}	138
I perceived pressure from students to implement tablet devices	0.30^{**}	138
I perceived pressure from parents to implement tablet devices	0.40^{**}	138

I perceived pressure from school board members to implement tablet devices	0.52**	138
I perceived pressure from the Indiana Department of Education to implement tablet devices	0.46**	138
I perceived pressure from Advocates for Special Education to implement tablet devices	0.37**	138
I perceived pressure from my superintendent to implement tablet devices	0.58**	138

* Correlation significant at the 0.01 level (2-tailed)

The frequencies of question 3 were then examined based upon the responses from question 3.1. These responses were split into two groups, by respondents who answered agreed (response coding 4,5,6) to perceiving pressure and those who disagreed (response coding 1,2,3) to the same questions. Here there were a total of 138 valid responses with n=81 (agreeing) and n=57 (disagreeing). This revealed a split in the responses of key areas. Responses of question 3.2 (pressure from certified staff members) and question 3.3 (pressure from administrators) displayed polar opposite z scores both of statistical significance. In addition, responses to questions 3.5 (pressure from students) and 3.6 (pressure from parents) displayed statistical agreement that these groups were not sources of pressure or influence when adopting mobile technologies regardless of responses to question 3.1. This data is represented in Table 11.

Table 11
Skewness of question 3 responses split into two cases

	Disagreeing (1,2,3) *n*=57				Agreeing (4,5,6) *n*=81			
To what degree do you agree with the following statements:	*M*	*Sk*	*SE k*	*z*	*M*	*Sk*	*SE k*	*z*

I perceived pressure to "keep up with other corporations" regarding tablet implementation	2.04	-.05	0.32	-0.20	4.8	.35	0.27	1.33
I perceived pressure from certified staff members to implement tablet devices	2.74	.60	0.32	1.90	3.9	-.39	0.27	-1.45
I perceived pressure from building administrators to implement tablet devices	2.82	.51	0.32	1.60	4.4	-.52	0.27	-1.96
I perceived pressure from students to implement tablet devices	2.47	.65	0.32	2.06	3.38	.36	0.27	1.34
I perceived pressure from parents to implement tablet devices	2.09	.92	0.32	2.91	2.93	.63	0.27	2.35

Summary

Frequency analysis was applied to all null hypotheses $H_0 1$, $H_0 2$, $H_0 3$, $H_0 4$, $H_0 5$,and $H_0 6$ to determine the perceived factors influencing educational technology decision makers when purchasing mobile tablet technologies. The only hypothesis that was supported was $H_0 4$. The data was grouped by corporation size and tested using ANOVA. Lastly, bivariate correlations, using the Pearson r method of calculation, were completed revealing additional nuances of the responses.

Chapter 5

Conclusions, Discussion, and Implications for Future Research

As noted within the contents of chapter two, the use of mobile technologies will continue to expand in the foreseeable future. As the review of literature indicated, the movement to electronic curriculum has increased the need for student access to affordable electronic devices capable of providing appropriate methods to access these forms of curricular media. Additionally, with the migration to electronic curriculum, the literature indicates that there is a strong desire to utilize mobile learning environments and devices to fill these needs. Mobile learning environments are characterized by the use of mobile devices such as tablets (iPads, Android Tablets, Windows 8 tablets) and smart cellular phones (iPhones, Samsung Galaxy, etc.) as client devices to access websites, video, discussion boards, and other supporting instructional resources. These devices typically offer a lower acquisition cost when compared to traditional notebooks and offer other advantages including being highly portable, long battery lives which often double those of notebook computers, and highly intuitive touch interfaces. Despite these advantages, the literature also revealed several limitations to these devices capabilities. Chief among these is the lack of a physical keyboard. While the touch screen interfaces utilized by tablet devices are generally considered to be highly intuitive, they do not lend themselves well to the act of touch typing. This often hampers the potential of these devices causing them to generally be considered better suited for the consumption of resources including viewing videos and websites rather than the act of higher-order skills like the synthesis of original projects, term-papers, or the creation of any other product demonstrating mastery of the content being studied. Despite these limitations and lack of a proven success regarding the implementation of such devices, many schools within Indiana have made substantial investments into tablet technologies of one form or another. As indicated by the review of relevant literature, the general consumer trends indicate high rates of growth regarding the adoption of mobile devices. However, regardless of market based trends in consumer behavior, schools within Indiana are also facing budget constraints due to the continuing effects of the constitutional amendment to cap taxes at 1% for residential, 2% for farm, and 3% for commercial properties. For many districts, the decision to implement mobile tablet technologies is often a difficult choice from a financial perspective as these caps place limitations upon the revenue generated within the capital projects fund, which is the common source of educational technology funding. These limitations in funding often cause the purchase of mobile technologies to be in direct competition with traditional notebooks, computer labs, and other traditional technology investments. Compounding the adoption issues, many of the newly introduced mobile devices are not compatible with Indiana's current method of distributing the I.S.T.E.P student assessment tests. As such, it is imperative that educational technology leaders have a better understanding of the factors that are motivating them to select and invest in such technologies. The purpose of this study was to better understand the factors influencing educational technology leaders to implement tablet technologies. In an attempt to categorize the factors prompting educational leaders' decisions, the influences were divided into three groups including political/social perspectives (pressure from certified staff, administrative staff, parents, and vendors), perceived benefits of tablet technologies (increased student motivation, easier access to courseware, collaboration, communication options) and hardware and software preferences (available software, hardware capacities, battery life). Surveys were sent to all technology coordinators of public school districts within the state of Indiana (an estimated population of 292) with 138 members of the available population choosing to complete the survey.

