Factors Influencing College Students' Acceptance of Push Communication Technology as a Means of Receiving Course-Related Content

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ABSTRACT

The purpose of this dissertation was to identify the factors that influence college students' acceptance of push communication (i.e., email and SMS messaging) as a means of receiving course-related content. This research combined mobile learning models and technology acceptance theories along with push communication literature to determine if a scheduled message impacted students' reception of the technology.

This study was conducted through two universities and six professors with a total enrollment of 343 students. The surveys were pushed to each student via email and Short Message Service (SMS) text messaging, which resulted in 301 students that opted to participate in the study. A total of four research questions were answered by sixteen hypotheses, of which seven supported the research questions. The most significant of the results was that scheduled messages, the newest construct in the model, did not affect the students' intention to use push communication as a means to receive course-related content. These findings, based on the survey results, were then compared to actual usage patterns by using Google Analytics embedded in courses' HTML landing pages.

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Chaper I

INTRODUCTION

Technology is changing at a rapid pace and vast amounts of information are now readily available at the click of a button. With this advancement, a profusion of new delivery options is available to professors to assist college students in the learning process both within synchronous and asynchronous classroom environments (Sorenson, 2011). Some of these technologies have been in existence for many years; however, with the prolific numbers of mobile devices and the continuing advancements of computer programs, which afford the ability to push scheduled, consistent content on demand directly to a student's mobile device, impactful, relevant communication between professor and student now no longer must wait for the next face-to-face meeting. Access to all varieties of course-related content is immediate through push communication and affords an almost endless number of opportunities in which the student can instantly receive learning material without the constraints of learning time frames and space considerations (Cheng, 2015).

Push technology can be defined as any technology that enables the end-users to receive information, files, and/or advertising from a network server for display on their cell phone or other device on a dynamic basis whenever a predetermined criterion, usually involving idleness of the local workstation, is met (Hassett, Douglas, & Mancini, 2004). In today's learning environment, older push technologies, such as email and Short Message Service (SMS) text messaging, have advanced and now can be sent by programs that are

able to deliver a message within precise time ranges, allowing the ability for the content to reach the end-user no matter their location (Spangler, 1997). This type of controlled interaction between two parties is commonly known as push communication and differs from traditional static or pull communication, wherein the end-user must go to a site and download the data (Lepori, Cantoni, & Mazza, 2002). In many instances, pull technologies, such as podcasts or websites, are a less effective means to provide additional course-related content for students outside of the classroom because the burden is on the student to physically go on their phones or computer and visit these sites to download or view the material. These extra steps have created communication loops, causing a drag in the response time between professor and students. Oftentimes, the material retrieved by the student after a length of time has lost some of its educational value and significance due to the delays.

Currently, new, more rigorous programs with push capabilities allow for scheduled content delivery any time of the day or night, enabling students to enhance their educational experience outside of class simply by clicking on the link in a SMS message or email. Furthermore, such push technologies close the communication loop much faster due to the instantaneous nature of the media. If students accept using these technologies and implement them into their study regime, they might be better prepared for their classroom lectures and discussions. Finally, by gaining a firm understanding and utilization of push communication, a student can conceivably become a better employee in the mobile workforce by being able to receive directives, training materials, data reports and other pushed content that is necessary to operate in today's fast-paced world of technology (Schmidt, 2015).

This study examines various mobile learning models (Uzunboylu, Cavus, & Ercag, 2009) paired with push communication research to provide a framework that professors can incorporate into both undergraduate and graduate curricula. A well-known and time-tested theory known as the technology acceptance theory (Davis, 1989) provides the baseline model. This theory, together with a more recent unified model called the Unified Theory of Acceptance and Use of Technology (Venkatesh et al., 2003), is used to examine students' acceptance and usage of content pushed to their mobile device. For purposes of this research, scheduled and unscheduled SMS messaging, along with scheduled and unscheduled email, is the vehicle to push content to the student. This intentional manipulation of timing as it relates to pushing content is analyzed to measure any correlation between a student's acceptance and intention to utilize pushed messages.

The technology acceptance model (TAM) has been the baseline model with which to measure the adoption of many different technologies in the fields of computer science and engineering over the past three decades (Chen, Sivo, Seilhamer, Sugar, & Mao 2013). It has only been recently that a more modern version of the technology acceptance model has been employed to study the acceptance of certain mobile technologies in the context of mobile learning in higher education (Chen et al., 2013). It was the combination of these acceptance theories that was used as the foundation for this study.

Problem Statement

The problem is that some professors do not adequately utilize technology to reach their students to supplement their lectures and classroom discussions. This failure to embrace certain mobile communication technologies, in many respects, has inadvertently

created a classroom filled with passive students unable to participate in lectures and adequately comprehend the content. Many professors may not understand nor appreciate the power of a simple SMS message or email when used to push course-related content. To successfully utilize push communication media such as a SMS message or email within college, professors should understand the relationships between the types of push technologies and their success rates in terms of their delivery dynamics and content. In addition, a keen awareness of the factors that influence students' acceptance of scheduled push communication may enable successful implementation of the aforementioned technologies and ultimately improve the college learning experience by engaging the student outside of the classroom.

Purpose Statement

The primary purpose of this study was to analyze multiple variables to determine which factors affect the students' acceptance of utilizing push communication as a means for receiving course-related content. By combining mobile learning models with technology acceptance research and examining push communication in terms of scheduling a message, strategies can be implemented to push course-related content to students that may have a better success rate in terms of their utilizing the message to its fullest potential and ultimately enhancing their college learning experience both inside and outside the classroom.

Mobile learning (m-learning) has been defined as "a personal, unobtrusive, spontaneous, anytime, anywhere way to learn and to access educational tools and material that enlarges access to education for all" (Kukulska-Hulme, & Traxler, 2005, p.1). Although

m-learning is a relatively new concept (Uzunboylu, Cavus, & Ercag, 2009), it has recently received much attention in academia since the explosion in the number of smartphones on college campuses. A study performed at Ball State University found that 99.8 percent of college students now have cell phones, and that smart phones are accounting for more of their electronic communication and computing needs than ever before (Ziegler, 2010). Despite this nearly 100 percent usage rate, a large percentage of all professors over the age of fifty are still not supportive of using such a device to enhance learning (O'Bannon & Thomas, 2014). This is despite that research suggests a vast potential in using mobile devices as a viable and powerful instrument to support learning in all areas of education (Hoppe, Joiner, Milrad, & Sharples, 2003). These devices have a ubiquitous quality and offer learning opportunities both on and off campus (Armatas, Holt, & Rice, 2005).

Definitions

Average Session Duration. In Google Analytics, this number is calculated by taking the total duration of all sessions (in seconds) and dividing it by the number of sessions.

Click-Through Rate. The percentage of people visiting a web page who access a hypertext link or click on other information contained on the web page.

HTML page. Hypertext Markup Language is used to create electronic documents (called pages) that are displayed on the World Wide Web. Each page contains a series of connections to other pages called hyperlinks.

Google Analytics. A service that generates statistical data on website traffic, alongside tools for analyzing such data.

Moderating Variable. A moderating variable is usually a third variable that affects the strength of the relation between independent and dependent variables in data analysis. For purposes of this study, the moderating variables gender, experience, and age are hypothesized to moderate the independent variables of effort expectancy, performance expectancy, social influence, and scheduled message.

Push Communication. Information whereby the sender of the message decides who will receive the content and when it will be sent (Lepori, Cantoni, & Mazza, 2002).

Short Message Service (SMS). Commonly referred to as a text message. Character space is limited to 160 characters.

Smartphone. A handheld device that enables the user to communicate through voice, video, messaging and other multimedia technology.

Technology Acceptance Model (TAM). TAM is the dominant model developed by Fred Davis (1989) and is used to investigate the factors that influence users' acceptance of a technology primarily in information systems. Additional elements of TAM that include mobile learning models are used to identify factors that predict the acceptance and use of mobile technology as a learning tool.

Unified Theory of Acceptance and Use of Technology (UTAUT). UTAUT is a model that extends TAM, incorporating eight distinct models of technology use and adoption (Venkatesh, Morris, Davis, & Davis, 2003). UTAUT also considers social influence and facilitating conditions.

Unique Visitor. A term in Google Analytics used to describe the number of unduplicated visitors visiting a website for the first time. It is recorded by Google Analytics as only one visit even if the same user returns to the site after an initial visit.

Conceptual Framework

There were two primary theoretical frameworks used as a baseline for this study. The first was mobile learning (m-learning), which for purposes of this research focused on a learner-centered perspective. This meant that m-learning can encompass all types of learning when the learner is not at a fixed, predetermined location such as a classroom and the learning is extended through mobile technologies such as SMS and email (Keskin & Metcalf, 2011). The present research introduced multiple mobile learning theories, the geneses of which lie in distance learning models and instructional design strategies used to help people learn.

The second theoretical framework, unified theory of acceptance and use of technology model (UTAUT), was employed to identify the factors that influence the students' acceptance and intention to use push communication as a means to receive course-related content. The model in this dissertation altered UTAUT by removing facilitating conditions as an independent variable and adding scheduled message as an independent variable. In this new model, a scheduled message was hypothesized to affect a student's intention to use push communication as a means of using course-related content to supplement their classroom material, the dependent variable. The other three independent variables-effort expectancy, performance expectancy, and social influence-were also hypothesized to affect the dependent variable. The three moderating variables, gender, experience, and age, were hypothesized to moderate the effects of all four independent variables on the dependent variable. A separate analysis measured scheduled email and SMS messages using Google Analytics to determine the relationship of these two means of communication on the students' actual usage of push communication (see Figure 1).

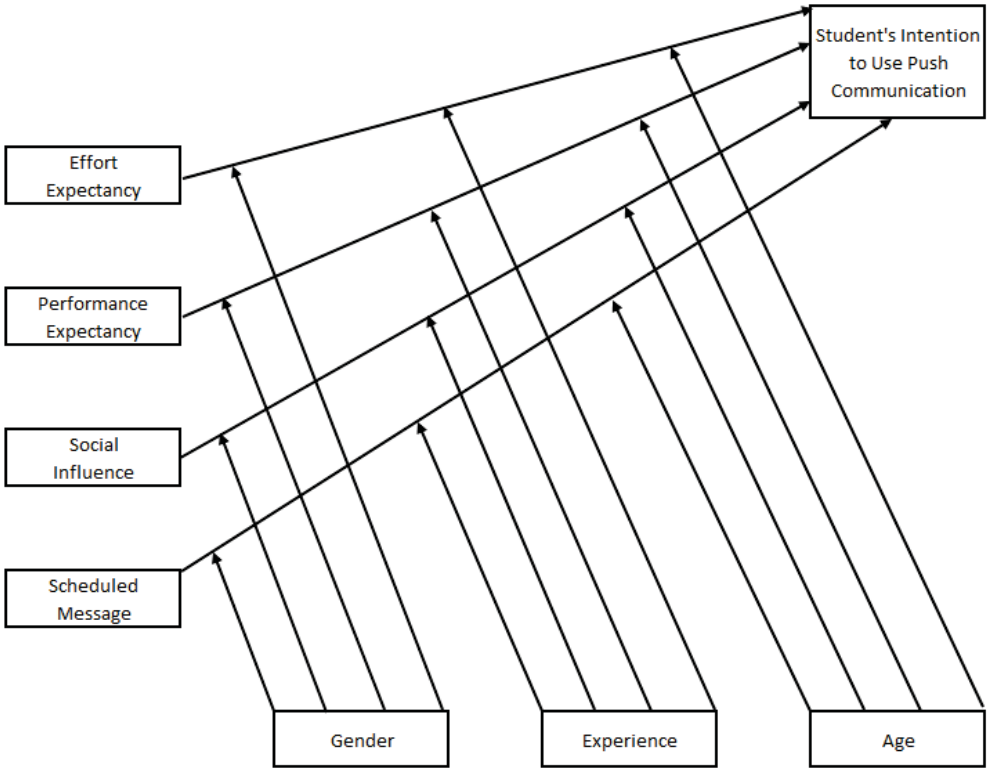

Figure 1. Modified UTAUT Model with addition of scheduled message

In addition to the above mentioned theoretical frameworks, commonly accepted universal design principles for mobile learning (Elias, 2011), the spacing effect (Greene, 1989), and push communication were examined to bring depth to the research.

Data Collection

Prior to the beginning of the study, a pre-test survey was designed by the researcher using iContact®. In addition, a link to the survey was created and administered via MailChimp® and D'langEmobile® to a participating class with a total of twenty-four students. The results were recorded and analyzed to measure the reliability of the survey items. This was measured using Cronbach's alpha (Field, 2009). Any corrections were made and incorporated in the final survey (see Appendix C).

After completion of the pretest, six professors from two different universities were selected to participate in the study. Each of these professors taught both undergraduate and graduate students, all of whom were enrolled in both synchronous and asynchronous environments. The professors pushed two scheduled pieces of course-related content and two nonscheduled pieces of course-related content to each student in their class. Each professor was asked to generate a total of four unique pieces of course-related content in a text-based format so that the material was consistent in terms of its appearance on the HTML page.

Each professor was given his/her own unique keyword assigned by the researcher. The first step was to begin acquiring the students' permission to be a part of this study. The professors were instructed to share with each class the purpose of this research and text their unique keyword to a shared short code (58632) for the students to receive the survey and opt-in to the research. When the SMS was received by the student, the software generated and sent an automatic reply reading "Thank you. Please reply "Y" for yes or "N" for no if do not wish to participate further in this research." Once their "yes" reply was received by the software, another reply was sent which read "Thank you. Your number has now been saved for this research and a short survey will follow." The survey was then administered via SMS and the results were recorded in iContact®. After the survey was complete, one final SMS message was generated that read "Thank you. Your survey is complete. Please reply to this number again with your email address you most frequently use to receive emails on your cell phone." This chain of SMS responses assured that all students had opted into the research and could send and receive SMS messages. This technique also enabled the software platform, D'langEmobile®, to systematically

record the correct email address and to be sure all students had opted into the research. For those students that may have experienced issues with their cell phone, an additional survey was pushed via email from MailChimp® allowing them to participate in the research. This also enabled the student to view an email from the software to ensure that spam filters allowed the communication to be delivered. Any technological issues were corrected during the opt-in phase of the study.

Each professor was given the schedule of messages in terms of the exact day and time at which their scheduled content was going to be pushed. They were asked to communicate to each student when to expect the scheduled message and by which medium it would be delivered, (i.e. SMS or email). They were also instructed to mention that two more messages would be sent but without scheduling as to when and how they would be delivered. For all students that opted in, a follow-up SMS text message and email was pushed reiterating each scheduled time for each professor.

The SMS messages and emails containing course-related content were pushed five weeks into the semester to allow for ample time for the students to become familiar with the course and to make sure all their email addresses and cell phones numbers were active and capable of receiving the messages. Beginning the fifth week of class, one SMS message containing course-related content from each professor was delivered to the students' cell phone at a predetermined, scheduled time and day. In the second week of the study, one scheduled email from each professor containing course-related content was pushed to the students' email address at a scheduled time and day. In the third week of

the study, one SMS message containing course-related content was pushed at unscheduled times ranging from 8am to 7pm. In week four, one email containing course-related content was pushed at an unscheduled time ranging from 8am to 7pm.

All the scheduled SMS messages were sent out by each professor at either 8am, 3pm, or 7pm on Monday through Saturday. All the scheduled email messages were sent out by each professor at the same times mentioned above. The times were consistent with SMS and email campaigns that businesses use to capture the most return on their investment. The rotation of time for each professor was predetermined by me and relayed to the professors so that they could announce the times and days of the scheduled messages.

All the SMS messages and emails were formatted identically and each contained a welcome message and an embedded link which the student was asked to click on. The embedded links were directly connected to each HTML landing page. This was done so that content of any size could be sent via SMS, circumventing the character limit. The embedded link, when clicked, directed the student to the HTML landing page, where the content could be viewed. There was a total of forty HTML landing pages created by me, which equated to each professor's class having four unique pages for each section they taught. In this study, three professors had multiple sections of the same class. Each HTML page was designed to host the content to monitor the students' usage patterns of the course-related content, thereby tracking and measuring the multiple variables hypothesized to be pertinent to this study. This was accomplished by embedding Google Analytics coding on each HTML page (see Appendix E).

Research Questions

1. What factors affect the student's intention to use push communication as a means to receive course-related content?

H1 – Effort expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.

H2 – Performance expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.

H3 – Social influence has a significant impact on a student's intention to use push communication as a means to receive course-related content.

H4 – Scheduled message has a significant impact on a student's intention to use push communication as a means to receive course-related content.

2. Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled message on a student's intention to use push communication as a means to receive course-related content?

H5 – The effect of effort expectancy on intention to use push communication to receive course-related content is moderated by gender, experience, and age.

H6 – The effect of performance expectancy on intention to use push communication to receive course-related content is moderated by gender, experience, and age.

H7– The effect of social influence on intention to use push communication to receive course-related content is moderated by gender, experience, and age.

H8– The effect of a scheduled message on intention to use push communication to receive course-related content is moderated by gender, experience, and age.

3. Does scheduling the delivery of emails and SMS messages at pre-determined times in the day influence the student's actual usage of course-related content as measured by average session duration times?

H9–Course-related content delivered via email at pre-determined times yields higher average session duration times by the students than content pushed at random times.

H10– Course-related content delivered via SMS message at pre-determined times yields higher average session duration times by the students than content pushed at random times.

4. Does scheduling the delivery of emails and SMS messages at pre-determined times in the day influence the student's use of course-related content regarding unique visitors, click-through rates, and returned visits?

H11 –Scheduled email yields higher unique visitor's rates than nonscheduled email communication.

H12 – Scheduled SMS messages yields higher unique visitors rates than nonscheduled SMS message communication.

H13– Scheduled email yields higher click-through rates than nonscheduled email communication.

H14– Scheduled SMS messages yields higher click-through rates than nonscheduled SMS message communication.

H15–Scheduled email yields more returned visits to the HTML page than nonscheduled email communication.

H16– Scheduled SMS messages yields more returned visits to the HTML page than nonscheduled SMS message communication.

Significance of Study

This study contributes to a better understanding of communicating with college students by using specific push communication technology to deliver scheduled course-related content. Previous research identifies various mobile learning strategies and their increased usage in classrooms; however, none at this point analyze a regimen of scheduled email or SMS messages that push course-related content within a technology acceptance model. Pushing out timely, course-related content to students beyond the classroom has vast potential and usability in college. No longer are face-to-face meetings necessary to supplement teaching lectures (Sorenson, 2011). Today, course-related content can be scheduled to be sent on demand and instantly arrive on a student's smartphone, personal computer, or tablet via email or SMS message, allowing for the student to access material anytime or anyplace. In addition, this distance learning capability provides access to relevant content that can be viewed as many times as necessary to comprehend the material. Research has shown that the more a student can see the material, the more likely they are to remember it (Sorenson, 2011). Also, it has been shown that spaced repetition can improve learning and increase results in testing (Cavus & Ibrahim, 2009).

Professors now can communicate with their students via smart programs that deliver SMS messages and email on a predetermined, scheduled basis. When students begin to learn how and when to access content via their smartphones or personal computers, they can also begin to learn how to better manage their time and communicate in a world that is driven by these technologies, which will ultimately aid them in their later academic and professional careers. Mobile learning is not a new concept, but this study adds

to the body of knowledge currently available by studying potential optimal times and intervals to push course-related content. This study addresses the relationship, if any, between a college student's acceptance of using a SMS message or email to access content delivered on a scheduled basis versus random times. Simply pushing content to students by using email and SMS messaging with no planning or scheduling may not be the most effective model for engaging college students outside of the classroom.

In addition, teaching college students how to more effectively communicate by accepting and using push communication can better prepare them for the workforce. By the end of 2017, an estimated 63 million American workers will telecommute and be expected to receive and utilize push communication as a vital component in their day-to-day activity (Vacanti, 2015). With better time management, students can become more productive both in and out of the classroom, and ideally these habits can carry over in their working career.

Assumptions

For purposes of this dissertation, the following assumptions are made:

1. All college students in this study have access to a smart phone to receive SMS messages and emails.
2. Almost all college students have unlimited data and SMS message phone plans that allow them to freely access SMS messages and email without cost considerations. This will allow them to access content without hesitation.

Limitations

All the students in this study were enrolled in online classes or face-to-face classes that met at least once per week. Another study that only examined asynchronous

online learning would have added depth to the study and made some of the findings more generalizable. Furthermore, a wider variety of college students in terms of majors and age may have produced different results. In addition, some students resided in regions other than the South, which could possibly create inconsistencies when generalizing the data.

Overview of the Dissertation Chapters

This dissertation is divided into the following chapters: Chapter 1 – Introduction, Chapter 2 – Literature Review, Chapter 3 – Methodology, Chapter 4 – Data Analysis and Results, and Chapter 5 – Discussion.

Chapter 1 includes a brief introduction to the study, including the problem statement, purpose statement, and definitions of uncommon terms. The conceptual framework, description of the data collection process, and research questions are also provided in this chapter. The chapter concludes with the significance of the study, a brief description of how the data was analyzed, and a summary.

Chapter 2 provides a literature review of (a) mobile learning, and (b) technology acceptance theories. In addition to the above mentioned theoretical frameworks, commonly accepted universal design principles for mobile learning (Elias, 2011), the spacing effect (Greene, 1989), and push communication are examined to bring depth to the research.

Chapter 3 outlines the methodology used to conduct this research. In this chapter, the research model is presented along with the research questions and hypotheses. The student's intention to use push communication and actual usage of scheduled messages model is identified, and the research methods and procedures are described in detail. The

chapter concludes with a description of the data analysis and a summary of the methodology.

Chapter 4 presents the data analysis and results of the study.

Chapter 5 provides a detailed description of the findings. In addition, limitations of the study and implications for others in the field as well as possible future studies are discussed.

Summary

This chapter provided an introduction to the dissertation titled "Factors Influencing College Students' Acceptance of Push Communication Technology as a Means of Receiving Course-Related Content." The problem and purpose statements were first presented along with definitions for uncommon but relevant terms. An overview of the conceptual framework and data collection methods were described. The research questions along with the hypotheses were also presented. The significance of the study and techniques for data analysis were given.

Chapter II

LITERATURE REVIEW

The primary purpose of this study was to analyze multiple variables to determine which factors affect the students' acceptance of utilizing push communication as a means for receiving course-related content. This study also intended to examine push communication strategies which could prepare college students for a career in any field of their choice. Furthermore, spaced presentation techniques were utilized to push the content at predetermined, scheduled times, which support current research on memory and learning techniques (Thornton & Houser, 2005).

