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Secure Mobile Deployment of NFL Training Materials

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by

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We hereby certify that this dissertation, submitted by Alexander Grosholz Corris, conforms to acceptable standards and is fully adequate in scope and quality to fulfill the dissertation requirements for the degree of Doctor of Philosophy.

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Abstract

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The problem addressed is the lack of empirical research describing the delivery of individualized learning material in a secure and mobile manner. The goal was to investigate the effectiveness of deploying training materials to National Football League (NFL) players during a recent NFL season.

Over the past few seasons, NFL teams have started to deliver player training material to mobile devices. The training material is sensitive and includes planning documents for upcoming games. An effort was made to survey a representative at each of the 32 NFL teams in order to gain insight on effectiveness, security, and process. Nearly half of the league responded with 14 of the 32 franchises reporting back.

The results demonstrate that mobile devices can be an effective means to distribute educational materials to individuals in secure manner. The iPad was identified as a suitable platform for delivery of instructional material. Security elements such as encryption and using mobile security products should be strongly considered. The results are discussed in detail. A set of standards and guidelines were created based on the responses provided by club employees.

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Table of Contents

List of Tables

Tables

List of Figures

Figures

Chapter 1

Introduction

Education and training are facing yet another deluge of technology with the new wave being made up of next generation mobile devices. Questions remain regarding implementation and usefulness of the devices and many are focusing on the iPad due to widespread use. The iPad is considered better suited for learning compared to competing technologies (Shim et al, 2011). According to Peluso (2012), discussion of the iPad in education needs to move from what apps are relevant to a critical discussion on how the iPad is used. Previous research has focused on using mobile devices as a supplement to learning materials and not a complete replacement (Chen & Huang, 2012). Work-based learning via mobile device has also been significantly underrepresented (Akkerman, 2011). On a broader level, delivering material securely is a concern as organizations are beginning to implement a paperless process for distribution (Mullholland, 2012). Due to an increase in network bandwidth, larger memory storage, and more powerful operating systems, many organizations are investigating using mobile devices to transfer informative documents (White, 2010). National Football League (NFL) franchises are among those that are currently looking at the iPad as a possible solution.

Problem Statement

The problem identified for investigation was the need to develop a set of standards and guidelines for publishing sensitive training materials to NFL players using the iPad mobile device. The delivery methods and the materials themselves vary by team and by player. Each coach and team instructs the way that works best for them. The iPad is the mobile device of choice; several different applications are being used by teams. Linendoll (http://espn.go.com/blog/playbook/tech/post/_/id/2808/nfl-teams-prefer-ipads-over-playbooks) explains that in addition to saving money that previously went to printing massive binders, the coaches now have a real-time method for making last minute changes and updates while preparing for the next game.

The investigator is an employee of the Miami Dolphins in the Information Systems department. The reporting in the following two paragraphs comes from personal knowledge acquired by meeting with employees of other franchises as well as information gathered from internal discussion for iPad deployment. Each team that is deploying digital material to players on the iPad has a unique and private training process. The playbooks containing the plays each player must learn are being distributed electronically. There are also documents that may contain information on key strategies for upcoming opponents. The transfer is primarily one directional where a team delivers content to the player via the iPad device. Teams are not willing to share their proprietary content such as training scenarios. However, many franchises were open to sharing how they used the iPad, what software they use to enable learning transfer, what security

measures were taken, and what successes and failures they may or may not have had. Therefore, the study focused on the areas that are measureable and in need of research to build an understanding for a proper deployment process in the secure and individualized learning environment.

During informal meetings with franchise teams across the league, some common questions became apparent. Can teams completely replace their playbook and player training materials with the iPad device? What is the process and does it work as advertised? Can we individualize instruction by player position? Can we depend on the security so that our confidential and competitive information is not accessible by other teams? With so many questions unanswered, very few teams attempted to implement iPads during the 2011-2012 season. During the 2012-2013 season, many teams were satisfied with the plans they developed internally to implement the iPad device while a few were still waiting to see what results show when the league year ended. There continues to be a need across the league to know what worked, what did not, and how to implement the iPad as a teaching tool in the NFL classroom.

There is no standard deployment of mobile devices to players in the NFL. There are however many similarities in implementation between the teams. Most teams have decided to provide an Apple iPad device to every single player on the team. Coaches produce and distribute instructional material electronically to the players' iPad devices. Learning materials include playbooks, installations, and upcoming scouting materials for the next opponent. NFL players hold many different positions and only need the material

that is relevant to their job duty on game day. The information is used for home study as well as live during meetings and in class discussion. The materials are highly sensitive and NFL teams rightfully place high priority on making sure their player learning materials do not fall into opponents' hands.

The coaches rely heavily on classroom instruction and home study to get their players prepared for upcoming games. Each NFL coach has his own method for creating documents that are delivered to the iPad devices. The Miami Dolphins were able to reduce a five inch binder to a single mobile device. The competitive nature of professional sports stresses the importance of security when it comes to player learning materials. In order to stress the importance of the property, the Miami Dolphins and the Dallas Cowboys have instituted a $10,000 fine for loss of the device as reported by Kelly (http://articles.sun-sentinel.com/2012-06-19/sports/fl-miami-dolphins-notes-0620-20120619_1_ipad-version-new-coach-joe-philbin-playbook) and Archer (http://espn.go.com/blog/dallas/cowboys/post/_/id/4694579/cowboys-playbook-goes-digital) respectively. According to team officials at the Miami Dolphins, the electronic playbook provides security measures printed materials did not. A printed playbook could be left in a hotel room, or even copied at kinkos. When an iPad is left behind, the device can be wiped clean remotely. The electronic method also provides means for copy protection. Each team designates the management, security, and delivery process for the electronic playbook.

Instructional Design and Development

A traditional football playbook consists of hundreds of pages of player learning materials. Some of the learning material might be team based where plays are created that involve multiple members of the team, and some information might be position specific. Each player is a member of a specific position and has certain duties they must perform on the field while football is being played. From an instructional standpoint, some learning material specific to one player might not be applicable to another. Material is broken up in sections, and traditionally provided to NFL players in print format. Material is distributed in big binders when digital formats are not available.

Players consume the information during individual study as well as in classroom instruction. Coaches will show game film, power points, and give lectures similar to a normal class environment. Players use the materials developed by coaches as instructional guides to learn their roles as players. Players are often guided to look at a certain section of their learning material during class time as instructors coach them on their specific tasks. The concentration might be on a specific formation, or might be learning more about an upcoming opponent. The learning materials are developed with improving player performance in mind and specifically preparing for the next upcoming opponent.

Implementation and Security

The iPad utilizes hardware and an operating system in order to electronically deliver the instructional material developed by coaches. A coach or staff member is assigned the task to distribute the learning material to each player's iPad device. The person assigned to creating the learning materials may or may not be the one that ensures that they are deployed out across to all the correct players and positions. The process is facilitated by software developed in-house or provided by a vendor. The Miami Dolphins use vendor software which provides an interface to personnel for pushing materials to specific groups of players, coaches, and staff.

Security of confidential material is provided by several methods. Encryption, password protection, and device management are all serviced by selected vendors at the Miami Dolphins. The information technology department has the power to remote wipe devices that are lost, and documents self destruct after a designated time. At the iPad level, players are required to enter in a password to access the device. A high level of encryption is used to protect data that are transferred wirelessly. The management of security is provided by vendors so that the players, coaches, and staff can concentrate on their responsibilities. The end result provides player learning materials such as the playbook to their iPad with security in place.

Goal

The goal was to investigate the effectiveness of deploying sensitive player training materials on the iPad, a mobile device, during recent NFL football seasons. Issues

addressed include training reported effectiveness, secure transmission of materials and the use of mobile technology as a delivery system for training. A survey instrument was used based upon best practices reported in the literature and personal communications with knowledgeable parties. The draft was validated by an expert review process and modifications made as necessary. Club employees who implemented mobile devices to deploy player education materials during previous seasons were surveyed. The employees were identified by title, or by personal knowledge to target key members who would be most intimate with knowledge at each member team. Results were analyzed and synthesized to establish a set of standards for the creation and mastery of deploying sensitive training materials using mobile technology. The standards will be of value to similar training on other devices and with other populations.

Whyno states that for almost all NFL teams in the league, the 2012 season was the first complete season moving to secure electronic delivery of training materials to players (http://www.washingtontimes.com/news/2012/aug/15/with-ipads-playbooks-a-new-game-for/). Gemmell (http://espn.go.com/blog/stanford-football/post/_/id/6803/cardinal-go-digital-with-playbook) explains the results may extend to colleges across the country as Stanford has announced they will be the first college football program to go completely electronic with the iPad devices. The results may also extend out to many areas of education and business where secure and individualized training material is needed. Many of the findings are applicable to the development of new applications in areas such as patient care (Tomori, Uezu, Kinjo, Ogahra, Nagatani, & Higashi, 2011).

Research Questions

1. What are the delivery systems used to provide training materials to the iPad?
2. What is the range of security measures employed?
3. How do implementers perceive effectiveness of deploying player learning materials on the iPad?
4. Based upon analysis of the results, what standards and guidelines are recommended for better implementation of the iPad-based play books?

Relevance and Significance

Many NFL teams are currently working towards a complete replacement of all printed learning materials (Archer, 2012). Game preparation relies on a good coach to player learning process and the iPad is being implemented as the mobile electronic educational delivery tool. Three challenges must be met by NFL franchises as they strive to implement a secure, paperless educational system on the iPad. First, an instructional design process must be mastered in order to move instruction into a new, flexible and accessible environment. The process must then be validated to ensure the process is a viable means to transfer training materials. Last, a security process must be established in order to keep proprietary information from falling into the hands of competitors.

The NFL is implementing the new mobile technology on a team by team basis to deliver instructional material to players. The iPad has been chosen as the primary delivery instrument. Learners are open and ready to receive mobile learning materials, but guidelines have yet to be established for delivery (Kenny, Van Neste-Kenny, Burton,

Park, & Qayyum, 2012). Yasinskas (http://espn.go.com/blog/nflnation/tag/_/name/average-age) explains that the NFL is perpetually young with an average age of 26 for players. Young students are readily accepting implementation of mobile devices as communication instruments (Squire & Dikkers, 2012). As soon as 2015, all students in all grades may have some type of mobile device (Hill, 2011).