Review of Hypothesis Testing

When testing the null hypotheses against corporation size four examined groupings were utilized consisting of schools reporting 1,500 or fewer students (very small corporations), 1,500 to 2,999 students (small corporations), 3,000 to 5,999 students (medium corporations) and, lastly, a total student enrollment of 6,000 and over (large corporations).

$H_0 1$. There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies.

Here, perceive pressure from students (z=1.90), perceived pressure from parents (z=2.41), and perceived pressure from school board members (z=2.84), displayed or neared statistical significance. Given that each of these items was positively skewed, while allowing for the rejection of the null hypothesis, the results indicated that these were not factors influencing the purchase of tablet technologies. As such, the research supported the rejection of $H_0 1$.

$H_0 2$. There is no significant difference between the attributes being cited as perceived pressure sources regarding purchase of tablet technologies when compared to corporation enrollment size.

These comparisons revealed that there were statistical differences between small and large corporations regarding the pressure perceived from school board members to implement tablets with the means producing a difference of 1.35. Here it is possible to extrapolate that technology leaders from small corporations reported more perceived pressure than their counterparts responding from large corporations. Additionally, perception of pressure from the superintendent was shown to be statistically significant between small districts and all other sizes, and between medium and large districts. Here the differences of the means all indicated that technology leaders in small districts reported perceiving higher levels of pressure from their superintendents to implement tablet technologies. As such, the research supported the rejection of $H_0 2$.

$H_0 3$. There is no significant difference between the attributes listed as educational reasons being cited as benefits of tablet technologies.

Many responses to this battery of questions achieved statistical significance. Among the ten items perceived to be benefits were:

- Improvement to classroom instruction
- Increase in differentiation of instruction
- Lowers printing costs
- Improvement of teacher-student communication
- Enhanced student collaboration
- Better student classroom involvement
- Positive public response to the technologies
- Essential to the adoption of digital textbooks
- Enhancement of student learning outside of school hours
- Devices are well suited to consume media

As such, the research supported the rejection of $H_0 3$.

$H_0$4. There is no significant difference between the attributes listed as educational reasons being cited as the benefits of tablet technologies when compared to corporation enrollment size.

Comparing the responses measuring perceived benefits to the four groups of school size produced no items differing in statistical significance. Here, across the range of corporation sizes educational leaders appear to agree with the perceived benefits of tablet technologies. As a result no items tested displaying statistical significance, the research supported the acceptance of *$H_0$4*.

$H_0$5. There is no significant difference between the types of preferred hardware attributes listed.

Many responses to this battery of questions achieved statistical significance. Among the six items perceived to be preferences were:

- Processor speed
- Battery life between 4-8 hours
- Battery life 8 hours and over
- IOS (Apple) based products
- 32 Gb or more of internal storage
- Screen size of 10 inches or over

As such, the research supported the rejection of *H_0*5.

$H_0$6. There is no significant difference between the types of preferred hardware attributes listed when compared to corporation enrollment size.

Here it was determined that there was a difference of statistical significance between very small and small districts providing a mean difference of -.91 indicating that small districts were more likely to report that the perception of the brand of tablet influenced their decision when compared to very small districts. As such, the research supported the rejection of $H_0 6$.