This chapter provides a literature review that is pertinent to the study's main purpose. The theoretical frameworks examined in the literature review include mobile technology acceptance theories and technology acceptance theories. Specifically, the Theory of Reasoned Action, the Technology Acceptance Model, and Theory of Planned Behavior are examined to analyze what actions or behaviors drive a person's decision-making process to reject or accept a certain technology. In addition, the main theory for this study, the Unified Theory of Acceptance and Use of Technology, UTAUT, is merged together with a scheduled message component, and serves as the foundation for the mobile learning acceptance model (Chen, et al., 2013). Furthermore, universal instructional design principles are examined to add depth to the research to assist professors in choosing appropriate designs that may make the greatest impact on a student in a mobile learning environment. The literature review concludes with a review of a model for predicting the

students' intention to use push communication and a students' actual usage of push communication as a means to receive course-related content. The scheduled push technology adoption and usage model served as the basis for this dissertation.

Mobile Learning Models

This section examines many learning theories that guide instructional strategies to help students learn. These same learning theories are also used in mobile learning and help build a basis for the design and implementation of instruction which professors can use to gain optimal results when pushing content to their students. For purposes of this dissertation, mobile learning is defined as "the exploitation of ubiquitous handheld technologies, together with wireless and mobile phone networks, to facilitate, support, enhance, and extend the reach of teaching and learning" (Molenet, 2007). In addition, this research identifies that m-learning can encompass all types of learning "when the learner is not at a fixed, predetermined location" such as a classroom and the learning is extended through mobile technologies such as SMS and email (O'Malley et al., 2003, p. 6).

Many researchers believe that mobile learning is simply an extension of electronic learning, also known as e-Learning (Keskin & Metcalf, 2011). This basically means that learning can take place anywhere and at any time through electronic means such as the internet. This is especially applicable in teaching now that students have universal access to smartphones, tablets, laptops and other portable devices. Despite some differences in opinion of what learning techniques constitute mobile learning, there are many learning theories in general that become a subset of mobile learning when certain mobile technologies become a part of the learning process.

Behaviorist Learning Theory

The behaviorist theory was founded by J.B. Watson and is heavily rooted in the field of psychology (Demirezen, 1988). Behaviorism in the past has been a dominant theory when looking at the ways in which children learn their native language but also has relevant application in this research. Wesche (2002) stated that "behaviorism in education is a psychological approach to studying learning that emphasizes the overt actions of the teacher and learner and the relationship between them" (p.18). Gagne (1973) described the behaviorist view of learning as a functional relation between observable inputs and outputs.

From the point of view from an educator that subscribes to the behaviorist theory, the goal of instruction "is to elicit the desired response from the learner who is presented with a target stimulus" (Ertmer & Newby, 1993, p.51). In addition, the teacher that subscribes to transmitting information by repetition fits firmly into a behaviorist's model for teaching (Herrington & Herrington, 2007). To maintain an active learning environment under these circumstances, a stimulus-response relationship requires instructions for the student to frequently use cues and reinforcements that are all very obtainable within the mobile learning environment. Common drill and practice is just one of many behaviorist techniques that both SMS messaging and email can afford the learner.

Cognitivist Learning Theory

Cognitivism, much like behaviorism, focuses on the role that environmental conditions have on the learner and how these conditions ultimately facilitate learning (Herrington & Herrington, 2007). The most significant difference between the two is that the "cognitive approach focuses on the mental activities of the learner that lead up to a re-

sponse and acknowledges the processes of mental planning, goal setting, and organizational strategies" (Shuell 1986, p. 416). Cognitivism also identifies how information is received, organized, stored and retrieved by the learner.

In essence, the cognitive load placed on students in today's fast-paced world of technology has in many instances overloaded their ability to comprehend material. Hence, a theory known as the cognitive load theory (Paas & Van Merrienboer, 1994) was born out of a cognitivist mindset to coordinate instructional design and learning procedures with human cognitive architecture (Sweller, Van Merrienboer, & Paas, 1998).

Figure 2 illustrates two main components in the cognitive architecture. The first is casual factors and the second is assessment factors. In a very general analysis, cognitive load can be defined as working memory resources that are considered necessary to complete a task or activity by a learner who has some level of prior knowledge of the material (Kalyuga & Liu, 2015).

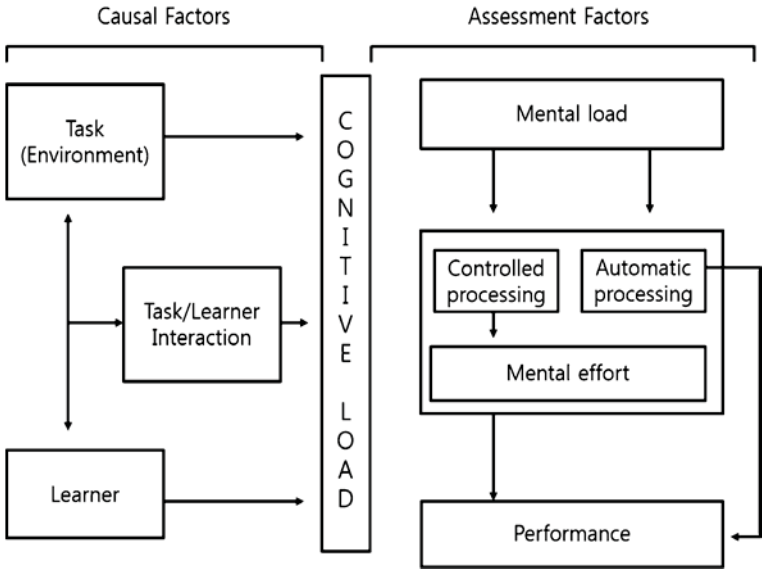

Figure 2. The original model of construct of cognitive load

Pushing small amounts of data in scheduled times via a SMS message or email has the potential to lessen cognitive overload, ultimately allowing the students a better opportunity to comprehend the material. This is also true in that the students can access the information on their own time frame and continue to access the data as many times as needed to help comprehend the material during and even after the course is completed.

The cognitive load theory was developed in part as a response to the behaviorist theory, which is to say that students are not merely "programmed animals" that only respond to certain stimuli within certain environments. A common metaphor used to explain the human mind is that it is much like a computer in that information comes in, then gets processed, and finally leads to certain outcomes (Bigge, 1982). Cognitive load can be defined as the working memory of the computer and therefore has its limitations as to the amount of information that can be processed during a single learning session. If the cognitive load, which in this study is directly related to the content pushed to the student, is too large, more than likely it will not be accepted by the students in terms of their willingness to access and attempt to learn the content. Mobile learning has the potential to lessen the cognitive load by pushing small amounts of data or links so that the students can take full advantage of processing the content, enabling them to learn from the material. One final benefit of mobile learning as far as a cognitive load is concerned is that a student has the content saved on his/her device, allowing for repeated access. Thus, a student may revisit the content as many times as necessary to comprehend the material.

Constructivist Learning Theory

From a constructivist viewpoint, learning is best understood by the way prior knowledge and meaning of that knowledge are put together within an individual's mind

and how this shared meaning can be used in social settings such as a classroom (Kirschner, Sweller, & Clark, 2006). As technology continues to advance, especially with mobile devices and social media, classrooms no longer have the traditional meaning in terms of learning. Without time constraints and space limitations, learning can now take place in any number of media. With the creation of digital classrooms and outside sources as teaching mechanisms, the implementation of a constructivist approach to learning has forced teachers to begin to rethink their old pedagogical practices (Kong & Song, 2013).

The new role of professors in this age of technology is to facilitate the learning process and be readily available to the students outside of the classroom to provide them with timely support. Professors also need to allow students to engage, at their own pace, the flow of information, both inside and outside the classroom. This learning model is drastically different from older, more traditional models, mostly due to the introduction of the discussed mobile technologies. This change in models has created its own set of issues as professors have been reluctant to accept technology-supported learning applications, essentially because they are not maintaining their needed levels of knowledge in the 21st century (Lawless & Pellegrino, 2007).

Figure 3 shows a principle-based pedagogical design framework that supports a constructivist learning environment. One of the key additions to this new model is the development of the community of practice (CoP). This community is designed for teachers to communicate with each other to engage in the new technologies and activities that fa-

cilitate a constructivist learning environment. Mobile technologies such as SMS and interactive mobile TV are examples whereby teachers can instantly communicate with students to promote active learning in the subject matter.

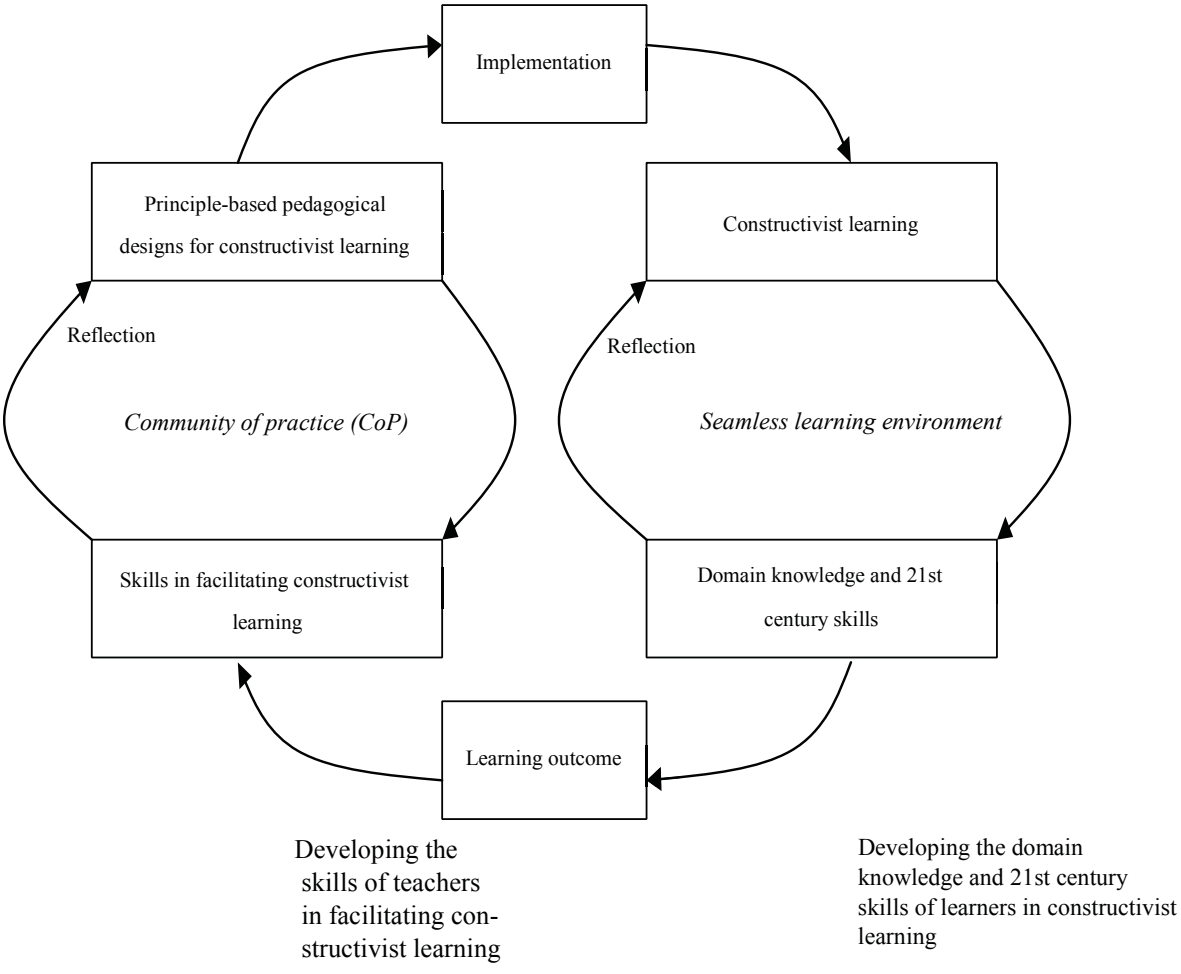

Figure 3. A principle-based pedagogical design framework for Constructivist Learning in a seamless learning environment (Kong & Song, 2013)

Conversational Theory

The Conversational Theory was developed in 1973 by Gordon Pask. Below is his model that he labeled the "skeleton of a conversation" between a teacher and a learner.

The basic model (shown in Figure 4) illustrates a "snapshot" view of two participants in conversation about a topic (Scott, 2001).

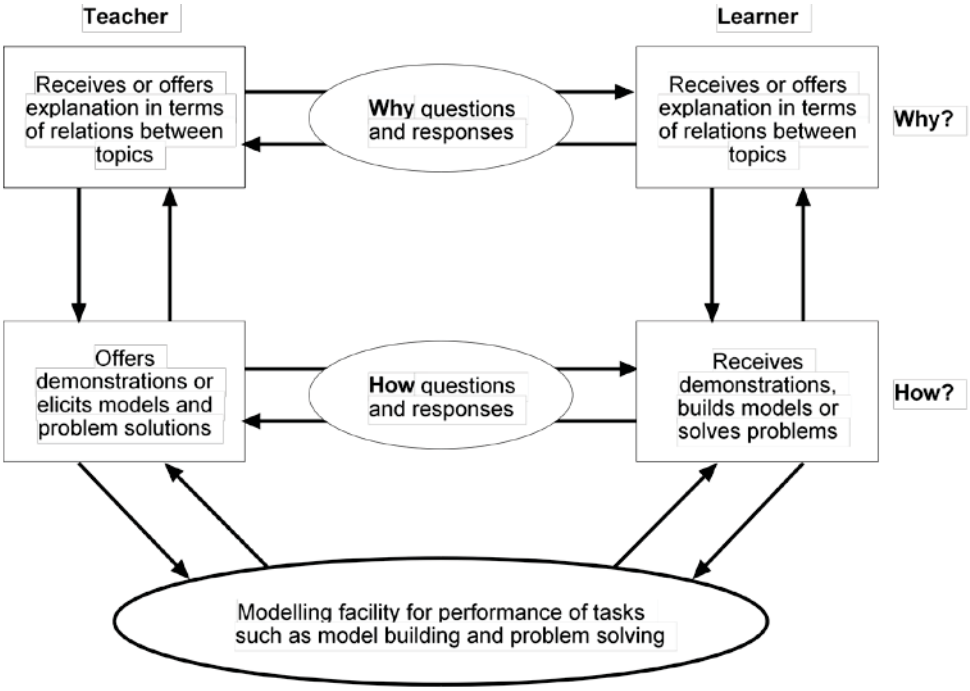

Figure 4. The "Skeleton of a Conversation" (after Pask)

Understanding this theory is useful for professors wanting to utilize technology to communicate effectively with a student. Since conversational theory states that learning can be successful if two-way communication is present, any form of communication outside of the classroom should consider this critical feature. This theory is essential to understand for purposes of this dissertation, since studies have shown that both email and SMS offer the ability for two parties to converse with each other (Sorensen, 2011). Without this key feature, many students may not wish to utilize the technology.

Universal Instructional Design Principles

With the passing of the Americans with Disabilities Act (ADA) in 1990, people in general began to look at the ways in which individuals can have equal access to public places (Pisha & Coyne, 2001). This movement soon migrated into the area of learning

and education. A concept soon developed known as universal instructional design (UID). UID principles have since been developed to build flexibility of use into both the instructional design and operating systems of educational materials, to make such materials accessible and appropriate to the widest range of students (Connell et al., 1997). Elias (2011) extracted eight principles that have proved useful to this study.

1. *Equitable use.* In the spirit of the original intention of UID, equitable use is designed to make the content all-inclusive for people of all abilities and locations. As this relates to mobile learning, the content should be delivered in the simplest possible format. Both email and SMS have the capability to send content to a mobile phone or personal computer. Cost factor is paramount for equitable use. Using SMS messages and email is very inexpensive and almost universally accessible for all students. Elias (2011) identified that the "simplicity of use, relatively low cost, and the asynchronous nature of SMS, which gives people time to reflect before responding to a message, as undoubtedly part of its phenomenal success" (Elias, 2011).
2. *Flexible use.* Flexibility is critical for UID, which means that all content should be able to accommodate any number of "individual's abilities, preferences, schedules, levels of connectivity, and choices in methods of use" (Elias, 2011). By nature, both email and SMS are very flexible and offer fast transmission of content directly to any student. When using SMS or email, UID usage in the mobile learning area recommends that all information be sent in small chunks. SMS, which has a limit of 160 characters, is well-adapted to this. This character limit may be circumvented if a concatenated SMS is pushed out. While a concatenated SMS enables larger messages, it

is not recommended due to its length and the fact that, when reading such a message on a cell phone, screen size may inhibit the best usage and retention.

3. *Simple and intuitive.* Course design and its content should be as straightforward and easy to understand as possible. This can be accomplished by using both email and SMS when pushing out content. It is important to remember that, in many instances, the content was viewed on smaller screens, which may affect how it was understood.

4. *Perceptible information.* As with all the other universal instructional designs, the most important aspect to consider when developing content and instruction is to be sure that it encompasses all learners. SMS can also embed video, captions, and transcriptions, elements which are sometimes necessary to include everyone.

5. *Tolerance for error.* This principle is designed to minimize hazards and adverse consequences of errors in software operations when using online and mobile teaching strategies. This is where m-learning is well positioned to support situated learning, which means that learning takes place through interpersonal relationships and emphasizes social interaction (Lave & Wenger, 1991). An educational support structure comprising email and SMS used in tandem with conventional classroom instruction to provide additional information is known as scaffolding. This well-known pedagogical technique fits well when using SMS and email as a network of information grows among the students, in which long lasting and meaningful relationships and connections can occur and add to the learning experience.

6. *Low physical and technical effort*. SMS and email are a natural fit for this principle. Both technologies require very little, if any, physical effort, and only small

amounts of technical effort. SMS and email also offer software that can help visually and hearing-impaired students so they may fully recognize and utilize the technology.

7. *Community of learners and support.* Once again, learning can best be achieved when communities and groups of learners have access to one another to share their knowledge. Scaffolding applies to this principle as well. Software exists to accommodate the community of learners by using SMS and email.

8. *Instructional climate.* Instructional climate focuses on course instruction and, in particular, content delivery. When using m-learning techniques such as SMS and email, professor-student interaction can occur at the click of a button. This instantaneous communication can be used to push any content the professor deems appropriate for the class. This can include, but is not limited to, reminders, videos, quizzes, or special requests. Furthermore, using these communication tools also enables two-way communication, allowing for the professor to answer follow-up questions and interaction between other students. This sharing of knowledge adds value to the learning process outside of the classroom.

The following table represents all eight of the above principles and how they apply to mobile learning.

Table 1

UID recommendations for inclusive m-learning (Elias, 2011)

UID Principles	**Online Distance Education recommendations**	**M-learning recommendations**

1. Equitable use	- put content online - provide translation	- deliver content in the simplest possible format - use cloud-computing file storage and sharing sites
2. Flexible use	- present content and accept assignments in multiple formats - offer choice and additional information	- package content in small chunks - consider unconventional assignment options - leave it to learners to illustrate and animate courses
3. Simple and intuitive	- simplify interface - offer offline and text-only options	- keep code simple - use open-source software
4. Perceptible information	- add captions, descriptors and transcriptions	
5. Tolerance for error	- allow students to edit posts - issue warnings using sound and text	- scaffold and support situated learning methods

6. Low physical and technical effort	- incorporate assistive technologies - consider issues of physical effort - check browser capabilities	- use available SMS readers and other mobile-specific assistive technologies
7. Community of learners and support	- include study groups and tools - easy-to-find links to support services	- encourage multiple methods of communication - group learners according to technological access and/or preferences
8. Instructional climate	- make contact and stay involved	- push regular reminders, quizzes, and questions to students - pull in learner-generated content

Technology Acceptance Theories

Technology acceptance research is examined in this section. There are three prevalent user behavior research models that have been used as the basis of all technology acceptance models: The theory of reasoned action, the theory of planned behavior, and the

technology acceptance model, all of which are discussed first in this literature review. After these models are presented, an overview is provided for the main basis of this research, which is the unified theory of acceptance and use of technology (UTAUT). Other models that were blended into the UTAUT model are also examined. This section concludes with a thorough look at user acceptance of mobile technology from the perspective of the UTAUT model.

In 1975, Schultz and Slevin performed one of the first studies of technology adoption, presenting an "exploratory factor analysis" to quantify otherwise normal day-to-day concerns of regular management information system users (Schultz & Slevin, 1975). In this study, "perceived effect of the model on the manager's job performance" (Schultz & Slevin, 1975) was deemed the most significant of the seven areas studied. This early study was the first of its kind to reason that many behavioral issues are at the root of acceptance and implementation of certain technologies. Furthermore, this study was the first in information systems to examine acceptance models. Their research showed a strong correlation between accepting the technology and the end-user's perception that their job performance would be enhanced (Sarker, 2000).

Theory of Reasoned Action

In 1975, on the heels of Schultz and Slevin's study, Fishbein and Ajzen developed a theory known as the theory of reasoned action (TRA), which identified two main components, beliefs and attitudes, and linked them to behavior (Fishbein & Ajzen, 1975). Even though the theory of reasoned action was developed in the social sciences field of psychology, it has relevance in technology acceptance models. In fact, all technology acceptance theories contain some elements grounded in psychology to attempt to explain

and predict the actions of human beings as they relate to technology and information systems.

The theory of reasoned action has been cited and referenced in numerous studies and has proven to be a good predictor of an end-user's actual behavior in various information system models (Davis, Bagozzi, & Warshaw, 1989). A graphic representation of this model can be seen in Figure 5.

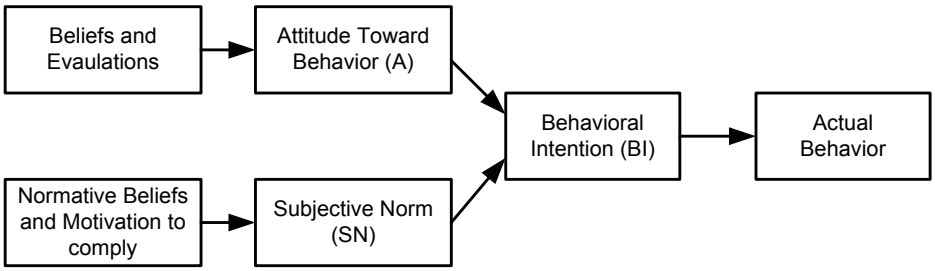

Figure 5. Theory of reasoned action (Ajzen & Fishbein, 1980)

In their model, Fishbein and Ajzen define attitude toward behavior as "an individual's positive or negative feeling about performing the target behavior" (p.17)**.** They define subjective norm as "the person's perception that most people who are important to him or her think he or she should not perform the behavior in question" (Fishbein & Ajzen, 1975, p. 17).

