# A QUANTITATIVE EXAMINATION OF USER EXPERIENCE AS AN ANTECEDENT TO STUDENT PERCEPTION IN TECHNOLOGY ACCEPTANCE MODELING

by

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**Abstract**

Internet-enabled mobile devices have increased the accessibility of learning content for students. Given the ubiquitous nature of mobile computing technology, a thorough understanding of the acceptance factors that impact a learner's intention to use mobile technology as an augment to their studies is warranted. Student acceptance of mobile learning is critical to the success implementation of the mobile learning component of non-traditional learning environments such as hybrid and fully online courses. This study investigates the impact of students' prior experience using mobile technology on their intention to use mobile technology to facilitate learning in a blended environment. In a study of 152 community college students, the intention to use mobile technology for hybrid learning was measured and it was found that students' intention to use mobile technology was highly correlated with their perceptions of the utility and ease of use of the technology. As an antecedent to perceived utility, prior experience was shown to be positively correlated. In contrast, the results of this study found prior experience to be negatively correlated with perceived ease of use. These results suggest a need for further research in this area with practical significance for evaluating the efficacy of mobile technology for learning while providing guidance for its implementation as a learning platform.

## Dedication

This dissertation is dedicated to my father Arthur and to my late mother Mamie who taught me the value of hard work, dedication, patience, and love. To my children Naku, Marquis, and Takiyah I hope this work will serve as a beacon and inspiration to each of you in your own personal quest for knowledge. Remember: if I can accomplish this, so too can you.

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# CHAPTER 1. INTRODUCTION

## Introduction to the Problem

As a result of the convergence of telephony and computing coupled advances in the deployment of cloud-based services, end-user access to information via laptops and desktop systems is fast giving way to cell phones, tablets, and other mobile platforms (El-Hussein & Cronje, 2010). Congruent with the rise in use of mobile technology is an increase in the number of fully online and hybrid courses being made available to students. From an educational perspective, the ubiquity of Internet-enabled hand-held mobile computing devices such as smartphones and tablet computers provides significant opportunities to enhance student learning. The proposed study will apply a technology acceptance theoretical framework to examine the impact of students' prior experience using mobile technology on their intention to use the technology for hybrid learning. Student acceptance of mobile learning is critical to the success implementation of the mobile learning component of a hybrid learning system. Consequently, it is important to understand the factors affecting their intention to use mobile technology for learning.

Along with the many benefits offered by mobile technology, users are simultaneously faced with challenges posed by attempting to access complex information using devices with smaller capacities and non-standard control interfaces (Jeon, Hwang, Kim, & Billinghurst, 2006; Oulasvirta, Wahlström, & Anders-Ericsson, 2011). In an effort to leverage mobile technologies for learning, education-based content delivery experts are being challenged to find ways of redesigning learning material so that mobile learners can access domain knowledge with the same richness and complexity as learners using traditional pedagogical methodologies (Liu & Li, 2011; Romero & Ventura, 2007).

The move toward m-learning in higher education is occurring at an interesting point relative to the use of technology in education. Keller (2011) argues that despite advances in mobile technology, many educational institutions continue to regard mobile learning as ancillary to traditional learning environments and continue to offer online course content that is not tailored for access using mobile technology. Parry (2011) advanced the notion that a critical aspect of m-learning that complicates the movement towards m-learning is that just as higher education has come to embrace the use of standard (i.e. desktop PCs) computer technology in the classroom, mobile technology is poised to make this technology irrelevant. Over the past few years there has seen a substantial investment by educational institutions as well as publishers and other content providers to make educational content accessible over the Internet and other electronic media (El-Hussein & Cronje, 2010; Magal-Royo, Montañana, Gimenez-López, & Alcalde, 2010; Okamoto, 2007). In a period of shrinking budgets and greater competition for resources, institutions must develop a more thorough understanding of the mobile learning or they risk losing prospective students as well as frustrating current learners who want to manage their coursework using mobile technology (Beldarrain, 2006; Billings, 2005; Cavus, 2011; Cavus, & Al-Momani, 2011; Eisele-Dyrli, 2011; Engelsma & Dulimarta, 2011; Gagnon, 2010; Gilroy, 2009; Holley & Oliver, 2010; Keller, 2011; Kember, McNaught, Chong, Lam, & Cheng, 2010; López-Pérez, Pérez-López, & Lázaro, 2011; Zawacki-Richter, Brown, & Delport, 2008).

Electronic-learning (e-learning) is the computer and electronically-enabled transfer of skills and knowledge (Holden & Westfall, 2010, p. 3; Nagarajan & Jiji, 2010; Zhang, 2003). E-learning applications and processes include Internet-based learning, computer-based learning, virtual classroom opportunities, digital collaboration, and with e-learning, content can be delivered via the Web, using intranet/extranet systems, audio or video recordings, television, and DVD (DeRouin, Fritzsche, & Salas, 2005). E-learning can be self-paced or instructor-led and includes media in the form of text, images, video, animation, and streaming technologies (Holden & Westfall, 2010). However, innovations in mobile technology have put increased pressure on institutions to keep up with the quickening pace of mobile adoption by students and other stakeholders (El-Hussein & Cronje, 2010; Keller, 2011). Mobile learning (m-learning) describes the use of mobile technology to access learning content outside of traditional learning boundaries. El-Hussein and Cronje (2010) and Keller (2011) suggest that there has not been much progress in the development of m-learning in higher education but that the pace is quickening as institutions become aware of the opportunities offered, as well as those potentially missed, by providing content and services outside of the traditional learning space.

## Background of the Study

In the course of their studies, contemporary students in higher education are called upon to assimilate vast amounts of information; information that is often derived from disparate sources and housed around the globe. For several years, educators have used personal computers to help students amass, organize, and digest these vast quantities of information (Okamoto, 2007; Romero & Ventura, 2007). In addition, the ubiquitous nature of desktop and laptop computers, has allowed educators and trainers to not only provide electronic versions of their curricula but also to develop learning content specifically designed to leverage multimedia and hypermedia technologies (Jeon, Hwang, Kim, & Billinghurst, 2006). For example, current textbooks routinely come with additional learning content stored on Compact Disk (CD) or Digital Video Disk (DVD). These data storage technologies provide for the delivery of rich learning content and can include media such as video, audio, and hypermedia treatments of the subject matter (Burigat & Chittaro, 2011; Romero & Ventura, 2007). A negative consequence of using traditional computing platforms (i.e. desktop computers) for learning, however, is the need for learners to be “tethered” to non-mobile devices while engaged in learning (Keller, 2011; Taxler, 2007). Recent trends in mobile technology may render traditional learning access models obsolete.

Today, there is a movement in higher education to employ Internet-based Learning Management Systems (LMS) to deliver course content (El-Hussein & Cronje, 2010; Keller, 2011). Educational institutions can select from a number of platforms including Blackboard, Angel, Sakai, Moodle, OLAT, KEWL, Joomla, and others (EduTools, 2012). These systems can be prove to be very cost effective and can provide educational institutions with an economical platform that simultaneously reduces overhead and increases their market footprint. These platforms also support learners with access to instructional content that is unencumbered by limitations of time and space (Choi, 2005; Liu, Li, & Carlsson, 2010; Taxler, 2007). The traditional model for educational content delivery has evolved such that students who would usually buy a textbook and download learning content, such as data files and applications, and would then install them on their individual computers now have access to Internet-based content delivery platforms (Choi, 2005; Okamoto, 2007; Magal-Royo, Montañana, Gimenez-López, & Alcalde, 2010). An LMS can prove useful to an institution as support for cloud-based content delivery and supports fully online courses as well as blended learning. In addition, electronic communication such as email, asynchronous discussion rooms, and synchronous virtual conferences have in many respects become the norm in higher education and the various stakeholders in the education process are expected to communicate electronically (Choi, 2005; Okamoto, 2007; Romero & Ventura, 2007). As a consequence, access to Internet-capable computing resources has become almost mandatory for students and educators alike (Billings, 2005; El-Hussein & Cronje, 2010; Keller, 2011).

There are a multitude of platforms and approaches available to institutions for implementing m-learning (Cobcroft, Towers, Smith, & Bruns, 2006). Mobile platforms range from small hand-held devices such as smartphones to traditional laptop computers outfitted with wireless network access. Student usage of mobile systems can range from simple email access and text alerts to full access of course learning content. Clearly, as an adjunct to traditional learning environments m-learning holds the promise of bringing new and exciting tools and learning strategies to bear. However, despite the ubiquity of mobile technology in Western society, m-learning has yet to become a standard teaching methodology (El-Hussein & Cronje, 2010). With no dominant framework for its development, m-learning in higher education can be likened to the Internet in the 1990s: there is no clearly defined path for the implementation m-learning systems (Keller, 2011). This study examined the impact of student experience with mobile technology has shed light on the efficacy of this technology in the context of established learning methodologies such as blended learning and will serve provide insight into the utility and applicability of mobile technology to learning in higher education.

## Statement of the Problem

This study investigated the impact of students' prior experience using mobile technology on their intention to use mobile technology to facilitate learning in a blended environment. As the competition for students between educational institutions increases, and as mobile technology becomes more ubiquitous, a blended m-learning model might allow educational institutions to more rapidly and effectively respond to current consumer needs and thus gain a competitive advantage in the marketplace (Lopez-Perez,Perez-Lopez, & Lazaro, 2011; Okamoto, 2007). Through the thoughtful integration of mobile technology into the fabric of the information flow of the institution, the institution's ability to compete for students can be enhanced and the learning experience for students can be deepened (El-Hussein & Cronje, 2010; Keller, 2011). In addition, mobile devices provide opportunities for institutions to establish better relationships with students, to build loyalty, to provide better service, and to establish their brand to a wider audience (Alvarez, Brown, & Nussbaum, 2011; Andrews, Smyth, & Caladine, 2010).