Mobile devices give companies the ability to deploy electronic documents immediately and provide documents created on internal private networks. The time is here for companies to begin investing in providing access to informational resources employees (White, 2010). There is a need for design and distribution guidelines for mobile learning deployment (Cheon, Sangno, Crooks, & Song, 2012). For most teams, the 2012-2013 football season was the first year using an electronic means for coaches to deliver educational materials. The timing provided a unique opportunity to gather data for research on secure mobile deployment of educational materials.

Assumptions, Limitations, and Delimitations

Participants surveyed were technology leaders or other team employees who are required to be proficient in the Microsoft Word application. Therefore, each participant was knowledgeable enough in basic computing skills to complete a Microsoft Word survey instrument. The assumption was also made that subjects understand electronic communication and return the results to the researcher via e-mail or other means. All NFL teams will be contacted, but subjects will be available to withdraw at any point.

There were no teams that responded yes to deploying digital learning materials that used any other device other than the iPad. The investigation was limited to the iPad as the primary instructional device. While the iPad is currently the dominant class of educational hardware, the process and technology could quickly become outdated. The results will be based on a sample, and not the total population. The study will be limited to only professional NFL teams because of the convenience of the sample.

Summary

The results of the investigation describe the software and processes that are being used by NFL teams to deploy training materials securely to the learner. The results also reveal what steps were chosen to ensure the training materials are secure. Using the recommendations by the key coordinators, a set of guidelines were developed for deploying learning resources in an individualized and secure manner. Finally, the perceptions of those who implemented the structure and the effectiveness of delivering educational materials on the iPad were reported. The synthesized results create a clear path for organizations or institutions to publish educational materials to a target audience securely. The rest of the report is made up of four parts. Chapter 2 examines the literature using the iPad as a tool in education. Chapter 3 describes the methodology that was used in order to answer the research questions. Chapter 4 examines the results, and Chapter 5 presents the conclusions.

Chapter 2

Review of Literature

The review that follows examines the use of iPad technology in education. There are many different ways that the iPad can be implemented in education. The review addresses general use of the iPad in learning, sports-specific use, instructional design and development, implementation and security issues. The review also covers sports specific education where appropriate. The following review also examines the challenges of providing custom content to end users. Finally, the review of literature will examine the need to have a complete understanding of best practices to implement a secure mobile environment that provides individualized educational material.

Mobile Educational Technology

Portable technology is the fastest growing segment of the technology market, and the iPad is well suited for use in education to match consumer demand (Lucking, AL-Hazza, & Christmann, 2012). The technology we know today has been developed over a few decades. Panzarino (http://thenextweb.com/apple/2012/10/02/rare-full-recording-of-1983-steve-jobs-speech-reveals-apple-had-been-working-on-ipad-for-27-years/) explains that in 1983 Steve Jobs directly laid out his strategy for the future. Jobs wanted to create a portable device that could easily be carried around and one could learn how to use in 20 minutes. He further laid out his vision by referring to a communication pathway using wireless signals in order to keep that device connected to a central system. The process may have taken longer than Jobs expected, but we now have the device that he envisioned almost 30 years ago in the iPad. The iPad is a mobile computing device that

allows for communication via wireless or cellular networks and has already been implemented in many places as an educational device. Video and other educational information can now easily be transferred to mobile devices with the widespread adoption of broadband (Horrigan, 2011).

Apple has a rich history of combining educational productivity with computing technology. Apple placed the Apple II machine in many classrooms in the 1980s and has more recently created iTunes U to help educators with the teaching process. iTunes U has been adapted to the iPad device to deliver entire college level courses in one easy to use location. The iPad has been the next step for innovation with the development of educational environments (Cooper, 2012). There may be more to the iPad than just another mobile computing device. McClanahan, Williams, Kennedy, and Tate (2012) suggest that the very nature of the iPad's interactive touch screen may further positive learning outcomes. Schwartz, Lepore, Morneau, and Barratt (2011) take learning even further by using the iPad to view the optical activity of sucrose solution. There is a wide spectrum of ongoing research on the value of the iPad to education. Martinez-Estrada and Conway (2012) predict radical innovation of educational use of the iPad in the present and near future.

According to Tomassini (2012), the *big three* producers of instructional material in print signed an exclusive deal with Apple for distribution in schools. Pearson, McGraw-Hill Education, and Houghton Mifflin Harcourt will provide learning content via the iPad mobile device and many school systems have already begun purchasing the device in bulk. Some educational institutions are considering requiring students to

purchase classroom electronic devices to offset costs. Questions regarding effectiveness and cost remain, but the hardware and software will be primarily provided by Apple. iPad textbooks are considered a starting point until more data can be collected in order to understand the full impact of moving to a completely digital learning environment. The iPad device could end up providing a complete course solution delivering interactive textbooks, lectures, and activities all in one product. Requiring the move to digital is not limited to the United States. South Korea put forth an aggressive implementation schedule. The intent in South Korea was to replace all printed materials by 2015, but a possible student dependency on technology put that decision on hold (Young, 2013). Learning institutions across the United States are not far behind in implementing digital textbooks and will soon be a part of every classroom in the country (Mardis & Everhart, 2011).

As explained by bigleadsports (http://www.thebiglead.com/index.php/2011/04/22/nfl-career-length-and-average-age-versus-average-life-expectancy/), the notion that the NFL is perpetually young is well established. As a consequence, the target learner in the NFL is also perpetually young. Learners are more and more being introduced to mobile learning technology at an early age. Students will be much more willing to embrace any type of technology that is presented to them enabling newer technologies to be introduced more quickly. Young learners are becoming more comfortable with connected technologies even possibly to the point of obsession, yet still require close monitoring and reinforcement in learning environments. The next generation of learners will be confident and adaptable to new

technologies (Mears, 2012). The transition to e-learning also empowers the student to be more independent from the facilitator (Kiboss, 2010). The iPad is already having a noticeable impact on curriculum movement towards e-learning. The mobile platform must be implemented properly to be effective and to motivate students to be active consumers in the learning process (Ingraham, 2013). The iPad provides a high level of technology without a steep learning curve (Manuguerra, 2011) which may be attractive in sports education.

The National Association for Sports and Physical Education (NASPE) is a strong advocate of using technology in sports education. The implementation of the iPad in sports education is just starting to gain traction. At the National Physical Education Teacher Education Conference in October 2012 presented by NASPE, several classes were presented specifically focused on introducing the iPad into the classroom (Physical Education Teacher Education, 2012). At the administrative level, the iPad provides a more efficient way to communicate and organize daily activities (Winslow et al., 2012).

Specifically for coaches, the introduction of the iPad, applications, and instructional videos appear to increase peer-to-peer interaction and the value of instruction. The iPad has also provided a sense of professionalism and seriousness to education during a sporting season. The iPad has the potential to unlock an area for knowledge transfer in sports education, but there is a need for tailoring the product to the specific requirement, class, or sport. There is a desire for ingenuity and creativity to adapt the product for the specific sports education need (Sinelnikov, 2012).

For the NFL, the implementation of the iPad device is new. Farrar explains via Yahoo! Sports (http://sports.yahoo.com/blogs/nfl-shutdown-corner/buccaneers-forget-recharge-ipad-playbooks-curtail-result-130925999--nfl.html) that a few teams experimented during the 2011-2012 season, and more are beginning to comment on iPad use for the 2012-2013 season. The iPad device provides an avenue to introduce unique applications specific to new goals in mind. According to Chan et al. (2010), a product was specifically developed for collecting assessment data on medical patients recovering from torn rotator cuffs. The iPad has also been recommended to ophthalmology patients who are in need of personal testing outside of the doctor's office (Zhang et al., 2013). Researchers have even been able to provide cognitive behavioral therapy via a mobile application with significant success (Watts et al., 2013). In education, use of the iPad has provided an avenue to improve success in math for students that that are dealing with emotional disturbance (Haydon et al., 2012). Facilitators are directed to use caution, however, because the iPad should not be used as a complete replacement for active engagement (Hill et al., 2013).

Digital Learning Material

The concept of electronic learning material is not new, but recent advances in accessibility, connectivity, and availability have laid the groundwork for full implementation (Sloan, 2012). Despite students' willingness to purchase paper textbooks even when free electronic versions are available, the transition to electronic media is still occurring (Robinson, 2011). In 2011, the sale of electronic books (e-books) eclipsed the sale of physical books. The paradigm shift to electronic resources is far reaching in scope

of impact (Chiarizio, 2013). Education has been directly impacted and there has been a noticeable move to digital content in classrooms. Traditional printed content is being converted for presentation in electronic format and educators have begun to review the process for textbook selection in the digital age. Educational materials distributed electronically are not limited to full scans of classroom texts, but also include teacher generated content (Schaffhauser, 2012). The state of Florida has installed legislation which requires districts to spend half of the total learning material budget on digital media. The Federal Government has already put forth an ambitious plan to go completely digital with instructional materials by 2017 (Tomassini, 2012). The use of mobile technology in all levels of education is becoming ubiquitous yet questions remain. The rapid development of technology demands literature is timely and pervasive (Wakefield & Smith, 2012).

According to Young and Lin (2012), investigation is needed for all aspects of digital format implementation in the classroom setting beginning with conversion. The initial step of converting printed materials to a format fit for digital consumption can be challenging and standard operating procedures must be developed. Although planning is required, distributing diverse educational materials on the digital platform is feasible. Pilot programs are being developed to discover the challenges of using digital learning materials in the classroom (Sloan, 2012). Effectiveness of using digital media in the classroom is a core principle that has been identified for usability (Lim, Song, & Lee, 2012). Digital media presents unique challenges in comparison to the physical media still widely in use (Chiarizio, 2013).

Traditional print material is still heavily favored when consuming more than a few paragraphs of educational material (Gibson & Gibb, 2011). However, options such as electronic highlighting not only need to be considered, but might also provide for more effective learning (Grier et al., 2011). Digital rights management (DRM) might also require consideration (Walters, 2013). The potential for quick propagation of intellectual property has lead to some of the most restrictive copyright laws (Postigo, 2010).

Effective and practical use of converted digital learning content is an area of concern (Martinez-Estrada & Conway, 2012). Facilitators must consider what options the iPad brings to the classroom or risk becoming less relevant (Geist, 2011). According to Faris and Stelber (2013), research considering adoption of iPads in the classroom is limited to focusing on data that is generalized to fit all or most instructional settings. In some cases, subsets of local populations could be further separated for individual study. Therefore, there is a need to focus on more specific implementations and how different populations interact with the new technology when teaching. Hesser and Scwartz (2013), for example, were able to demonstrate success by creating a paperless chemistry laboratory course using the iPad as the primary instructional device.