The theory of reasoned action is based on an individual's attitude toward a certain behavior, combining this with the individual's perception of people whom the individual deems important to him/her, which, in the final analysis, was found to influence the individual's behavior as an end-user (Marshall, 2006). This study was a first of its kind to analyze human behavior when facing decision-making opportunities. The theory's primary focus was to estimate the discrepancy between attitude and behavior, but behavior was only considered to be voluntary in their original model. After utilizing the model,

Fishbein and Ajzen began to realize that in many settings, behavior was not always voluntary and so they added a new construct known as perceived behavior control, which was added to their next theory, known as the Theory of Planned Behavior (Ajzen, 1985).

Theory of Planned Behavior

The theory of planned behavior was proposed by Icek Ajzen in his article "From intentions to actions: A theory of planned behavior" (Ajzen, 1985). This theory was developed from the theory of reasoned action and examines the intentions of the end-user when that individual lacks absolute control over a specified target behavior (Hu & Chau, 1999).

The theory has three main components that are germane to the model employed in this study. The first is attitude toward behavior, the second is subjective norm, and the third is perceived behavioral control (see Figure 6). Perceived behavioral control is the added component and primary construct that expands on the TRA model explained above. Perceived behavioral control is a key element for discussion as, in many organizations, new technology is forced upon the end-user; if this action is perceived, the end-user may accept the new technology simply because of this control factor. Because of this, this variable must be controlled in any technology acceptance model for the results to be considered accurate.

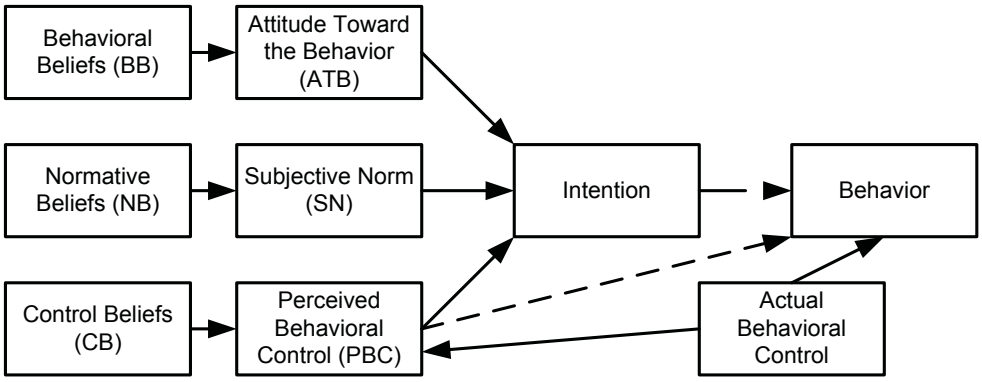

Figure 6. Theory of planned behavior (Ajzen, 1991)

Technology Acceptance Model

In 1985, Fred Davis adopted his first conceptual model for technology acceptance by adapting the theories of reasoned action and planned behavior. His new model, the technology acceptance model (TAM), was heavily influenced by both psychology models analyzing individual behaviors. Figure 7 illustrates the first TAM model.

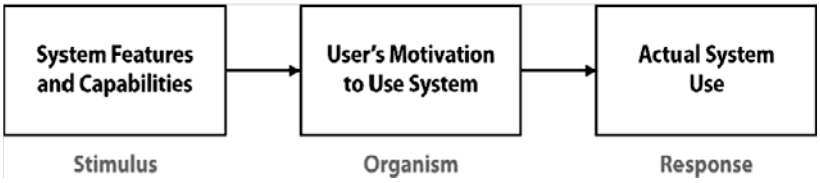

Figure 7. Conceptual model for technology acceptance.

Davis suggested that the actual usage of the system is a response that can be explained or predicted by user motivation, which is also directly influenced by system features and capabilities which are external stimuli (Marangunić & Granić, 2015). In 1989, Davis applied many of the fundamental concepts of the TRA model to his conceptual model, adding three additional factors: perceived usefulness, perceived ease of use, and the end-user's attitude toward using the technology in question (Davis, 1989). This can be seen in Figure 8, which graphically depicts his new technology acceptance model.

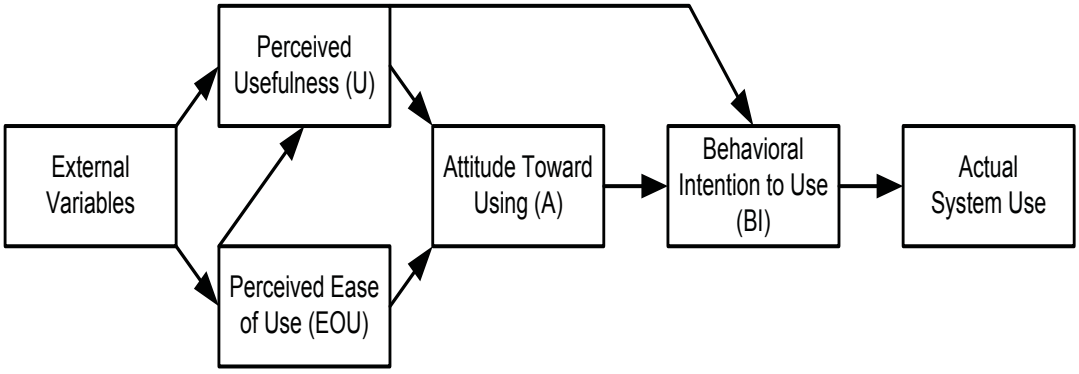

Figure 8. Technology acceptance model (Davis, 1989)

In 2000, Davis and Venkatesh proposed an extended model to the original TAM. In the course of over 10 years, the original technology acceptance model was tested numerous times, and consistently the model found that perceived usefulness was a major determinant of the end-user's behavior of intention to use (Venkatesh & Davis, 2000). In their new model (see figure 9) Venkatesh and Davis sought to isolate the variables that they believed had the most influence on perceived usefulness.

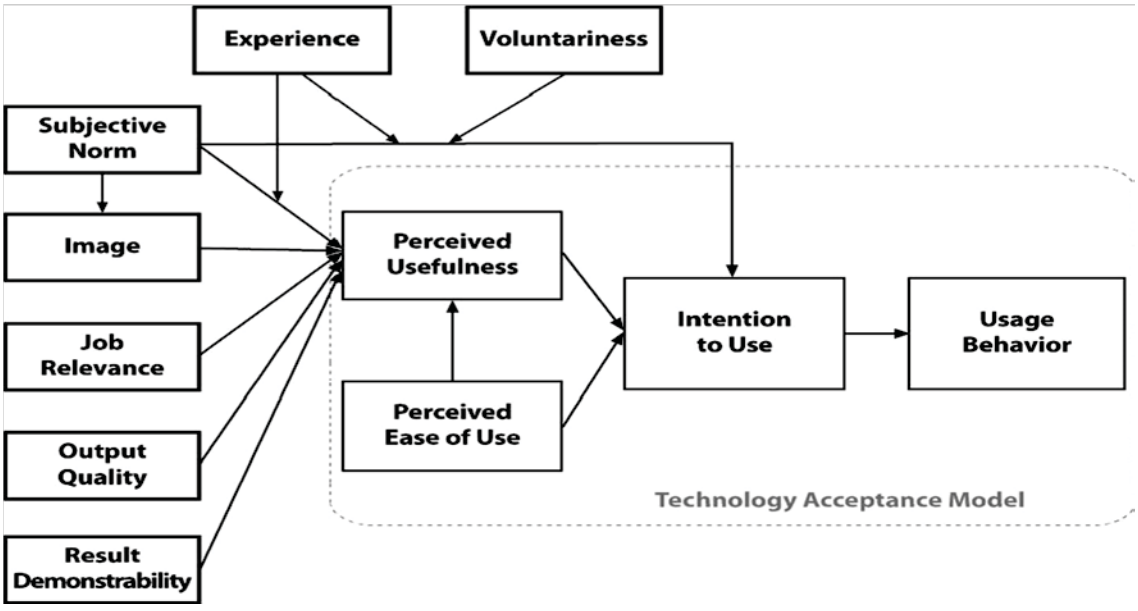

Figure 9. TAM 2

New variables were added to the left of the original TAM and included subjective norm, image, job relevance, output quality, and result demonstrability. In addition to the

new variables, two moderating variables, experience and voluntariness, were added, which they believed impacted the variable subjective norm. In their longitudinal research, the aggregate results across all the studies did reveal that all four of the new variables were significant determinants of perceived usefulness (Venkatesh & Davis, 2000).

TAM and TAM 2 continue to be the primary sources in explaining perceived usefulness and perceived ease of use as it relates to the acceptance of nearly all technologies (Venkatesh & Davis, 2000). As you can see from Figure 9, perceived usefulness (U) and perceived ease of use (EOU) continue to be the two main contributors to both models. In his subsequent studies, Davis maintained that individuals would accept new technology only if they believe the new technology will assist them in their current job by providing usefulness and if the new technology is perceived to be easy to use. Without these two components, Davis maintained that people would reject any new technology. The significance of these studies cannot be overstated. As of June 8, 2016, Google Scholar (https://scholar.google.com/) records that exactly 28,892 research publications have cited these two technology acceptance models in their research concerning the acceptance of technology. The original model has been used as the standard in technology acceptance across multiple fields of science and other areas of research, which demonstrates its enormous impact in the prediction of end-user acceptance. This has been and continues to be a critical component that enables decision makers to determine which factors can increase their chances of implementing and using a new technology either for their own business or for the open market.

Unified Theory of Acceptance and Use of Technology

Using the previous three models as a baseline, Venkatesh, Davis, Davis and Morris (2003) synthesized a total of eight behavioral models and concepts into a new theory known as the unified theory of acceptance and use of technology (UTAUT). The eight models that were combined to form the UTAUT are as follows: (a) theory of reasoned action (TRA), (b) technology acceptance model (TAM), (c) motivational model (MM), (d) theory of planned behavior (TPB), (e) combined TAM and TPB (C-TAM-TPB), (f) model of PC utilization (MPCU), (g) innovation diffusion theory (IDT), and (h) social cognitive theory (SCT) (Venkatesh et al., 2003).

Motivational Model

The motivational model (MM) theory was developed in 1997 by Robert Vallerand as an explanation for individual behaviors (Vallerand, 1997). There are two primary core constructs that together form the center of this theory: extrinsic motivation and intrinsic motivation (Vallerand, Fortier, & Guay, 1997). Extrinsic motivation is the perception that end-users decide to perform an activity "because it is perceived to be instrumental in achieving valued outcomes that are distinct from the activity itself, such as improved job performance, pay, or promotions" (Davis et al., 1992, p. 1112). Intrinsic motivation is the perception that end-users decide to perform an activity "for no apparent reinforcement other than the process of performing the activity per se" (Davis et al., 1992, p. 1112). The model as designed in 1997 by Vallerand suggests that ultimately dropout behavior is influenced by behavioral intentions, which in turn, is influenced by the motivation of the student (see Figure 10).

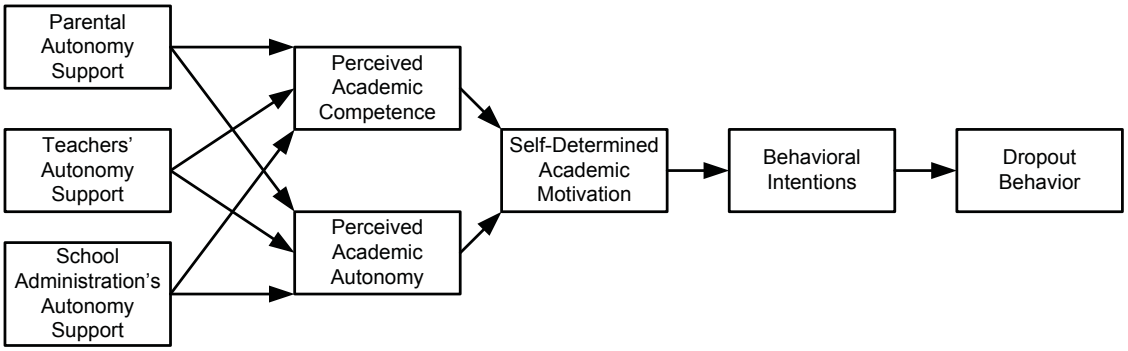

Figure 10. Motivational model (Vallerand et al., 1997)

Combined TAM and TPB

In 1995, Taylor and Todd developed a test comparing the TAM model and two variations of the theory of planned behavior to see which model, if any, works best within a business to understand the end-user's usage of information technology (Taylor & Todd, 1995a). Their new model added ease of use and usefulness as additional variables (see Figure 11). Taylor and Todd concluded in their longitudinal study of 786 college students, of which 430 were experienced computer users and 356 were inexperienced computer users, that TAM is the "most commonly employed model of IT usage" (Marshall, 2006, p. 16), but also many TAM models may miss their target in accuracy due to a lack of recognizing social and other control variables used in many IT usage models. They also determined that their model could be used to predict usage even when the identified user did not have any recognizable experience with the particular technology in question. However, they also concluded that users with some experience demonstrated stronger behavioral intention and behavior to use the technology as opposed to those with no prior experience with the technology in question.

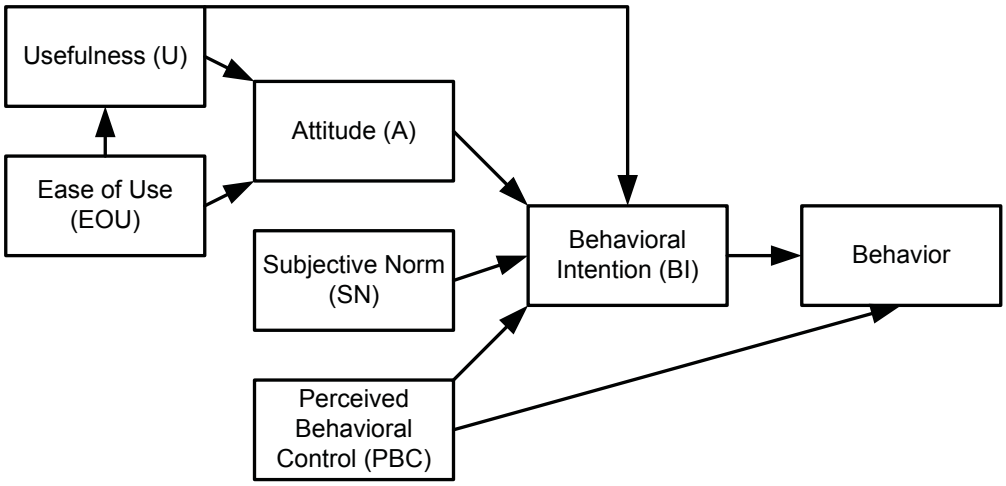

Figure 11. Combined TAM and TPB

Model of PC Utilization

In 1991, Thompson, Higgins, and Howell developed the model of PC utilization (MPCU). This model was an extension of the Theory of Human Behavior model developed by Triadis in 1977 (Venkatesh et al., 2003). The design of the model makes it useful for predicting user acceptance of PCs as well as other technologies (Venkatesh et al., 2003), since it measures usage instead of the intention to use a technology.

The model of PC utilization contains a total of six independent variables and one dependent variable, this being the actual utilization of a personal computer (see figure 12). The core constructs of job-fit, complexity, long-term consequences, affect towards use, social factors, and facilitating conditions all have some measurable effect on the actual usage of a personal computer. Because of the model's design, Venkatesh et al. adopted many of the same constructs in their UTAUT model.

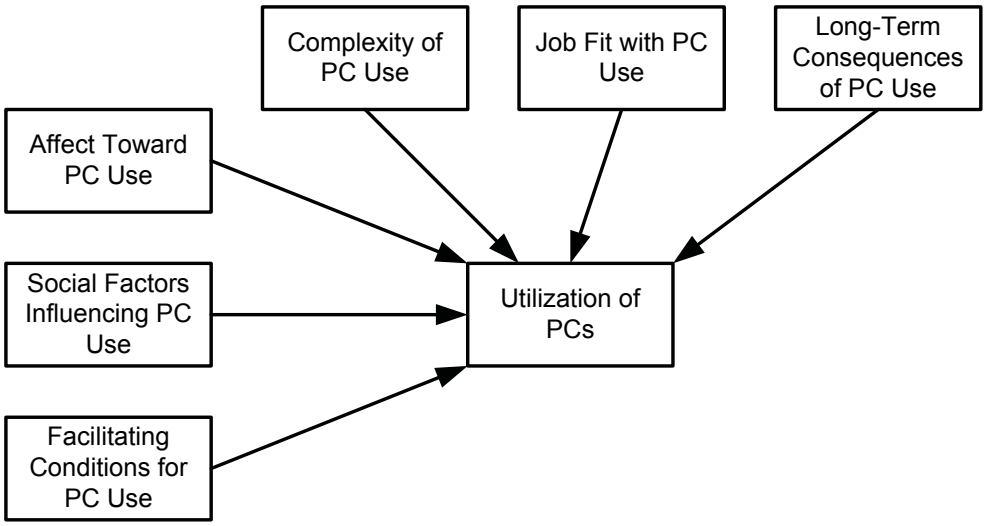

Figure 12. Model of PC utilization

Innovation Diffusion Theory

Everett Rogers developed the innovation diffusion theory in the early 1960s (Rogers, 1995). This theory, represented in Figure 13, is widely used to study any number of innovations that range from agricultural tools to organizational innovation (Tornatzky, & Klein, 1982). Since its adoption, it has rapidly become a broadly applied model for measuring the rate of adoption in behavioral science fields (Rogers, 1995). In 1991 Moore and Benbasat adopted the characteristics represented in Figure 13 and modified the innovation theory to apply to individual technology acceptance. In doing so, they could find support for predictive validity with respect to using the following core constructs: relative advantage, ease of use, image, visibility, compatibility, results demonstrability, and voluntariness of use (Venkatesh et al., 2003).

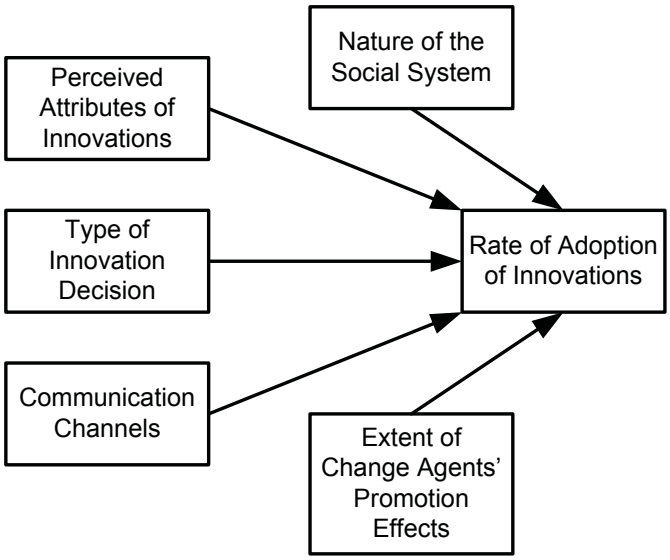

Figure 13. Innovation diffusion theory (Rogers, 1995)

Social Cognitive Theory

Social cognitive theory is derived from social learning theory and is one of the most powerful theories of human behavior (Venkatesh et al., 2003; Bandura, 1986). The theory suggests that individuals can extract and remember information by observing "a model performing a behavior"; thus, a portion of an individual's knowledge is directly related to his/her interaction with the environment and others in that environment.

Compeau and Higgins (1995) applied and extended the social cognitive theory to examine the technology of computers and their usage. The nature of their model and many of their baseline theories enabled their research to allow for predicting the acceptance of a specific technology as well as other technologies in general. This model maintained the following five constructs: outcome expectations, environmental influences, self-efficacy, affect, and anxiety. Of the five constructs, self-efficacy was found to support the most weight in the analysis. Self-efficacy was defined in the theory as the judgment of one's ability to use a technology (see figure 14).

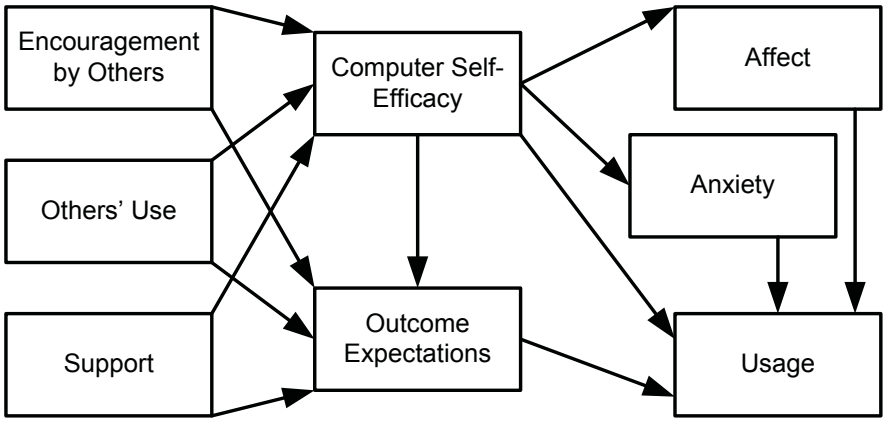

Figure 14. Social cognitive theory

The above eight theories and their respective constructs along with research to support their significance were all combined to develop the Unified Theory of Acceptance and Use of Technology (UTAUT). The next section examines the UTAUT study.

Overview of UTAUT Study

In the previous section, the eight primary models were illustrated and reviewed. The review of their background theories and constructs was necessary to understand that in the UTAUT study, Venkatesh, Morris, Davis, and Davis developed four main objectives: (a) to review the current state of knowledge with respect to user acceptance of a named technology, (b) to empirically review the eight models via longitudinal studies among four organizations, (c) to formulate the unified theory of acceptance and use of technology model (UTAUT), and (d) to empirically test and validate the UTAUT model (Venkatesh et al., 2003).

As a beginning point for research, they proposed a baseline model (see figure 15). It was from this basic conceptual map that Venkatesh et al. (2003) built their model by

empirically examining 32 constructs from the other eight models discussed in the previous section. In addition, they also identified and tested four moderating variables.

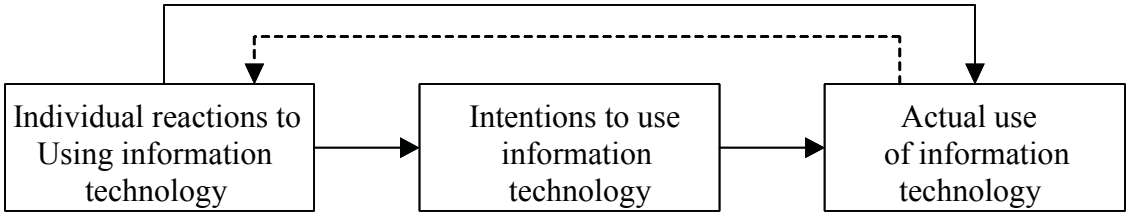

Figure 15. Basic concept underlying user acceptance model

In addition, they also identified and tested four moderating variables. In their research, they confirmed that in all the past tests and research using the eight models, five key limitations existed and were therefore addressed in their model. The five limitations are as follows:

1. Technology examined: they concluded that very little research existed pertaining to complex technologies that management would like to address.
2. Participants: most studies examined students and their technology acceptance patterns.
3. Timing as it pertained to measuring the acceptance: in most of the studies, the acceptance or rejection of the measured technology was analyzed after the fact and never during the actual decision-making process.
4. Type of measurement used: most of the studies deployed cross-sectional or between-subject comparisons as opposed to tracking the subjects throughout different stages in the acceptance process.
5. Voluntary versus mandatory technologies: most of the tests analyzed only voluntary technologies; but in many business settings, technology acceptance must be measured in mandatory settings (Venkatesh et al., 2003).