## Purpose of the Study

The purpose of this survey study was to test aspects of technology acceptance theory that relate prior user experience with mobile technology to the behavioral intention to use the technology, controlling for the perceived usefulness and perceived ease of use of the technology for students at Monroe Community College. The independent variable Prior Experience is generally defined as the number of mobile devices used by the student and the amount of time spent using the technology. The dependent variable is generally defined as the user's Behavioral

Intention to use mobile technology for learning, and the control and intervening variables, Perceived Ease of Use and Perceived Utility, were statistically controlled in this study.

The study tested the determinants of the acceptance and intended use of mobile technology for blended learning by community college students. The research model for the study was based upon relevant technology acceptance theory. The theoretical foundation for the study was based upon the original Technology Acceptance Model (TAM) as proposed by Davis (1986). However, research has shown that the original TAM may not fully explain user intention to use technology in an online context (Hossain & de Silva, 2009; Shih, 2004; Sun & Zhang, 2006; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). Further, the original TAM also lacks the expressive power to account for user acceptance of mobile technology for learning (Wendeson, Ahmad, & Haron, 2010; Westera, 2011; Wu, Wang, & Lin, 2007). Despite the limitations of the original model however, the TAM remains a useful tool given its parsimonious nature. This study incorporated students' prior experience with mobile technology as a means of enhancing the predictive power of the TAM in a mobile-enhanced, blended learning environment. Studies have shown that similar modifications to the original model have yielded better results when applied to specific problem domains (Aggelidis & Chatzoglou, 2009; Ahn, Ryu, & Han, 2007; Arning & Ziefle, 2007; Autry, Grawe, Daugherty, & Richey, 2010; Bueno & Salmeron, 2008; Castañeda, Muñoz-Leiva, & Luque, 2007; Hossain, 2009; Liu, Li, & Carlsson, 2010; Swanson, 1994; Shih, 2004; Sun, 2003; Teo, 2009; Teo & Noyes, 2011).

The goal of this study was to explore how mobile technology can be used to enhance student learning in a blended learning environment. Specifically, this study sought to describe the relationship between learner prior experience using mobile technology and their intention to use this technology for learning in a non-traditional framework. The results of this study extend existing technology acceptance theory by examining the impact prior experience has on student willingness to use mobile technology for blended learning. As an aid to practice, this study provides knowledge that could assist institutions in the efficient allocation of scarce resources.

The end product of this study contributes to the ongoing conversation about the direction of m-learning in higher education. The results of this study will help educational institutions justify the investment of limited funds for the development of mobile-enhanced learning content and delivery services

## Rationale

Mobile technology can enhance student access to online content and services.(El-Hussein & Cronje, 2010). Mobile technology provides educators with the ability to deliver learning content irrespective of time or space. Mobile computing devices combined with modern wireless networks facilitate mobile learning and allow learning to extend beyond the traditional classroom. Implemented correctly, technology can serve as a powerful enabler in an increasingly mobile society (OECD, 2011). Inside the classroom, mobile learning gives instructors and learners increased flexibility to both deliver and assimilate content (Billings, 2005; Means, Toyama, Murphy, Bakia, & Jones, 2009). It also presents opportunities for increased social interaction among students (Beldarrain, 2006; Wagner, 2011).

Means et al. (2009) suggest that online and blended learning models can be cost effective alternatives to traditional classroom instruction. However, it could be argued that if students choose not to use mobile technology to access mobile learning components then the development of mobile content would be a waste of valuable institutional resources. In order to ascertain the viability of using mobile technology for hybrid learning, this research examined the relationship between students' previous experience with mobile technology and their intention to utilize mobile technology for blended learning.

## Research Questions

The following questions were designed to address the overarching general question: Are the Technology Acceptance Model constructs perceived ease of use and perceived usefulness, coupled with an additional variable prior experience, significant predictors of the behavioral intention of community college students to use mobile technology to augment their studies in a blended learning environment?

*Research Question #1*:

To what extent is a learner's prior experience with mobile technology a significant predictor of their perception of ease of use (effort expectancy) of the technology to support his/her learning in a blended environment?

*Research Question #2*:

To what extent is a learner's prior experience with mobile technology a significant predictor of the learner's perceived usefulness (utility) of mobile technology to support his/her learning in a blended environment?

*Research Question #3*:

To what extent is a learner's perceived usefulness (utility) of mobile technology a significant predictor of his/her intention to use the technology to support their learning in a blended environment?

*Research Question #4*:

To what extent is a learner's perceived ease of use (effort expectancy) with mobile technology a significant predictor of his/her perceived usefulness (utility) of the technology to support his/her learning in a blended environment?

*Research Question #5*:

To what extent is a learner's perceived usefulness (utility) with mobile technology a significant predictor of their intention to use the technology to support their learning in a blended environment?

## Significance of the Study

The results of this study expand upon existing technology acceptance theory by explaining how prior experience impacts students' perceptions about the ease of use of the technology for learning as well as the impact it has on their intention to use the technology for learning. In addition to adding to the technology acceptance body of knowledge, this study has implications to practice as well. Advances in Internet-based educational content delivery systems are causing a shift away from a linear, textbook metaphor toward a hypermedia model (Köse, 2010; Parry, 2011; Twigg, 2003). This shift in learning delivery models appears to coincide with an explosion in the use of mobile technology in our society (Köse, 2010; Liu, Li, & Carlsson, 2010). This study provides insight into the influence students' prior experience with mobile technology has on the technology acceptance factors that impact their learning in a mobile-enhanced, blended-learning model.

Mobile technology has the potential to enhance student access to information. However, mobile learning implementation frameworks in higher education are nascent and deployment strategies continue to evolve (El-Hussein & Cronje, 2010; Keller, 2011). In a time of shrinking budgets and dwindling resources, it seems reasonable to expect educational institutions to be able to justify the investment of limited funds for the development of mobile-enhanced content and delivery services. Similarly, it seems reasonable to conjecture that should students choose not to use mobile technology to access mobile learning components provided to them, then the development of those resources by institutions could turn out to be a waste of valuable resources. Consequently, an understanding of how mobile devices impact student's impressions of the utility of these devices for learning would assist educational institutions in the development of strategies for the financing, implementation, deployment, and support of mobile learning.

## Definition of Terms

### *Mobile Technology*

Mobile technology includes small, wireless devices that provide access to Internet-based information. From a technological standpoint, mobile technology can be viewed as a combination of hardware, operating systems, networking and software that is relatively small and portable. Consequently, mobile hardware ranges from laptops, notebooks, and tablets, to Mobile

Internet Devices (MIDs) and smartphones. Other mobile devices include global positioning systems (GPS), wireless debit/credit card payment terminals, palmtop computers or personal digital assistants (PDAs), wireless scanners and point-of-sales (POS) terminals, and plain mobile phones (Eisele-Dyrli, 2011).

*Blended/Hybrid Learning*

Blended learning refers to a conscious integration of synchronous and asynchronous learning frameworks (Ocak, 2011). While there appears to be no general consensus on a precise description of blended learning, the terms "blended," "hybrid," and "mixed-mode" are used with similar precision in current research literature (Graham, 2005; López-Pérez, Pérez-López, & Lázaro, 2011). However, all of these terms broadly refer to the amalgamation, a "blending", of e-learning tools and techniques with traditional teaching methodologies. Blended learning can be defined as the combination of multiple approaches to teaching and learning. Blended learning often refers specifically to the provision or use of resources that combine e-learning with other educational resources. A blended learning approach can combine traditional face-to-face instruction with both e-learning and m-learning instruction.

*Mobile Learning*

Mobile Learning (m-learning) refers to the wireless delivery of instructional content (e.g. lecture slides, video, audio, and assessments) to students through mobile technology devices (e.g. laptops, personal data assistants, smartphones, and tablet computers) (Andrews, Smyth, & Caladine, 2010; Korucu & Alkan, 2011; Wendeson, Ahmad, & Haron, 2010; Young, 2011a).

## Assumptions and Limitations

This study investigated the use of mobile devices in a blended learning environment in higher education. This research was conducted under the following assumptions:

- The research included only commonly available mobile devices such as smartphones, tablets, notebook computers, E-readers, laptops, and personal data assistants (PDAs).
- Hybrid m-learning in other educational settings such as corporate or K-12was not examined in this study.
- Neither the use of non-mobile computing technology nor traditional classroom-only pedagogy was explored in this study.

In addition, the study had the following limitations:

- The study was conducted in a single community college located in the Northeastern United States. Consequently, the results of this study may not be generalizable to other types of institutions or to other countries.
- Participant responses were limited by their ability to recall their experience with mobile technology as well as their willingness to honestly self-report.

The preceding limitations can be remedied in future research. For example, to improve the generalizability of the study, future research could use the same survey instrument with randomly sampled community college students from across the United States.

## Theoretical/Conceptual Framework

As our society becomes more mobile and as learner demand for mobile learning grows, educational institutions will be faced with increased pressure to develop systems that can deliver learning content tailored for mobile platforms (Rodrigo, 2011; Theys, Lawless, & George, 2005). Parry (2011) called attention to the idea that in the future, learning content will be mediated and weaved together by the mobile web. The proliferation of mobile technology may necessitate a re-envisioning of the ways information is presented to learners. Their experience with mobile technology coupled with their expectations for ubiquitous, instantaneous access may not only shape their attitudes about information technology but may also have an impact on their perceptions about learning. The explosion in the use of mobile computing platforms by students presents an opportunity for educational institutions to increase their reach as well as to provide students with the ability to access information irrespective of time or space (Beckmann, 2010; Idrus & Ismail, 2010; Looi, Seow, Zhang, So, Chen, & Wong, 2010; Young, 2011b).