The simplicity of the interface and the interactive nature of the touch screen make the mobile devices a good fit for education (Lynch & Redpath, 2012). Observations of applications in action show that much of the perceived benefits of the iPad devices are because of the design of the iPad hardware and the iOS software. The potential of implementing the iPad mobile device in the classroom appears high, but more discovery must be done on specific delivery methods (Murray & Olcese, 2011).

Instruction Design and Process

The investigation of using iTouch devices in education is mostly limited to studies from the learners' perspective. Production and use of learning materials by instructors requires consideration (Mayberry et al., 2012). Educators see promise in using the iPad as a tool, but are in need of training and a defined process (Wainwright, 2012). Effectiveness of the digitized material is dependent on facilitator knowledge of the process as well as properly developed policies and procedures (Stolte et al., 2011). Many instructors do not even consider the many beneficial aspects of using the iPad for preparation and focus solely on student interactions (Keeling, 2012). A process or flow must be defined for mobile devices to work in a production environment. Reliability, performance, and functionality are three key elements for mobile devices to be used by end users (Shrestha, 2012).

According to Crichton, Pegler, and White (2012), there are four conditions that must be met for the iPad to deliver on the promise of a paperless learning environment. The first is a learning oriented infrastructure. The learning oriented infrastructure includes a dedicated wireless network, guidelines for acceptable use, and consent forms among others. Second, instructors must be close to the design process and understand the technology before implementation. Third, the design has to be consistent with curriculum and application use must be targeted and meaningful. Finally, personalization of the device must be considered when working with older students.

The end user experience needs to be strongly considered and can impact the efficiency of the knowledge transfer process (Jiao , Bowen, & Siranc, 2012). There are

times where the learner will need individualized learning. iPad use in the instructional process can deliver positive results for individualized instruction. The iPad has already been implemented as a readable device for published texts and documents (Cannon, 2010). Children with autism spectrum disorder have benefitted from the independence of performing tasks specific to them (Kagohara, 2011). The abilities of the iPad, such as the camera and video playback, have been exploited for educational purposes as well (Burton et al., 2013). iPad devices have also been implemented across several different subject types with similar success. Disparate subjects such as General Principles of Biology, Calculus II, Ordinary Differential Equations, Applied Linear Algebra, Introduction to Political Science, Speech Science, and Principles of 2-D Design and Color have been able to implement similar systems on the iPad and still cover the unique topics of each class. At the very least, the iPad has shown some promise for delivering content that is specific to the learner's needs (Mayberry et al., 2012). Educating students on how to interact with mobile educational material and providing the proper functionality required might possibly be key elements for successful introduction of learning materials such as e-books (Folb, Wessel, & Czechowsk, 2011).

Mobile Devices in Production

The publishing and use of e-book materials has been reported to have increased significantly. The production is in the early stages of development as even such basic elements of navigation are still being perfected (Browne & Coe, 2012). The use of e-books is promising, however, and could possibly even lead to a measurable reduction in carbon footprints for learning institutions (Gattiker & Lowe, 2012). Overall costs can also

be lowered by purchasing older generations and used versions of the iPad (Aronin & Floyd, 2013). The use of e-books in academic settings has no effect on reading comprehension, yet introduction of digital devices is still moving forward (Connell, Bayliss, & Farmer, 2012). A large majority of students still prefer print, but movement towards a predominately digital distribution means is understood (Howard, 2013). Although reading comprehension is not compromised, the amount of time to complete required reading is longer when using e-books (Connell, Bayliss, & Farmer, 2012; Parry, 2013). According to Carr (2012), effectiveness of iPad use in education has provided for mixed results of success.

Exploration of e-book use in an educational setting has been going on for some time. Guasco (2003) raised questions as to how interactive an instructor must be with the electronic learning material. According to Ahmad and Brogan (2012), actual use of e-books in an academic setting is mostly limited to a low percentage of knowledgeable users who have an active interest in using the technology. Very low usage levels of e-books have also been observed in completely virtual classrooms. Some research suggests that current development of e-books is not mature enough for use even in higher education (Olsen, Kleivset, & Langseth, 2013).

The implementation of electronic learning materials is still moving forward in spite of initial data collection. Cost is one driver raising interest in e-book instructional material among the student body (Parry, 2013), and there are ongoing efforts to provide digital material to students for free (Azevedo, 2013). There are other reasons to consider. Stone and Baker-Eveleth (2013) identified several factors that elevate learner use of

electronic information resources. Primarily, if the resource is easy to use, students are more likely to engage digital instruction material again in the future. Other factors that affect use include faculty perception on implementation, student attitudes, and previous experience. Navigation should be a primary focus for end user ease of use (Richardson & Mahmood, 2011). Overall, student acceptance of electronic materials is accelerating (Weisberg, 2011). How students actually use the iPad, however, is still being debated (Nguyen & Chaparro, 2012).

The transition of learning materials from print to digital has not gone unnoticed by professional football teams. Linendoll (http://espn.go.com/blog/playbook/tech/post/_/id/2808/nfl-teams-prefer-ipads-over-playbooks) explains that the NFL is in part, simply moving from printed materials to a digitized version of the playbook and training materials. According to Huang, Liang, Su, and Chen (2012), e-books are possibly a suitable replacement to individualized learning when supplanting printed material. The iPad is also successful when only used on a limited basis, or when each student does not have access to their own personal device (Bennett, 2011). Several other factors may contribute to success such as the learner's perceived usefulness and enjoyment, convenience and compatibility (Lai & Ulhas, 2010). Using the iPad allows for convenient updating of learning material when content change is necessary (Albrecht, Larvick, Litchfield, & Weishaar, 2012). The basic and simple use of the devices has given rise to learners' engagement in active learning. There is potential that the basic process of moving required learning materials to a digitized format could produce a more productive learning environment (Rollag & Billsberry, 2012).

Security Issues

There are many companies working to keep electronic information resources protected by digital rights management (DRM) or other means. Indeed, mobile devices might possibly be more secure from the outset. Traditional print media is inherently insecure due to the advent of the photocopier. Copy devices provide a means where duplicates of printed material can easily be made (Chiarizio, 2013). Security and privacy concerns specific to the iPad might lead to lower levels of market penetration (Abbas, 2012). The use of the iPad mobile device brings the significant challenge of protecting the hardware and data stored on the device. The iPad also relies on wireless technology that must be taken into consideration. There are concerns in areas of education with data retrieval and information security when working with the iPad (Crichton, Pegler, and White, 2012).

Integrating the iPad with already existing networks and information systems is a process that must be considered (Marcegla et al., 2012). The topic of wireless iPad security is wide ranging and can quickly become a computer science focused study. There are high level concerns of implementing an iPad that must be considered. Security requirements are defined and implemented by technology teams. Technology teams recommend and supply the security procedures from a technical perspective, while management introduces policy on how the devices are deployed and inventoried (Cook, 2011). Many organizations admit to not having well defined management and governance of mobile devices, even in an important sector such as healthcare. Security is an area that needs growth both in definition and in process (Shrestha, 2012).

The most important concern when working with the iPad is security. The iPad is delivered with the default ability to remote wipe in cases of lost or stolen hardware, but there are more concerns (Drew, 2011). New applications developed specifically for iOS have security analysts concerned as cyber criminality is becoming more prevalent (Gold, 2012). Threats such as mobile malware already exist and are expected to grow exponentially as the use of mobile devices become more and more ubiquitous. The iPhone, which uses the same operating system as the iPad, contributed half the number of vulnerabilities in the first two-and-a-half years of use. The rapid growth of iOS implementation makes it an even more likely target in the future (Yan, Deng, Li, & Li, 2010).

Market leaders in mobile devices will continue to deal with the lion's share of the security threats (Hammond, 2010). Businesses working with information that requires security such as financial planners require an even higher level of scrutiny (Schulaka, 2013). The 2012 Mobile World Congress held a first ever dedicated forum on meeting the new challenges brought by devices such as the iPad due to the growing awareness of mobile security needs. The inclusion is another sign that security specific to a mobile device is a separate entity from normal PC and information security. A risk-assessment process may be formed as a step to determine levels of vulnerability. Companies are still sorting out who is responsible for securing information systems on devices such as the iPad or iPod (Goth, 2012).

The security of systems is a specialized strand of professionalism (James, 2012). Security issues are important, and critical information needs to be protected as long as

usability is also considered. There is a balancing act that must be done when implementing security procedures on iPad mobile devices. The information must be secure and the system must remain accessible and user friendly at the same time (White, 2010).

Due to the number of complex security issues it is often the best practice for companies to seek outside vendors and assistance through externalization. Using vendors may even provide for a more accessible process than other options. Outcomes of service can be analyzed and changes may be made as necessary. Vendor selection can be viewed as an important part of the process. Cost, management, and legal considerations are important topics that require discussion when working with vendors (Foster, 2012). Due to the many different services that are needed to complete a secure infrastructure when working with wireless mobile devices, organizations often look for a single vendor to provide coverage for a specific project. The importance of having the ability to quickly update information wirelessly must be balanced with a good security process (LePree, 2012).

Securing mobile devices can quickly become a study which stands by itself. Ren and Boukerche (2010) created ARMA, a wireless adhoc network security protocol in order to provide verifiable security measures. The protocol is above and beyond the mobile ad hoc networks in place at military and highly secure commercial institutions. Discussion of the protocol development process is beyond the scope needed here; however, the work demonstrates the complex understanding needed in order to properly secure information provided wirelessly to mobile devices. The work also provides further

evidence that a strong consideration of security is necessary when working with transmissions that must remain confidential. Most mobile users do not see security as an important issue as they commonly do for the personal computer. Trojan horses have been demonstrated to steal personal information and transmit the material to a nefarious source. The user may be left unaware, and the mobile hardware and software in use can even remain intact (Fuentes et al., 2010). Device security is important because it is a key component of initial trust by users when implementing new systems and could ultimately determine if adoption is successful or not (Zhou, 2011).