Other Findings

As indicated by the review of available literature, students often have a high level of support for the use of technology to supplement their learning. Technology has been shown to increase student interest and increase student motivation levels. Given this level of interest, it was intriguing to discover that student demands for table technologies were not demonstrated by the survey to be a social/political factor influencing the adoption of mobile technologies. Parallel to that revelation, parents were also found to not be an influence driving tablet adoptions. In addition to the lack of perceived influence from parents and students, school board members were revealed to not hold any significant influence regarding tablet acquisitions. The results of the study did not return any social/political factors that educational technology leaders felt were of significance when explored statistically. Despite the absence of statistical proof of parent, student, and school board influence, respondents overwhelmingly (81.7%) indicated that the implementation of tablet technologies receive positive public responses.

As previously discussed, the review of the literature indicated that mobile technologies offer a great deal of educational promise, but are also often limited in capabilities and functionality when compared to traditional technologies. This is especially pronounced when examining higher order skills associated with the writing process. As the literature indicates, mobile devices (including tablet technologies) are often found to be too cumbersome and are not currently well suited for crafting narratives and creating presentations. Despite this indication from the literature, respondents to question 4 item 18, which essentially asked respondents if they felt tablet technologies were suited for the completion or demonstration of higher-order thinking skills, demonstrated a split disagreement in the results obtained. Responses to this question produced a mean of 3.26 with a standard deviation of 1.45 from all participants (N=138) with a possible range of answers from 1-6. These responses demonstrated that 57% concurred with the available research while 43% held opinions to the contrary and when examined graphically, these responses were bimodal in nature with no responses falling in the middle categories. While this data was skewed slightly positive (.028) it is apparent that not all educational technology leaders concur with the general assessment of the literature available. In contrast, responses to question 4 item 17 were nearly unanimous with 89% indicating that tablet technologies were well suited to basic research tasks including consumption of video, audio, and web browsing. Clearly, responses to these two items tentatively agree with the established body of research, yet it is possible that the bimodal split demonstrated in question 4 item 18 could be one possible factor that is causing some school corporations to invest heavily in tablet technologies while others do not.

One of the missing pieces of literature is definitive proof that mobile technologies actually improve classroom instruction. Regardless, the results of this study show that a majority (82%) of educational technology leaders responding believe that tablet technologies do improve classroom instruction. Additionally, 117 of respondents (85%) believe that tablet technologies serve to increase the differentiation of instruction within classrooms. In addition, 84.8% of those responding believe that the implementation of tablet technologies increase student involvement in classroom activities. Unfortunately, this study did not provide for a method to determine causality for the reason that instruction is believed to be improved due to the presence of tablet technologies. Contrasting these responses, when asked if they believe that tablet technologies improve student test scores a slim majority (55%) did not feel that test scores are improved by the presence of tablet technologies. More information beyond the scope of this study could prove beneficial as intuition would lead one to believe that if instruction is improved test scores would increase as a result of that improvement.

Looking at the hardware preferences, respondents prefer the specifications of hardware, including screen size, internal storage capacity and battery life that coincide with Apple products. Additionally, when specifically asked, 87% indicated they would consider implementing Apple products into their environments. Contrasting this, only 60% of respondents indicated that they would consider implementing Android based tablets. Clearly, the preference of the Indiana educational technology leaders of public school districts is for the implementation of Apple (IOS based) products.

There were some variations between the three base hypotheses when compared by corporation size. However, the overall trends remained the same as the respondents indicated a preference towards Apple products. Social/political and perceived benefits also showed some slight differences, however, they did not reveal a stark contrasting pattern of preferences or influences.

Responses to question 3 item 1 asked respondents to indicate whether they perceived pressure to keep up with other corporations regarding the adoption of tablet technologies. These responses were split into two groups, those indicating they perceived some form of pressure (n=81) and those who did not perceive pressure (n=57).

Interestingly, this item, when compared to the remaining social/political factors of question 3 did reveal a trend. Those reporting pressure to keep up with other corporations were much more likely to indicate that they felt pressure from certified staff members and administrators than those who were did not. Here is an area where the inclusion of an additional question would have allowed participants to indicate whether they were the source of motivation to adopt tablet technologies or if they felt the motivation was from external sources. It is possible that the link between item 1 and the remaining social/political factors is a manifestation of such a difference, however, without further study a correlation between is not possible.