Although related to e-learning and distance education, mobile learning (m-learning) is distinct in that its focus is on learning across multiple contexts (Traxler, 2007). M-learning systems focus on the mobility of the learner, on how they interact with portable technology, on independent socially-based learning, and on how educational systems can accommodate and support an increasingly mobile population (El-Hussein & Cronje, 2010). M-learning includes learning with portable technologies including laptops, hand-held digital players, tablets, and mobile phones. Hand-held devices such as tablets, e-readers, and smartphones are becoming the dominant form of web access for many users and the user's experience must be factored into the design of m-learning systems (El-Hussein & Cronje, 2010; Keller, 2011). M-learning is convenient in that it is accessible from virtually anywhere and facilitates strong content portability by replacing books and notes with small electronic memories and data communications technologies. M-learning ameliorates the limitations imposed by learning location through the use of portable general-purpose computing devices. With blended learning, both learners and teachers work together to improve the quality of learning with the ultimate aim of providing realistic practical opportunities for making the learning useful (López-Pérez, Pérez-López, & Lazaro, 2011; Yen & Lee, 2011). M-learning supports the blended learning model by providing anywhere, anytime access to learning material (Keller, 2011; Taxler, 2007). Blended m-learning provides a mixture of computing technologies and social interactions, resulting in a socially relevant, constructive, learning experience that provides a rich context for student-focused learning. When implemented correctly, the blended learning framework provides learners with an environment that has the potential to help them learn more effectively (Keller, 2011; Rodrigo, 2011; Taxler, 2007).

M-learning has the potential to provide students with "everywhere, every time" access to learning content. However, there are still challenges that may inhibit the spread of this model (El-Hussein & Cronje, 2010; Taxler, 2007). Issues such as accessibility and cost barriers, the need for ongoing technical support, privacy issues, teacher and student adaptive strategies, and the accelerated pace of technological change represent challenges to the blended m-learning model (Taxler, 2007). In addition, the lack of industry standards for mobile technology coupled with the need to rework existing e-learning content to accommodate mobile technology may make blended m-learning a daunting undertaking for many institutions. Traditional personal computing platforms perform well with respect to providing access to online learning systems (Billings, 2005; Theys, Lawless, & George, 2005). A key concern with the adoption of m-learning, however, is that the mobile devices may not perform as well as traditional PCs given their limited resources (El-Hussein & Cronje, 2010; Theys, et al., 2005). For example, research has shown that, if users find the interface to a data application difficult to work with, then they may not readily accept the system (Billings, 2005; Glassberg, Grover, & Teng, 2006; Jeon, Hwang, Kim, & Billinghurst, 2006; Oakley & Park, 2009). Given the ubiquitous nature of mobile technology, a thorough understanding of the acceptance factors that impact a learner's perceptions to use mobile technology to augment their studies seems warranted. When this concept of user acceptance is extended to an educational environment, it could be conjectured that the learner's intention to use a m-learning system might be directly related to their perception of how easy the system is to use and to its ability to help them assimilate relevant information provided online (Okamoto, 2007; Romero & Ventura, 2007; Taxler, 2007). Although much of the e-learning content currently being developed in higher education is designed for access with conventional desktop and laptop systems, institutions are being challenged by advances in mobile learning to reevaluate their learning content delivery strategies (El-Hussein & Cronje, 2010; Engelsma & Dulimarta, 2011). To survive and flourish in a global education market, educational institutions will have to pay serious attention to the impact of mobile technology on student access to online learning content (Chuang, 2009; Gilroy, 2009; Shurville, Browne, & Whitaker, 2009).

The infusion of mobile technology in blended learning would enable institutions to offer students the opportunity to benefit from their previous experience. A study by Rodrigo (2011) advances the notion that successful student learning emerges from their active engagement in the learning process, by connecting new learning to the students' prior knowledge and experience, and by effectively modeling of real world experiences. For example, because of their experience with mobile web services and social media, students may have their expectations for interactivity and connectedness unmet when they use traditional online resources such as digital textbooks for learning (Ai-Lim Lee, Wong, Fung, 2010). The resulting frustration may have a negative impact on the mass adoption of other mobile learning tools (Mayrath, Nihalani, & Perkins, 2011). Previous research on the impact of technology on learning has indicated a significant relationship between previous experience and learning (Ai-Lim Lee, Wong, Fung, 2010; Allan & Lewis, 2006; Arning & Ziefle, 2007; Bailey & Card, 2009; Baird & Fisher, 2005; Beckmann, 2010; Benbunan-Fich & Benbunan, 2007; Billings, 2005).

Critical to the effective integration of new technology in the blended m-learning environment is the user's level of comfort with mobile technology. Mobile learning implementation in higher education is still in the embryonic stages of development and how readily students accept the use of mobile technology for learning may have a significant impact on the efficacy of the technology for blended learning. (Andrews, Smyth, & Caladine, 2010; Liu, & Li, 2011; Liu, Li, & Carlsson, 2010). Prior to investing limited resources in the development of mobile services and content, it is imperative for institutions to take the time to anticipate the factors that influence students' intention to use technology for learning. If students fail to use mobile technology for learning then it would make little sense for institutions to allocate resources to the development of mobile content.

This study attempted to address the need for a more comprehensive understanding of student acceptance and use of mobile technology for learning. The findings from this research expand the existing body of knowledge by determining if the original Technology Acceptance Model when combined with an additional independent variable prior experience is a significant predictor of the intention of community college students to use mobile technology for blended learning. The results of this study are expected to aid in the development of a technology acceptance model that would help educators meet student expectations and would empower them with sufficient knowledge to design more student-centered learning content. The diagram in Figure 1 describes the general theoretical framework for this study.

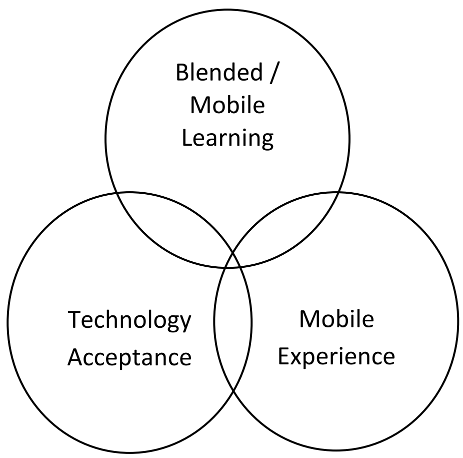


Figure 1. Proposed study theoretical model

## Organization of the Remainder of the Study

This research is organized into five chapters. Chapter 1 outlines the study context, the research problem, research questions, definitions, purpose, significance, limitations, and provided the theoretical framework for the proposed study. Chapter 2 presents a review of the relevant literature related to mobile technology, blended learning, and technology acceptance. Chapter 3 describes the study methodology and includes descriptions of the operationalized metrics, survey instrument, sample population, data collection, and data analysis procedures that were used in the study. Chapter 4 presents an analysis of the results of the survey. Chapter 5 presents a discussion of the result findings. These chapters are followed by a series of appendices that include instrumentation, letters of communication, and other artifacts that were used in the study.

# CHAPTER 2. LITERATURE REVIEW

## Introduction

Today, many institutions of higher education embrace the idea of offering learning content virtually. Consequently, there has been a dramatic shift in the number of institutions willing to invest in non-traditional course delivery frameworks. Noting the widespread use of mobile phones and other mobile devices among students, many institutions are becoming interested in ascertaining the extent to which student access to college content and services can be enhanced through the use of mobile technology (El-Hussein & Cronje, 2010; Engelsma & Dulimarta, 2011). As the competition for students among educational institutions increases and as mobile technology becomes more ubiquitous, many schools are exploring the notion that a blended mobile learning (m-learning) model might provide a cost-effective learning platform that would allow them to more rapidly and effectively respond to consumer needs and to gain a competitive advantage in the marketplace.  Blended learning is an excellent platform from which to initiate an organizations journey into e-learning because of its flexibility as well as its benefits to learners, faculty, and the organization's bottom line (Driscoll, 2002; Holley & Oliver, 2010).

The explosion in the use of mobile computing platforms by students presents an opportunity for educational institutions to increase their reach as well as to provide students with the ability to access information irrespective of time or space. Through technology, the unwired learning space is poised to substantially alter the educational landscape (Parry, 2011). Although related to electronic learning (e-learning) and distance education, mobile learning (m-learning) is distinct in its focus on learning across multiple contexts (Taxler, 2007). M-learning ameliorates the limitations imposed by learning location through the use of portable general-purpose computing devices. M-learning includes learning with portable technologies including hand-held digital players, tablets, and mobile phones. M-learning systems focus on the mobility of the learner, on how they interact with portable technology, on independent socially-based learning, and on how educational systems can accommodate and support an increasingly mobile population (El-Hussein & Cronje, 2010). M-learning is convenient for students in that it makes learning content accessible from virtually anywhere. This model also facilitates strong content portability by replacing books and notes with small electronic memories and data communications technologies. M-learning provides “anywhere, anytime access” to learning material or, more appropriately, it provides “everywhere, every time” access to learning content (Keller, 2011, Taxler, 2007).