Learning institutions in general implement closed systems where the networks are secured by implementing encryption and multiple layers of security. Although it is nearly impossible to consider a closed system completely secure, a well defined process can help mitigate risk (Haynes, 2012). Modern networks have multiple levels of security to consider and are not easily defined. Multiple devices may enter a network requesting information from multiple clients ranging from employees, to outside vendors, and even visitors. There needs to be a policy and security plan in place specifically designed for the deployment of the materials to learners. Traditional security methods which employ separate products working in conjunction with each other are not adequate in today's diverse settings. Security processes must be considered and implemented in learning environments when necessary (Lakbabi, Orhanou, & Hajji, 2012). Security measures can create challenges and issues that students must overcome unrelated to the instructor's lesson or discussion (Faris & Selber, 2013).

Another key element to the security of the mobile devices is the management of those devices. There are two common practices when deploying mobile devices in the work place. The first is to allow users to bring their own device (BYOD), and the second is to provide managed devices purchased by the issuer. According to a recent global survey, 42% believe the dominant risk to BYOD is potential data loss and exposure to malicious data threats. There are also issues with end users not wanting security measures implemented on their personal devices. The BYOD process can actually disrupt learning by the distracting process of managing and coordinating multiple devices (Hill, 2011). Proper mobile device management should merge all the required services efficiently. The services include device connectivity, diagnosing the devices remotely, updating clients remotely, network performance monitoring, and service provisioning (Ma, Liao, & Zhu, 2008).

Summary

Many NFL teams recently began replacing their printed training material books with the iPad mobile electronic device. The iPad has been shown to be an effective tool in education. Effectiveness, implementation process, and security are key components when implementing the iPad in an educational environment that requires individualized learning of confidential material. The review presented here covers what is known for the three components, and how they may relate to the NFL's transition from printed material to the iPad device.

The review shows that while the impact of the iPad on education is evident, the NFL is presenting a great opportunity for further study. The new implementation of the iPad in the player classroom setting will give us further insight to some still outstanding questions.

Chapter 3

Methodology

The problem addressed was the lack of useful information about and guidelines for deploying sensitive training materials on mobile devices. Many NFL teams have implemented the iPad mobile device as a delivery system for sensitive training materials to players. A survey research design was used based on the methodology presented by Creswell (2008) and Fowler (2009). The opportunity to collect data presented itself at the end of the 2013-2014 NFL Season. The data provided current views on the mobile technology, security of deployment systems, and the delivery methods in general. The practices, effectiveness, and beliefs of team employees were measured using a cross-sectional survey instrument.

The methodology described here shows the process that was implemented to address the research questions. The goal was to examine the use of the iPad by NFL teams to instruct their players for game preparation. To determine implementation, effectiveness, and security concerns, NFL team personnel were surveyed. Many NFL teams are currently implementing an electronic method of transferring player training materials via the iPad. Farrar (http://sports.yahoo.com/blogs/nfl-shutdown-corner/buccaneers-forget-recharge-ipad-playbooks-curtail-result-130925999--nfl.html) explains that there is no centralized or defined process and each NFL team is deploying the systems independently and sometimes unsuccessfully. The approach addressed the effectiveness of using the mobile electronic delivery method.

The review of the literature established a baseline to discover what research questions needed to be asked for the new NFL venture of using iPads to deliver educational material. The review along with educational research guidelines provided the foundation for discovery (Creswell, 2008). One person was identified as a key member at each NFL franchise and a form e-mail was sent to him using the researcher's NFL account (Appendix A). A qualified member was defined as a person who would have overseen the implementation and the execution of delivering learning materials securely on mobile devices to players. The initial list was made primarily of Information Technology professionals in high management positions. Example titles included: Director of Information Technology, Chief Information Officer, and Vice President of Information Technology. In some cases, the target individual did not respond, but forwarded the survey to an individual better suited to respond to the survey. The final list of survey respondents included Information Technology, Video Department, and Executive Football professionals.

The questions sent were developed using educational research and standard survey guidelines (Creswell, 2008; Fowler 2009). Reduction of errors was the primary concern in following an educational research survey methodology. The target population was strictly defined, and the content of the survey was verified by experts. Each NFL team was sent a survey in an attempt to reach everyone in the population. The survey was sent to the identified NFL team representatives (Appendix B). If no response was given after a few weeks, a follow-up e-mail was sent (Appendix C). The responses were returned via e-mail, hard copy, and by fax. A critical review guided by Fowler (2009)

was applied to the MS Word survey to identify flaws. The target population was administrators who have implemented the iPad device for deployment to players.

Research Design

While developing a custom iPad solution to aid in patient education and decision making, Tomori et al. (2011) focused on feedback from the client. In order to solve the research questions presented below, a similar process of focusing on feedback was constructed. The process focused on key members of the implementation team who were wiling to respond. At the end of an NFL season, clubs that had implemented an iPad solution had knowledge of the success or failure of implementation. The member clubs were in a unique position to help guide the development of a process for delivering secure, personalized educational material. Due to the researcher's unique position within the NFL, a direct survey was employed using convenience sampling.

In an ideal world, all NFL teams would respond allowing for the full population to be studied. The sampling was based on the teams that chose to respond to a questionnaire. The scenario is different from studying most populations because each team is a similar unit of a single organization. Each team approached the problem of delivering educational content on the iPad with their own vision, but what works at one team may be assumed to work successfully at another team. Each team is similar enough in structure that we can gain insight with limited responses. In effect, 14 sets of useful responses were received from the 32 teams in the NFL. Future research may include implementing the guidelines that will be developed at teams that do not currently employ such systems.

Permission to conduct the survey (Appendix D) was obtained from the Institutional Review Board (IRB) of Nova Southeastern University (NSU). A cross-sectional survey design was employed to answer the research questions at the end of the 2013 NFL season which ended in early February 2014. Cross-sectional survey designs allow the researcher to examine current practices and opinions. The cross-sectional survey was used to gain better understanding of the opinions and practices in the NFL. The results of the survey allowed for evaluation of each football club's iPad implementation. An electronic instrument was used to complete the process and is described more in-depth in the instrumentation section (Creswell, 2008). In many cases the instrument was printed, filled out, and returned to the researcher either as a scan or as a hardcopy. In other cases, the Microsoft Word document was edited, saved, and returned via e-mail with responses.

Instrumentation

The process began by defining the key objectives. The objectives were to gather data on type of system employed, define what security measures were used, understand the perceived effectiveness, and gain enough understanding that guidelines could be formed for implementing a solution. A basic set of questions was created following guidelines from Fowler (2009) and Creswell (2008). Quality question construction was attempted by creating clear, concise questions that the target population would be able to understand and respond to. The original draft, along with the research questions to be answered was presented to an expert team. The survey instrument went through many changes until the team was in agreement that not only were the questions valid and

consumable, but also that they would answer the research questions being addressed. The resulting instrument had three sections: Delivery System, Security, and Effectiveness. The survey questions in each section were specific to the subsection.

Data were collected using the self-administered survey instrument sent directly to current leaders in the NFL who have deployed electronic learning materials (Creswell, 2008). The electronic instrument was developed in Microsoft Word as a text document. The document was delivered to key members of the NFL organizations directed towards specified individuals. The individuals were representatives directly involved with deployment of iPads to NFL players. The assumption was made that the population held basic computing skills based on the employment title of every individual. Concerns about respondent skills to complete the survey were at a minimum based on the assumed population skill set (Fowler, 2009). A web instrument was considered, but there are two reasons why using Microsoft Word is a better process. The first is that it was safe to assume that the technology representatives at each club were all very familiar with answering a survey designed in Microsoft Word. The NFL has used a basic Microsoft Word document to obtain survey data in the past. Second, the process eliminated the issues of a web produced survey related to technology support, data storage, time-limit, and other challenges that may occur. There are 32 clubs in the NFL, and only one response was requested at each club. Sending a survey document was simply the most direct method to gather data from the member teams.

Creation of an instrument is more difficult than identifying an existing instrument. The instrument was designed considering different types of questions and good

techniques for question construction. The survey was examined by some key members of the NFL. A two-tiered approach was used to provide validity to the survey instrument. The first step was to ask some key members in the NFL to look over the survey instrument and agree that the results would serve the intended purpose. Key representatives from the NFL looked over and validated the survey. Based on the feedback, revisions were made to the survey design. The survey was sent out to each member club in the NFL. The process described below helped weed out poorly worded questions and other issues that may have reduced the quality of the instrument (Creswell, 2008).

Step 1: Apply findings of literature review

The literature review highlighted questions that might be answered by the survey instrument.

Step 2: Develop survey instrument

Items within the survey instrument were identified in the literature, through personal experience and through personal interactions with NFL football technology experts.

Step 3: Validate survey instrument

The validation was a three tier process. First, key NFL employees looked over the survey. Second, the expert panel was extended to include researchers who have a demonstrated command of the topic of mobile technology in learning, football education, or security on mobile devices. Finally, the instrument was reviewed by the expert panel.

Approach

A list was compiled of key members from each of the 32 National Football League teams. The list was built by identifying the most likely professionals at each team to have implemented the iPad as a learning platform for players at their respective team. The survey was developed based on the literature review, validated by an expert panel, and then received IRB approval (Appendix D). The expert panel composed of researchers and high level professional experts agreed to review and validate the instrument. Communication with the expert panel was by phone, e-mail, and in person. Each member of the expert panel reviewed the instrument and suggested changes they deemed necessary to answer the research questions. The instrument was revised until all changes requested had been implemented. The survey instrument was executed by sending out the documents to each of the key members of the 32 teams after the committee approval of the research proposal.

Data Collection

An e-mail (Appendix A) was sent from the researcher's NFL account to the current Information Technology contact of all 32 teams at his respective franchise. The questions were developed and validated and were filled out by key members of the iPad implementation team at each respective club. In some cases the survey instrument was forwarded or introduced to a more appropriate member of the team to facilitate a proper response. The data were collected via e-mail, hard copy, and fax. The data were stored and review began after a few months had passed after the last e-mail was sent to the member teams. The completed instrument is available in Appendix B.

Resources

The main resources to complete the research project were people and time. In terms of human resources, there were several groups that committed to the effort of completing the research. The dissertation committee was formed by the advisor at Nova Southeastern University to guide the research process. The survey instrument was reviewed by an expert panel, and the process was reviewed by the Institutional Review Board. Every person that responded to the survey instrument was a human resource that spent time on the project. A great amount of time and human resources were spent making sure the research could come to completion.

Technology was a key resource. Teams that implemented a secure digital learning system had several layers of technology that were made available as a resource via the survey instrument. Mobile devices, software systems, security systems, and servers were all involved as a resource. The response survey was created using Microsoft Word and several PCs were used in the development of the research document. The quantitative data were analyzed using the PSPP (http://www.gnu.org/software/pspp/) software.