Recommendations

One item that was found to be missing from this study was that the survey neglected to inquire whether participants were self-motivated to recommend the purchase of tablet technologies. This is an obvious piece of data that is missing from this study which would help give better insight into the social/political factors. It might be discovered that if educational technology leaders were in and of themselves the sources of social/political pressures, then they may not report other forms of external pressures as they would find such factors to be congruent with their own beliefs.

Given the divide between educational technology leaders regarding the appropriateness of tablet devices when attempting higher order skills such as writing, another study could be performed focusing on implementation successes and failures in such environments.

While Apple products appear to be the devices of choice among public schools, the actual reason for this preference still remains unclear. Further studies could explore this from a holistic point of view including device familiarity, ease of use, software, capabilities and cost. A detailed examination of the software applications being leveraged and a cross matrix of whether those titles, or comparable offerings, are available for Android could prove to be very useful to decision makers.

Study of other technologies such as the Google Chromebook should be explored and contrasted. This study did not provide for the ordering of preference between existing forms of technology including notebooks, netbooks, and desktops and allow for the comparison based upon cost, features, portability and usability when compared to tablets and other new technological offerings.

It is recommended that a study of tablet acquisitions be conducted in conjunction with the status of school corporations' financial statuses. Examining the purchase habits of schools that have experienced funding limitations due to the property tax caps to those who have not experienced such issues may provide additional insights into the factors influencing such acquisitions.

Summary

Following a review of the results, there were differences found between the social/political pressure sources, perceived educational benefits and lastly hardware and software attributes. Additionally, when combined with school corporation size, the data revealed differences in the participant responses in all categorical areas except for the attributes listed as educational benefits of tablet technologies. Further research should be conducted to better understand the sources of social/political pressures allowing for the educational decision makers to also be cited as the sources of the perceived influence impacting the selection process.

References

Alavi, M., & Joachimsthaler, E. A. (1992). Revisiting DSS implementation research: A meta-analysis of the literature and suggestions for researchers. *Mis Quarterly*, 95–116.

Ashcraft, D., Treadwell, T., & Kumar, V. (2008). Collaborative online learning: A constructivist example. *MERLOT Journal of Online Learning and Teaching*, *4*(1), 109–117.

Ayabe, B. S., Chander, S. S., & Mizikovsky, S. B. (2000). *Short message service*. Google Patents.

Bagozzi, R. P., Davis, F. D., & Warshaw, P. R. (1992). Development and test of a theory of technological learning and usage. *Human Relations*, *45*(7), 659–686.

Bjerede, M., Atkins, K., & Dede, C. (2010). Ubiquitous Mobile Technologies and the Transformation of Schooling. *Educational Technology*, *50*(2), 3–7.

Botelho, S. (2012). HTML5: Assessing the Promise. *Folio: The Magazine for Magazine Management*, *41*(2), 8–9.

Brown, E., Börner, D., Sharples, M., Glahn, C., de Jong, T., & Specht, M. (2010). *Location-based and contextual mobile learning*. Retrieved from http://hal.archives-ouvertes.fr/hal-00704065

Chang, H. H., Rizal, H., & Amin, H. (2013). The determinants of consumer behavior towards email advertisement. *Internet Research*, *23*(3), 316–337.

Cochrane, T. D. (2010). Beyond the Yellow Brick Road: Mobile Web 2.0 Informing a New Institutional E-Learning Strategy. *ALT-J: Research in Learning Technology*, *18*(3), 221–231.

Cromity, J. (2011). Tablet Computers. *Online*, *35*(1), 25–28.

Elias, T. (2011). Universal Instructional Design Principles for Mobile Learning. *International Review of Research in Open and Distance Learning*, *12*(2), 143–156.

Ertmer, P. A. (2005). Teacher Pedagogical Beliefs: The Final Frontier in Our Quest for Technology Integration? *Educational Technology Research and Development*, *53*(4), 25–39.

Fies, C., & Marshall, J. (2006). Classroom Response Systems: A Review of the Literature. *Journal of Science Education and Technology*, *15*(1), 101–109.

Fingas, J. (2012, June 27). Google Play hits 600,000 apps, 20 billion total installs. *Engadget*. Retrieved October 6, 2012, from http://www.engadget.com/2012/06/27/google-play-hits-600000-apps/

Finkel, E. (2011). How Much Computing Power Do You Need? *District Administration*, *47*(9), 92–98.