Blended m-learning provides a mixture of computing technologies and social interactions, resulting in a socially relevant, constructive, learning experience that provides a rich context for student-focused learning (Driscoll, 2002; Köse, 2010). These same features however, can present to several challenges to institutions that may inhibit their adoption of this model (El-Hussein & Cronje, 2010; Holley & Oliver, 2010; Köse, 2010; Taxler, 2007). For example, issues such as accessibility and cost barriers, the need for ongoing technical support, privacy issues, teacher and student adaptive strategies, and the accelerated pace of technological change represent challenges to the adoption of a blended m-learning model (Taxler, 2007). In addition, the lack of industry standards for mobile technology coupled with the need to rework existing e-learning content to accommodate mobile technology may make blended m-learning a daunting undertaking for many institutions. Many organizations have invested substantial resources in the development of learning content and are reluctant to throw that investment away. Blended learning can address the need to recoup this investment by allowing institutions to supplement or compliment existing courseware rather than replace it (Driscoll, 2002). With these challenges in mind, it would be prudent for institutions interested in developing m-learning systems to gain perspective on the impact of adoption a blended m-learning model would have on the institution.

Studies have shown that a critical component to the success of the adoption of new technology is the level at which the major stakeholders of the old system accept the new system (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Driscoll, 2002; Holley & Oliver, 2010; Hu, Chau, Sheng, & Tam, 1999; Koufaris, 2002; Mathieson, 1991; Morris & Dillon, 1997; Szajna, 1996). The Technology Acceptance Model (TAM) (Davis, 1989) is an often-used theory of IT adoption that defines two belief constructs that can be used as predictors of usage behavior (BI): perceived ease of use (PEOU) and perceived usefulness (PU). The implication of the relationship between BI and acceptance is that if users accept a technology then they will intend to use it. In the case of blended mobile learning, TAM can be used to describe psychological factors that impact the student's usage behavior relative to this framework. With blended m-learning, it can be postulated that if students feel comfortable using mobile technology and find it useful to their learning, then they may be more likely to adopt it to meet their needs. Given the relationship between the user's acceptance or rejection of a technology intention and their intention to use it, the following general investigative question served as a guide for this study.

> *Are the Technology Acceptance Model constructs perceived ease of use and perceived usefulness, coupled with an additional variable prior experience, significant predictors of the behavioral intention of community college students to use mobile technology to augment their studies in a blended learning environment?*

Advances in mobile technology are a driving force in the advance of mobile learning (Engelsma & Dulimarta, 2011; Köse, 2010). Smartphones, laptop computers, and tablets along with the corresponding software and communications systems act as enablers for m-learning. This technology has both advantages and disadvantages that impact its ability to support m-learning. Accordingly, any discussion of m-learning must begin with an understanding of mobile technology. The following sections will provide an overview of mobile technology as it is related to m-learning.

## Mobile Technology

Although mobile technology is fast becoming the dominant medium used for personal communication, no precise definition for mobile technology exists (Suki, 2007). At its core, mobility implies information portability and the ability to "roam." The term "mobile device" is a generic term used to refer to a variety of devices that allow users to communicate and access data and information from without using a physical connection. Most often, the term mobile is used in conjunction with the term "wireless." Margherita (2004) suggest that three converging trends serve to accelerate the upward swing in today's mobile-technology adoption curve:

- There are more wireless networks, services, and devices than ever before,
- Consumers expect better mobile experiences,
- Users want "anytime, anywhere" access to content.

From a technological standpoint, mobile technology can be viewed as a combination of hardware, operating systems, networking and software that is relatively small and portable (Sharples, 2000). Mobile hardware ranges from laptops, notebooks, and tablets, to Mobile Internet Devices (MIDs) and smartphones (Theys, Lawless, & George, 2005; Young, 2011a, 2011b). Other mobile devices include global positioning systems (GPS), wireless debit/credit card payment terminals, palmtop computers or personal digital assistants (PDAs), wireless scanners and point-of-sales (POS) terminals, and plain mobile phones (Clough, 2010; Eisele-Dyrli, 2011).

The sheer diversity of mobile technology available on the market makes access to location–independent information available to a broader range of consumers than in the past. Mobile computing has come a long way, from early laptops, to PDAs, to today's proliferation of smartphones, tablets, and e-readers; the pace of innovation continues to accelerate. Laptops, smartphones, and tablets are perhaps the most used mobile devices in higher education today (Engelsma & Dulimarta, 2011). In addition to mobile devices, other major system components such as operating systems, networks, and applications play a pivotal role in the deployment of mobile systems. Mobile operating systems, like their traditional cousins, serve to control and coordinate the various hardware and software components of a mobile device. Currently, there are many competing operating system platforms including Google's Android, Apple's iOS, RIM's BlackBerry OS, Microsoft's Windows Phone 7, Linux, HP's webOS, Samsung's Bada, Nokia's MeeGo as well as legacy platforms such as Symbian, PalmOS, and others (Ash, 2010; Cavus, 2011). Since they don't require the full processing power of a notebook or even ultra-mobile PCs, mobile operating systems tend to be smaller and less feature-rich than traditional operating systems (Ash, 2010).

Networks are the infrastructure that supports the transfer of information in a mobile environment (Ash, 2010). Mobile devices can use a variety of communications technologies to access a network including:

- Wireless Fidelity (Wi-Fi) - a type of wireless local area network technology
- Bluetooth – short-range protocol that connects mobile devices wirelessly
- Third generation (3G), global system for mobile communications (GSM) and general packet radio service (GPRS) data services - data networking services for mobile phones.

The first generation mobile communication systems were completely analog and offered very limited services (Ash, 2010; Ngai & Gunasekaran, 2007). The Second generation (2G) communication networks were digital, which allowed them to make better use of available frequency spectrum while offering greater security and better customer service. Third generation (3G) communication systems provided for faster data connections. The fourth-generation technology promises super-fast broadband service that should speed up access to high-bandwidth applications such as video. For now however, Fourth generation (4G) networks mainly provide service for smartphones and complete nationwide coverage does not yet exist.

Mobile applications (apps) are small special-purpose computer programs, like phone books, games, and calendar programs that provide utility to the user (Ash, 2010; Ngai & Gunasekaran, 2007). Currently, there are a plethora of apps that have in effect, turned mobile devices like smartphones into game rooms, barcode scanners, and video manipulators. Three years after Apple reluctantly opened its iPhone to outside developers, apps have grown from time-killers into an ecosystem seen as a key to keeping consumers loyal to their devices. Many companies such as Google, RIM and Verizon have opened their own online marketplaces for third-party programs. Apps, many of which cost as little as 99 cents each, have also spawned a cottage industry where thousands of independent developers, established software vendors, and young start-ups alike all focus on the rapid development of programs for mobile platforms. The adoption of tablets by business users is helping fuel this trend. In a 2011 study, Young researched ways smartphone apps are used for m-learning tasks such as lecture captures, textbook readers, and other learning tasks.

Together, the hardware, software, and communications components of mobile systems form a cluster of technologies that provides a framework for universal access that is not bound by location (Ash, 2010; Cavus, 2011; Ngai & Gunasekaran, 2007). As a result of the convergence of telephony and computing, as well as advances in the deployment of cloud-based services, end-user access to information via laptops and desktop systems is fast giving way to smartphones, tablets, and other mobile computing platforms (Cavus & Al-Momani, 2011; El-Hussein & Cronje, 2010). The ubiquity of hand-held mobile computing devices such as the iPhone and Droid, as well as tablet computers such as the iPad and Xoom, provides educators and students alike with significant opportunities to use mobile technology to enhance learning. Along with the many benefits offered by mobile technology, users are simultaneously faced with challenges posed by attempting to access complex information using devices with smaller computing and storage capacities (Cavus & Al-Momani, 2011; Jeon, Hwang, Kim, & Billinghurst, 2006; Oulasvirta, Wahlström, & Anders-Ericsson, 2011).

In the course of their studies, contemporary students in higher education are called upon to assimilate vast amounts of information; information that is often derived from disparate sources and housed on systems located around the globe. For several years, educators have used personal computers to help students amass, organize, and digest these vast quantities of information (Okamoto, 2007; Romero & Ventura, 2007). In addition, the ubiquitous nature of desktop and laptop computers, has allowed educators and trainers to not only provide electronic versions of their curricula but also to develop learning content specifically designed to leverage multimedia and hypermedia technologies (Jeon, Hwang, Kim, & Billinghurst, 2006). For example, current textbooks routinely come with additional learning content stored on Compact Disk (CD) or Digital Video Disk (DVD). These data storage technologies provide for the delivery of rich learning content and can include media such as video, audio, and hypermedia treatments of the subject matter (Burigat & Chittaro, 2011; Romero & Ventura, 2007). A negative consequence of using computers for learning, however, is the need for learners to be "tethered" to non-mobile devices while engaged in learning (Keller, 2011; Taxler, 2007). Mayrath, Nihalani, and Perkins (2011) speculate that the deployment of media-rich, cost-effective educational textbooks that could be used on a wide variety of mobile platforms has not gained sufficient momentum in part because of higher education's failure to effectively exploit the didactic potential of mobile devices. Recent trends in mobile technology may render traditional learning access models obsolete since it is now possible for students to engage in cloud-based learning anywhere simply by networking their mobile devices to a home, office, or publically available broadband network.

Research by Baird and Fisher (2005), Beckmann (2010), as well as Engelsma and Dulimarta (2011) concluded that mobile technology can be used by students to successfully augment learning for many reasons including:

- Convenience and social benefits,
- Small device form factors and high portability,

- Almost instantaneous access and fast system boot-up sequences,
- A wide range of applications that can be used to support mixed learning modalities,
- The ubiquitous nature of smartphones and other hand-held mobile devices,
- The relatively low cost of mobile devices,
- Many students have experience using mobile technology.

When used in higher education, mobile computing can improve the services offered to students. For example, registering for classes, and checking admissions or financial aid status can easily be accomplished using web access via mobile devices (Darus & Hussin, 2006). More powerful applications can link students directly into the college's learning Management System. For example, students could remotely engage in real-time class discussions, virtual meetings, and could take exams all using mobile technology offsite (Nagi, 2008). Access to these services could lead to greater flexibility in student learning, given that mobile technology allows the learning content to be available whether the student is in class, at home, or even while travelling. Additionally, the explosive growth of cloud computing supports a more flexible educational experience by providing access to both institutional services and course content anytime, anywhere (Meloni, 2010; Xhafa, Caballe, Rustarazo, & Barolli, 2010).