All the above five limitations were purposely addressed and accounted for in their new study design, which is discussed below.

Their study design began with four organizations and various employees all being introduced to voluntary and involuntary technology. To increase the strength of their new model, they also examined multiple technologies, various business models, and multiple business functions (Venkatesh et al., 2003).

Multiple scales were adapted from all eight of the models previously mentioned in order to develop a very robust questionnaire. Venkatesh et al. utilized a focus group in which to evaluate their questionnaire. They also changed the tense of verbs throughout the questionnaire to reflect timing issues in the acceptance or rejection process.

The researchers validated their study by administering the survey on three separate occasions in two different studies. The survey was given post-training, one month after the implementation phase, and three months after the implementation phase. Using partial least squares to examine the reliability and validity of their measures, the researchers found that most of the loadings were at .70 or greater, meaning that the loading patterns fell within the acceptable range. In addition, internal consistency reliabilities were also greater than .70. The results and their patterns were found to be extremely consistent with the results in their previous research (Venkatesh et al., 2003).

In each of the previously discussed eight models, at least one construct was found to be significant. Of these eight constructs, seven were directly associated with intention or usage in one or more of the models. The researchers eliminated the following three constructs: (a) attitude toward technology, (b) anxiety, and (c) self-efficacy. The remain-

ing four constructs were measured and ultimately used in their new model. The four constructs, which were not mentioned in any specific order, were: (a) social influence, (b) facilitating conditions, (c) effort expectancy, and (d) performance expectancy. Venkatesh et al. defined them as:

Social influence. Measurement in which the individual believes that other people find the technology important and useful.

Facilitating conditions. "The degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 452).

Effort expectancy. Measurement in which a certain amount of ease is determined from the user's standpoint for using the technology.

Performance expectancy. Measured by the belief of the end-user that by using the technology, their job performance will increase.

These four independent variables are examined in greater depth in a later section.

The researchers also identified four new moderating factors that they viewed as potential influences on the four independent variables mentioned above. The four moderating factors were: (a) gender, (b) age, (c) experience, and (d) voluntariness of use. Represented in Figure 10 is their final model, today known as the UTAUT model.

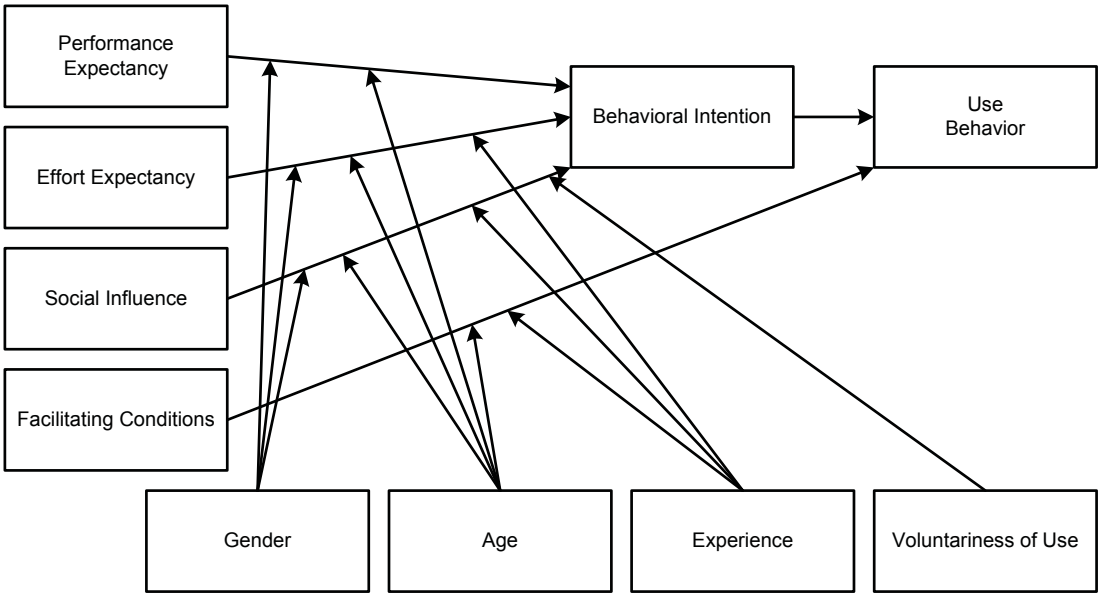

Figure 16. UTAUT model (Venkatesh, Morris, Davis, & Davis, 2003)

To cross-validate their original model, they gathered additional data from two new businesses: a retail electronics store with a sample size of 53, and a financial services group with a sample size of 80. The data were analyzed in the same manner and confirmed their first study's results (Venkatesh et al., 2003). The items used in estimating the different constructs found in the UTAUT are listed in Table 2. The statements were extracted from six of the different theories mentioned above because they demonstrated the highest loading of all the constructs (Marshall, 2006).

In the survey, administered on three separate occasions in two different studies, each question was based on a seven-point Likert scale, 1 being most negative and 7 being most positive. They also formed a focus group of five individuals to evaluate the questions (Venkatesh et al., 2003).

Table 2

Items used in estimating UTAUT (Venkatesh et al., 2003)

Performance Expectancy
1. TAM Theory: I would find the system useful in my job.
2. IDT Theory: Using the system enables me to accomplish tasks more quickly.
3. IDT Theory: Using the system increases my productivity.
4. SCT Theory: If I use the system, I will increase my chances of getting a raise.
Effort Expectancy
1. TAM Theory: My interaction with the system would be clear and understandable.
2. TAM Theory: It would be easy for me to become skillful at using the system.
3. TAM Theory: I would find the system easy to use.
4. IDT Theory: Learning to operate the system is easy for me.
Attitude Toward Technology
1. TRA Theory: Using the system is a bad/good idea.
2. MPCU Theory: The system makes work more interesting.
3. MPCU Theory: Working with the system is fun.
4. SCT Theory: I like working with the system.
Social Influence

1. TRA Theory: People who influence my behavior think that I should use the system.
2. TRA Theory: People who are important to me think that I should use the system.
3. MPCU Theory: The senior management of this business has been helpful in the use of the system.
4. MPCU Theory: In general, the organization has supported the use of the system.
Facilitating Conditions
1. TPB Theory: I have the resources necessary to use the system.
2. TPB Theory: I have the knowledge necessary to use the system.
3. TPB Theory: The system is not compatible with other systems I use.
4. IDT Theory: A specific person (or group) is available for assistance with system difficulties.
Self-Efficacy
I could complete a job or task using the system...
1. SCT Theory: If there was no one around to tell me what to do as I go.
2. SCT Theory: If I could call someone for help if I got stuck.
3. SCT Theory: If I had a lot of time to complete the job for which the software was provided.

4. SCT Theory: If I had just the built-in help facility for assistance.
Anxiety
1. SCT Theory: I feel apprehensive about using the system.
2. SCT Theory: It scares me to think that I could lose a lot of information using the system by hitting the wrong key.
3. SCT Theory: I hesitate to use the system for fear of making mistakes I cannot correct.
4. SCT Theory: The system is somewhat intimidating to me.
Behavioral Intention to Use the System
1. I intend to use the system in the next <n> months.
2. I predict I would use the system in the next <n> months.
3. I plan to use the system in the next <n> months.

A more detailed examination in the next section adds depth to the researchers' four independent variables and moderating variables as they are germane to this study. The section concludes with the two dependent variables: behavioral intention and actual use.

Independent Variables

Performance Expectancy. Performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in

job performance" (Venkatesh et al., 2003, p.447). Performance expectancy was derived from the constructs of five of the eight models mentioned above. They are as follows: (a) perceived usefulness from TAM and TAM 2, (b) extrinsic motivation from the Motivational Model, (c) job-fit from the Model of Personal Computer Utilization, (d) relative advantage from the Innovation Diffusion Theory, and (e) outcome expectations from the Social Cognitive Theory. Of all the models, the performance variable construct was found to be the strongest predictor of intention, as well as the most significant in both voluntary and mandatory settings where the technology is presented (Venkatesh et al., 2003). Another significant finding in their research confirmed their original hypothesis that, in men and younger workers, performance expectancy was more influenced by gender and age.

Effort Expectancy. Effort expectancy is defined as "the degree of ease associated with the use of the system" (Venkatesh et al., 2003, p. 450). There were three constructs that captured effort expectancy in the models above. They are as follows: (a) perceived ease of use from TAM and TAM2, (b) complexity from the Model of Personal Computer Utilization, and (c) ease of use from the Innovation Diffusion Theory. This construct was hypothesized and was confirmed to be moderated by gender, age, and experience, and effects of the moderating variables were strongest for younger women with little to no experience with the technology.

Social Influence. Social influence is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (Venkatesh et al., 2003, p. 451). This construct was based on constructs from the models discussed above: (a) subjective norm from the theory of reasoned action, TAM2, theory of planned

behavior, and Combined TAM and Decomposed Theory of Planned Behavior, (b) social factors from the Model of Personal Computer Utilization, and (c) image from the Innovation Diffusion Theory (Venkatesh et al., 2003). There were no social influence constructs found to be significant in any technology that was offered as a voluntary option, but each construct was found significant when the voluntary option was changed to a mandatory one. Furthermore, all four moderating factors—gender, age, experience, and voluntariness of use—were hypothesized and proven to moderate social influences with older women with little to no experience with the technology.

Facilitating Conditions. Facilitating conditions is defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support use of the system" (Venkatesh et al., 2003, p. 452). There were three constructs out of the eight models that captured facilitating conditions. These were: (a) perceived behavioral control from the theory of planned behavior, (b) facilitating conditions from the Model of Personal Computer Utilization, and (c) compatibility from Innovation Diffusion Theory (Venkatesh et al., 2003). Facilitating conditions was hypothesized to influence actual usage but not influence behavioral intention. Two moderating factors, age and experience, were found to have the greatest impact on older more experienced workers as opposed to younger adults.

Constructs Not Found to Affect Intention to Use

The following three constructs were analyzed in the UTAUT model but not found to directly affect the intention to use a technology.

Attitude Toward the Technology. Attitude toward the technology is defined as "an individual's overall affective reaction to using a system" (Venkatesh et al., 2003, p. 455).

There were four constructs out of the eight models that captured attitude toward the technology. They are: (a) attitude toward behavior from the theory of reasoned action, theory of planned behavior and Decomposed Theory of Planned Behavior, and the Combined - TAM and Theory of Planned Behavior, (b) intrinsic motivation from the Motivational Model, (c) affect toward use from the Model of Personal Computer Utilization, and (d) affect from the Social Cognitive Theory. Venkatesh includes the attitude toward the technology construct within the UTAUT measure under the presumption that it does influence behavioral intention (Marshall, 2006). In the final analysis, this construct was not found to be significant and therefore not included in their final model.

Self-Efficacy. To add computer utilization to their original model, Compeau and Higgins (1995) extended Social Cognitive Theory by defining self-efficacy as the judgment of a one's own ability to use a certain technology to perform or accomplish a named job or itemized task. Self-efficacy was theorized and ultimately found to not have a significant effect on a person's intention to behave in a certain way and therefore was dropped from the final model developed by Venkatesh et al., (Venkatesh et al., 2003).

Anxiety. To add computer utilization to their original model, Compeau and Higgins (1995) defined anxiety as a feeling that evokes anxiousness or other emotional reactions when performing a named behavior as it pertains to using a computer or other unfamiliar technology (Compeau & Higgins, 1995). In previous research conducted by Venkatesh et al., anxiety was not found to be conceptually and empirically distinct from effort expectancy, therefore it was not included as direct determinants in the UTAUT model (Venkatesh et al., 2003).

From their previous research and in the course of their current UTAUT model, Venkatesh et al., identified four moderating factors that, at some level, had an influence on the four independent variables: (a) performance expectancy, (b) effort expectancy, (c) social influence, and (d) facilitating conditions. The four moderating variables are: (a) gender, (b) age, (c) experience, and (d) voluntariness of use. In the next section, the four moderating variables are examined more thoroughly.

Moderating Variables

Gender. Previous research found gender to be a factor in identifying relations among variables and that men are highly task-oriented (Minton & Shneider, 1980). Venkatesh et al. postulated that since men are more task related, performance expectancy, which is directly associated with task and job performance, would have the most noticeable relationship with the moderating variable, gender. Furthermore, in their research while developing the UTAUT model, Venkatesh et al. found that in gender schema theory, gender roles and their effects on an independent variable such as the four in the UTAUT model mostly originate from birth and not socialization factors (Bem 1981; Bem & Allen, 1974; Kirchmeyer, 1997; Lubinski et al, 1983; Lynott & McCandless 2000; Motowidlo, 1982). Venkatesh et al. also suggested that in previous research (Bem & Allen, 1974; Bozionelos, 1996) effort expectancy was more salient among women (Venkatesh et al., 2003). Finally, in other research Venkatesh et al. found that women may be more sensitive to other people's opinions, which is why they hypothesized that social influence would be more salient among women when examining a person's intention to use any new technology (Miller, 1976).

Age. For their research, Venkatesh et al., defined age as the approximate age of the person at the time when the survey is first administered. Age is theorized in their model as one of the four moderating factors having influence on social influence, performance expectancy, and effort expectancy, and ultimately the acceptance of a new technology. In previous research containing multiple literature reviews, Venkatesh et al. found that age has a measurable effect on the adoption of a new technology. According to Plude and Hoyer's research in 1985, older workers can demonstrate less of an aptitude toward processing complex actions when dealing with certain technologies in a job setting (Plude & Hoyer, 1985). Significantly, Venkatesh et al. found in earlier studies that as people age, they feel a need to affiliate with other workers, therefore suggesting that the independent variable, social influences, is most salient in older workers in an organization (Morris & Venkatesh, 2000).

Experience. Experience was found to have only one moderating effect with an independent variable, effort expectancy. Venkatesh et al. defined experience as the amount of experience that a person has in a specific area within an organization. Venkatesh et al. identified numerous research articles that demonstrated a negative correlation between experience and effort expectancy (ease of system use). In other words, as experience with the technology increases, the amount of effort expectancy decreases (Agarwal & Prasad, 1997, 1998; Davis, Bagozzi, & Warshaw, 1989; Thompson et al., 1991; Thompson, Higgins, & Howell, 1994).

Voluntariness of Use. Voluntariness of use is defined by Venkatesh et al. as whether or not an individual is mandated or required to use a new technology. They recognized that nearly all the previous research in technology acceptance models had been

conducted on a voluntary basis, but that in many mandatory environments where workers are required to use a new technology, the opinions of others do matter and in fact influence overall usage of the technology (Hartwick, & Barki, 1994). In their model, voluntariness of use is a moderating factor that moderates the effect of social influences.

Dependent Variables

Behavioral intention to use a technology and actual use of a technology were identified as the two dependent variables. They were hypothesized to be dependent upon effort expectancy, performance expectancy, social influence, and facilitating conditions being moderated by gender, experience, age, and voluntariness of use.

Behavioral Intention. Behavioral intention is defined as an individual's intention or plan to use a new technology to perform a task. Behavioral intention to use the system was adapted from the TAM model (Davis, 1989). Research has consistently shown a positive relationship between intention and actual behavior (Sheppard, Hartwick, & Warshaw, 1988). As pointed out by Venkatesh et al., most technology acceptance research prior to their model only focused on intention rather than the actual use of a technology by which to predict future use (Trice & Treacy, 1988).

Actual Usage. Actual Usage is defined as "the objective measurement of use of a particular system "(Marshall, 2006, p. 36). Trice and Treacy (1988) point out that prior research did not attempt to measure actual usage due to the difficulty in quantifying the variable. In the UTAUT model, Venkatesh et al. were able to measure actual usage by charting computer use by the users' log-in information.

Research Citing the UTAUT Model

As of June 30, 2016, Publish or Perish (http://www.harzing.com) records that the UTAUT has been cited 19,201 times in various research projects and in 37 papers since 2003 (Harzing, 2007). This technology acceptance model has been modified and applied in a wide range of fields such as technology, government, health care, finance and communication (Marshall, 2006). UTAUT continues to be the primary model and theory used to explain technology adoption.

Statistics Used in the Analysis of the UTAUT Model

Due to the uniqueness of their new model, which set out to measure voluntary versus mandatory technology environments, Venkatesh et al. created two data sets. Partial Least Squares was used in their theory "to test all of the eight models at the three points of measurement in each of the two data sets" (Venkatesh et al., 2003, p. 439), and is considered the most common method for examining the reliability and validity of the measures associated in their model (Venkatesh et al., 2003). Of major importance in their final analysis was their comment that "only the direct effects on intention were modeled as the goal was to examine the prediction of intention rather than interrelationships among determinants of intention; further, the explained variance (R2) is not affected by indirect paths" (Venkatesh et al., 2003, p. 439). PLS-PM is a second-generation multivariate technique which assesses the measurement model and structural model simultaneously in one operation (Marshall, 2006). In addition to the above justifications for Venkatesh et al., using PLS has been proven to be a reliable method to estimate models with minimal requirements for sample size and normal distribution (Chin, W. W. 1998).

Mobile Wireless Technology Acceptance Model

According to Nysveen, Pederson, and Thorbjornsen (2005), the technology acceptance model remains very helpful and significant in explaining the behavioral intentions of people and their acceptance of technology. However, it does not seem to work in its entirety when acceptance models are analyzed with respect to many of the relatively new technologies available today, such as recently developed mobile technologies (Nysveen, Pederson, & Thorbjornsen, 2005).

In 2009, Kim and Garrison extended the TAM model to include mobile wireless. Increasing demands are being placed on employees to remain in contact with their employer to be competitive in the market. Up until this point, very little research existed in the information technology acceptance literature as it pertained to mobile technology. In their model, job relevance was added in the cognitive influence processes, while perceived ubiquity and perceived reachability were added to investigate key factors that drive users' behavioral intention to use a named mobile wireless technology (see Figure 17).

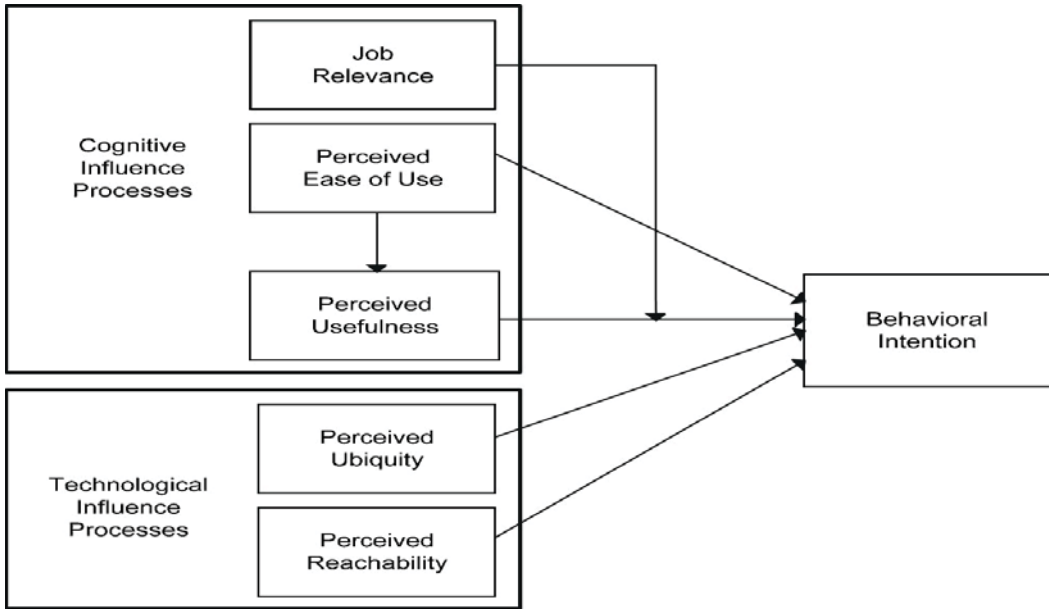

Figure 17. Mobile wireless technology acceptance model (Kim and Garrison, 2009)

In 2009, Mihail Cocosila, Norm Archer, and Yufei Yuan created a new information technology acceptance model based on a perceived-risk motivational model (Cocosila, Archer, & Yuan, 2009). By controlling for certain variables, their research analyzed text messaging as the new technology and its usage for health reminders. This research was the first of its kind to separate risk into four separate facets, which were financial risk, social risk, psychological risk, and privacy risk. The findings "detected a significant influence of attitude toward the activity supported by the technology on behavioral intention and a slight non-significant influence on extrinsic motivation" (Cocosila, Archer, & Yuan, 2009, pp. 351-352).

Summary of Technology Acceptance Research

This review of literature also identified some social science research in the areas of behavior and reasoning, which are necessary when considering people and their willingness to adopt or reject a new technology. The older technology acceptance models remain very relevant today and such social models mentioned above enhance them. To gain an accurate picture of acceptance models, multiple social, behavioral, and business models must be blended; my research thus far has shown such blending to be, at this point, minimal. The number of dependent variables continues to expand as new research in these areas develops. It is important to remember that, due to its protean nature, technology will always challenge these theories.

TAM has many implications in education. Technology acceptance models have been used "to identify the factors that influence electronic collaboration technology and predicted usage for virtual team collaboration projects in higher education courses" (Godin, 2013, p. i). The practicality of using technology acceptance models as a basis for

theories is extensive, which makes this topic extremely useful for, and applicable to, multiple fields of interest.

Spaced Retrieval Theories

The focus of this dissertation is to examine the factors that influence a college student's acceptance of receiving push communication to receive course-related content. The primary factor that is hypothesized to affect the actual usage of accepting an email and/or SMS message is if the message has been pushed out at predetermined time intervals.

Research on memory and learning indicates that memory is enhanced and best stored in long-term memory when information is distributed in increments as opposed to a single distribution episode (Bjork, 1979). This section examines two primary classes of theories that together consider spacing effects in memory. The first class is deficient-processing theory and the second is contextual-variability theory (Greene, 1989).

Deficient-Processing Sub-Theory

This theory can help account for spacing effects in tasks where the learner is supplied cues when an item is presented on a list. When the learner is presented the list of items to study, this theory identified that the main decision as to how much effort is placed on learning the material is directly related to the learner's perception of how easy the material would be to remember later (Greene, 1989). If the items to learn are repeated multiple times, the learner begins to become more and more familiar with the items, which ultimately leads to an increase in memory. Spacing the material over certain increments in time in an orderly fashion also improves recall of the items (Bregman, 1967).