Fullan, M. G., & Miles, M. B. (1992). Getting Reform Right: What Works and What Doesn't. *Phi Delta Kappan*, 745–752.

Galagan, P. (2012). From Pie in the Sky to the Palm of Your Hand: The Proliferation of Devices Spurs More Mobile Learning. *T+D*, *66*(3), 29–31.

Gay, L. R., Mills, G. E., & Airasian, P. W. (2006). Educational research: Competencies for analysis and applications.

Geist, E. (2011). The Game Changer: Using iPads in College Teacher Education Classes. *College Student Journal*, *45*(4), 758–768.

Gregor, K., Terry, J., Anna Churchward, Kathleen, G., & Kerri-Lee, K. (2008). First year students' experiences with technology: Are they really digital natives? *Australasian Journal of Educational Technology*, *24(1)*, 108–122.

Hall, S. O. H., Brandon. (2004). A GUIDE TO Learning Content Management Systems. *Training*, *41*(11), 33–37.

Hamblen, M. (2008). iPhone: OneYear Later. (Cover story). *Computerworld*, *42*(23), 24–29.

Hassan, M., Hamdan, Z., & Al-Sadi, J. (2012). A New Mobile Learning Content Design Process. *International Journal of Academic Research*, *4*(1), 23–28.

Hew, K., & Brush, T. (2007). Integrating technology into K-12 teaching and learning: current knowledge gaps and recommendations for future research. *Educational Technology Research & Development*, *55*(3), 223–252.

Hew, K., Hur, J., Jang, H., & Tian, L. (2004). The Eight Events of Instruction: An Instructional Method based on the Constructivist Paradigm. *Society for Information Technology & Teacher Education International Conference 2004*, *2004*(1), 4110–4115.

Hinsdale, B. A. (1898). *Horace Mann and the common school revival in the United States*. C. Scribner's sons.

Holden, H., & Rada, R. (2011). Understanding the Influence of Perceived Usability and Technology Self-Efficacy on Teachers' Technology Acceptance. *Journal of Research on Technology in Education*, *43*(4), 343–367.

Hubbell, E. R. (2011). Before Adopting a Laptop Initiative. *School Administrator*, *68*(2), 36–37.

Hunger, G., & Hodges, C. (2009). Using Tablets for Collaborative Problem-Based Learning in a Mathematics Specialist Program. *Society for Information Technology & Teacher Education International Conference 2009*, *2009*(1), 386–388.

Imel, S. (2002). E-Learning. Trends and Issues Alert. Retrieved from http://www.eric.ed.gov/ERICWebPortal/detail?accno=ED469265

Index, C.V.N. (2013, 6). Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2012–2017, white paper. Retrieved from http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-520862.html

Jeng, Y.-L., Wu, T.-T., Huang, Y.-M., Tan, Q., & Yang, S. J. H. (2010). The Add-On Impact of Mobile Applications in Learning Strategies: A Review Study. *Educational Technology & Society*, *13*(3), 3–11.

Jensen Schau, H., & Muñiz, A. (2006). A tale of tales: the Apple Newton narratives. *Journal of Strategic Marketing*, *14*(1), 19–33.

Kerr, D. (2012, September 4). Apple’s iPad overtaking PC sales in schools | Apple - CNET News. *CNET*. Retrieved February 4, 2013, from http://news.cnet.com/8301-13579_3-57506171-37/apples-ipad-overtaking-pc-sales-in-schools/

Kolakowski. (2009, November 9). Barnes and Noble's Nook E-Reader Delayed. *eWeek*. Retrieved October 29, 2013, from http://www.eweek.com/c/a/Mobile-and-Wireless/Barnes-and-Nobles-Nook-EReader-Delayed-268593

Korkmaz, B., Christian, K., & Jean-Hubert, L. (2012). Cyberboom: Why tablet domination has only just begun. *McKinsey&Company*. Retrieved April 6, 2013, from http://csi.mckinsey.com/knowledge_by_topic/digital_consumer/why_tablet_domination_has_only_just_begun

Koulopoulos, T. M. (2012). *Cloud Surfing: A New Way to Think About Risk, Innovation, Scale and Success*. Bibliomotion.

Kroenke, D., & Nilson, D. (2011). *Office 365 in Business*. John Wiley & Sons.