There are several challenges that may serve to inhibit the spread of mobile technology in higher education (El-Hussein & Cronje, 2010; Taxler, 2007). Implementation issues, including the need for ongoing technical support, privacy concerns, the adaptive strategies of teachers and students, as well as the accelerated pace of technological change, all present significant challenges to the integration of mobile technology in higher education (Taxler, 2007). Technological limitations such as small screens, limited processing capabilities, and small memories also make using mobile technology for learning problematic (Magal-Royo, Montañana, Gimenez-López, & Alcalde, 2010; Sweeney & Crestani, 2006). Other concerns, such as the lack of industry standards for mobile technology coupled with the need to rework existing electronic learning (e-learning) content to accommodate mobile technology, may make the adoption of mobile learning (m-learning) a daunting undertaking for many institutions (Duval & Verbert, 2008; Gimenez-López, Magal-Royo, Laborda, & Garde-Calvo, 2009; Watters, Duffy, & Duffy, 2003). There are significant short-term and long-term costs associated with the purchase, implementation, and maintenance of mobile hardware and software (Ash, 2010). In addition, initial training is required to ensure that users understand how to make efficient use of mobile systems and ongoing training may be necessary as new apps are deployed (Bailey & Card, 2009).

Student acceptance is another key success factor in the development of mobile learning systems. Studies have shown that if students feel comfortable using a technology and find it useful to their learning, then they would be more likely to adopt it to meet their needs (Cavus, 2011). Students can be mandated to use a technology for learning. However, studies have shown that the mandated use of technology often mitigates both the acceptance of the technology as well as its perceived usefulness (Cavus, 2011). Consequently, student buy-in is crucial to the efficacy of using mobile technology as a learning tool.

## Mobile Learning

The explosion in the use of mobile computing platforms by students presents an opportunity for educational institutions to increase their reach as well as to provide students with the ability to access information irrespective of time or space. Much of the e-learning content currently being developed for higher education is designed for access with conventional desktop and laptop systems. However, hand-held devices such as tablets and smartphones are becoming the dominant form of web access for many students and current research appears to support the notion that m-learning is poised to become a major mode of learning in the near future (Eisele-Dyrli, 2011; El-Hussein & Cronje, 2010; Keller, 2011; Young, 2011). Parry (2011) outlined a set of three "literacies" institutions should recognize so as to help students take advantage of m-learning opportunities. To exploit m-learning, it has been suggested that learners and teachers alike need to develop an understanding of information access, hyper-connectivity, and a new sense of "space" (Parry, 2011).

Information access relates to learners' ability to access learning content online. Effective m-learning requires that students develop an understanding of how mobile technology creates situations in which information is quickly and easily available online (Caverly, Ward, & Caverly, 2009; Cavus & Al-Momani, 2011). It is important that students know how to navigate the web efficiently. M-learning by its very nature impels learners to practice information access skill. In addition, this model encourages them to view this activity as a valuable part of academic conversation: not just as the quickest means of answering unimportant and trivial questions (Chuang, 2009). While information access can be effective in a wired classroom using desktop computers or laptops, however having learners use mobile devices demonstrates to them how finding information is not dependent on location. Mobile learning promotes the development of quick information access and credibility detection skills. These skills will support the learner throughout their lives regardless of what they choose to do professionally (Parry, 2011). "Always-on" connectivity (hyper-connectivity), for example the use of social media, can facilitate m-learning by acting as both a place to share experiences as well as platform with which the learning conversation can be extended beyond the classroom. Conversely, social networking and other mediated experience can distract learners from directing their full attention to a particular event such as classroom participation (Parry, 2011).

## Theoretical Foundation

The move toward mobile learning in higher education represents a significant paradigm shift is represents an evolving area of research (Engelsma & Dulimarta, 2011; Margaryan, Littlejohn, & Vojt, 2011). Consequently, new learning theories are needed to serve as guides in its development. Many different learning theories support the notion of mobile learning including behaviorism, learning theory, informal learning theory, social learning theory, and constructivist learning theory (Nian-Shing & Kan-Min, 2008). However, while these learning concepts provide a firm theoretical foundation for mobile learning, in practice, m-learning also has a significant technical component that, through the application of user acceptance theory, provides a theoretical foundation for the application of m-learning theory in practice (Derntl & Motschnig-Pitrik, 2005; Eisele-Dyrli, 2011). The current literature related to mobile learning as it is related to higher education addresses several relevant areas including the infiltration of mobile learning in education and the impact of cloud-based computing on pedagogy (Cavus, 2011; Keller, 2011; Korucu & Alkan; 2011; Liu, Li, & Carlsson, 2010; López-Pérez, Pérez-López, & Lázaro, 2011; Mayrath, Nihalani, & Perkins, 2011; Meloni, 2010; Ocak, 2011; Oulasvirta, Wahlström, & Anders-Ericsson, 2011; Park, 2011; Parry, 2011; Rodrigo, 2011; Wagner, 2011; Westera, 2011; Young, 2011a, 2011b; Xhafa, Caballe, Rustarazo, & Barolli, 2010). The research conducted in this report explored aspects of learning theory as well as user acceptance theory and contributes to the understanding of the mobile-enhanced blended learning modality.

## Infiltration of Mobile Technology in Higher Education

The penetration of mobile technology in the consumer market has fueled a movement by educational institutions at every level to find ways of enhancing learning by leveraging student experience with mobile devices (Eisele-Dyrli, 2011; Meloni, 2010). In an analysis of the infiltration of mobile learning in K-12 systems Eisele-Dyrli (2011) noted that many administrators and faculty alike acknowledged the inevitability of using mobile learning. The deep penetration of mobile technology into academia acknowledges that true mobile learning shifts the focus from the device to the curriculum and to student needs (Derntl & Motschnig-Pitrik, 2005; Eisele-Dyrli, 2011; Yen & Lee, 2011). From a study on clinical placement of health related students, Andrews, Smyth, and Caladine (2010) posited that the brisk infiltration of mobile devices both nationally and internationally may provide fertile ground for exploring ways in which institutions of higher learning might leverage student’s mobile devices to support teaching and learning (2011). They concluded that in addition to obvious benefits of using mobile technology for learning, mobile learning can provide considerable opportunities to link formal and informal learning across a broad spectrum of educational contexts (Andrews, Smyth, & Caladine, 2011). In a similar vein, Chapel (2008) investigated the potential for new technologies to further the development of a virtual campus and provided a case study of the deployment of mobile technology at colleges and universities.

The suitability of mobile technology for teaching and learning has been studied across a wide spectrum of curricula including computer science (Engelsma & Dulimarta, 2011; Avery, Castillo, Huiping, Jiang, Warter-Perez, Won, & Dong, 2010), health care (Keller, 2011; Akkerman & Filius, 2011; Wu,Wang, & Lin, 2007), English as a second language (Sandberg, Maris, & de Geus, 2011), the social sciences (Evans & Johri, 2008; Margaryan, Littlejohn, & Vojt, 2011) and engineering (Alvarez, Brown, & Nussbaum, 2011; Avery, et al., 2010; Margaryan, Littlejohn, & Vojt, 2011). While these studies have produced a plethora of mobile technology implementation guidelines, sets of best practices, as well as a rich set of case studies, the vast majority of them focused on the impact of mobile technology on learning in a traditional learning environment. To extend our knowledge in this area additional research related to the use of mobile technology for hybrid learning seems warranted.

## Cloud-Based Mobile Learning

Higher education is only beginning to completely appreciate the degree to which geo-location and the mobile technology has changed the lives of modern learners. Cloud-based services allow massive amounts of data to be layering on top of the physical world and that will substantially alter how we can interact with space (Meloni, 2010). These services provide an increasingly complex, data-rich online information landscape (Xhafa, Caballe, Rustarazo, & Barolli, 2010). Although mobile learning (m-learning) is closely related to e-learning and distance education, it is distinct in that its primary focus is on learning across multiple computing platforms (Taxler, 2007). Teaching and learning in higher education are evolutionary processes. Today, there is a movement in higher education to deliver course content using cloud-based Learning

Management Systems (LMS) such as Blackboard, Angel, and iMobileU (Cavus, 2011; El-Hussein & Cronje, 2010; Keller, 2011). Parry (2011) called attention to the need for institutions to recognize that the mobile computing power available to learners radically changes not merely the classroom but also the information spaces students' inhabit and the conversations they participate in outside of formal learning. Many organizations have invested substantial resources in the development of learning content and are understandably hesitant to throw that investment away. Blended learning can address the need to recoup this investment by allowing institutions to supplement or compliment existing courseware rather than replace it (Driscoll, 2002). These systems can be very cost effective for an institution and an LMS can provide them with a sophisticated platform that can simultaneously reduce overhead and increase market footprint. These platforms also support providing learners with access to instruction that is unencumbered by limitations of time and space (Chuang, 2009; Choi, 2005; Liu, Li, & Carlsson, 2010; Taxler, 2007). The traditional model for educational content delivery has evolved such that students who would, in the not too distant past, purchase a textbook, download learning content such as data files and applications from the publisher's or author's website, and would then subsequently install them on their individual PCs or laptops now have access to the same content via the LMS (Choi, 2005; Okamoto, 2007; Magal-Royo, Montañana, Gimenez-López, & Alcalde, 2010). In addition to pedagogical content, an LMS can prove useful to an institution as support for cloud-based services delivery as well. Electronic communication such as email, discussion forums, chat rooms, and virtual conferences have, in many respects become the norm in higher education, and the all of the various stakeholders in the education process are expected to communicate electronically (Choi, 2005; Okamoto, 2007; Romero & Ventura, 2007). As a consequence, access to Internet-capable computing resources has become almost mandatory for students, educators, and administrators alike. Mobile technology can serve as a powerful communication enabler and potent service amplifier for institutions of higher learning (Cavus & Al-Momani, 2011; Chapel, 2008; El-Hussein & Cronje, 2010; Keller, 2011; Young, 2011). As educational institutions move toward offering greater levels of content via e-learning, the asynchronous nature of the online model would appear to require a corresponding shift from teacher-centered to learner-centered education. This shift from pedagogy to andragogy or student-centered learning, in many ways mirrors the growing trend that appears to indicate that Internet-generation learners depend more heavily on information gleaned from the web to learn than on static texts used in conventional learning environments. Students must learn to take ownership of m-learning so that they can shape the mobile learning environment just as much as they are shaped by it (Parry, 2011). A cloud-based m-learning model ameliorates the limitations to learning imposed by time and space through redesigned pedagogy and through the use of portable general-purpose computing devices. This framework facilitates constant learning assessment and provides for a flexible, ever evolving curriculum (Eisele-Dyrli, 2011).