Analysis

The results of the survey were examined in order to answer the four research questions presented. Data were adjusted and errors were examined (Fowler, 2009). PSPP software was used to derive consumable results from the quantitative data. PSPP is a statistical analysis software that allows for quick calculation of survey results. The software is a free open-source alternative to the popular SPSS (http://www-01.ibm.com/software/analytics/spss/) software often used in research. Quantitative data

helped verify effectiveness of the various implementations. The qualitative data collected provided further insight into the process and deployment systems used. The combined analysis of the qualitative and quantitative data resulted in the reported understanding of iPad implementations in the NFL for player education.

The complete survey and review process answered each research question as described below.

Research Question 1: *What are the delivery systems used to provide training materials to the iPad?*

Delivery systems used to disseminate player learning materials to iPads are covered in the first section of the survey. The analysis of the data returned from the first section is intended to answer the first research question.

Research Question 2: *What is the range of security measures employed?*

Security measures employed while distributing confidential learning material are covered in the second section of the survey. The questions in the second section have been designed so that the range of security measures is better understood.

Research Question 3: *How do implementers perceive effectiveness of deploying player learning materials on the iPad?*

Perceived effectiveness of deploying player training material to the iPad is covered in the third section of the instrument. The questions in the third section are designed to get an overall idea from key implementers on the effectiveness of the deployment systems.

Research Question 4: *Based upon analysis of the results, what standards and guidelines are recommended for better implementation of the iPad-based play books?*

The results of the iPad implementation survey were synthesized and the best common standards and guidelines have been extracted. A general guideline quick reference sheet was developed.

A report section has been produced containing actionable items with the results examined and the research questions answered. The first survey section provided a foundation to discover the actual delivery methods used. The second survey section provided guidance for actionable security methods that can give insight to other educators implementing a similar system. The third survey section helped gauge what solutions worked and what did not. The set of guidelines also provided issues encountered as a result of implementing digital learning materials.

Summary

The information presented here explains the methods and procedures used to gain insight on iPad implementation in the NFL. A cross-sectional survey design was implemented and returned data that may help guide future implementations of iPads in secure and learner independent environments.

Chapter 4

Results

The problem, confirmed by the literature, addressed the lack of empirical evidence about secure and effective delivery of learning materials through mobile devices. The goal was to produce results that answered four stated research questions. The research questions were intended to show what delivery systems were used, the range of security measures used to protect confidential training material, and the perceived effectiveness of using the system. To reach the goal, every team in the NFL was approached. The instrument design and implementation are described in full in chapter 3. The results are described here in chapter 4.

Implementation

IRB permission was granted to send out the survey instrument to gather data from the NFL teams. There are 32 football teams in the National Football League. Responses were received by 15 of those teams. The results provided insight on the process, security, and effectiveness of deploying learning materials to players. The review of the literature demonstrated a need for closer examination of iPad implementation in production environments. The goal was to investigate the effectiveness of deploying sensitive player training materials on the iPad, a mobile device, during recent NFL football seasons. To reach the goal, results were examined that were retrieved from key members of the teams that responded to the developed and validated survey instrument. The instrument was validated by a team of experts listed in Table 1.

Table 1: Expert Panel Members

Expert	Credentials
Christopher Shea, Esq. Football Administration Expert	• Attorney-at-Law, admitted to the New York State Bar • J.D., Hofstra University Law School • 23 Season combined football-related employment experience in the NFL and NCAA • Served as I.T. Liaison from the Player Personnel Dept. for three NFL franchises (Cowboys, Dolphins and Jets) and the Boston College Football Program.
Tery Howard Football Technology Expert	• CTO/Senior VP of Information Technology for the Miami Dolphins • Over 15 years of experience working with technology in the NFL • Long time leader in technology innovation in sports
Roberta Sloan, PhD. iPad in Education Expert	• Associate Professor in the School of Science, Technology, and Health Services • Conducted pilot test integrating educational materials and the iPad • Areas of concentrations: Computer Information Systems, Information Technology: End User Support, and Information Technology: Application Systems Development
Nael B. Abu-Ghazaleh, PhD. Network and Security Expert	• Associate professor in the Computer Science Department of Birmingham University • Research sponsorships include the National Science Foundation, Air Force Research Labs, Air Force office of Scientific Research, Qatar National Research Fund, and the US Army. • Extensive list of published articles: http://www.cs.binghamton.edu/~nael/pubs.html
Scott Ragsdale, PhD.	• Football coach at Harding University (NCAA Division II) in Searcy, AR for 24 years. • Offensive Coordinator for 1989, 2000, and 2007 seasons

	• Assistant Professor of Computer Science for 29 years at the same school. • Ph.D in Computing Technology in Education

Only one team responded that they do not currently have a digital player learning system in place, but did comment in a note written on the response that they intend to in the upcoming season. Table 2 presents the remaining 14 quantitative responses (Appendix E). The results presented here examine the process of providing digital learning content in a secure and individually specific manner.

Evaluation

Only one team reported not using iPad mobile devices in the previous season for training. All teams that used iPads reported using an outside vendor. Respondents answered several questions on a five point scale where one meant to strongly disagree, and five meant to strongly agree. There were zero instances of responses less than 3 for players showing improvement. The average response to players showed improvement was a mean of 3.92 (s=.9). Further, an average of 3.86 (s=1.35) were satisfied overall with the deployment. Coaches were slightly less pleased with a mean satisfaction of 3.79 (s=1.37).

Respondents average response on satisfaction with security was 3.93 (s=1.33). Coaches had a mean satisfaction with security of 3.86 (s=1.29). There was a correlation between satisfaction with security and satisfaction with deployment, r=.94, p= <= 2E-7. The positive correlation was true for both respondents and coaches. The implication is that satisfaction with security is directly related to the level of satisfaction with

deployment. The evaluation is presented here in three sections. The sections are delivery systems, security, and effectiveness.

The first section of the survey instrument addressed Research Question 1: *What are the delivery systems used to provide training materials to the iPad?* There were 14 teams that responded that player educational materials were distributed via a mobile device. These teams also confirmed they used the Apple iPad mobile platform in order to distribute the content. The systems and processes used varied between the teams. Several different vendor deployment products were used. Table 3 shows the product used and the mean for responses related to satisfaction (Appendix F).

Table 3. Applications Used and Satisfaction Levels

Product	**Used By**	**Coaches Satisfaction**	**All Satisfaction**	**Improved Learning**
Player Lync	8	3.25	3.38	4
XOs Playbook	3	4.33	4.33	3.33
Gameplan	3	3.67	3.67	4
Araloc by Modevity	1	5	5	5

In the short answer section, respondents were given an opportunity to describe the application used and what process was used to distribute the materials. Table 3 shows a breakdown of the responses and the number of clubs currently using the application to distribute. One team reported using a combination of applications to distribute their materials; therefore the total is 15.

The short-answer responses showed a general process that is shared between the teams. The first step is to distribute personal iPads to each player with the selected vendor software in place. Coaches and staff are then given access to either a share folder or an interface in order to distribute playbook and learning materials to players. Multiple products are used to create instructional documents. One respondent noted specifically that products such as Visio and Power Point are used to create original documents. Materials in general are converted to PDF format before any distribution begins. When the file has been converted, the staff member (primarily coaches), copy the file to a specified shared folder or use a vendor developed interface. In some cases, cloud products were used to distribute content via the internet. Other teams used a private network and distributed content over an in-house wireless system. Further discussion regarding the different delivery methods appears in the security and effectiveness sections.

In summary, the delivery systems used to provide content all used iPad hardware devices along with a partnership with a vendor. The vendor provided the system to broadcast learner specific educational materials directly to players. To publish content, coaches and staff first convert materials to PDF and then engage a publishing system. The publishing system is either a vendor produced interface or a file share system where learning documents are dropped. The learning materials are then delivered to a player's iPad via cloud or an in-house wireless system. The end product is displayed using the vendor software on the player's assigned iPad.

The second section of the research instrument addressed Research Question 2: *What is the range of security measures employed?* Teams implemented an array of security measures in order to provide sensitive training documents to players. The most basic security measure was to use the built-in security options available standard on the iPad device. Only one team that implemented a digital iPad solution reported not using any delivery security. Of the 13 teams that used security to delivery digital learning materials, all used encryption and 12 used security systems outside of the delivery system. One team reported specifically using a level of 2048 SSL bit encryption. The communication between the learning device and the servers was also reported as being encrypted. In all, every team that implemented security found it necessary to use some form of encryption and therefore is included in the guidelines for implementing a secure mobile learning system. Other security measures concentrated on the user privilege aspect when interacting with the learning materials.

Several account management features were reported in use to ensure communications remained secure and documents remained viewable to the intended recipient. Teams reported various management systems that allowed for revoking access at any time for any user. The process allowed for real-time changes to occur allowing for immediate termination of rights. Some systems implemented a time to live function which limits the lifespan of educational information on the mobile units. Accounts were also monitored for login times, content viewed, and the IP addresses of the devices that were used to consume the learning material. The account monitoring also allowed for administration to see who was accessing the content and how often. A final user level

security measure was defined as a “dead man switch.” If the iPad mobile device does not report back as active and communicating properly with the existing system, the iPads are automatically erased.

Several measures were reported on securing the material itself. The first basic measure included was a optional digital watermark on the material. The content delivered to the learning devices could also be restricted. One team reported having the ability to set dead periods where users would be unable to access material. Audit logging was a method used as a means to keep track of use and time in the delivery system. iPad passwords and separate vendor login passwords were implemented for user verification. iPads were sometimes limited to company issued hardware, and restrictions were implemented regarding what applications would be made available. Mobile device management allowed teams to prevent users from printing, e-mailing, or off-lining content. Airwatch security software was one tool that was used to lock down the mobile devices, enabling teams to limit applications on learning specific to football. Personal applications were also limited on some iPad devices. E-mail, apps store, and internet browsers were removed to prevent unauthorized materials from being downloaded and installed.

Further security methods revolved around issuing device certificates to ensure only certain mobile units had access to secured learning material. Role based security was also implemented to limit access to specified users. Some systems introduced file shares. The file shares were set-up so that only users in the local building had access to learning documents. Virtual private networks were also employed to give remote users

access to file shares when not on site. The entire structure included secure rights that were specified by user. Documents could also be stored and encrypted in a database. In the case of encrypted database storage, the information is unreadable without the use of specific vendor software.