Latamore, G. B. (2006). PDAs. *Computerworld*, *40*(42), 44–44.

Levy, F., & Murnane, R. J. (2004). *The New Division of Labor: How Computers Are Creating the Next Job Market*. Princeton University Press.

Liu, M., Horton, L., Olmanson, J., & Toprac, P. (2011). A study of learning and motivation in a new media enriched environment for middle school science. *Educational Technology Research & Development, 59*(2), 249–265.

Lovell, M., & Phillips, L. (2009). Commercial Software Programs Approved for Teaching Reading and Writing in the Primary Grades: Another Sobering Reality. *Journal of Research on Technology in Education*, *42*(2), 197–216.

Lytle, R. (2012, September 3). Tablets Trump Laptops in High School Classrooms - US News and World Report. *US News and World Report*. Retrieved October 19, 2012, from http://www.usnews.com/education/high-schools/articles/2012/08/03/tablets-trump-laptops-in-high-school-classrooms

Mainka, C. (2007). Putting staff first in staff development for the effective use of technology in teaching. *British Journal of Educational Technology*, *38*(1), 158–160.

Manyika, J. (2008). Google's view on the future of business: An interview with CEO Eric Schmidt. *McKinsey Quarterly*.

Marie, B., & Tzaddi, B. (2012). *Learning is Personal: Stories of Android Tablet Use in the 5th Grade* (p. 47). Retrieved from http://www.learninguntethered.com/wp-content/uploads/2012/08/Learning-is-Personal.pdf

Marx, R. G., Menezes, A., Horovitz, L., Jones, E. C., & Warren, R. F. (2003). A comparison of two time intervals for test-retest reliability of health status instruments. *Journal of Clinical Epidemiology*, *56*(8), 730–735.

McLeod, S. (2009). Jean Piaget | Cognitive Theory. *Simply Psychology*. Retrieved from http://www.simplypsychology.org/piaget.html

McLester, S. (2012). One Tablet Per Child? *District Administration*, *48*(6), 58–67.

Means, B. (1994). *Technology and education reform : the reality behind the promise*. San Francisco: Jossey-Bass.

Meister, J. C., Kaganer, E., & Von Feldt, R. (2011). 2011: The Year of the Media Tablet As a Learning Tool. *T+D*, *65*(4), 28–31.

Mell, P., & Grance, T. (2011). The NIST definition of cloud computing (draft). *NIST Special Publication*, *800*, 145.

Mergel, B. (1998, May). Instructional design and learning theory. Retrieved from http://members.iinet.net.au/~aamcarthur/11_March_2008_files/Learning_Theories_of_Instructional_Design.pdf

Merrick, A. (2010, June 30). Indiana Embraces Tax Caps Despite Hit to City Services. *The Wall Street Journal*. Retrieved October 28, 2013, from http://online.wsj.com/news/articles/SB10001424052748704194504575031192182383762

Middleton, J. A., Flores, A., & Knaupp, J. (1997). Shopping for Technology. *Educational Leadership*, *55*(3), 20–23.

Moren, D., Caldwell, S., Frakes, D., & Friedman, L. (2012). UP CLOSE WITH IOS 5. *Macworld*, *29*(1), 36–52.

Murray, O., & Olcese, N. (2011). Teaching and Learning with iPads, Ready or Not? *TechTrends: Linking Research & Practice to Improve Learning*, *55*(6), 42–48.

Nooriafshar, M. (2011). New and emerging applications of tablet computers such as iPad in mathematics and science education. In *Proceedings of the 11th International Conference of the Mathematics Education into the 21st Century Project (ME21)* (pp. 242–247).

Norman, N. (2011). Mobile Learning Made Easy. *T+D*, *65*(12), 52–55.

Norris, C., & Soloway, E. (2011). Learning in the Age of Mobilism. *District Administration*, *47*(8), 96–96.

November, A. (2013, January 29). Why schools must move beyond "one-to-one computing." *eSchool News*. Retrieved February 4, 2013, from http://www.eschoolnews.com/2013/01/29/why-schools-must-move-beyond-one-to-one-computing/print/

Oehler, R. L., Smith, K., & Toney, J. F. (2010). Infectious Diseases Resources for the iPhone. *Clinical Infectious Diseases, 50*(9), 1268–1274.

Oppenheimer, T. (2007). *The flickering mind: Saving education from the false promise of technology*. Random House.