## Current State of Mobile Learning in Higher Education

Many institutions continue to regard mobile learning as ancillary to traditional learning environments and continue to offer web portals that are not tailored for access using mobile technology (Donnelly, 2010; Keller, 2011). However, as Gagnon (2010) suggests, the impact of mobile learning on higher education should not be underestimated given that there is an estimated one billion mobile devices with broadband wireless connections. Holley and Oliver (2010) posit that modern students use technology as a way of negotiating between their busy personal lives and their coursework. In a period of shrinking budgets and greater competition for resources, these institutions risk losing prospective students as well as frustrating current learners who want to manage their coursework using mobile technology. In an effort to leverage mobile technologies for learning, education-based content delivery experts are being challenged to find ways of redesigning learning material so that mobile learners can access domain knowledge with the same richness and complexity as learners using traditional pedagogical methodologies (Liu & Li, 2011; Romero & Ventura, 2007).

Much of the e-learning content developed for higher education continues to be designed for access with conventional desktop and laptop systems (Driscoll, 2002). However, hand-held devices such as tablets and smartphones are becoming the dominant form of web access for many users (Donnelly, 2010; El-Hussein & Cronje, 2010; Keller, 2011; Young, 2011). The explosion in the use of mobile computing platforms by students presents an opportunity for educational institutions to increase their reach as well as to provide students with the ability to access information irrespective of time or space. Although related to e-learning and distance education, mobile learning (m-learning) is distinct in its focus on learning across multiple contexts (Taxler, 2007). M-learning ameliorates the limitations imposed by learning location through the use of portable general-purpose computing devices. M-learning includes learning with portable technologies including hand-held digital players, tablets, and mobile phones. M-learning systems focus on the mobility of the learner, on how they interact with portable technology, on independent socially-based learning, and on how educational systems can accommodate and support an increasingly mobile population (Donnelly, 2010; El-Hussein & Cronje, 2010). M-learning is convenient in that it is accessible from virtually anywhere and facilitates strong content portability by replacing books and notes with small electronic memories and data communications technologies.

Over the past few years there has seen a substantial investment by educational institutions as well as publishers and other content providers to make educational content accessible over the Internet and through electronic media (Donnelly, 2010; Driscoll, 2002; El-Hussein & Cronje, 2010; Magal-Royo, Montañana, Gimenez-López, & Alcalde, 2010; Okamoto, 2007). Electronic-learning (e-learning) is the computer and electronically-enabled transfer of skills and knowledge. E-learning applications and processes include Internet-based learning, computer-based learning, virtual classroom opportunities, digital collaboration, and others (Gaskell, 2007). With e-learning, content can be delivered via the Web, using intranet/extranet systems, audio or video recordings, television, and DVD (Bailey & Card, 2009). E-learning can be self-paced or instructor-led and includes media in the form of text, images, video, animation, and streaming technologies (DeRouin, Fritzsche, & Salas, 2005). However, innovations in mobile technology have put pressure on institutions to keep up with the quickening pace of mobile adoption by students and other stakeholders (Chuang, 2009; Donnelly, 2010; El-Hussein & Cronje, 2010; Keller, 2011). Mobile learning (m-learning) describes the use of mobile technology to access learning content outside of traditional learning boundaries. El-Hussein and Cronje (2010) and Keller (2011) suggest that there has not been much progress in the development of m-learning in higher education but that the pace is quickening as institutions become aware of the opportunities offered by providing content and services outside of the traditional learning space.

As a result of the infiltration of mobile technology is every facet of students' lives, m-learning appears to offer a viable teaching modality that provides an authentic, relevant context with which to practice and demonstrate useful learning (Donnelly, 2010; Gagnon, 2010).The m-learning framework focuses on the mobility of the learner, on how learners interact with portable technologies, on independent socially-based learning, and on how educational systems can accommodate and support an increasingly mobile learner population (El-Hussein & Cronje, 2010; Young, 2011). M-learning includes learning with portable technologies including hand-held digital players, tablets, and mobile phones. M-learning is convenient in that it is accessible from virtually anywhere and facilitates strong content portability by replacing books and notes with small electronic memories and data communications technologies. M-learning supports the blended learning model by providing anywhere, anytime access to learning material (Cavus & Al-Momani, 2011; Keller, 2011, Rodrigo, 2011; Taxler, 2007). Or more appropriately m-learning provides "everywhere, every time" access to learning content. Blended m-learning provides a mixture of computing technologies and social interactions, resulting in a socially relevant, constructive, learning experience that provides a rich context for student-focused learning (Young, 2011). M-learning supports the blended learning model by providing anywhere, anytime access to learning material (Cavus & Al-Momani, 2011; Keller, 2011, Taxler, 2007). Gagnon (2010) correctly posited that the coincidence of learning environments and mobile technologies provides institutions of higher learning with an opportunity to develop innovative frameworks for situated, contextual, just-in-time, participatory, experience-based, and personalized learning. Non-traditional learning environments, such as blended m-learning, provide a mixture of computing technologies and social interactions, resulting in a socially relevant, constructive, learning experience that provides a rich context for student-focused learning.

## Blended Learning

The concept of blended learning conjures up different meanings depending upon the audience. In many respects, this seeming ambiguity in definition may in fact characterize the untapped potential of this model (Driscoll, 2002). Most scholars in this area agree however, that at its core, a blended learning approach usually combines the best of traditional face-to-face instruction with both e-learning and m-learning instruction (Holley & Oliver, 2010; Köse, 2010; López-Pérez, Pérez-López, & Lazaro,  2011; Yen & Lee, 2011). According to Driscoll (2002), when used as a verb the term “blended learning” can have four distinct connotations.

1. To combine or mix modes of Web-based technology (e.g., live virtual classroom, self-paced instruction, collaborative learning, streaming video, audio and text) to accomplish an educational goal.
2. To combine various pedagogical methodologies (e.g., constructivism, behaviorism, etc) to produce an optimal learning outcome with or without instructional technology.
3. To combine various form of instructional technology (e.g., chat, email, videotape, DVD, Web-based training, etc) with traditional face-to-face instructor-led training.
4. To mix or combine instructional technology with actual job tasks in order to create a harmonious effect of learning and working (Driscoll, 2002, p.1).

Computer-mediated education is no longer regarded as an alternative to traditional forms of learning and teaching (Alvarez, Brown, & Nussbaum, 2011; Donnelly, 2010). Indeed, successful computer assisted learning employs methods that are carefully selected to augment a specific learning purpose or pedagogical environment. Blended learning is does not represent a completely original concept. Most teachers have relied on the use of combined resources, e.g., copies of lecture notes, reading lists, models, whiteboards, overheads, etc to deliver learning content. Consequently, blended learning can be viewed as simply a combination of teaching or facilitation methods, learning styles, resource formats, and technologies.

In standard face-to-face classroom training, the didactical strategy rests upon several core precepts (Theys, Lawless, & George, 2005; Wurst, Smarkola, & Gaffney, 2008):

- The development and presentation of learning content by the teacher
- Interaction between teacher and students as well as among the students themselves
- The assignment, assessment, and follow up of content presentation using exercises, exams, and presentations by students either individually or in groups.

Consequently, traditional learning can be viewed as predominately teacher-centered given that the instructor controls the structuring and presentation of content as well as the level of learner support and control (Rodrigo, 2011). Research by Sohn, Park, and Chang (2009) suggests that another implication of the traditional learning model is that the organization of social learning in the classroom remains firmly under the teacher's control.

When implemented correctly, blended learning provides learners and teachers with a potential environment in which they can learn and teach more effectively (Sohn, Park, & Chang, 2009; Platz, Liteplo, Hurwitz, & Hwang, 2011; Rodrigo, 2011). Content delivery trends in higher education may indicate that blended learning has the potential to become the dominant teaching model in the future (Driscoll, 2002; López-Pérez, Pérez-López, & Lazaro, 2011; Yen & Lee, 2011). Driscoll (2002) asserts that the untapped potential of this model is a direct result of its rather imprecise definition (p. 1). Despite this seeming ambiguity, blended learning can be viewed as an extension of conventional learning concepts given that, like the blended model, traditional learning also relies on aspects of student self-directed learning. Garrison and Kanuka (2004) noted the transformative nature of blended learning and posited that the blended learning model is consistent with traditional pedagogy.