Teams also implemented security that focused specifically on the wireless transfer of data. Private corporate wireless networks were reported as a common security measure. For local wireless network access, Apple serial numbers were used as identifiers to determine what devices could access content wirelessly along with implementation of firewalls. The MAC address for each device was also used in order to allow specific devices only to connect to local networks. The MAC address list was also used and set up on wireless networks at remote locations when teams are traveling for games. Teams also restricted access only to iPads that could VPN in using credentials specific to the local network. All teams that implemented security measures also used encryption for wireless delivery. The specific vendor chosen application was required with correct credentials in order to view the encrypted player learning materials.

Coaches and staff overall were satisfied with the security measures taken to protect their proprietary training material. Two teams showed a low level of confidence in the security measures taken, however the rest of the teams either agreed or strongly agreed along with coaches and staff with being satisfied with security measures in place. Implementers reported coaches and staff being only marginally less satisfied than the staff that put the processes in place as shown in Figure 1 (Appendix F).

The third section of the research instrument addressed Research Question 3: *How do implementers perceive effectiveness of deploying player learning materials on the iPad?* and Research Question 4: *Based upon analysis of the results, what standards and guidelines are recommended for better implementation of the iPad-based play books?* Staff and coaches were satisfied using the iPad to deliver sensitive player training materials. The various systems allowed for distribution and were reported as effective in use as educational material. Preparation and execution were key components to the process. As one respondent mentioned in the short answer section, there are many moving parts. Creating a well thought out project plan was noted as one of the reasons respondents were satisfied with the implementation and the results were effective. Communication and extensive preparation between information technology, information systems, the video department, coaches, players, and other staff was a requirement. With a good team in place, and a good vendor relationship established, the systems received a positive review.

Teams found that distributing information digitally to mobile devices was fast, easy, and efficient. A key element was reducing the need to make multiple copies while increasing the speed at which information was delivered. Educational materials could be quickly updated and broadcast to the entire team when needed in what was referred to as a streamlined and timely process. Players were able to pick up the devices and begin using them with little training. One respondent remarked that the players love the new digital system. Deployment to specific users was made with ease and experiences with

the available vendors were generally regarded as good. Some teams even integrated video training.

Several responses provided guidance for roadblocks to implementation. By far the most referenced issue was wireless connection. When the devices have trouble connecting, or no connection is available, getting learning materials out to the players has been shown to be a hassle. Scaling to the maximum connected devices was a presented as a concern. The issue may be the amount of data being pushed out especially when it relates to video going to multiple team members. One team reported that they needed to use the hotel wireless connection, but were unable to because they had disabled the Safari internet browser. The restriction put in place due to security concerns prevented the devices from accepting the hotel's usage policy and were rendered unable to connect. Continual testing and adjusting of the wireless set-up was discussed as a key point for success. When video is being distributed, it is recommended that initial downloads should be done ahead of the deployment in order to avoid overloading access points.

Other roadblocks focused on usability and hardware. Some reported not having a good search capability for players to quickly find sections in their educational material. Coaches are also sometimes required to do more set-up and are not willing to put in the appropriate time. Making sure that the iPads are always charged for use was presented as a challenge. Ensuring the players downloaded the information they needed or accepted the document changes were also met with some difficulty. There was also a reported learning curve for the distribution process and for the players using the interface to the educational material. Using the iPad in particular presented one unique challenge.

Applications require yearly license renewal when distributed in-house as a product. The profile may expire and not run at all requiring an update of all iPads distributed.

Teams reported several recommendations for using the iPad as a delivery device. One team explicitly stated, "I strongly recommend maximizing the utility of the iPads as a learning vehicle to all levels of training and learning. Very easy to manipulate, security platforms are available today to assist with this challenge and the student/player is able to learn anywhere, anytime and at their leisure." Another team reported, "Real good technically to get information quickly to a group of people or an individual as well as being able to remove the same information. Being able to secure the information so that it cannot be shared with other devices (is a positive)." One respondent summed up a key point as, "Having a solid app with a solid technical team (IT/Video) and an engaged user group (Football Execs/coaching/support staff) is key! This applies to any application rollout whether on an iPad or any other device!"

Using the iPad as a delivery device came strongly recommended and was noted as being "implemented by most teams in the NFL." The foundation of that is built on the vendor relationship. In the short answer section, one response read, "Ensure that you research all available options and chose the product that has a combination of the most functionality with superior support. Through support you will find the companies that will flourish and be a great partner for your organization." In regard to security another response read, "Due to the sensitive nature of the playbook information, security was a primary concern for us on this project. Once the acceptable level of security in content

delivery and retention is achieved, and with the management tools available, distributing learning materials to the iPad is a great solution."

The teams did find value in using wireless mobile devices and found that the iPad was an effective platform for providing players with the training materials they need in a secure manner. There are also several guidelines to follow. Ensuring a healthy and secure wireless environment is a key component. Strong communication and project dedication between staff members is needed to implement a system that is successful. The security results show that there are requirements for multiple areas that must be addressed. Issues such as battery life and application distribution must also be considered. From the results we can draw conclusions and build a framework. The framework will help provide guidance when installing a personalized and secure learning environment on a mobile device.

Chapter 5

Conclusions, Implications, Recommendations, and Summary

The problem addressed was the need for more research on implementing a mobile device in a learning environment. More specifically, the research and results focused on using the Apple iPad mobile device to deliver learner specific training materials in a secure manner. The results provided insight and answers on deploying secure mobile learning systems from which a guideline summary was drafted.

Conclusions

As one respondent pointed out, there are many moving parts to implementing a mobile platform to deliver learner specific materials in a secure manner. An instructor will not be able to purchase a simple application from the app store and have a fully functional system in place. Some useful guidelines were extracted through an analysis of the survey responses. First and foremost the iPad has been established as a credible platform and verified by successful implementations in the league. Every team that implemented a digital solution responded that they were able to provide learning materials to players via iPads. The transfer was successful, but there was also discovery of process and issues that will help provide structure for development of guidelines. Research Question 1: *What are the delivery systems used to provide training materials to the iPad?*

The delivery system goals were common between the teams. Every team that implemented a mobile learning solution used the Apple iPad hardware. The conclusion we can draw from answering the research question is that we can depend on the iPad as a

viable delivery device. No respondent reported issues directly towards the iPad, and most teams found that using the mobile delivery system improved player learning outcomes. Hardware platforms are often replaced by other systems. It is possible that similar systems could be provided on other mobile devices. At this time, it appears that the iPad is the device of choice in the NFL. The applications used to publish and deliver the content did vary between the teams. The process, mobile hardware, and application that suit a specific installation should be investigated when implementing a secure mobile learning system.

There is no single right application and process, but there are multiple avenues to achieve the desired result. Some teams used a publication interface while others used a folder based system to deliver player learning materials. The process of deployment is an important discussion to have with the members of the implementation team. Coaches, personnel, players, and information technology professionals should all be a part of defining expectations from vendors. The process of content delivery is dependent on what vendor is chosen. When deciding on a vendor, it is important to question the process and to find one that will work best for the goals that have been set. There were several vendors to choose from that were specifically used to delivery player learning content. A majority of respondents used PlayerLync in their environments and that might be a good starting point in the discovery process.

Research Question 2: *What is the range of security measures employed?*

The primary concern when securing learning material is protecting that information. The concern is evident in the wide array of security measures teams

implemented in order to protect their proprietary learning materials. Mobile devices can be lost or stolen. Sensitive training materials could be intercepted during transmission. The wide array of security measures reported by the teams provides insight that securing training material requires considering many different options. The mobile device, the storage of the educational material, the transmission of the material, and the publication of the material must all be secured.

The important lesson here is that a multi-level plan was needed to completely secure the process. Among others, those levels include passwords on the device, encryption, limiting wireless communication to only certain devices, and a separate mobile device manager that allows the iPad features such as wipe and reset. In all, teams employed a wide array of measure in order to protect the sensitive training materials. Considerations for encrypting the data are a requirement. Security should be considered from the beginning of the process until the end result.

Research Question 3: *How do implementers perceive effectiveness of deploying player learning materials on the iPad?*

Many teams answered that they strongly agreed with the statement "Players showed improvement in learning compared to methods used pre-mobile device." Not only did the process work, but there is a perceived effectiveness that the process is better than anything that came before the iPad mobile device. There were several qualifying reasons given for why deploying training materials on the iPad successful. One item that stands out is that the players enjoyed using the system. Coaches and administration also appeared to be very satisfied with how the educational material was prepared and

distributed to the players. Speed was often mentioned as added value for using mobile devices to send training documents to the team. The effectiveness of using the system is directly related to the planning and implementation of the systems themselves. A set of standards and guidelines was created to ensure effective instruction. Following the guidelines developed will result in an effective iPad deployment system.

Research Question 4: *Based upon analysis of the results, what standards and guidelines are recommended for better implementation of the iPad-based play books?*

Teams were forthcoming in the qualitative short answer areas. Guidance provided was compiled as part of the results in the guidelines section below.

Project planning and selecting a compatible vendor are key. Good communication between team members and working with a company that can provide the exact service you need are important factors. The intent here was not to become an advertisement for any one vendor, but to understand the process for success. In general, the positive responses were coupled with short answer responses directly relating to why the vendor selected was suitable for them. The time must be put in for research, planning, and selection of the right company that fits the needs of the team implementing the learning solution.

Securing the transmission of learning material requires a multi-level approach. The iPad has built-in functions, but a mobile device manager (MDM) expands on those functions. An MDM allows for an administrator to lock down the device and only allow approved applications to be installed. The MDM also gives direct access to remotely wipe and destroy sensitive data in case of loss or theft. The vendor product chosen may

also include such options, but an MDM is a fully featured product that gives the administrator more control. When wireless access is needed, in-house networks can limit what devices are even able to connect so transmissions can remain separate. All teams that implemented a mobile digital solution with security used some form of encryption, so that should be considered as well.

The wireless access of the mobile devices was one of the major concerns and roadblocks reported. If devices are to be taken out of the office and on the road, considerations must be made for when the educational material is loaded. The material might be installed only on in-house networks, but still accessible on the device outside of the office. Some teams used cloud based distribution making content available anywhere a web connection is present, or allowed for access to content over public wireless networks. Wireless networks allow for mac address control of who connects to the team's network. Player devices can connect to limited and secure networks provided by the company. The study of securing private, competitive, and proprietary information could be a project by itself. The important conclusion is that there are many options and many levels that need to be considered.