Contextual-Variability Sub-Theory

This theory, also known as the Study-Phase Retrieval Theory, assumes that increasing the space and time between information facilitates memory simply by increasing the number of cues that the learner processes for each item (Melton, 1970). This theory has produced evidence to support that the temporal information is stored automatically in the form of contextual change (Block, 1982). Greene (1989 p. 372) argues "that when repetition leads to study-phase retrieval, the subject encodes those aspects of the context that have changed between occurrences." Greene goes on to say that because contextual elements will be stored with longer lags, retrieval of items should be facilitated by utilizing spacing in between the times the information is relayed to the learner.

Summary of Literature Review

This literature review included mobile learning theories along with instructional design strategies to establish a baseline for what components should be incorporated into the content, as well as past strategies that allow students the best opportunity to engage the content. The literature review concluded with technology acceptance research, mobile technology acceptance research, and how spaced-retrieval affects memory. The review of literature clearly identified a gap in the research as it relates to the scheduling of content and the acceptance of using push communication as a means to receive course-related content beyond the classroom. The following chapter identifies the methodology used in identifying the factors that influence a college student's acceptance of a scheduled push message delivering course-related content.

Chapter III

METHODOLOGY

This research combined mobile learning and other pedagogical theories with technology acceptance theories to examine the factors influencing a college student's acceptance of course-related content via scheduled push communication comprising email and SMS messaging. Chapter 2 contained a summary of the literature related to mobile learning theories, various pedagogical theories, and technology acceptance models, in addition to spaced retrieval theories and their effects on memory. This chapter provides an overview of the model which was used for examining scheduled push communication. This chapter also identifies factors which contributed to the actual usage of push communication. The theoretical constructs of the research model, including the research questions and hypotheses for the study, are also presented in this chapter. The final portion of this chapter examines the research methods and procedures used to test the hypotheses.

Research Model

The research model (see Figure 18) was designed to measure a student's reception of scheduled push communication. The model was developed from constructs of UTAUT theory and mobile learning technologies, as well as spacing effect literature.

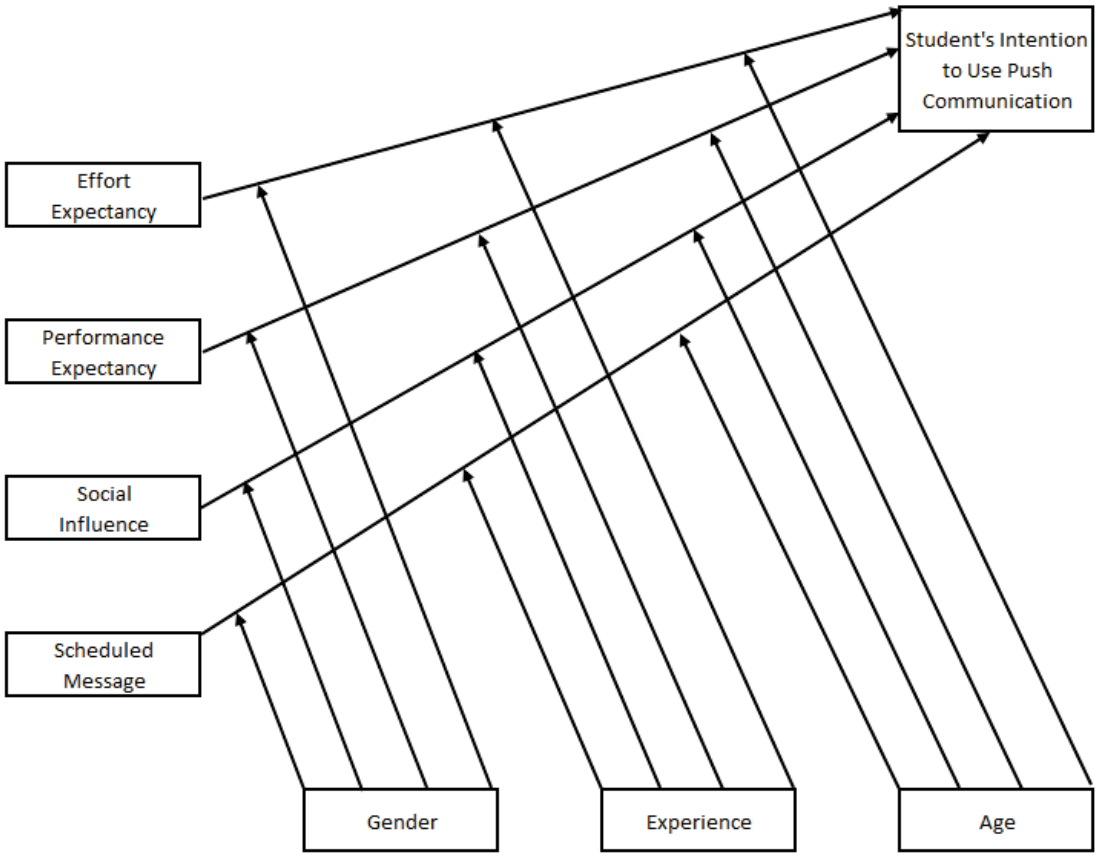

Figure 18. Modified UTAUT model with addition of scheduled message

Research Questions and Hypotheses

Figure 18 is a representation similar to the UTAUT model; however, in this model, "scheduled message" replaces "facilitating conditions." The models are similar in that both scheduled message and facilitating conditions achieve the same purpose with respect to the end-user's actual usage. The remaining independent variables are effort expectancy, performance expectancy, and social influence. In the model above, these variables are hypothesized to influence the student's intention to use scheduled push communication. The independent variable, scheduled message, is hypothesized to influence students' intention to use push communication as a means to receive course-related content

and is measured by Google Analytics to compare the students' intention to their actual usage of scheduled push communication. Gender, experience, and age represent moderating variables that may each uniquely influence the independent variables. The study was guided by four research questions, each of which related to a set of hypotheses.

- Question one, "What factors affect the students' intention to use push communication as a means to receive course-related content?" related to the hypotheses one through four.
- Question two, "Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled messages on a student's intention to use push communication in receiving course-related content?" related to hypotheses five through eight.
- Question three, "Does scheduling delivery of push communication at predetermined times influence the students' actual usage of course-related content as measured by average session duration times?" related to hypotheses nine and ten.
- Question four, "Does scheduling the delivery of emails and SMS messages at pre-determined times in the day influence the student's use of course-related content regarding unique visitors, click-through rates, and returned visits?" related to hypotheses eleven through sixteen.

Effort Expectancy

Venkatesh et al. (2003) define effort expectancy as "the degree of ease associated with the use of the system" (p. 450). Effort expectancy was measured by recording responses to the following three survey items:

- Using email and SMS messaging as a means to receive course-related content would not require a lot of technological expertise.
- I believe that using email and text messaging will be easy for me.
- Actually using email and text messaging should be easy for me to do.

Performance Expectancy

Venkatesh et al. (2003) define performance expectancy as the "degree to which an individual believes that using the system will help him to attain gains in job performance" (p. 447). In the present model, performance expectancy is defined as the degree to which a college student believes that using email and SMS as a means to receive course-related content relative to his class will result in better understanding of the material and possibly yield a better grade. Performance expectancy was measured by recording responses to the following two items:

- I believe that communication such as email and text messages would be useful for receiving course-related content.
- Receiving emails and text messages from my professor should enable me to learn from the material better.

Social Influence

Venkatesh et al. (2003) define social influence as "the degree to which an individual perceives that important others believe he or she should use the new system" (p. 451). Social influence was measured by recording responses to the following three items:

- People who influence my behavior think I should use email and text messages sent from my professor.

- People who I perceive as important to me think I should use email and text messages sent from my professor as additional learning material.
- My professor thinks that I should use email and text messages to receive course-related content.

Scheduled Message

For this study, scheduled message was measured by recording responses to the following statements:

- Knowing that my professor will utilize email and text messages to push out course-related content at pre-determined times would allow me to better use the technology.
- Knowing that my professor will utilize email and text messages to push out course-related content at random times could deter me from using the technology.
- By knowing what times an email or text message will be sent from my professor could better prepare me to utilize the course-related content.
- I like the idea of knowing when I would receive an email and text message.
- I do not care when my professor communicates with me via an email or text message.

Moderating Variables

Moderating variables, as described in the UTAUT model, have been presented and discussed in detail. Three of the same moderating variables were used for this study. They are as follows: age, gender, and experience. The moderating variables may have an effect on the amount of response variance for each of the independent variables.

*Age. A*ge is defined in this study as the approximate age, in years, of the person at the time the survey is initially administered. Previous research has shown that age has moderated performance expectancy, effort expectancy, and social influence (Venkatesh et al., 2003).

Gender. Researchers have found gender to be an important moderating factor for performance expectancy, effort expectancy, and social influence (Venkatesh et al., 2004; Venkatesh & Morris, 2000).

Experience. Experience is defined in this study as the familiarity a student has with receiving and utilizing SMS messages and email to view academic-related content. Experience was measured by recording responses to the following four items:

- I have received scheduled emails from my professors in the past.
- I have received scheduled text messages from my professors in the past.
- In the past, my professors have utilized emails to send course-related content.
- In the past, my professors have utilized text messages to send course-related content.

Further Hypothesized Relationships

In a study conducted on memory and learning, Bjork (1979) suggested that long-term memory is best achieved when distributed practice is used to disseminate the information, as opposed to mass practice. This spacing effect is demonstrated when two presentations are spaced apart as opposed to being presented very close together. The more spaced presentations result in better memory performance. In their research on using mobile phones to teach the English language in Japan, Thornton and Houser (2005) emailed vocabulary words at predetermined times of the day, spaced apart from each

other to accommodate Greene's (1989) spacing effect, resulting in better retention and acceptance rates by the students. Based on these findings, it is hypothesized:

H9–Course-related content delivered via email at pre-determined times yields higher average session duration times by the students than content pushed at random times.

H10– Course-related content delivered via SMS message at pre-determined times yields higher average session duration times by the students than content pushed at random times.

These assumptions also aid to further hypothesize:

H11 –Scheduled email yields higher unique visitor's rates than nonscheduled email communication.

H12 –Scheduled SMS yields higher unique visitor's rates than nonscheduled SMS communication.

H13 – Scheduled email yields higher click-through rates than nonscheduled email communication.

H14– Scheduled SMS yields higher click-through rates than nonscheduled SMS communication.

H15 – Scheduled email yields more returned visits to the HTML page than nonscheduled email communication.

H16 – Scheduled SMS yields more returned visits to the HTML page than nonscheduled SMS communication.

Research Design

The primary purpose of this study was to analyze multiple variables to determine which factors affect the students' acceptance of utilizing push communication as a means

for receiving course-related content. A correlational research design was used to explore the relationships among variables. In addition, the nature of correlational research allows for the prediction of certain outcomes when a predictor variable is known. However, the outcomes generally do not lend themselves to strong conclusions (Gall, Gall, & Borg, 2003). Correlational research, like causal-comparative research, is an example of associational research (Fraenkel, Wallen, & Hyun, 1993).

Sample

Subjects for this study included 301 undergraduate and graduate students enrolled in two different universities located in Wisconsin and Georgia. The participants were chosen based on their enrollment in classes taught by professors assisting me in this study.

Data Collection Method

This study utilized a self-administered survey which was distributed via SMS through D'langEmobile® and email via MailChimp®. Administering the survey via SMS and email gave the students a choice of which survey to complete based on their preference of screen size when reading SMS. This ideally allowed for a more reliable response. These survey techniques have the distinct advantage of timing, meaning that the informants could respond at any time that was convenient for them. They also allow for less bias as opposed to a survey administered in person when the researcher is present (Bourque & Fielder, 2003). The primary disadvantage with unsupervised self-administered surveys is a potential lack of depth in questioning (Bourque & Fielder, 2003).

Instruments and Measures

Data were collected by administering an online survey that was pushed to each student's cell phone number and email address. The survey was designed by using preexisting ranges from the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003) but was reworded to fit this model more appropriately by added components of the mobile wireless technology model (MWTAM) (Kim & Garrison, 2009). Responses were scaled using the pattern described by the UTAUT and MWTAM models, which use a 7-point ordered-response scale for each indication. In this study, the survey followed the agreement scales used in the UTAUT and MWTAM, with 1 representing very strongly disagree and 7 representing very strongly agree. A pilot study was initiated to test the validity and reliability of the survey.

Pilot Study

Prior to the study, a pretest survey designed using iContact® was pushed to 24 students via MailChimp and DLEM (see Appendix C). There were 24 completed surveys recorded and analyzed to measure the reliability and validity of the survey items. Reliability was measured by using Cronbach's alpha (Field, 2009). After running the results through the statistical software R, the reliability statistics for the 20 survey questions returned a value for Cronbach's Alpha at .774. (R Core Team 2015). According to Field (2009) any value greater than .7 indicates acceptable reliability. In Figure 3, all the constructs returned a value greater than .7. In addition, the validity of the survey was analyzed to be sure that the instrument was adequate in measuring the relationships outlined in this study

Survey Items

Each of the constructs are listed in Table 3 with the corresponding number of survey questions that relate to its own construct. All the constructs except Scheduled Message are components of the original UTAUT model. In addition, the Cronbach alpha value identifies the reliability test results for the pilot study. A copy of the survey, from which the factors were derived, is shown in Appendix C.

Table 3

Cronbach's alpha reliability test results for the pilot study

Construct	Number of items	Survey Questions	Cronbach's Alpha
Intention to Use	3	Q1-3	.76
Performance Expectancy	2	Q4, Q5	.77
Effort Expectancy	3	Q6-8	.76
Social Influence	3	Q9-11	.76
Scheduled Message	5	Q12, Q14, Q15	.77
Experience with Technology	4	Q17-20	.77

Procedures

The study began the semester after the IRB (Institution Review Board) was approved from Valdosta State University and the University of Wisconsin—Eau Claire, where all the student respondents were enrolled. Each of the six professors asked their

students either in person or via email to participate in this study by responding to the survey. The survey participation was optional but encouraged since it referred to receiving course-related content via email and SMS message, both of which, would later be used by each professor to deliver course-related material. Each professor received his or her own unique keyword set up by me. These unique keywords enabled the software to identify each student's response as it related to the course in which they were enrolled. Each student was asked to text their professor's keyword to a short code (58632) in order to have their official opt-in to the research. When the SMS was received by the student, the software sent an automatic reply stating "Thank you. Please reply "Y" for yes or "N" for no if do not wish to participate further in this research." Once their "yes" reply was received by the software, another reply was sent which said "Thank you. Your number has now been saved for this research and a short survey will follow." The survey was then administered via SMS and the results were recorded in iContact®. After the survey was complete, one final SMS message was generated that said "Thank you. Your survey is complete. Please reply to this number again with your email address you most frequently use to receive emails on your smart phone." This technique also enabled the software platform to systematically record the correct email address and populate the MailChimp® database for accuracy. For those students that may have experienced issues with their cell phone, an additional, follow-up survey was pushed via email from MailChimp®. This also enabled the student to view an email from the software to ensure that spam filters allowed the communication to be delivered. Any technological issues were corrected during the opt-in phase of the study.

Each of the six professors provided me with their content for each section and class, which gave specific instructions that highlighted areas they wanted the student to concentrate on when reading the content. The professors were also asked to provide the content in a text format for consistency. No videos were allowed as content (see Appendix D). They also provided the approximate dates that they wanted the content to be pushed to the students so that the material was in synch with the class schedule. Once the content and dates were organized, I then gave the professors the content calendar which provided exact days and times at which the content was to be pushed as a scheduled SMS and an email message. I asked the professors to relay the days and times to their students so that they would be aware of when the emails and SMS messages would be sent. In addition, a follow-up email and SMS message were sent to each student with an exact time and date to expect to receive the message containing the course-related content. This was necessary to measure the scheduled message component for this research. The unscheduled messages sent via SMS and email were sent Monday through Saturday but at random times ranging from 8 am to 7pm. These messages were sent unannounced on behalf of each professor. After the calendar was set, I then posted on each professor's unique web page a link that, when clicked, redirected the student to the full text document. See Appendix D for scheduled email. See Appendix E for scheduled SMS. The unscheduled email and SMS web page were purposely configured in the exact same manner. Each SMS message and email sent to the student's smart phone contained the highlighted URL link that when clicked directed the students to their professor's unique web page. There was a total of 40 such pages designed for this study. In addition, each web page was

linked to Google Analytics via a block of JavaScript code which executes tracking information. This allowed me to utilize a dashboard that monitored the unique visitors, click-through rates, and return visits (see Appendix E). These analytics were imperative to this research model in terms of measuring actual usage patterns. The HTML web pages were all securely housed on an encrypted server located on the campus of Georgia College.

As seen in Figure 19, in week one 1 of the study, each of the six professors sent a scheduled SMS message at the times of 8am, 3pm, or 7pm on Monday through Saturday. In week 2 of the study, each professor pushed a scheduled email at the times of 8am, 3pm, or 7pm on Monday through Saturday. With six teachers, the calendar worked best by utilizing 6 days of the week. By plan, each professor sent their class course-related content at the same time for each scheduled message. For example, professor 1 in the calendar schedule, pushed his/her content at 8am and professor 2 pushed his/her content at 3pm and so forth. At the beginning of week 3, each professor pushed an unscheduled SMS message on Monday through Saturday at any time ranging from 8am until 7pm. In week 4, each professor pushed an unscheduled email on Monday through Saturday at any time ranging from 8am until 7pm. The email messages were sent by using MailChimp®, an advanced email marketing and communications platform, and D'langEmobile®, a proprietary SMS message platform. In both programs, messages were placed in the queue and delivered between 8am and 7pm as shown in Figure 19.

Figure 19. The timing of scheduled and unscheduled SMS messages and emails.

	Time	Professor 1 Monday	Professor 2 Tuesday	Professor 3 Wed	Professor 4 Thursday	Professor 5 Friday	Professor 6 Saturday
Week 1	8:00 AM	☑			☑		
	3:00 PM		☑			☑	
	7:00 PM			☑			☑

Scheduled Email							
	Time	Professor 1 Monday	Professor 2 Tuesday	Professor 3 Wed	Professor 4 Thursday	Professor 5 Friday	Professor 6 Saturday
Week 2	8:00 AM	☑			☑		
	3:00 PM		☑			☑	
	7:00 PM			☑			☑

Unscheduled SMS Message							
	Time	Professor 1 M-Sat	Professor 2 M-Sat	Professor 3 M-Sat	Professor 4 M-Sat	Professor 5 M-Sat	Professor 6 M-Sat
Week 3	8:00 AM - 7:00 PM	☑	☑	☑	☑	☑	☑

Unscheduled Email							
	Time	Professor 1 M-Sat	Professor 2 M-Sat	Professor 3 M-Sat	Professor 4 M-Sat	Professor 5 M-Sat	Professor 6 M-Sat
Week 4							

	8:00 AM - 7:00 PM	☑	☑	☑	☑	☑	☑

The six professors in this study, combined, taught a total of ten different courses that required their own unique course-related content. Therefore, the total content over the four-week period comprised of twenty SMS messages and twenty emails, equating to 40 content web pages.

Data Analysis

Descriptive statistics, correlation analysis, and structural equation modeling were used to analyze the data. Descriptive statistics reflected the demographics of the students, which are gender, age and experience receiving course-content via email or SMS messages. The survey also captured the major of each student. A correlational matrix was constructed to illustrate how each construct correlated with the others and with the dependent variable (students' intention to use push communication). In addition, since Google Analytics could not identify and measure each individual student's actual usage as a comparison against his/her answers in the survey, equality of proportions (Chi-Square) was used to measure general usage characteristics for each type of push communication, specifically email and SMS.

The data analysis was conducted in two stages for this research. The first stage set out to determine reliability and validity of each construct. In the second stage, the model was tested along with the hypotheses (Sun, Wang, Guo, & Peng, 2013). In particular, the structural equation modeling tool, Partial Least Squares Path Modeling (PLS-PM), was used to examine the reliability and validity of the measure. PLS-PM allows for research-

ers to work with a variety of variables that can be measured directly or indirectly. By doing so, a representation of the relationships can be better understood (Berkout et al., 2014). The PLS-PM process most often involves the following five steps: model specification, identification, estimation, evaluation, and modification (Lomax & Schumacker, 2012). PLS-PM has been used when examining technology acceptance models because of the inclusion of several moderating factors, which were germane in this study.

PLS-PM has many advantages as a modeling technique, the primary being that it is more robust than covariance-based structural equation modeling due to fewer statistical identification issues (Sun, Wang, Guo, & Peng, 2013). In addition, PLS-PM is best suited for models with formative and reflective constructs. Since latent variables cannot be measured definitively, complex hypothesized relationships are best analyzed in PLS-PM because the techniques can model the relationships among many independent and dependent constructs simultaneously (Gefen, Straub, & Boudreau, 2000). In their UTAUT model, Venkatesh et al. (2003) used PLS-PM to simultaneously test all eight models at the three points of measurement. Furthermore, according to Chin (1998), PLS-PM, by design, is preferred when sample sizes are smaller and does not require normal distributions. Using PLS-PM does allow the researcher to use regression analysis on certain portions of a model at one time as opposed to combining all the variables in one analysis (Chin, 1998). Finally, the same objective is true of PLS-PM as is with linear regression, which is to show a high R^2 and significant t-value which would reject the null hypothesis of no effect on the variables in the model (Gefen et al., 2000).

Summary of the Methodology

A review of the model for analyzing scheduled push communication and identifying factors that contribute to a student's intention to use push communication and actual usage of a scheduled push communication was provided at the beginning of this chapter. The theoretical constructs of the research model, including the model's diagram, research questions, and hypotheses for the study, were described in detail. The surveys were administered by the researcher at the beginning of the semester and the results were analyzed using descriptive statistics, correlational analysis, and partial least squares path modeling, one of many SEM modeling techniques. Assessment of the path model and data analysis results are presented in Chapter 4.

Chapter IV

DATA ANALYSIS

In this chapter, the data analysis and results are presented. Specifically, the demographics of the individual students, reliability and validity of measures, and testing of the sixteen hypotheses along with a summary of findings are presented. The data were collected as described in Chapter 3 and then processed in response to the problems set forth in Chapter 1 of this dissertation.

Description of the Respondents

A total of 343 students were either emailed or texted a survey at the beginning of the semester. Of the 343 surveys sent, 301 (88%) were returned. The results of the demographics are displayed in Table 4. The sample comprised 170 (56.48%) males and 131 (43.52%) females. The ages of the respondents ranged from 18 to 51 years. The mean age was 20.79, with a standard deviation of 2.88.