Blended learning conceptualizes not only different delivery methods, but also different, more student-centered, theories of learning (Rodrigo, 2011; Sohn, Park, & Chang, 2009). The application of these theories is facilitated through the use of traditional and new media and can affect learning on several levels:

- The theoretical level by combining different theories of learning, like constructivism and behaviorism,
- The methodical level by combining self-directed with instructor-led learning, individual with cooperative learning, and receptive with explorative learning, and
- The level of the media through the combination of face-to-face with on-line elements, using different media, using different technologies, etc. (Alonso, 2009).

In the blended learning model, learners and teachers work together to improve the quality of learning and teaching and the ultimate aim of blended learning is to provide realistic practical opportunities for learners and teachers to make learning useful. Blended learning provides a learning strategy that facilitates a more synergistic, integrated approach for learners (Holley & Oliver, 2010; López-Pérez, Pérez-López, & Lazaro, 2011; Rodrigo, 2011). Although technology-based platforms have for years played a supporting role in face-to-face instruction, through blended learning, the effective use of technology has become an integral part of teaching and learning (Donnelly, 2010).

## Theoretical Foundation

The concept of blended learning has been around for many years and its name has evolved as its uses and recognition have spread (Bliuc, Goodyear, & Ellis, 2007; Derntl & Motschnig-Pitrik, 2005;Garrison & Kanuka, 2004; López-Pérez, Pérez-López, & Lazaro, 2011; Olapiriyakul & Scher, 2006;). While e-learning and m-learning can be classified as blended, in other circumstances the concept of blended learning may simply entail a greater reliance on technology within the classroom. Blended learning can be facilitated by incorporating activities that are structured around access to online resources (Rodrigo, 2011). In addition, both communication via social media and interaction with distance learners in other classrooms are also ways of implementing blended learning.

M-learning supports the blended learning model by providing anywhere, anytime access to learning material (Cavus & Al-Momani, 2011; Keller, 2011, Taxler, 2007). Or more appropriately m-learning provides "everywhere, every time" access to learning content. Blended m-learning provides a mixture of computing technologies and social interactions, resulting in a socially relevant, constructive, learning experience that provides a rich context for student-focused learning. Educators must be sensitive to how mobile learning changes not only how they teach, but also how mobile fluency colors perceptions of what it means to be knowledgeable and educated in our culture (Donnelly, 2010; Parry, 2010; Rodrigo, 2011). Mobile learning opens up a host of pedagogical possibilities. However, introducing mobile technology into the curriculum means more than just "making it work" and principles of adult learning theory can be used to facilitate the design of technology-based instruction so as to make it more effective (Donnelly, 2010; Ocak, 2011; Rodrigo, 2011; Smith, 2010; Vaughan & Garrison, 2005). Many educational institutions have given priority to the integration of computer technology into their curricula (Rivero, 2011). As a consequence, these institutions are coming face to face with many issues that surround making computer-enhanced learning succeed technologically (Baggaley, 2008; Bhati, Mercer, Rankin, & Thomas, 2010; Cramer & Hayes, 2010; Donnelly, 2010; Idrus & Ismail, 2010; Ktoridou, Gregoriou, & Eteokleous, 2007; Nachmias, 2002; Rodrigo, 2011). Higher education faculty must learn to incorporate the learner's technological experience into the design of instructional technology so that they can create a learning framework that is not only technology-effective but that is relevant from the learner's standpoint (Ktoridou, Gregoriou, & Eteokleous, 2007; Rodrigo, 2011; Smith, 2010; Ocak, 2011).

Parry (2011) affirmed the fact that as a society, we have reached the point where the ability to use social media, and particularly social media leveraged through the power of mobile technology, has become a key literacy for students. Holley and Oliver (2010) and Driscoll (2002) among others, argue that a blended learning model allows organizations to gradually move learners from traditional classrooms to e-learning using small steps, thus facilitating user acceptance of web-based systems. The development of curriculum in a blended environment allows faculty and instructional designers to develop the skills needed for e-learning in small increments and provides students time to acclimate to a new instruction delivery dynamic (Rodrigo, 2011). Studies have shown that student satisfaction with non-traditional learning such as e-learning and blended learning was directly related to their perceived level of support for collaborative learning (Rivero, 2011; Rodrigo, 2011; So & Brush, 2008). To be literate in the m-learning space requires that students develop the skills needed to navigate and take ownership of their learning (Parry, 2011). This skill far exceeds the comparatively simple skill of comprehending written text so teaching mobile web literacy may be as crucial as teaching basic literacy (Parry, 2011).

Research on the effectiveness of the blended learning is mixed. For example, a study on the effectiveness of blended learning conducted by Kember, McNaught, Chong, Lam, and Cheng (2010) discovered that while the web-based learning content of blended learning had a marginal effect on the student's ability to learn, those characteristics of blended learning that promoted constructive dialogue and interactive learning activities appeared to encourage deep learning, the development of communication skills, and an enhanced understanding of course content. Research into studies that focus in the efficacy of online and blended learning suggest that student learning outcomes are similar for both models but that other aspects of technology-mediated learning such as learner acceptance diverge depending up on the field of study (Arbaugh, Godfrey, Johnson, Pollack, Niendorf, & Wresch, 2009). Yen and Lee (2011) conducted a study that combined m-learning, e-learning, and face-to-face teaching that was designed to develop problem solving skills using realistic, practical case studies. In their study, they identified three distinct groups of learners: a hybrid-oriented group, a technology-oriented group, and an efficiency-oriented group (Yen & Lee, 2011). Each group displayed varying degrees of success with the efficiency-oriented group showing the greatest increase in problem-solving skills (Yen & Lee, 2011). In a study by López-Pérez, Pérez-López, and Lazaro (2011) it was shown that the use of blended learning appeared to have a positive effect in reducing dropout rates and in improving assessment scores. Studies have found a positive correlation between students' perceptions on blended learning and final grades. In a similar study, López-Pérez, Pérez-López, and Lazaro (2011) conjecture that students' final grades in a course depended on their age, attendance, background, and their level of participation in blended learning activities. Holley and Oliver (2010) developed a model that facilitated the design and analysis of blended learning courses and provided a way of mapping aspects of course design to different course retention risk profiles for students. So and Brush (2008) make a convincing case that critical factors such as course structure, emotional support, and communication medium directly impact student perceptions of collaborative learning, social presence, and satisfaction. According to So and Brush (2008), social presence and personal satisfaction were positively related to student acceptance of blended learning. Despite mixed reviews, data provided by the preceding studies tend to support the notion that student perceptions regarding the blended learning approach has a significant impact on their acceptance of the modality and hence, their ability to learn in that environment.

## Student Acceptance of Technology

Studies have shown that student satisfaction with non-traditional learning such as e-learning and blended learning is directly related to their perceived level of support for collaborative learning (So & Brush, 2008). Ginns and Ellis (2007) conducted a study that extended previous research into the domain of blended learning and concluded that the approaches used by students for learning and the quality of their learning, were closely related to their perceptions of their learning experience. Mayrath, Nihalani, and Perkins (2011) investigated the ways in which students' attitudes and perceptions affect mobile device usage by students for learning and cited several studies that discovered a positive correlation between the use of mobile applications, perceptions of increased engagement by students, and higher grades. Research on the impact of technology in blended learning conducted by Derntl and Motschnig-Pitrik (2005) suggest that blended learning enhanced student learning only when accompanied by reliable, easy-to-use technology. In an effort to leverage mobile technologies for learning, education-based content delivery experts are being challenged to discover ways of redesigning learning material so that mobile learners can access relevant content with the same level of familiarity, ease of use, pedagogical richness, and contextual complexity as those learners using traditional computing platforms (Liu & Li, 2011; Romero & Ventura, 2007). To accomplish this goal requires a thorough understanding of the factors that influence student acceptance of m-learning systems.

## Modeling Behavioral Intention

Research surrounding the ways humans make decisions has resulted in the development of several significant frameworks (Fishbein & Ajzen, 1975; Ajzen, 1985). These models have been used extensively in the area of organizational researcher to attempt to predict why some users in an organization are more apt to accept new technology. Although seminal frameworks such as the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975) and the Theory of Planned Behavior (TPB) (Ajzen, 1985) have been successfully used to predict various types of organizational behaviors, these models have been proven to be less effective for adequately predicting user's acceptance of new technology. Limitations of the TRA and TPB models led to research aimed at refining these models.

## The Theory of Reasoned Action

The Theory of Reasoned Action (TRA) is a framework conducive to explaining the precursors of human behavioral intention (Fishbein & Ajzen, 1975). The TRA maintains that the intention to take action in a particular manner is related to the user's perception that a particular effort will result in a predictable outcome. This model incorporates two basic types of beliefs or awareness: normative and behavioral. Normative beliefs influence the subjective precepts associated with the user's actions and behavioral beliefs influence a user's attitudes about performing the behavior in question (Madden, Ellen, and Ajzen, 1992). Consequently, the TRA model suggests that any planned behavior is influenced no only by the user's attitudes related to performing the act (internal pressure), but is also impacted by their perceptions about what significant groups may think about them (external pressure) if they perform the act. The Theory of Reasoned Action shown in Figure 2 provides a visualization of the relationship between internal factors (attitudes), external factors (subjective norms), and intention.

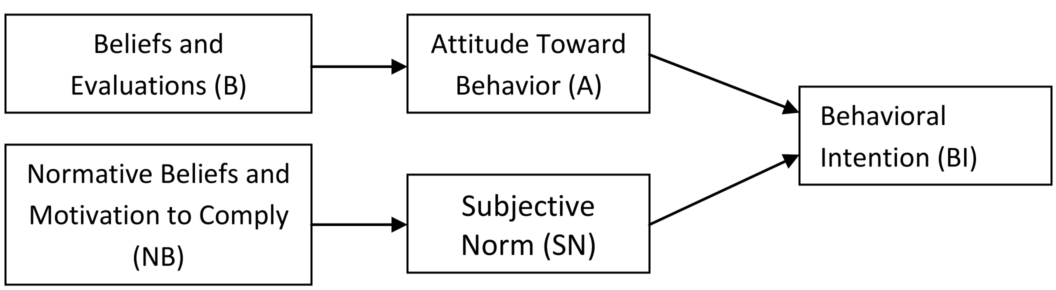


Figure 2. Theory of Reasoned Action (TRA). Adapted from "Belief, attitude, intension, and behavior: An introduction to theory and research", by M. Fishbein and I. Ajzen, 1975, Reading, MA: Addison Wesley.