The installation of a secure mobile and personal learning environment is a major undertaking and must be planned for appropriately. For base installs delivering secure and individualized learning, several standards are required. The iPad is standard, along with the basic security included. Software is required to process and deliver learning materials to the students' mobile devices. Encryption must be considered as an additional layer of security. There are many other options to consider before deploying. The

conclusions and guidelines are summarized here. The following is a bulleted list of minimum standards that NFL teams should adhere to when implementing a mobile learning solution at their club.

- Team communication – There are many employees involved in the process of digitizing player learning materials. Good communication with involvement by coaches, information technology, players, and other personnel is a requirement.
- iPad as hardware platform – The iPad has been proven to be a reliable and secure device on which to transmit player learning material.
- Charging stations or system – Keeping mobile devices charged and units ready for learning may be a challenge. A system should be in place to ensure units have the power needed to remain an effective tool. Units should be charging when not in use.
- A robust inventory – There should be back-up hardware devices and chargers in the event of failure.
- A vetted vendor application – There are a few vendors products currently used in the NFL. They are Player Lync, XOs Playbook, Game Plan, and Araloc. Each product should be closely looked at and verified for suiting the specific needs of the club.
- Strong wireless network – Wireless access is the backbone for transmitting player learning materials to the iPad. If materials can not be distributed in a timely manner, or if poor connections exist, the learner experience may be negatively

impacted. Considerations must be made for when team travels to remote locations.

- Multiple levels of security – The iPad itself has built-in security features that should be enabled at a minimum. Each vendor application may have further options for security. All options should be considered and tailored to a team's needs.
- Encryption – Encryption provides a means to ensure that only authorized players and personnel will have the ability to read the educational documents. Teams may want to not only consider encryption of documents, but also the transmission of data.
- Strong support network – A strong support network of information technology professionals is a requirement. Support should include resources dedicated to wireless technology and the player learning application.

There is a positive correlation between coaching satisfaction with the mobile learning product, and their satisfaction with security. Although generalized above, levels of security and encryption are topics that hold much more depth. A good amount of time, investigation, and exploration needs to be spent on the many options available before implementing a secure mobile learning system. It is recommended that a product such as AirWatch is considered for Mobile Device Manager (MDM). Already existing MDM products are designed to secure mobile products at a level required for deploying sensitive learning materials. Encryption should be a security measure that is considered as a separate issue. There varying levels of encryption with multiple areas that can be

encrypted. The highest and most robust level of encryption should be considered as long as the product remains effective as a learning solution.

Implications

Initially a need was identified for understanding practical implementations of mobile devices in learning. More specifically, a need was discovered to study unique examples of deploying learning materials in a secure environment. The goal of the study then was to investigate the effectiveness of deploying sensitive player training materials on the iPad, a mobile device, during an NFL football season. The results provide a guide for anyone who might need to apply learning materials in a personalized and secure manner. The report here provides additional insight that did not exist before the study was performed.

One NFL team responded that they will be implementing this process next year. There are also many colleges that are beginning to look at player education on mobile devices. Businesses which engage in proprietary information might also want to implement similar systems. The information presented here might be valuable and important for competition. The guidelines may also be valuable anywhere individualized educational material needs to be delivered in a secure manner. The research might also be used as a base for future research as explained in the recommendations section.

Recommendations

The survey instrument was designed to provide a high level understanding of using mobile devices for educating players in a secure environment. The results of that understanding show that implementing the iPad for NFL player education can be

accepted as successful, although there are areas that need to be considered. The instrument was designed to ask as many questions as possible while not taking up too much time to be answered. Due to the competitive nature of the teams, it was a concern as to how much would be disclosed in regard to the process and the success of that process. The resulting survey instrument left room for more of the story to be told. The short answer questions provided a good amount of qualitative data and respondents may have been open to providing more data. The focus of future research might also expand specifically on security, learner interaction with the tool implemented, and other mobile devices.

Security is a concern when you are working in competitive environments in sports or business. Securing competitive learning material on the mobile device level as well as at the transaction levels require separate research. Different levels of encryption, different security settings between vendors, concerns when dealing with wireless, and separate applications dedicated to securing the mobile device results in some unanswered questions. More specifically, how does the security process impact learning? At a certain point does the security process begin to infringe on the learning process? Research specific to security has room to grow.

There is also opportunity for research in direct player interaction with mobile learning devices. Not one team responded with less than a three on the scale to five to the statement, "Players showed improvement in learning compared to methods used pre-mobile." How much did the players improve? How did the players interact with the devices? Were there quizzes or live interaction with coaches? At the professional level

these questions might be impossible to gain insight on due to the competitive nature, but there might be potential at the collegiate level or in other non-professional sports leagues. Further research on player interaction with applications and instructors might provide better insight on why the iPad is considered to improve learning compared to methods used prior.

The survey instrument focused on the iPad. All teams that responded that they had employed a mobile learning application at their team also responded that they had used an iPad as their device of choice. Using the iPad might not be the choice for every sport or business environment. As discussed, there are situations in business and education where users may even provide their own device. Other devices need to be explored. Future research might also look at different security options across different platforms. There are plenty of options to continue researching learner directed mobile learning in a secure environment. If research is directed towards sports, the best idea might be to focus on college or high school where staff might be more willing to respond.

Summary

The research effort began with an earnest look for an empirical knowledge deficit somewhere in the literature. The process went in various directions for almost a year. Meanwhile, many NFL clubs were beginning or continuing the new process of securely delivering player training materials directly to the iPad. The media had begun reporting the new trend of teams becoming more technology oriented by implementing mobile devices in their training material delivery process. The search of the literature and the NFL iPad trend converged to become the focus for the dissertation effort. It became clear

that NFL clubs were entering new territory for themselves in an area that was lacking in the literature. After reviewing the literature and reports of mobile technology implementations, research questions began to develop. The idea was that learning from the NFL's effort to deploy sensitive training material might provide insight into best practices when deploying such systems.

An extensive look at existing literature resulted in establishing a baseline for what was already understood. Mobile technologies, learning material deployment, security, and sports education were all considered as the information was collected. The research questions were then formally developed. The focus was first on finding out what delivery systems were used. The concentration then moved to security. Defining what security was in place turned out to be a key part of the project because it provided a catalog of measures that might be considered for use. The questions centered on effectiveness after the delivery and security systems were defined. Finally, consideration for standards and guidelines was given after the results came in. Modifications were made, and four definitive research questions emerged.

The process to develop a survey instrument took longer than expected. There was no survey instrument that existed which would work to answer the research questions that were outlined. The first step then became to try and follow already existing guidelines in educational research to develop a good survey instrument. After the first version of the survey instrument was completed, it needed to be validated. The expert team was a small challenge to put together. The first three experts to agree were fluent in football and technology and fairly accessible. Yet, there was still a need to find experts who could

validate specifically the security and educational use of the iPad portions of the instrument. After researching experts in the field and reaching out to as many as possible, two people were kind enough to agree to review the survey instrument. One was an expert in networking and security, while the other was an expert in iPad use in education. The group was then complete with five people, and the survey instrument was updated with changes that were specified.

Armed with research, and a verified survey instrument, the process to identify a key member from each club began. No person was contacted while a broad attempt to define the population commenced. Most NFL team websites provide basic employee information on their websites. Club employees that held a management position in information technology were identified. An Excel document was created with names and positions and a loose idea of what the population would be was formed. Before anyone could be contacted, however, IRB permission was still required. Two survey e-mails were developed, and all the required documents were submitted for approval. The process was guided by the dissertation chair and the IRB. With some minor revisions, the study was given approval and surveys could then be sent to the identified club employees.

There were some immediate responses to the survey, but the replies were not great in number. After a few weeks the responses continued to trickle in. Some respondents returned the printed paper filled out. Some responses were scanned in PDF and returned via e-mail. In some cases, the information was forwarded to someone who would have more knowledge on the subject or an introduction was made to a club employee who could respond to the survey more appropriately. Other teams politely

declined or directly made notice they would not be responding to the survey instrument. In one instance, the response was faxed to the number at the bottom of the consent form. Immediate action was required to track down the office and fax machine where the survey was sent. Although enough responses had been gathered to extract some information, a good amount of surveys came back upon release of the second follow-up e-mail. After a few weeks with no more responses, the process of examining the data began.

The data collected was organized by section and response type. If the Likert scale was used, the data were entered into an Excel spreadsheet. The qualitative data were gathered into a Word document. The data were entered into these documents randomly in order to keep the respondents as anonymous as possible. The data collected were examined by section, and PSPP software was used to process the quantitative data collected. Common themes began to emerge. There were only a few vendors catering to the NFL for secure content delivery. In most cases respondents were satisfied, felt the process was effective and secure. Many teams were very forthcoming regarding what security measures were taken. The data helped form some general processes and guidelines for a successful implementation. All of the responses were considered and the results were reported on.

Although teams chose different vendors and processes, the implementation of secure and individualized learning material was reported as a success. The responses to the survey instrument showed that not only did the systems deliver the desired result; they were also viewed as effective. The results provided us with some common themes

upon which to build a set of standards and guidelines for implementing a secure and individualized learning environment. Plenty of planning, strong inter-department communication, good vendor selection, multiple points of security, and a strong wireless connection and set-up all played part. If the standards and guidelines are implemented in an educational environment, a good foundation will be present to have a successful implementation.

Appendix A

E-mail Communication for Survey Participants

February 12, 2014

Dear Colleague,

As you are probably well aware, NFL franchises have begun the move to electronic playbooks and learning materials using the iPad mobile device. You have been selected because you are a technology leader and have been directly involved with the decision of implementing an iPad at the franchise you are associated with. Responding to the attached survey will help promote the development of a process for iPad implementation in a secure environment individualized for players. By responding to this survey, you can help provide a greater understanding of using the iPad in education of players. The survey is being conducted as a part of my dissertation initiative as a Graduate School of Computer and Information Sciences student at Nova Southeastern University.

I am conducting the survey to explore how the teams are employing iPads to replace their playbooks and other training materials. The primary focus is on how educational materials can be deployed in a secure and individualized manner. The population concentration is on current NFL teams.

Everyone who participates in this research project will remain anonymous. Your participation is 100% voluntary. I will release the results back to each of you when the data collection has been completed, but there will be no identifiable information for what club or person the response is from.