Ostashewski, N., & Reid, D. (20100629). iPod, iPhone, and now iPad: The evolution of multimedia access in a mobile teaching context. *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2010*, *2010*(1), 2862–2864.

Perenson, M. J. (2012). Android Tablets: Finally Ready? *PC World*, *30*(1), 58–63.

Rapp, D. (2011). CES 2011: Tablet Crazy. *Library Journal*, *136*(3), 42–44.

River, V. (2010). 21st-Century Learning in 2010: A Global Imperative. In *MultiMedia & Internet@Schools* (Vol. 17, pp. 11–14). Information Today Inc.

Roberts, C. M. (2010). *The dissertation journey: A practical and comprehensive guide to planning, writing, and defending your dissertation*. Corwin Press.

Rosell-Aguilar, F. (2007). Top of the Pods - In Search of a Podcasting “Podagogy” for Language Learning. *Computer Assisted Language Learning*, *20*(5), 471–492.

Sagers, G., Kasliwal, S., Vila, J., & Lim, B. (2010). Geo-Terra: Location-based Learning Using Geo-Tagged Multimedia. *Global Learn Asia Pacific 2010*, *2010*(1), 205–211.

Shaikh, Z. A., & Khoja, S. A. (2012). Role of Teacher in Personal Learning Environments. *Digital Education Review*.

Siemens, G. (2005). Connectivism: A Learning Theory for the Digital Age. *International Journal of Instructional Technology & Distance Learning*, *2*. Retrieved from http://itdl.org/journal/jan_05/index.htm

Sparks, S. D. (2012). Panel Parses Out Skills Needed for 21st-century Workplace. *Education Week*, *31*(36), 7–7.

Speelman, P., Gore, D., & Catarino, J. (2012). Cloud Computing and Creativity in Education. *Society for Information Technology & Teacher Education International Conference 2012*, *2012*(1), 921–924.

Staples, A., Pugach, M. C., & Himes, D. (2005). Rethinking the Technology Integration Challenge: Cases from Three Urban Elementary Schools. *Journal of Research on Technology in Education*, *37*(3), 285–311.

Stokes, K. (2012, October 9). Why Some Worry Property Tax Caps Will Lead To "Inequities" In School Funding. *StateImpact Indiana*. Retrieved March 26, 2013, from http://stateimpact.npr.org/indiana/2012/10/09/why-some-worry-property-tax-caps-will-lead-to-inequities-in-school-funding/

Straub, E. T. (2009). Understanding Technology Adoption: Theory and Future Directions for Informal Learning. *Review of Educational Research*, *79*(2), 625–649.

Thomas, A. (1994). Conversational Learning. *Oxford Review of Education*, *20*(1), 131–142.

Ting, Y.-L. (2012). The Pitfalls of Mobile Devices in Learning: A Different View and Implications for Pedagogical Design. *Journal of Educational Computing Research*, *46*(2), 119–134.

Trifonova, A., & Ronchetti, M. (2003). Where is Mobile Learning Going? *World Conference on E-Learning in Corporate, Government, Healthcare, and Higher Education 2003*, *2003*(1), 1794–1801.

Van der Veen, J., van Riemsdijk, M., Jones, V., & Collis, B. (2000). “Theory Repositories” via the Web for Problem-Based Learning. *Interactive Learning Environments*, *8*(3), 257–277.

Vaughan-Nichols, S. J. (2012). Can Android Tablets Finally Take On the iPad? *Computerworld*, *46*(14), 32–32.

Warschauer, M. (1997). Computer-Mediated Collaborative Learning: Theory and Practice. *The Modern Language Journal*, *81*(4), 470–481.

White, N. (2007). The Accidental Technology Steward: Or, How You Can Gamble Very Little and Gain a Lot. *Knowledge Quest*, *35*(4), 32–35.

Wu, W.-H., Jim Wu, Y.-C., Chen, C.-Y., Kao, H.-Y., Lin, C.-H., & Huang, S.-H. (2012). Review of trends from mobile learning studies: A meta-analysis. *Computers & Education*, *59*(2), 817–827.

Young, J. R. (2011). Top Smartphone Apps to Improve Teaching, Research, and Your Life. *Education Digest: Essential Readings Condensed for Quick Review*, *76*(9), 12–15.