The experience level with using the technology was broken into the two types of push communication analyzed in this study. The first was experience with using email as a means of receiving course-related content. A majority of the respondents—241 (80.0%)—reported that they have used email in the past to receive course-related content. The second medium of push communication analyzed in this study was SMS. In this case, most of the respondents, 180 (59.8%), reported that they disagreed at some level with having any experience in the past with receiving SMS messages from their professor as a means to receive course-related content.

Table 4 also describes the student's identification of their respective majors. The majority of the respondents majored in Management of Information Systems 97 (32.25%). The second highest response was Non-Business-related majors, which were 53 (17.60%). All other majors listed in the table were business related and accounted for the remaining students 151 (50%).

Table 4

Demographics of Survey Respondents

Characteristics	Frequency	Percent (%)
Gender		
Male	170	56.48
Female	131	43.52
Age		
18	21	6.98
19	44	14.62
20	78	25.91
21	94	31.22
22	45	14.95
23	9	2.99
24 and over	10	3.32
Experience with Email		
Very Strongly Agree	43	14.29
Strongly Agree	88	29.24
Agree	110	36.54
Neutral	49	16.28
Disagree	11	3.65
Strongly Disagree	0	0
Very Strongly Disagree	0	0

Experience with SMS		
Very Strongly Agree	17	5.65
Strongly Agree	16	5.32
Agree	43	14.29
Neutral	45	15.95
Disagree	85	28.24
Strongly Disagree	31	10.30
Very Strongly Disagree	64	21.26
Major		
Accounting	36	11.96
General Business	31	10.30
Management	41	13.62
Management Information Systems	97	32.23
Marketing	35	11.63
Non-Business	53	17.61
Undeclared	8	2.66

Partial Least Squares Path Modeling Results

All PLS-PM requires testing of the entire structure in a two-step process (Chin, 1988). The first test examines the sub model known as the outer model. The outer model, also known as the measurement model, examines the relationship between each latent variable and the items in the survey that help define the latent variable in measurable terms (Sanchez, G., 2013). This test determines the reliability and validity of the survey instrument and the results can be seen in Figure 20. By graphing the outer model results, all loadings, with the exception of questions 13 and 16, indicate that the survey items are positively correlated to their related latent variables, effort expectancy, performance ex-

pectancy, social influence, scheduled message, experience, and intention to use. Questions 13 and 16 returned a loading that was not deemed reliable and was therefore removed from the analyses.

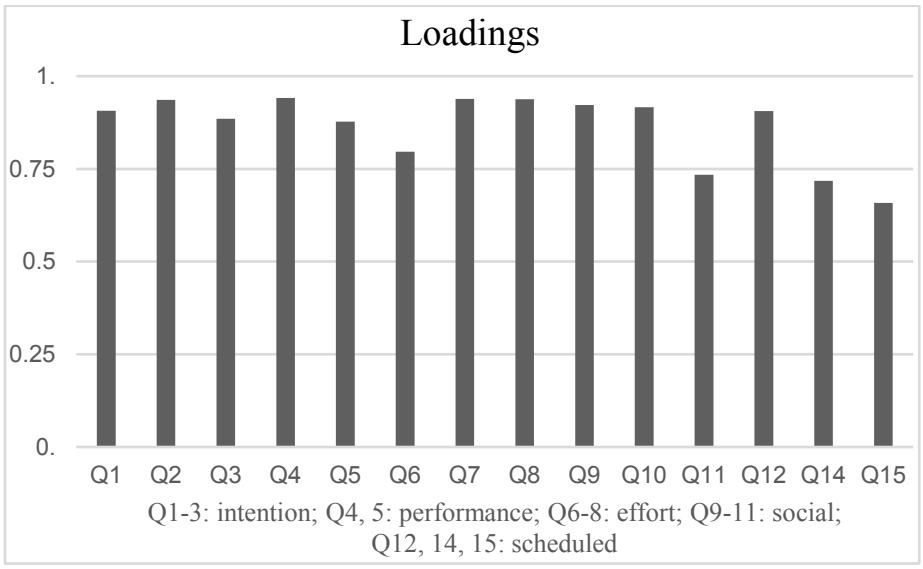

Figure 20. Graphing the outer model (R Core Team 2015)

The second test assesses the sub model known as the inner model or structural model. The inner model examines the relationships between the independent latent variables and the dependent latent variable. Once the inner and outer sub models are identified, the reliability and validity of the survey instrument is examined. It is only after this step that the final inner model, or structural model, and its corresponding strength of relationships between the independent and dependent variables can be analyzed.

Internal Reliability and Validity of the Measures

In any set of data that is collected there are certain amounts of error that present themselves. For any measure to be considered valid, it must first be deemed reliable (Marshall, 2006). Reliability is a statistical measure that is commonly used to compare survey items in an effort to be sure that the survey instrument's data are reproducible (Litwin & Fink, 1995). There are multiple techniques by which to test for reliability.

Since, by their nature, latent variables cannot be directly measured, they must be indirectly measured by other types of observable variables. These variables are known as survey items, or indicators. In Table 5, the indicators are represented by Number of Items. For example, in Table 5, there were three questions in the survey that corresponded to intention to use. Thus, there were three indicators for intention to use.

When using PLS-PM it is important to identify the indicators' nature as reflective or formative. In this model, all latent variables were identified as reflective in nature. This means that it is assumed that each of the latent variables can be measured indirectly through their consequences, and reflect certain characteristics captured by the survey questions. Therefore, if a reflective indicator were to change, either by an increase or a decrease, then the constructs associated with them will also change in the identical direction. Because of this proportional relationship, the indicators are closely related in such a way that they are considered to be in one dimensional space (Sanchez, 2013). When these conditions exist, it is necessary to check for unidimensionality. This assessment for reliability of the survey's internal consistency is best examined with the following three fundamental measurements in PLS-PM: Cronbach's alpha, Dillon-Goldstein's rho, and the first eigenvalue of the indicators. Cronbach's alpha coefficient typically ranges from 0 to 1 but there is actually no lower limit to the coefficient. The closer Cronbach's alpha is to 1, the greater the internal consistency of the survey items. (Gliem & Gliem, 2003). Dillion-Goldstein's rho is another metric used to measure the unidimensionality of a reflective indicator. As with Cronbach's alpha, a value of 0.7 or greater is considered unidimensional. This index is considered an even better indicator than Cronbach's alpha because by its calculation in the PLS-PM package in R, it considers the extent to which the

latent variable explains its block of indicators (Sanchez, 2013). The third and final metric used to test for unidimensionality involves an eigen-analysis of the correlation matrix of each set of indicators. Simply stated, the first eigenvalue should be larger than 1, whereas the second value should be smaller than 1. When this occurs, the variables are considered to be unidimensional and deemed reliable.

Table 5 represents each of the constructs in this model and 18 of the survey items along with their corresponding Cronbach's alpha., Dillion-Goldstein's rho, and Eigen-value. All the coefficients in the Table 5 were above the acceptable values for each met-ric. After testing the internal consistency of all questions from the pilot study, each of the corresponding constructs passed the test for unidimensionality and therefore was deemed reliable. Questions 13 and 16 produced data that were inconsistent with other responses. While these questions were included in the survey, they were removed from analysis due to these inconsistencies.

Table 5

Cronbach's alpha, DG. rho, and eigenvalue 1st and 2nd

Construct	Number of Items	Cronbach's Alpha	DG. rho	Eig.1st	Eig.2nd
Intention to Use	3	.90	.93	2.48	.33
Performance Expectancy	2	.80	.91	1.66	.34
Effort Expec-tancy	3	.87	.92	2.40	.48
Social Influ-ence	3	.82	.90	2.23	.61
Scheduled	3	.72	.85	1.94	.70

Experience	4	.77	----	----	----

Validity

In PLS Path Modeling, there are three basic requirements to ensure the outer models are considered reliable and valid. The first requirement is to measure the unidimensionality of the indicators. This was performed and represented in Table 5. The second requirement is to check that the indicators are explained well enough by the latent variable, by using the average variance extracted (AVE), as seen in Table 6. Table 6 represents the AVE values for each construct in the inner model. The commonly acceptable threshold for AVE values is 0.5. This means that all AVE values of 0.5 or greater demonstrate that the latent variable in the model will, on average, explain over 50% of the variance of its selected indicators (Henseler et al., 2009). All AVE values in the present study are above 0.5, which satisfies the second requirement for ensuring validity of the inner model.

Table 6

Average variance extracted (AVE)

Construct	Number of items	AVE
Intention to Use	3	.83
Performance Expectancy	2	.83
Effort Expectancy	3	.80
Social Influence	3	.74

Scheduled Message	3	.60

The third requirement is to satisfy validity of the outer model by examining the loadings and commonalities. The loadings are the correlations between the latent variable and its indicators. The commonalities are represented by squaring the correlations and measure part of the variance between a latent variable and its indicator. All loadings in Table 7 are greater than .7 and considered acceptable. In addition, all the commonality values are above 0.49 and are considered acceptable. Since a loading of .7 squared is acceptable, 50% of the variability in all the indicators is captured by their constructs.

Table 7

Loadings and Commonalities

Construct	Number of Items	Loading	Commonality
Intention to Use	3	.91	.83
Performance Expectancy	2	.91	.83
Effort Expectancy	3	.89	.80
Social Influence	3	.86	.74
Scheduled	3	.76	.59

After examining the indicators of the latent variables, a cross loading analysis is necessary to compare the other indicators with each of the latent variables to be sure there

is consistency throughout the outer model. This determines if any survey questions are more or less related to an identified construct, as opposed to other constructs. A bar chart is illustrated in Figure 21 to represent the cross-loading results. All cross-loadings greater than 0.7 indicate acceptable indicators. Only question 15 was below this threshold with a value of 0.66 which is only slightly below the acceptable range. Therefore, the question was deemed to be within a reasonable range and included in further analyses.

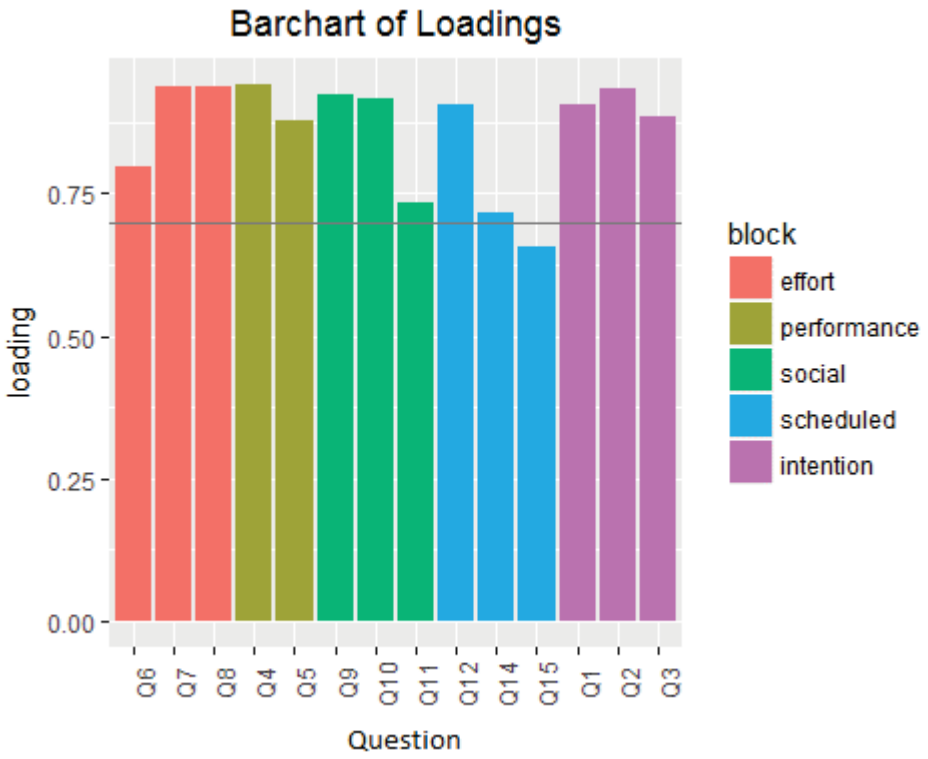

Figure 21. Bar chart of loadings

The last component of testing the validity of the outer model requires comparing the average variance extracted value to the construct correlations. Table 8 identifies each AVE value's square root and compares that value with the construct.

Table 8

Validity: Average variance extracted and construct correlations

Construct	1	2	3	4	5
1. Intention to Use	**.91**				
2. Performance Expectancy	.64	**.91**			
3. Effort Expectancy	.67	.66	**.89**		
4. Social Influence	.43	.57	.47	**.86**	
5.Scheduled Message	.33	.51	.53	.49	**.77**

Note: Square-root of AVE on the diagonal (in bold type)

Table 8 shows that all square roots of the AVE value are greater than the correlations of the construct in the model. This indicates a strong validity for each of the constructs. Utilizing the three basic measures and corresponding tests mentioned above, all the rules of reliability and validity were satisfied for the survey instrument.

The Research Model Test

Once the measurement model commonly called the outer model in PLS-PM analysis was tested and demonstrated to be both valid and reliable via the unidimensionality, AVE, loading and commonalities tests, the inner model or structural model was ready to be analyzed. First, in order to test the research model's hypotheses, a correlation matrix was used to measure the influence each construct had on the dependent variable, intention to use push communication.

The four research questions in this study are as follows:

(1) What factors affect the student's intention to use push communication as a means to receive course-related content?

(2) Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled message on a student's intention to use push communication as a means to receive course-related content?

(3) Does scheduling the delivery of emails and SMS messages at predetermined times in the day influence the student's actual usage of course-related content?

(4) Does scheduling the delivery of emails and SMS messages at pre-determined times in the day influence the student's use of course-related content regarding unique visitors, click-through rates, and returned visits?

After identifying the values in the correlation matrix, the structural model was tested using PLS-PM, a structural equation modeling (SEM) technique often used in technology acceptance models whereby complicated variable relationships can be systematically analyzed simultaneously (Gefen et al., 2000) The first two research questions were answered using hypotheses 1 through 8. Research question 3 and 4 were answered by multiple tests performed in the statistical software R, an open source programming language and software environment used to support statistical computing (R Core Team 2015). The Chi-Square tests were used to evaluate the students' usage patterns as measured in Google Analytics. Table 9 represents the Hypotheses presented in Chapter 3.

Table 9

Hypotheses

Hypothesis	Description

H1	Effort expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.
H2	Performance expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.
H3	Social influence has a significant impact on a student's intention to use push communication as a means to receive course-related content.
H4	Scheduled message has a significant impact on a student's intention to use push communication as a means to receive course-related content.
H5	The effect of effort expectancy on intention to use push communication to receive course-related content is moderated by gender, age, and experience.

H6	The effect of performance expectancy on intention to use push communication to receive course-related content is moderated by gender, age, and experience.
H7	The effect of social influence on intention to use push communication to receive course-related content is moderated by gender, age, and experience.
H8	The effect of a scheduled message on intention to use push communication to receive course-related content is moderated by gender, age, and experience.
H9	Course-related content delivered via email at pre-determined times yields higher average session duration times by the students than content pushed at random times.
H10	Course-related content delivered via SMS message at pre-determined times yields higher average session duration times by the students than content pushed at random times.

H11	Scheduled email yields higher unique visitors rates than nonscheduled email communication.
H12	Scheduled SMS messages yield higher unique visitors rates than nonscheduled SMS message communication.
H13	Scheduled email yields higher click-through rates than nonscheduled email communication.
H14	Scheduled SMS messages yield higher click-through rates than nonscheduled SMS message communication.
H15	Scheduled email yields more returned visits to the HTML page than nonscheduled email communication.
H16	Scheduled SMS messages yield more returned visits to the HTML page than nonscheduled SMS message communication.

Correlation Matrix

A correlation matrix is shown in Table 10 and identifies the correlation coefficients between the constructs introduced in this model. The matrix also identifies the mean and standard deviation for each variable. Using a two-tailed test level, all of the correlations were significant at the 0.01 value.

Table 10

Correlation Matrix

Variables	Mean	Standard Deviation	1	2	3	4	5
Intention to Use	6.12	1.03	1.00				
Performance Expectancy	5.63	1.09	.64**	1.00			
Effort Expectancy	6.11	.94	.67**	.66**	1.00		
Social Influence	4.99	1.04	.43**	.57**	.47**	1.00	
Scheduled	5.54	.88	.33**	.51**	.43**	.49**	1.00

*** p < 0.01 N = 301*

Correlation Results of the Independent Variables

The results of all four independent variables listed in Table 10 identify a correlation of each with the dependent variable. In addition, the results were consistent with the findings in the original UTAUT model, which identified the independent variables of intention, performance, effort, and social influence to be strongly correlated with intention to use. In this correlation matrix, performance 0.64, effort 0.67, social 0.43 are correlated to intention at the 0.01 level.

The additional independent variable introduced in this model, scheduled push communication 0.33, which is defined as email and SMS, was also correlated to intention at the 0.01 level.

Coefficient of Determination

Once the outer model has been tested for its level of quality, the inner model or structural model can be assessed for its own quality. The following three metrics were performed to further examine the quality of the inner model: calculating the coefficient of determination, calculating the redundancy index, and finally a goodness of fit test. The coefficient of determination is represented by R^2. An R^2 value of .67 or greater is considered substantial, a value of .19 or less is considered weak. All values in the middle are considered moderate (Chin, 1998). In this model, intention is the only variable whose behavior is determined by functions within the model. Intention is therefore only represented by a single R^2 value. PLS-PM in R demonstrated that the dependent variable, Intention to use push communication as a means to receive course-related content, indicated $R^2 = .59$, which is a moderate to substantial value. This means that 59% of the variance in the dependent variable, intention to use push communication as a means to receive course-related content, can be explained by the independent variables effort expectancy, performance expectancy, social influence, and scheduled message. In addition to the coefficient of determination value, a redundancy test was performed to measure the percent of the variance of indicators on the endogenous latent dependent variable, intention, as it related to the independent latent variables. The redundancy value of 0.49 indicates a relatively moderate ability to predict (Sanchez, 2013). The third metric to test quality of the inner model and outer model is to measure the goodness of fit. This value

measures the overall predictive power of both the inner and outer model. The value of 0.67 was calculated in PLS-PM in R. This means that this model has 67% prediction power. A value of 0.7 or greater is considered a good value. A value of 0.67 is a modest predictive value.

Hypotheses Testing

The inner model was tested by utilizing partial least squares modeling techniques with PLS-PM package in R (R Core Team, 2015). In addition, R studio programming language enabled the software to run many of the models (R Studio Team 2016).

Distributional assumptions do not exist in PLS-PM; therefore, significance levels for the parameter estimates (based on normal theory) are not suitable (Sanchez, 2013). As PLS-PM is not based on a given distribution, the variability of parameters was tested using bootstrap resampling. In this analysis, bootstrapping was utilized with 500 resamples to obtain information about the variability of the parameters, giving a total effect with a confidence interval of 95%, which is reflected in the values between the percentiles 0.025 and 0.975 (see Tables 11 and 12). Hence, if the lower value (0.025) is negative and the upper value (0.975) is positive, then the interval value contains a zero in between the upper and lower bounds and therefore means that the beta value is not significantly different from zero. When this occurs, these coefficients are not considered to be suitable at the 5% confidence level. In addition, when using PLS analysis and bootstrapping techniques, *t*-values greater than 1.96 are considered significant at the .05 level ($p < .05$). *T*-values of 2.58 are significant at the .01 level ($p < .01$) and t-values of 3.34 are significant at the .001 level ($p < .001$) (Fraenkel & Wallen, 2009)

The first research question was answered by using the first four hypotheses. The moderating variables gender, age, and experience were introduced in question 2. Each variable was hypothesized to moderate the four independent variables (effort, performance, social influence, and scheduled message) on the dependent variable, intention to use push communication as a means to receive course-related content. The second question was answered by hypotheses 5, 6, 7, and 8. Questions 3 and 4 answered the remaining 8 hypotheses by extracting Google Analytics data to assist in measuring certain attributes that demonstrate usage habits.

Research Question 1 is: What factors affect the students' intention to use push communication as a means to receive course-related content? The answer to research question 1 is made by the following four hypotheses and the results of testing each one.

H1 – Effort expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.

H2 – Performance expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.

H3 – Social influence (SN) has a significant impact on a student's intention to use push communication as a means to receive course-related content.

H4 – Scheduled message has a significant impact on a student's intention to use push communication as a means to receive course-related content.

Table 11

Results of testing hypotheses 1, 2, 3, and 4

	Original sample (O)	Sample Mean (M)	Standard error (STERR)	t-stat (O/STERR)	Perc. .025	Perc. 0.975

EE → SI	0.51	0.51	0.07	7.29	0.37	0.64
PE → SI	0.28	0.29	0.08	3.50	0.14	0.43
SN → SI	0.06	0.05	0.06	1.00	-0.06	0.19
SM →SI	-0.01	0.00	0.06	.167	-0.12	0.11

Table 11 presents the results of testing the first four hypotheses in this study. Due to incompleteness of returned surveys, the total number of respondents deemed valid during PLS-PM analysis was 281. Thus, the total number of respondents the data in tables 11 and 12 are based off of is 281. Hypothesis 1 is supported, demonstrating that effort expectancy has a significant effect on a student's intention to use push communication as a means to receive course-related content (H1: $\beta = 0.51$, $t = 7.29$) with a 95% bootstrap confidence interval between .037 and 0.64).

Hypothesis 2 is also supported, demonstrating that performance expectancy had a significant effect on a student's intention to use push communication as a means to receive course-related content (H2: $\beta = 0.28$, $t = 3.5$) with the 95% bootstrap confidence interval between 0.14 and .43.

Hypothesis 3 is not supported. Social influence (SN) did not have a significant effect on a student's intention to use push communication as a means to receive course-related content (H3: $\beta = 0.06$, $t = 1$) with the 95% bootstrap confidence interval between -0.06 and 0.19).

Hypothesis 4 is not supported. Scheduled message did not have a significant effect on a student's intention to use push communication as a means to receive course-related content. (H4: β = -0.01, *t* = 1.67) with the 95% bootstrap confidence interval between -0.12 and 0.11). As with all PLS-PM analyses, the relationships can be seen graphically in Figure 22; they are also visually identified by the blue and red arrows representing positive and negative effects respectively.

Figure 22. Plotting the inner model

Research question 2 is: Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled message on a student's intention to use push communication as a means to receive course-related content?