The survey should take about ½ hour. Please return the survey no later than the beginning of next month, March 1, 2014. The results can be saved as a Microsoft Word document and returned to me via e-mail.

I appreciate your time in responding to the survey. I understand that time is at a premium by the nature of working in the NFL and I thank you for the time you give in consideration for this project.

Sincerely,
Alexander R. Grosholz
Director of Football Systems
Miami Dolphins
7500 SW 30th Street
Davie, FL, 33314
954-649-7131; grosholza@dolphins.com

Appendix B

NFL iPad Implementation Survey

NFL iPad Implementation Survey

I. Delivery System

Please select the appropriate response. All questions are regarding the distribution of player learning materials electronically.

Our team deployed player educational materials via a mobile device during the season.

[ ] Yes [ ] No

Our team used an Apple iPad to deploy player educational material.

[ ] Yes [ ] No

If you answered no to both questions above, please describe any considerations currently being made to implement a mobile device in your environment and end the survey. If you answered yes to either of the questions above, please continue below in the short answer section.

Was an outside vendor used?

[ ] Yes [ ] No

Short Answer

What software or app was used to distribute player materials electronically?

Describe process used to distribute player materials to the mobile devices.

II. Security

Please select the appropriate response. All questions are regarding the distribution of player learning materials electronically

Did your delivery method use any type of security? If the answer is no, the remaining questions in the Security section do not have to be completed.

[ ] Yes [ ] No

Did your process use encryption?

[ ] Yes [ ] No

Did you use security measures outside the delivery application?

[ ] Yes [ ] No

Please place an X to the left of the appropriate response below

I believe our coaches and staff are satisfied with our security

[ ] - *Strongly Disagree* **[ ]** - *Disagree* **[ ]** - *Neutral* **[ ]** - *Agree* **[ ]** - *Strongly Agree*

I was satisfied with our security

[ ] - *Strongly Disagree* **[ ]** - *Disagree* **[ ]** - *Neutral* **[ ]** - *Agree* **[ ]** - *Strongly Agree*

Short Answer

What security measures were used to secure player learning documents?

What steps, if any, were taken to secure wireless transmission of player documents?

III. Effectiveness

Please select the appropriate response. All questions are regarding the distribution of player learning materials electronically

Please place an X to the left of the appropriate response below

Our coaches are satisfied with our process

[ ] - *Strongly Disagree* **[ ]** - *Disagree* **[ ]** - *Neutral* **[ ]** - *Agree* **[ ]** - *Strongly Agree*

I was satisfied with our deployment process

[ ] - *Strongly Disagree* **[ ]** - *Disagree* **[ ]** - *Neutral* **[ ]** - *Agree* **[ ]** - *Strongly Agree*

Players showed improvement in learning compared to methods used pre-mobile device

[ ] - *Strongly Disagree* **[ ]** - *Disagree* **[ ]** - *Neutral* **[ ]** - *Agree* **[ ]** - *Strongly Agree*

The solution deployed allowed us to distribute materials by position

[ ] Yes [ ] No

The coaches were able to distribute materials targeted to unique individuals

[ ] Yes [ ] No

Short Answer

What do you feel was especially successful about your deployment?

Can you describe any issues or roadblocks you encountered when deploying electronic playbooks and other learning materials?

Do you have any recommendations for using an iPad to distribute learning materials?

Appendix C

E-mail Follow-Up for Survey Participants

March 24, 2014

Dear Colleague,

A short time ago I sent out a survey asking for your input for a study. There is no requirement to respond. If you do not intend to reply, please simply respond to let me know you will not be participating. By responding to this survey, you can help provide a greater understanding of using the iPad in education of players. The survey is being conducted as a part of my dissertation initiative as a Graduate School of Computer and Information Sciences student at Nova Southeastern University.

I am conducting the survey to explore how the teams are employing iPads to replace their playbooks and other training materials. The primary focus is on how educational materials can be deployed in a secure and individualized manner. The population concentration is on current NFL teams.

Everyone who participates in this research project will remain anonymous. Your participation is 100% voluntary. I will release the results back to each of you when the data collection has been completed, but there will be no identifiable information for what club or person the response is from.

The survey should take about ½ hour. Please return the survey no later than the beginning of next month, *April 1*. The results can be saved as a Microsoft Word document and returned to me via e-mail.

I appreciate your time in responding to the survey. I understand that time is at a premium by the nature of working in the NFL and I thank you for the time you give in consideration for this project.

Sincerely,
Alexander R. Grosholz
Director of Football Systems
Miami Dolphins
7500 SW 30th Street
Davie, FL, 33314
954-649-7131; grosholza@dolphins.com

Appendix D

IRB Permission Letter

Institutional Review Board

NSU

MEMORANDUM

To: Alexander Grosholz

From: Ling Wang, Ph.D.
Institutional Review Board

Date: Dec. 17, 2013

Re: *Secure Mobile Deployment of NFL Training Materials*

IRB Approval Number: wang12151301

I have reviewed the above-referenced research protocol at the center level. Based on the information provided, I have determined that this study is exempt from further IRB review. You may proceed with your study as described to the IRB. As principal investigator, you must adhere to the following requirements:

1) CONSENT: If recruitment procedures include consent forms these must be obtained in such a manner that they are clearly understood by the subjects and the process affords subjects the opportunity to ask questions, obtain detailed answers from those directly involved in the research, and have sufficient time to consider their participation after they have been provided this information. The subjects must be given a copy of the signed consent document, and a copy must be placed in a secure file separate from de-identified participant information. Record of informed consent must be retained for a minimum of three years from the conclusion of the study.

2) ADVERSE REACTIONS: The principal investigator is required to notify the IRB chair and me (954-262-5369 and 954-262-2020 respectively) of any adverse reactions or unanticipated events that may develop as a result of this study. Reactions or events may include, but are not limited to, injury, depression as a result of participation in the study, life-threatening situation, death, or loss of confidentiality/anonymity of subject. Approval may be withdrawn if the problem is serious.

3) AMENDMENTS: Any changes in the study (e.g., procedures, number or types of subjects, consent forms, investigators, etc.) must be approved by the IRB prior to implementation. Please be advised that changes in a study may require further review depending on the nature of the change. Please contact me with any questions regarding amendments or changes to your study.

The NSU IRB is in compliance with the requirements for the protection of human subjects prescribed in Part 46 of Title 45 of the Code of Federal Regulations (45 CFR 46) revised June 18, 1991.

Cc: Protocol File

3301 College Avenue • Fort Lauderdale, FL 33314-7796 • (954) 262-5369
Fax: (954) 262-3977 • Email: *inga@nsu.nova.edu* • Web site: www.nova.edu/cwis/ogc

Appendix E

Quantitative Results of NFL iPad Implementation Survey

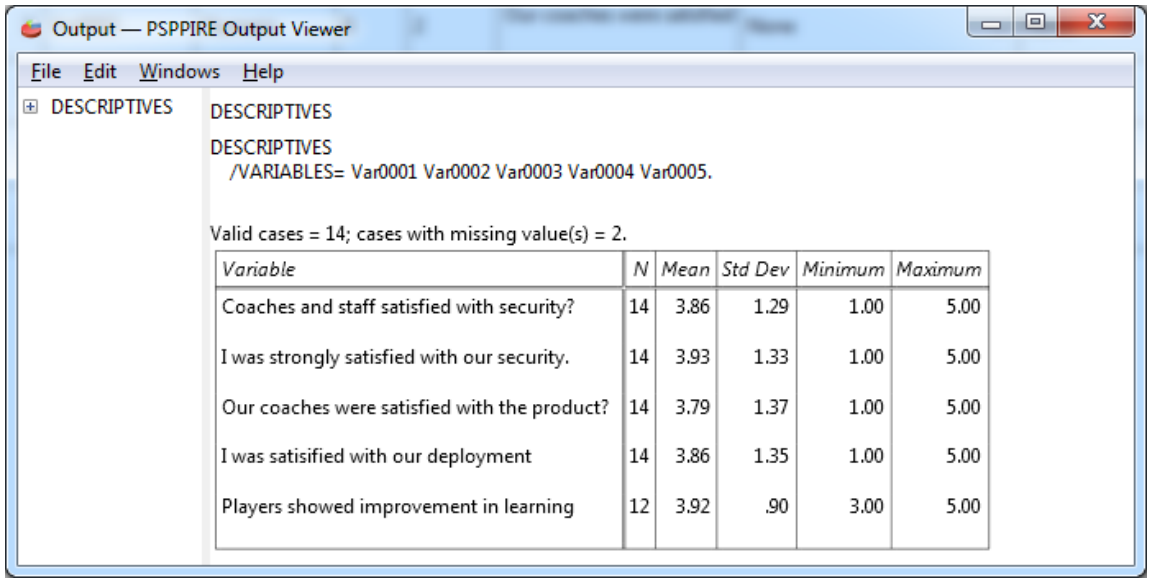
Table 2. Detailed results of the quantitative sections of the NFL iPad implementation survey

Respondent	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
Delivery System															
Question 1	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question 2	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question 3	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Security															
Question 1	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	No	Yes	Yes	Yes	Yes
Question 2	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes
Question 3	Yes	Yes	Yes	Yes		Yes	Yes	No	Yes	Yes		Yes	Yes	Yes	Yes
Question 4	5	4	4	4		1	4	4	4	5	4	5	4	5	1
Question 5	5	4	4	4		1	4	4	4	5	4	5	5	5	1
Effectiveness															
Question 1	5	5	4	4		1	4	4	4	5	3	5	3	5	1
Question 2	5	5	4	4		1	4	4	4	5	3	5	4	5	1
Question 3	5	3		3		5	4	3	4		3	5	3	5	4
Question 4	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Question 5	Yes	Yes	Yes	Yes		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Appendix F

PSPP Descriptive Statistics

Figure 1. PSPP Descriptive statistics of the Likert scale questions.



Variable	*N*	*Mean*	*Std Dev*	*Minimum*	*Maximum*
Coaches and staff satisfied with security?	14	3.86	1.29	1.00	5.00
I was strongly satisfied with our security.	14	3.93	1.33	1.00	5.00
Our coaches were satisfied with the product?	14	3.79	1.37	1.00	5.00
I was satisified with our deployment	14	3.86	1.35	1.00	5.00
Players showed improvement in learning	12	3.92	.90	3.00	5.00

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