Zheng, Y., Li, L., Hiroaki, O., & Yano, Y. (2005). Using Context-Awareness to Support Peer Recommendation. *World Conference on Educational Multimedia, Hypermedia and Telecommunications 2005*, *2005*(1), 2367–2373.

Appendix A: Survey instrument export from Qualtrics

Q1. Corporation Demographic Information: Please indicate the total student enrollment of your school corporation?

Q2. Please indicate your e-rate (Universal Service Fund) discount percentage

Q3. Social and political influences: To what degree do you agree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
I perceived pressure to "keep up with other corporations" regarding tablet implementation	❍	❍	❍	❍	❍	❍
I perceived pressure from certified staff members to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from building administrators to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from the curriculum department to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from students to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from parents to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from school board members to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from the Indiana Department of Education to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from Advocates for Special to Education to implement tablet devices	❍	❍	❍	❍	❍	❍
I perceived pressure from my superintendent to implement tablet devices	❍	❍	❍	❍	❍	❍

Q4. Perceived benefits of tablet technologies: (Page 2 of 3) To what degree do you agree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Tablet technologies improve student productivity	❍	❍	❍	❍	❍	❍
Tablet technologies improve teacher productivity	❍	❍	❍	❍	❍	❍
Tablet technologies improve classroom instruction	❍	❍	❍	❍	❍	❍
Tablet technologies increase the differentiation of instruction	❍	❍	❍	❍	❍	❍
Tablet technologies improve test scores	❍	❍	❍	❍	❍	❍
Implementing tablet technologies lowers printing costs	❍	❍	❍	❍	❍	❍
Implementing tablet technologies improves teacher-student communication	❍	❍	❍	❍	❍	❍
Implementing tablet technologies improves teacher-parent communication	❍	❍	❍	❍	❍	❍
Implementing tablet technologies improves student-student communication	❍	❍	❍	❍	❍	❍
Implementing tablet technologies improves student collaboration	❍	❍	❍	❍	❍	❍
Implementing tablet technologies increases student involvement in classroom activities	❍	❍	❍	❍	❍	❍
Implementing tablet technologies lowers district expenditures on technology	❍	❍	❍	❍	❍	❍
Implementing tablet technologies eliminates the need to adopt and purchase textbooks	❍	❍	❍	❍	❍	❍

Tablet technologies receive positive public responses	❍	❍	❍	❍	❍	❍
Tablet technologies are essential to the adoption of digital textbooks	❍	❍	❍	❍	❍	❍
Tablet technologies increase student learning outside of school hours	❍	❍	❍	❍	❍	❍
Tablet technologies are well suited to student tasks regarding the viewing of media and basic research (examples: watching videos, web browsing)	❍	❍	❍	❍	❍	❍
Tablet technologies are well suited to student tasks regarding synthesis and authoring (examples: writing original papers or presentations)	❍	❍	❍	❍	❍	❍

Q5. Hardware/ Software/OS influences: Reflecting on the purchasing process, to what degree do you agree with the following statements:

	Strongly Disagree	Disagree	Somewhat Disagree	Somewhat Agree	Agree	Strongly Agree
Public perception of the brand of tablet device influences my purchase decisions	❍	❍	❍	❍	❍	❍
Screen resolution of the tablet device influences my purchase decisions	❍	❍	❍	❍	❍	❍
Processor speed of the tablet device influences my purchases decisions	❍	❍	❍	❍	❍	❍

Q6. Hardware/ Software/OS influences (continued): Regarding tablet technologies, would you consider purchasing:

	Definitely will not	Probably will not	50/50 Toss up	Probably will	Definitely will
Device's battery life being less 4 hours	❍	❍	❍	❍	❍
Device's battery life being between 4-8 hours	❍	❍	❍	❍	❍
Device's battery life being 8+ hours	❍	❍	❍	❍	❍
IOS based (Apple) tablets	❍	❍	❍	❍	❍
Android based tablets	❍	❍	❍	❍	❍
Windows RT based tablets	❍	❍	❍	❍	❍
Tablets with 16 Gb or less of internal storage	❍	❍	❍	❍	❍
Tablets with 32 Gb or more of internal storage	❍	❍	❍	❍	❍
Tablets with a screen size from 6 inches and less than 10 inches	❍	❍	❍	❍	❍
Tablets with a screen size greater than 10 inches	❍	❍	❍	❍	❍

Q7. Please provide any additional information which you feel the researcher should consider regarding the procurement of tablet devices in K-12 schools.