Table 12

Results of testing hypotheses 5-8: Path coefficients with moderating variables

	Original sample (O)	Sample Mean (M)	Std. Error (STERR)	t-stat (O/STERR)	Perc. .025	Perc. 0.975
Effort Age=>Intention	0.06	-0.37	0.90	.067	-2.47	1.03
Effort Exp.=>Intention	0.01	-0.11	0.57	.017	-1.28	0.89
Effort Gender=>Intention	-0.15	-0.30	0.48	.313	-1.24	0.58
Performance Age=>Intention	-0.51	-0.12	1.67	.305	-3.67	2.79
Performance Exp.=>Intention	-0.31	-0.27	0.60	.5147	-1.28	1.12
Performance Gender=>Intention	0.29	0.27	0.39	.744	-0.54	1.04
Social Age=>Intention	0.18	0.16	0.75	.24	-1.27	1.64
Social Exp.=>Intention	0.71	0.43	0.54	1.31	-0.67	1.45
Social Gender=>Intention	-0.19	-0.10	0.24	.792	-0.59	0.36

Scheduled Age=>Intention	-0.04	0.09	0.48	.083	-0.92	1.34
Scheduled Exp.=>Intention	-0.64	-0.26	0.67	.955	-1.47	1.27
Scheduled Gender=>Intention	0.10	0.12	0.27	.37	-0.37	0.66
Gender=>Intention	-0.03	0.05	0.33	.091	-0.56	0.74
Experience=>Intention	-0.15	-0.06	0.17	.882	-0.39	0.26
Age=>Intention	0.16	0.11	0.60	.267	-1.05	1.54

In Table 12, neither gender, experience, nor age were shown to moderate any of the effects on the dependent variable (intention to use push communication as a means to receive course-related content), since all of the t-values were below 1.96 and each confidence interval contained a zero value in between the lower and upper bounds. Therefore, Hypotheses 5, 6, 7, and 8 were not supported. For the same reasons, gender, age, and experience by themselves did not have significant effects on intention to use push communication as a means to receive course-related content.

Research question 3 is: Does scheduling the delivery of emails and SMS messages at predetermined times in the day influence the student's actual usage of course-related content as measured by average session duration times?

Research question 3 is answered by the following hypotheses:

H9–Course-related content delivered via email at pre-determined times yields higher average session duration times by the students than content pushed at random times.

H10– Course-related content delivered via SMS message at pre-determined times yields higher average session duration times by the students than content pushed at random times.

For these hypotheses to be analyzed in terms of average session duration times, Google Analytics was embedded in the HTML pages to capture the student's actual usage patterns for the all push communication sent. Usage metrics in Google Analytics can be determined by many ways; but for purposes of this research, click through rates, average session durations, return visits and unique visits were specifically identified. To test these two hypotheses, the mean and standard deviation was calculated to measure how long a student spent on the HTML page when the message was pushed scheduled versus unscheduled. Then, a Welch's *t*-test was generated in R since the variances of the two means were not equal. This was performed to determine if there were any significant differences in average session durations between a scheduled message and unscheduled message. Hypotheses 9 and 10 were analyzed in the same manner and the results are recorded in Tables 13 and 14 respectively. Based on the Welch's *t*-test values listed in each table, hypothesis 9 is *not supported* ($p > 0.05$), whereas hypothesis 10 is *supported* ($p < .01$). There were 103 scheduled email and 78 nonscheduled email respondents recorded by Google Analytics to measure average session duration times. The total recorded SMS respondents were 103 scheduled and 109 nonscheduled.

Table 13

Results of testing hypothesis 9 (scheduled email yields higher average duration times than nonscheduled email)

Average Session Duration	Respondents	Mean (secs)	Std. dev. (secs)	t-test	Std. Error Difference	P-value	df	Mean difference	lower	upper	Cohen's effect size
Scheduled Email	103	58.91	276.076	1.94	27.324	0.055	103.83	53.077	-1.12	107.26	0.254
Non-scheduled email	78	5.83	22.78								

N (number of emails sent) = 343

Table 14

Results of testing hypothesis 10 (scheduled SMS yields higher average duration times than nonscheduled SMS)

Average session duration	Respondents	Mean (secs)	Std. dev. (secs)	t-test	Std. Error Difference	P-value	df	Mean difference	lower	upper	Cohen's effect size
Scheduled SMS	103	52.89	176.185	2.88	17.412	0.005	103.22	50.11	15.58	84.64	0.407
Non-scheduled SMS	109	2.79	13.98								

N (number of SMS sent) = 343

Research question 4 pertains to actual usage of the email or SMS message by the student. Both push communication types contain the link to the HTML page. When this

link is clicked, Goggle Analytics begins to record the student's activities. Unique visits, click-through rates, and returned visits were analyzed to measure usage patterns by the students.

Research question 4 is: Does scheduling the delivery of emails and SMS messages at predetermined times in the day influence the student's use of course-related content regarding unique visitors, click-through rates, and returned visits?

As the variables unique visitors, click-through rates, and returned visits are categorical from a single random sampling of the population, the following six hypotheses were all tested in R by using the Chi Square (X^2) Goodness of Fit Test (McHugh, 2013). By looking at the proportions of the sample, each hypothesis can be examined.

H11 –Scheduled email yields higher unique visitor's rates than nonscheduled email communication.

H12 – Scheduled SMS messages yields higher unique visitors rates than nonscheduled SMS message communication.

H13– Scheduled email yields higher click-through rates than nonscheduled email communication.

H14– Scheduled SMS messages yields higher click-through rates than nonscheduled SMS message communication.

H15–Scheduled email yields more returned visits to the HTML page than nonscheduled email communication.

H16– Scheduled SMS messages yields more returned visits to the HTML page than nonscheduled SMS message communication.

The following tables address each hypothesis to identify any significant differences between scheduled and unscheduled push communication for the students' usage patterns in terms of their direct contact with the HTML page.

Table 15

Results of testing hypothesis 11 (scheduled email yields higher unique visitors than non-scheduled email)

	Number of unique visitors	X-squared	df	p-value	proportion	Cohen's effect size
		.452	1	0.5015		
Scheduled email	104				.303	0.053
Nonsched-uled email	96				.279	

N = 343

Table 15 reflects the results found by using a Chi-Square Goodness of Fit Test to measure the proportions of students that accessed the HTML page once they were sent a scheduled email versus a non-scheduled email. Based on the findings, hypothesis 11 is *not supported* ($p > .05$).

Table 16

Results of testing hypothesis 12 (scheduled SMS yields higher unique visitors than non-scheduled SMS)

	Number of unique visitors	X-squared	df	p-value	proportion	Cohen's effect ize
Sched-uled SMS	227	116.82	1	0.000	.661	0.851
Non-sched-uled SMS	86		1		.250	

N = 343

Table 16 reflects the results found by using a Chi-Square Goodness of Fit Test to measure the proportions of students that accessed the HTML page once they were sent a scheduled SMS message versus a non-scheduled SMS message. Based on the findings, hypothesis 12 is *supported* ($p < .05$).

Table 17

Results of testing hypothesis 13 (scheduled email yields higher click-through rates than nonscheduled email)

	Click-through	X-squared	df	p-value	proportion	Cohen's effect size
		16.886	1	0.000		
Scheduled email	30				.087	0.337
Nonsched-uled email	6				.017	

N = 343

Table 17 reflects the results found by using a Chi-Square Goodness of Fit Test to measure the proportions of students that accessed the HTML page once they were sent a scheduled email message versus a non-scheduled email, and then measured the click-through rate to determine how many students clicked additional links on the page to access further course-related content. Based on the findings, hypothesis 13 is *supported (*$p < .05$).

Table 18

Results of testing hypothesis 14 (scheduled SMS yields higher click-through rates than nonscheduled SMS)

	Click-through	X-squared	df	p-value	proportion	Cohen's effect size
		77.807	1	0.000		
Scheduled SMS	100				.291	0.732
Nonscheduled SMS	14				.041	

N = 343

Table 18 reflects the results found by using a Chi-Square Goodness of Fit Test to measure the proportions of students that accessed the HTML page once they were sent a scheduled SMS message versus a non-scheduled SMS message, and then measured the click-through rate to determine how many students clicked additional links on the page to

access further course-related content. Based on the findings, hypothesis 14 is *supported* ($p < .05$).

Table 19

Results of Testing Hypothesis 15 (scheduled email yields more returned visits than non-scheduled email)

	Returned visits	X-squared	df	p-value	proportion	Cohen's effect size
		50.03	1	0.000		
Scheduled email	185				.539	0.547
Nonsched-uled email	94				.274	

N=343

Table 19 reflects the results found by using a Chi-Square Goodness of Fit Test to measure the proportions of students that accessed the HTML page once they were sent a scheduled email message versus a non-scheduled email message, and then measured return visits to determine how many students returned to the HTML page to access the course-related content. Based on the findings, hypothesis 15 is *supported* ($p < .05$).

Table 20

Results of Testing Hypothesis 16 (scheduled SMS yields more returned visits than non-scheduled).

	Returned visits	X-squared	df	p-value	proportion	Cohen's effect size
		82.04	1	0.000		

Scheduled SMS	130				.379	0.707
Nonsched-uled SMS	248				.723	

N=343

Table 20 reflects the results found by using a Chi-Square Goodness of Fit Test to measure the proportions of students that accessed the HTML page once they were sent a scheduled SMS message versus a non-scheduled SMS message, and then measured return visits to determine how many students returned to the HTML page to access the course-related content. Since scheduled SMS did not produced more returned visits than non-scheduled SMS, hypothesis 16 is *not supported* ($p < .05$).

Summary of Data Analysis and Results

The data analysis was conducted in two stages for this research. The first stage set out to determine if the outer model or measurement model was reliable and valid. The second stage of the research analyzed the inner model which contained 4 research questions and their corresponding hypotheses. By utilizing Partial Least Squares Path Modeling (PLS-PM), Correlation analysis, and Chi Square Tests, the research questions were answered by supporting or not supporting each of the hypotheses. The summary of the results is presented in Table 21.

Table 21

Study hypotheses results

Hypothesis	Description	Results

H1	Effort expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content	Supported
H2	Performance expectancy has a significant impact on a student's intention to use push communication as a means to receive course-related content.	Supported
H3	Social influence has a significant impact on a student's intention to use push communication as a means to receive course-related content.	Not supported
H4	Scheduled message has a significant impact on a student's intention to use push communication as a means to receive course-related content.	Not supported
H5	The effect of effort expectancy on intention to use push communication to receive course-related content is moderated by gender, age, and experience.	Not supported
H6	The effect of performance expectancy on intention to use push communication to receive course-related content is moderated by gender, age, and experience.	Not supported
H7	The effect of social influence on intention to use push communication to receive course-related content is moderated by gender, age, and experience.	Not supported
H8	The effect of a scheduled message on intention to use push communication to receive course-related content is moderated by gender, age, and experience.	Not supported

H9	Course-related content delivered via email at pre-determined times yields higher average session duration times by the students than content pushed at random times.	Not supported
H10	Course-related content delivered via SMS message at pre-determined times yields higher average session duration times by the students than content pushed at random times.	Supported
H11	Scheduled email yields higher unique visitors' rates than nonscheduled email communication.	Not supported
H12	Scheduled SMS messages yield higher unique visitors' rates than nonscheduled SMS message communication.	Supported
H13	Scheduled email yields higher click-through rates than nonscheduled email communication.	Supported
H14	Scheduled SMS messages yield higher click-through rates than nonscheduled SMS message communication.	Supported
H15	Scheduled email yields more returned visits to the HTML page than nonscheduled email communication.	Supported
H16	Scheduled SMS messages yield more returned visits to the HTML page than nonscheduled SMS message communication.	Not supported

Chapter V

CONCLUSION

This chapter presents a summary of the study, followed by a discussion of the findings. This chapter also presents contributions to the field, limitations to the study, and suggestions for future research.

Summary of the Study

The purpose of this study was to examine the factors that influence college students' acceptance of push communication technology as a means of receiving course-related content. The preexisting UTAUT model was modified to include scheduled messages as an independent variable. There was a total of four research questions in this study that incorporated a total of sixteen hypotheses, each designed to measure the acceptance of push communication as a means to receive course-related content. These questions and their hypotheses are examined in the following section, Discussion of the Findings.

Of importance to this study, the hypothesis that scheduled message had a significant impact on a student's intention to use push communication as a means to receive course-related content was not supported.

Discussion of the Findings

Research Question 1

What factors affect the students' intention to use push communication as a means to receive course-related content?

In the UTAUT model, performance expectancy, effort expectancy, social influence, and facilitating conditions are all independent variables that are used to measure an individual's intention to use—and, ultimately, the actual use of—a certain technology. Venkatesh et al. (2003) observed that the UTAUT model provides a tool to "assess the likelihood of success for new technology introductions" (p. 426). Because of this, it is only natural that the model is applied to comparatively new and widespread technologies (such as email and SMS messaging). At the time of this research, there were no known models that specifically analyzed SMS messages and emails that contained course-related content when the independent variable (scheduled message) was used to measure the impact on intention to use.

There were four hypotheses associated with research question one. The first was that effort expectancy would have a significant impact on a student's intention to use push communication as a means to receive course-related content, which was supported. This study was partly influenced by cognitivist learning theory. Cognitive load theory analyzes the interaction between the learner and the task and how this relates to the cognitive load (Paas & Van Merrienboer, 1994). The cognitive load relates to the working memory resources necessary to complete a task or activity by a learner who has some level of prior knowledge of the material (Kalyuga & Liu, 2015). As effort expectancy is the perceived ease associated with using the system in question, my findings suggest that push communication was perceived to lessen the intensity of the task, and thus the task was less stressful. This would agree with the assessment aspect of the cognitive load model, in which mental effort plays a key role (Kalyuga & Liu, 2015). If a student perceived that a task would require less mental effort if they accepted push communication,

it follows that they would accept such communication. My study suggests that ease of use is correlated with acceptance of push communication.

It is also important to remember that, according to cognitive theory, the human mind has its limitations as to the amount of information that can be processed during a single learning session (Bigge, 1982). The awareness of such limitations relates to both hypothesis one and two, the latter being that performance expectancy would have a significant impact on a student's intention to use push communication as a means to receive course-related content. Performance expectancy relates to the students' perception that they will attain gains by using the technology. That hypothesis two was supported suggests that students are operating in response to their limitations. The theory of reasoned action states that an individual's beliefs and evaluations inform their attitude toward a behavior, which in turn influences their behavioral intention, which affects the actual behavior (Ajzen & Fishbein, 1980). In their model, Ajzen and Fishbein define attitude toward behavior as "an individual's positive or negative feeling about performing the target behavior" (p.17). It is logical, then, that students who had a positive response to the push communication—that is, they believed that they would attain gains by using it—would choose to accept it.

That hypothesis three (social influence has a significant impact on a student's intention to use push communication as a means to receive course-related content) was not supported is in concord with the theory of reasoned behavior. While the theory of reasoned behavior does consider social influence to have a role in determining the actual behavior of an individual, it is articulated as "the person's perception that most people who are important to him or her think he or she should *not* perform the behavior in question"

(Fishbein & Ajzen, 1975, p. 17, emphasis added). This means that the theory of reasoned behavior does not look at whether or not people important to the student were supportive of accepting push communication. It is unlikely that any student involved in this study was pressured by peers to actively avoid accepting the pushed content, rendering social influence inconsequential.

This is what hypothesis one and two show: The decision, on the part of the student, to accept push communication is based on the interaction between the task and the learner (i.e., the student). Social matters would be extraneous to this relationship, and thus would not be expected to play a significant role during the learners' navigation of their task. As shown by the survey, this extended to the influence of professors—students answered the question "my professor thinks that I should use email and SMS messages to receive course-related content" in the negative range of the Likert scale.

Of most importance to this study was hypothesis four, which stated that scheduled message would have a significant impact on a student's intention to use push communication as a means to receive course-related content. This was not supported. As with the findings for research question two, the fact that scheduled message did not have a significant impact on a student's intention to use push communication as a means to receive course-related content suggests that the media used to push content (email and SMS) follow the eight principles of Universal Instructional Design (UID). These principles are in place so that educators can make educational materials as accessible and appropriate as possible to the widest range of students (Connell et al., 1997). Of importance to hypothesis four is the second principle, which is flexibility. Flexibility means that content should

accommodate any number of "individuals' abilities, preferences, schedules, levels of connectivity, and choices in methods of use" (Elias, 2011, p. 150). In this study, the pushed content was rendered accessible because of its format, regardless of whether or not it was scheduled.

Research Question 2

Do gender, experience, and age moderate the effects of effort expectancy, performance expectancy, social influence, and scheduled message on a student's intention to use push communication as a means to receive course-related content?

There were four hypotheses associated with research question two. Hypotheses five through eight stated, respectively, that the effect of effort expectancy, performance expectancy, social influence, or scheduled message on intention to use push communication to receive course-related content would be moderated by gender, experience, or age. None of the four were supported; neither social influence, gender, experience, nor age had any significant effect on a student's intention to use push communication.

Gordon Pask's Conversational Theory perhaps best addresses this outcome. Conversational theory states that learning can be successful if two-way communication is present (Scott, 2001). Push communication in the form of email and SMS is a form of two-way communication (Sorensen, 2011). Scott's (2001) description of a conversation requires just two parties, the teacher and the learner, both of which exchange how and why questions. This, in turn, informs the performance of tasks. This relationship is maintained with push communication: There are two parties (the teacher and the learners, or, in this

case, the students), between which is an exchange of information. As neither gender, experience, nor age would affect the two-way model of the push communication, there is little reason why they would affect a student's intention to use the push communication.

Furthermore, there was homogeneity with respect to age (93.7 percent of the respondents were between the ages of 18 and 22), and a fairly even divide between males and females (56.1 and 43.2 percent, respectively). The homogeneity of age largely renders age, as a variable, of little consequence. Even if experience did play a role, it would be expected that students of the age spectrum of 18-22 would have a similar level of experience with SMS and email.

The outcomes of hypotheses five through eight also suggest that material pushed through email and SMS follow the eight principles of Universal Instructional Design. The first principle, equitable use, states that content should be all-inclusive for people of all abilities and locations. Here, abilities would relate to experience. Both our forms of pushed content (email and SMS) fit the criteria for UID inclusive learning: They are online, delivered in the simplest possible format, each representing a different format, and, finally, presenting a continual effort to make contact and stay involved with the student's progress. Moreover, the material was pushed through email and SMS, both of which may be accessed via near-universally owned or available technologies (computers and cell phones). Since our study so closely adhered to these principles, it would be expected that neither gender, experience, nor age would have a significant moderating effect on the independent variables.

Research Question 3

Does scheduling the delivery of emails and SMS messages at pre-determined times in the day influence the student's actual usage of course-related content as measured by average session duration times?

The hypotheses related to research question three were measured by Google Analytics, rather than the survey; the intention was to study the students' actual usage habits. Hypothesis nine stated that course-related content delivered via email at pre-determined times would yield higher average session duration times by the students than content pushed at random times. Hypothesis ten was formatted the same, but replaced the delivery medium (email) with SMS.

Hypothesis nine not being supported may lend itself to common issues that have plagued email usage in general. These issues become more glaring when compare to SMS when used to push communication containing course-related content. Unlike SMS, which is an immediate and direct method of communication, emails are retrieved through mail servers and email client software, which can drastically inhibit the delivery time, rendering the scheduling aspect irrelevant. Further, there is the problem of email overload. Email overload is described by Whittaker and Sidner (1996) as a "major problem" which interferes with users' abilities in "reading and replying to email in a timely manner" due to "backlogs of unanswered email, and in finding information in email systems" (p. 277). This results in lost information and "reduced responsiveness" (p. 277). In a survey performed by Whittaker and Sidner, many respondents described this problem as resulting from the amount of email they receive as well as how to organize it (p. 278).

Hypothesis ten, which stated that course-related content delivered via SMS at predetermined times yields higher average session duration times by the students than content pushed at random times, was supported. This study developed three key times in the day that paralleled optimal times businesses utilize both email and SMS campaigns to garner the most return on investment (ROI). The times of 8 am, 3 pm, and 7 pm were used to push all scheduled communication. The nonscheduled push communication times were generated randomly between the hours of 8 am and 7 pm, via the proprietary software D'langEmobile®. Based on the results for hypothesis ten, students responded most favorably to the scheduled SMS as supported by their average session duration times. Sessions accessed from a scheduled SMS message had duration times with a mean difference of fifty seconds longer than those accessed from a nonscheduled SMS.

Of note in this section is the stark difference in the technology of delivering a scheduled email vs scheduled SMS. As mentioned above in the discussion of hypothesis nine, emails are at the mercy of servers and client software programs that, when combined, can substantially affect delivery times. Delivery challenges are not a problem with SMS campaigns when using designated Short Codes. Each professor shared a unique five-digit number that was preapproved by each cell phone carrier, enabling their messages to be directly delivered to students without any delayed consequence of servers or client software issues. Since the phone carriers must approve the SMS campaigns prior to usage, a direct line from carrier to end user is established, making the handshake nearly instantaneous. Furthermore, Whittaker and Sidner determined that the email inbox "operates as a *task manager*, where people are *reminded* of current tasks" (p. 277). Such an interface is not an issue with SMS, as the message does not need to be filed or stored in

any way—due to its immediacy, it functions as part of the conversation between the professor and student. This might suggest that students became trained to receive their course-related content via SMS, which was always delivered at the expected, pre-determined time. This confidence in timing could have made the students check their cell phones at the pre-determined times because of anticipating a text from their professor, which they also viewed as a more personal form of communication. A random SMS message, however, may have been received at inconvenient times, rendering a briefer visit to the HTML page or accessing the page at a later time or not at all.

Although research question ten aimed at scheduled SMS vs nonscheduled SMS average session duration times, it is worth mentioning in this discussion the total number of SMS respondents accessing the HTML page in general. A total of 62% of the students accessed the HTML page from both scheduled and nonscheduled messages. By any standards in business models that utilize SMS campaigns, this percentage of targeted customers accessing a web page is considered very likely to garner a "call to action," which in this case was to click on the course-related content. This is likely due to what Kim, Park, and Oh (2008) call interface convenience (IC). IC is defined as "the extent to which an individual believes that SMS would provide easy and efficient ways of user-system interaction" (Kim, Park, & Oh, 2008, p. 773). In addition, most people, especially college students in the predominant age group of the study (18-22), always have their phones on them. This fact explains the relatively high percentage of total hits on the HTML page. By sheer convenience and easy access to a timely scheduled pushed form of communication, the HTML page was open much longer on average than the random SMS messages

produced. These longer average lengths of session duration times indicate that the students were more engaged regarding the content. However, 109 of the nonscheduled SMS respondents did briefly access the HTML page.

Research Question 4

Does scheduling the delivery of emails and SMS messages at predetermined times in the day influence the student's use of course-related content in regard to unique visitors, click-through rates, and returned visits?

Of note are the findings relating to hypotheses twelve to fifteen, all of which were supported. Hypothesis twelve was supported by a very large percentage. Over 227 visitors (66%) were identified as a unique visitor. A unique visitor is someone accessing an HTML page at least once within a specific reporting period. For purposes of this study, Google Analytics measured unique visitors during a twenty-four-hour period after receiving the push communication either by email or SMS. Such a large proportion of scheduled SMS yielding higher unique visits than nonscheduled SMS continues to add strength to the previous discussion concerning hypothesis ten. It can be inferred that students receiving scheduled SMS not only preferred this form of scheduled communication but accessed the HTML page within the twenty-four-hour period and on average continued to remain on the HTML page, increasing average session duration times.

Another concept proposed by Kim, Park, and Oh (2008) could also explain why hypothesis twelve yielded such high results. Their concept of context controllability observes that, with the usage of SMS, "both senders and recipients of messages have self-control" regarding the "time and place to send, read, or respond to SMS messages" (Kim, Park, & Oh, p. 773). Recipients of the SMS, in this case the students, could access pushed

content at any time convenient to them. The fact that the scheduled SMS at 8am, 3pm, and 7pm yielded 227 unique visitors indicates that these time slots were convenient for the students, allowing them to access the HTML page. The research mentioned above does add some merit to the other 86 nonscheduled respondents, suggesting that although scheduled SMS yielded more unique visitors, it is not surprising that nonscheduled SMS did produce 25% of the total students to visit the HTML page at least once in the reporting period. This concept of context controllability may explain why 91% of the students were identified as unique visitors.

The findings mentioned above are also consistent with hypothesis fourteen, which states that scheduled SMS yielded higher click through rates than nonscheduled SMS. In this case, scheduled SMS received seven times as many clicks on the embedded content links as nonscheduled. This finding is in concord with scheduled SMS yielding higher average session duration times. It only makes reasonable sense that students' longer interaction with the HTML page means higher click-through rates to retrieve the course-related content. Once again, hypothesis fourteen's results demonstrated more favorable usage patterns in scheduled SMS as a means to receive push course-related content.

The findings as they relate to hypothesis thirteen can likely be explained by considering that scheduling emails relieves the effects of email overload somewhat, as hypothesis thirteen states that scheduled email yields higher click-through rates than nonscheduled email communication. This also assumes that the scheduling component worked. That is, the emails were delivered on the scheduled time and day that the student was expecting to receive the push communication. Whittaker and Sidner observed that "email can be an important determinant of how people spend their working day" (pp.

278). One of their survey respondents made it a habit to "check [email] before I leave the house, just in case there's anything I didn't get the night before" (p. 278). If an email is successfully delivered on a pre-determined schedule, then users might find the interface more convenient and accommodating, resulting in higher click-through rates. Although this hypothesis was supported, it is important to point out that only 30 total scheduled emails demonstrated click-throughs while 6 nonscheduled produced a click-through. Clearly, the overall volume of participation was much smaller with email than SMS.

That hypothesis eleven (scheduled email yields higher unique visitor's rates than nonscheduled email communication) was not supported can be explained by the same set of email-related concerns mentioned above. As discussed earlier, email can be caught up in servers and email client software and delay their arrival. This means that even if an email were scheduled on the teacher's end, the students might not have received it at the scheduled, expected time or even at all. This is important, especially if the student did not access the scheduled email within the twenty-four-hour reporting period. Although scheduled email did yield more unique visitors than nonscheduled email (104 vs 96), this was not found to be significant at the .05 level. This finding may also further explain why hypothesis fifteen was supported. The fact that scheduled email was not found to yield higher unique visitors than nonscheduled email perhaps caused higher returned visits by the student to re-engage with the course-related content. Although hypothesis eleven was not supported, it is important for this discussion to point out that Google Analytics revealed that 200 students accessed the HTML page for the first time via email (both scheduled and unscheduled), and the margin of scheduled vs nonscheduled was only 8 students, indicating that email is still a valid medium as a means to push course-related

content to the students. Based off this, instructors should still consider using email at some level of involvement, in addition to other easier-to-use media, such as SMS. Possibly a mixture of at least these two forms of pushed communication would yield more student interaction with instructional content, ideally leading to a more engaged student in the classroom.

Hypothesis sixteen, which was not supported, stated that scheduled SMS messages would yield more returned visits to the HTML page than nonscheduled SMS message communication. This can be explained inversely by the successful usage rates found in hypothesis ten, twelve, and fourteen, which ultimately lead to all three hypotheses being supported. Since these three hypotheses' results demonstrated high engagement between the student and the HTML page, it could be inferred that students received a timely, scheduled SMS, used their cell phones to access the course-related content in a more thorough manner and therefore did not feel the need to revisit the content. All three of these metrics (higher average session duration times, higher unique visitor's rates, and higher click through rates) supported the three hypotheses that measured scheduled SMS. In particular, it only makes sense that as it relates to hypothesis twelve, nonscheduled SMS resulting in relatively low unique visitors would explain why more nonscheduled SMS logged more returned visits. For these nonscheduled messages, the students were not able to view the content at the random times and therefore felt the need to return to the HTML page, which they did in very large numbers. In fact, the proportion ratio of returned visits for nonscheduled SMS measured the highest metric in all the research questions. Due to context controllability mentioned above, the students decided to access the

HTML page at their convenience and did so at a very high percentage (72%). This finding is important in itself because of the total number of returned visits, which totaled 378. This demonstrates that SMS is extremely effective for accessing course-related content in terms of visiting a site more than once if necessary, especially when it is convenient for the student.

This interpretation can also be linked with the findings regarding effort and performance expectancy, which are heavily rooted in the UTAUT model. It is likely that students who believed that the system seemed too difficult, or would not result in performance gains, declined to use it. This was not the case. That scheduled SMS resulted in higher average session duration times, more unique visitors, and higher click through rates, suggests that students who used their cell phones to access the course-related content did so because a scheduled message was expected at a certain time, delivered at that exact time, easy to use or access, required minimal effort, and yielded a positive performance in terms of engaging the content. Even when the scheduling aspect was not supported, as mentioned in hypothesis sixteen, students continued to access the course-related content.

Contributions of the Study

From a practical standpoint in education, this study set out to determine which, if any, factors influenced a college student's acceptance of receiving push communication from their professors for course-related content. By path modeling the relationships and analyzing and measuring the factors, this study has contributed to a better understanding of which variables could possibly allow for professors to enhance their courses and participation by each student. In today's technological world, students are using a multitude

of platforms by which to learn and communicate with their professors outside of the classroom. Many hours of additional learning may take place outside of the classroom. By identifying the most practical sources of communication media that can deliver additional course-related materials which are positively received by the students, ideally, a better total learning experience could be attained. The benefits to the students and professors are worthy of discussion. Traditional communication techniques that may or may not deliver pertinent current content must be enhanced and utilized to keep up with the ever-changing dynamics of today's college student.

The results of this study added to the body of existing knowledge in that they measured and demonstrated that both email and SMS messages containing course-related content pushed at scheduled times do have positive results.

These findings demonstrated significance in the field of education, both from the faculty and administrative sides. The way college students receive and access course-related content is critical to an effective academic environment. It is inherently self-limiting to expect that the educational experience of students, especially within the studied age group (18-22), must be kept within the classroom. It is clear that students not only respond to but actively incorporate pushed material into their study regime. Instructors can only improve the quality of their students' education by extending the course into media such as SMS and email. Doing so will create a more involved and prepared student population, which, in turn, will improve the educational experience within the classroom. Administration should encourage their faculty to be more proactive in their students' educational experience by incorporating such technology.

Since teaching at the college level over the past three years, I have utilized and seen the importance of scheduled SMS and scheduled emails to convey course-related material. I have also seen the value of these tools used in the private sector. Both for-profit and nonprofit entities utilize SMS and email at all levels to communicate with their clientele. They also employ many strategies that incorporate scheduling components to maximum their return on investment. That employers use such push communication is only more evidence for the importance of exposing students to such techniques before they enter the workforce.

Limitations of the Study

This study was heavily rooted in the UTAUT model, which, for most studies, has been implemented in either social sciences or by companies wanting to measure results of the introduction of new technologies used to either manufacture products or enhance work environments. Companies want to gather this information to measure return on their investments, which is normally not the case in nonprofit educational environments. Therefore, this model may have had some identifiable variables that could have either been further manipulated or removed altogether to better fit the technology acceptance of communication techniques that pertain to college students.

In addition, only 17.7% of the 301 students surveyed were non-business students. Therefore, it could be argued that since most of the students were business majors that utilize technology in their major courses, the results were skewed toward a demographic already familiar with implementing such technologies in their curricula. Taking this one step further, this sample of students could also have affected the moderating variables of age and experience. A larger sample size in multiple majors across the United States

could have added more age differences as well as experience levels, ultimately producing more generalizable findings. Furthermore, since the professors asked their students to take the survey, the students could have felt some pressure to answer the survey in ways that they perceived the professor would want them to. To hopefully negate any of this psychology, Google Analytics was used to measure their actual patterns.

Finally, there were some technical limitations to Google Analytics in measuring the results. In some instances, there were zero-average session duration times which may have skewed the results. Google is unable to calculate duration times if the page visitor does not click on other links while on the page (Len, 2017). This was statistically adjusted for by only calculating for new visitors where zeroes were present. In addition, all visitors were classified as new visitors if the visitor used a different Internet Protocol (IP) address. In other words, a student may have already visited the page from one device but returned on another device, which would categorize the student as a new visitor. As with any web analytics tool, there will always be some degree of error that should be accounted for. Furthermore, there are many different data collection methods and each one poses its own set of advantages and disadvantages in terms of relative accuracy and convenience.

Suggested Future Research

Further research could be done in terms of additional usage patterns as offered in Google Analytics today and what will be available in months to come. By analyzing additional usage patterns, professors could take further actions to enhance their communication and course-related material. Additionally, it would be insightful if not only text links were used, but also video feeds as well to measure acceptance patterns. Finally, more

depth in HTML page content and designs that encourage engagement by the students could add value to studies such as this one.

Summary

This study set out to identify the factors that influence a college students' intention to use push communication as a means to receive course-related content. It also went one step further and measured the actual usage once the SMS message and email were pushed to the student either randomly or at predetermined time intervals. By using this two-dimensional analysis, the study measured the actual usage habits and compared the results to the students' survey questions measuring intention. The model showed significance in both the students' survey responses measuring intent to use and actual usage as measure by Google Analytics; however, it was research questions three and four that demonstrated the strongest case that scheduled push communication does in fact have significant effects on usage habits. A total of six hypotheses were shown to be significant in identifying certain factors that affect a student's intention to use and actual usage. These supported hypotheses were also joined by relevant data extracted within Google Analytics that demonstrated email and SMS usage, although not necessarily from a scheduled perspective. This is good evidence that professors should begin to incorporate some type of pushed communication medium in their curriculum if they want to enhance their lectures, create a more engaging learning experience, and ultimately produce a more involved college student.

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APPENDIX A:

Institutional Review Board Protocol Exemption Report

Institutional Review Board (IRB)

for theProtection of Human Research Participants

VALDOSTA STATE UNIVERSITY

PROTOCOL EXEMPTION REPORT

PROTOCOL NUMBER:	**03441-2016**	**INVESTIGATOR:**	**Mr. Eric Kobbe**
		SUPERVISING FACULTY:	**Dr. Lars Leader**
PROJECT TITLE:	***Factors Influencing College Students Acceptance of Push Communication Technology as a Means of Receiving Course Related Content.***		

INSTITUTIONAL REVIEW BOARD DETERMINATION:

This research protocol is **exempt** from Institutional Review Board (IRB) oversight under Exemption **Category 2**. You may begin your study immediately. If the nature of the research project changes such that exemption criteria may no longer apply, please consult with the IRB Administrator (irb@valdosta.edu) before continuing your research.

ADDITIONAL COMMENTS:

- Students conducting research at other institutions are required to identify a point of contact. Please email the name of the GCSU staff or faculty member that has agreed to be your contact person.
- Upon completion of your research all data must be kept securely (locked cabinet/password protected computer, etc.) for a minimum of **3 years.**

☒ ***If this box is checked, please submit any documents you revise to the IRB Administrator at irb@valdosta.edu to ensure an updated record of your exemption.***

Elizabeth W. Olphie *02/03/2017*

Elizabeth W. Olphie, IRB Administrator Date

Thank you for submitting an IRB application.

Please direct questions to irb@valdosta.edu or 229-259-5045.

Revised: 06.02.16

APPENDIX B:

Institutional Review Board Protocol Exemption Report

University of Wisconsin-Eau Claire
105 Garfield Avenue • P. O. Box4004 • Eau Claire, WI 54702-4004

Eric S. Kobbe

Dear Mr. Kobbe:

The University of Wisconsin – Eau Claire has reviewed the materials submitted for the Georgia College State University Institutional Review Board (IRB) application entitled "Factors Influencing College Students' Acceptance of Push Communication Technology as a Means of Receiving Course-Related Content." This letter is to formally approve your research detailed in that application. The University of Wisconsin Eau Claire's Institutional Review Board for the Protection of Human Subjects does not consider our site to be actively engage in the research process and since the Georgia College State University IRB has reviewed this study and approved is under Exempt review, we require no further action.

As a small condition of our approval, our Provost and I would ask that you share your findings with our instutition. You and Dr. Jean Pratt should consult about how to best do this.

If you have questions regarding our participation in the research, please contact me at 715.836.5020 or axelromi@uwec.edu. Best of luck with your research.

Sincerely,

Michael I. Axelrod, Ph.D., LP, NCSP
Chair, Institutional Review Board for
the Protection of Human Subjects
University of Wisconsin – Eau Claire
Schofield 17
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APPENDIX C:

Push Communication Technology Survey

Push Communication Technology Survey

Statement of consent: You are being asked to participate in a research study entitled "Factors Influencing College Students' Acceptance of Push Communication as a Means of Receiving Course-Related Content." This research is being conducted by Eric S Kobbe, a student at Valdosta State University. The purpose of this study is to examine the factors that may or may not influence your acceptance of receiving emails and text messages from your instructor that contain actual content designed to ultimately add value to your class. This research study is anonymous. No one, including the researcher, will be able to associate your responses with your identity. Your participation is voluntary. You may choose not to participate, to stop responding at any time, or to skip questions that you do not want to answer. You must be at least 18 years of age to participate in this study. Your participation serves as your voluntary agreement to participate in this research project and your certification that you are 18 or older. Questions regarding the purpose or procedures of the research should be directed to Eric S Kobbe at eskobbe@valdosta.edu. This study has been exempted from Institutional Review Board (IRB) review in accordance with Federal regulations. The IRB, a university committee established by Federal law, is responsible for protecting the rights and welfare of research participants. If you have concerns or questions about your rights as a research participant, you may contact the IRB Administrator at 229-259-5045 or irb@valdosta.edu. Thank You!

Circle one: **Agree** **Disagree**

Legend			
Very Strongly Disagree	1	Agree	5
Strongly Disagree	2	Strongly Agree	6
Disagree	3	Very Strongly Agree	7

1.	I intend to read emails and text messages sent from my professor in the near future.	1 2 3 4 5 6 7
2.	I predict I would read emails and text messages sent from my professor in order to receive course-related content.	1 2 3 4 5 6 7
3.	I plan to utilize emails and text messages in the future if my professors would offer the technology in order to deliver course-related content.	1 2 3 4 5 6 7
4.	I believe communication such as email and text messages would be useful for receiving course-related content.	1 2 3 4 5 6 7
5.	Receiving emails and text messages from my professor should	1 2 3 4 5 6 7

	enable me to learn the material better.							
6.	Using email and text messaging and a means to receive course-related content would not require a lot of technological expertise.	1	2	3	4	5	6	7
7.	I believe that using email and text messaging will be easy for me.	1	2	3	4	5	6	7
8.	Actually using email and text messaging should be easy for me to do.	1	2	3	4	5	6	7
9.	People who influence my behavior think I should use email and text messages sent from my professor.	1	2	3	4	5	6	7
10.	People who I perceive as important to me think I should use email and text messages sent from my professor as a means to learn.	1	2	3	4	5	6	7
11.	My professor believes I should use email and text messaging to receive course-related content.	1	2	3	4	5	6	7
12.	Knowing that my professor will utilize email and text messages to push out course-related content at pre-determined times would allow me to better use the technology.	1	2	3	4	5	6	7
13.	Knowing that my professor will utilize email and text messages to push out course-related content at random times could deter me from using the technology.	1	2	3	4	5	6	7
14.	By knowing what times an email or text will be sent from my professor could better prepare me to utilize the course-related content.	1	2	3	4	5	6	7
15.	I like the idea of knowing when I would receive an email and text message.	1	2	3	4	5	6	7
16.	I do not care when my professor communicates with me via an email or text message.	1	2	3	4	5	6	7

17. I have received scheduled emails from my professors in the past.	1	2	3	4	5	6	7
18. I have received scheduled text messages from my professors in the past.	1	2	3	4	5	6	7
19. In the past, my professors have utilized emails to send course-related content.	1	2	3	4	5	6	7
20. In the past, my professors have utilized text messages to send course-related content.	1	2	3	4	5	6	7

21. What is your gender? _____

22. What is your college major? _____

23. How old are you? _____

APPENDIX D:

Screenshot of Scheduled Email HTML Page

SCHEDULED E-MAIL

GC1Y1000 - Critical Thinking in Technology

Professor Eric Kobbe

Hello class, below is the link to your assigned reading "What Makes Uber Run?". For this assignment I want you to pay particular attention to the following:

1. Kalanick's overall business philosophy?
2. Their plans for expansion?
3. The Uberization effect?

What Makes Uber Run?

APPENDIX E:

Screenshot of Scheduled SMS Message HTML Page

SCHEDULED TEXT MESSAGE

GC1Y1000 - Critical Thinking in Technology

Professor Eric Kobbe

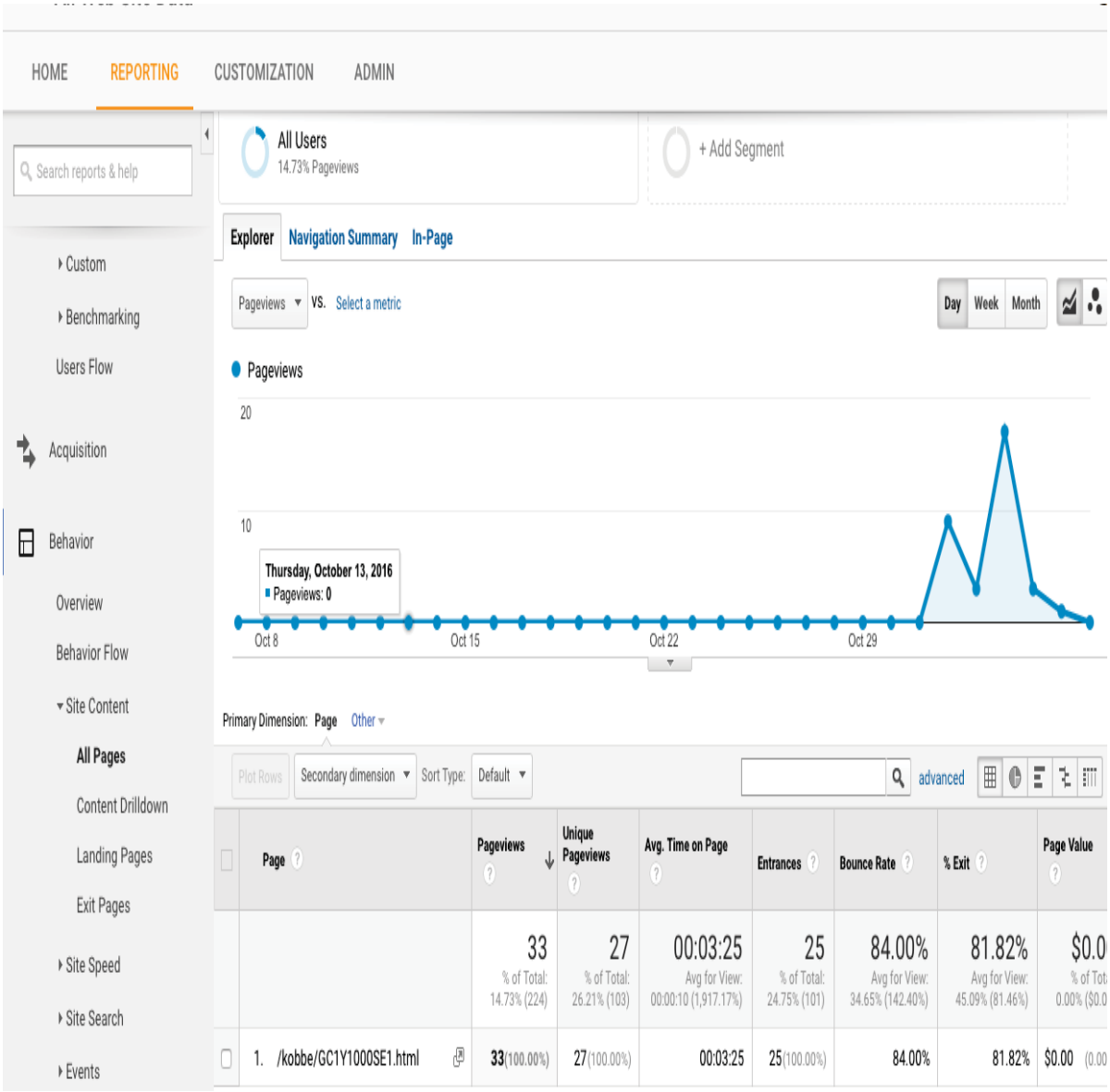
Hello class, below is the link to your assigned reading The Rules of Innovation. For this assignment I want you to pay particular attention to the following:

1. What does the author mean by "asymmetric" motivation?
2. What companies does he use as examples and why?
3. What does the author mean by disrupting competitors, not their customers?
4. What is a potential disadvantage of companies that have large amounts of capital?

The Rules of Innovation

APPENDIX F:

Screenshot of Web Data in Google Analytics


HOME
REPORTING
CUSTOMIZATION
ADMIN
Search reports & help
All Users
14.73% Pageviews
+ Add Segment
Custom
Benchmarking
Users Flow
Acquisition
Behavior
Overview
Behavior Flow
Site Content
All Pages
Content Drilldown
Landing Pages
Exit Pages
Site Speed
Site Search
Events
Explorer
Navigation Summary
In-Page
Pageviews
vs.
Select a metric
Day
Week
Month
Pageviews
20
10
Thursday, October 13, 2016
Pageviews: 0
Oct 8
Oct 15
Oct 22
Oct 29
Primary Dimension: Page
Other
Plot Rows
Secondary dimension
Sort Type:
Default
advanced
Page
Pageviews
Unique Pageviews
Avg. Time on Page
Entrances
Bounce Rate
% Exit
Page Value
33
% of Total: 14.73% (224)
27
% of Total: 26.21% (103)
00:03:25
Avg for View: 00:00:10 (1,917.17%)
25
% of Total: 24.75% (101)
84.00%
Avg for View: 34.65% (142.40%)
81.82%
Avg for View: 45.09% (81.46%)
$0.0
1. /kobbe/GC1Y1000SE1.html
33(100.00%)
27(100.00%)
00:03:25
25(100.00%)
84.00%
81.82%
$0.00