In the TRA, “attitude toward behavior” describes the result of the user’s interpretation of the potential positive or negative consequences of engaging in a particular action. “Attitude” is modeled as the summation of all of the user’s beliefs surrounding the potential consequences of the action, augmented by their evaluations of the potential outcomes. In this model, “subjective norm” refers to the user’s perceptions regarding external influence to participate in a behavior. Davis, Bagozzi, and Warshaw (1999) calculated subjective norm by factoring the normative beliefs of the user and their motivation to act in accordance with those beliefs. Peer influence and organizationally mandated usage are the two factors that are the most influential to subjective norm in the context of technology acceptance.

**The Theory of Planned Behavior**

The Theory of Planned Behavior (TPB) generalizes the Theory of Reasoned Action (TRA) by acknowledging the user’s sensitivity to internal and external constraints on their behavior (Ajzen, 1985). Due to the addition of perceived behavioral control in this framework, it addresses the fact that behavior can be mediated by factors such as resource availability and institutional mandates (Madden, Ellen, and Ajzen, 1992). According to the TPB, technology users view their behavior as being under their direct control to the degree that they think they have the resources needed to complete a task in a specific situation. Figure 3 below models the effects of behavioral control, attitude, and subjective norm on the user’s motivation to participate in a specific action.

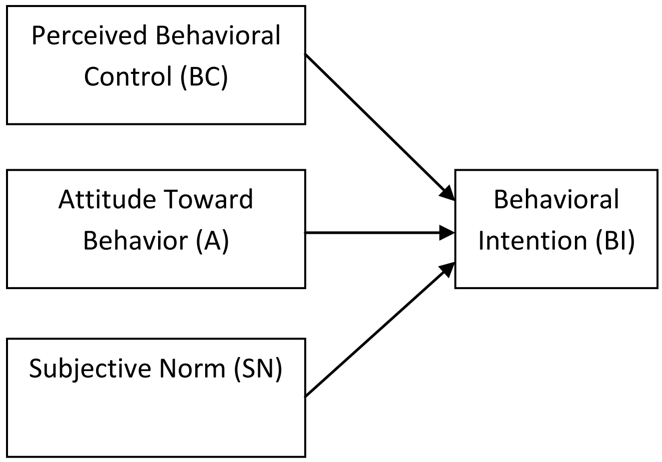


Figure 3. Theory of Planned Behavior (TPB). Adapted from "From intentions to actions: A theory of planned behavior" by I. Ajzen, 1985, In J. Kuhl & J. Beckmann (Eds.), Action control: From cognition to behavior. Berlin, Heidelber, New York: Springer-Verlag.

### The Technology Acceptance Model

Over the past few decades, there has been significant research into the conditions or factors that facilitate the integration of technology in a business environment. As a result of this research, several models have been developed and tested to predict technology acceptance. The Technology Acceptance Model (TAM) is arguably the most referenced model for measuring technology acceptance (Davis, Bagozzi, & Warshaw, 1989; McCoy, Galletta, & King, 2007). This model has been adapted to various contexts and has consequently garnered empirical support for representing a robust, parsimonious framework for predicting technology acceptance using a variety of technologies (Legris, Ingham, & Collerette, 2003). The TAM has been used extensively in Information Systems research to measure both the user's attitude toward using technology and as well as to gauge their actual use of the technology (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989).

The Technology Acceptance Model (TAM) has been used extensively to explain how users adapt to new technology. The TAM is an adaptation of the Theory of Reasoned Actions (TRA) as well as the Theory of Planned behavior to the field of Information Science (Ajzen, 1985; Ajzen & Fishbein, 1977; Fishbein & Ajzen, 1975; Terzis & Economides, 2011). Both the TRA and TPB have their roots in the field of psychology. However, The Technology Acceptance Model (Davis, 1989, Davis & Venkatesh, 1996) evolved out of the need to predict which users were most inclined to successfully utilize innovative technology in an occupational context. The TAM is a variation of the Theory of Reasoned Action, in that the TAM framework presumes that the user's beliefs guide the intentions that lead to their behavior. The Technology Acceptance Model can be differentiated from the Theory of Planned Behavior however because the model posits that in an organizational setting the extent to which users embrace innovative technology is not determined exclusively by their attitude.

Davis (1989) hypothesized that employees frequently use technology because it is mandated as part of their employment or because it might improve their productivity; even though they may not choose to use the technology under other circumstances. This modification was motivated by the limitations of the existing behavioral models most of which assumed that user behavior was voluntary. Consequently, Davis et al. (1989) extended the Theory of Planned Behavior to justify the use of innovative technology to accomplish productivity-related objectives. The TAM postulates that perceived ease of use and perceived usefulness of technology are predictors of user attitude toward using the technology, subsequent behavioral intentions, and actual technology usage. In addition, perceived ease of use is thought to have influence on the user's perceived usefulness of technology. The original Technology

Acceptance Model is depicted in Figure 4 below (Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Davis & Venkatesh, 1996).

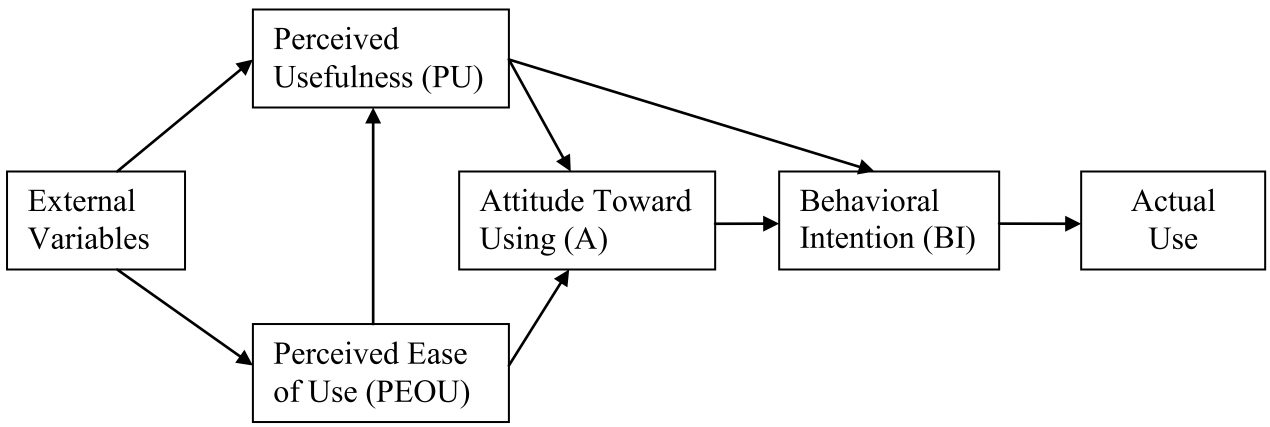


Figure 4. Technology Acceptance Model (TAM). Adapted from "User acceptance of computer technology: A comparison of two theoretical models" by F.D. Davis, R.P. Bagozzi, and P.R. Warshaw, 1989, Management Science, 35, p. 982.

The psychometric constructs used in the original TAM are defined as:

- *Perceived Usefulness (PU)* – the degree to which a user believes that using a technology would enhance their job performance or would produce a more desirable outcome
- *Perceived Ease of Use (PEOU)* – the degree to which a user believes that using a technology would be effortless
- *Attitude (A)* – a user's positive or negative feeling about using a technology
- *Behavioral Intention (BI)* – a user's subjective probability that they will use the technology.

The TAM posits that perceived usefulness and perceived ease of use determine an individual's intention to use a system with intention to use serving as a mediator of actual system use. Perceived usefulness is also seen as being directly impacted by perceived ease of use. In the context of m-learning, technology acceptance refers to student perceptions and behaviors related to the technology and relates to the ability of the mobile system to support students in a range of learning activities. TRA and TAM, both of which have strong behavioral elements, assume that when a user of technology forms an intention to act, that they will be free to act without limitation. Research has shown that there is a significant connection between planned behavior and actual system utilization. For example, Yi and Hwang (2003) discovered that behavioral intention significantly influenced behavioral intention in a web-based environment.

**TAM Extensions**

The original TAM framework has evolved over the years. Some of the original psychometric constructs contained within the TRA such as attitude, although included in the original TAM, were later removed from the model since they were not found to significantly impact the users' intention to accept novel technology (Teo, & Noyes, 2011; Venkatesh & Davis, 2000). The TAM2 is an extension to the original TAM and represents a parsimonious framework that excludes attitude. Figure 5 details the TAM2 framework.

Wu, Cheng, Yen, and Huang (2011) posited that the parsimonious TAM2 framework seemed to offer a better fit than the original model in actual studies. TAM2 holds that potential users will make the decision to use innovative technology based on their assessment of the complexity of engaging the technology (Perceived Ease of Use), their belief that using the technology will enhance their productivity (Perceived Usefulness), and the encouragement of peers and management (Subjective Norm) (Venkatesh & Davis, 2000). TAM2 explicates perceived usefulness and behavioral intention in terms of social influence and cognitive instrumental processes (Venkatesh & Davis, 2000). This framework also takes into account the user's experience to explain the impact of subjective norms on perceived usefulness and intention.

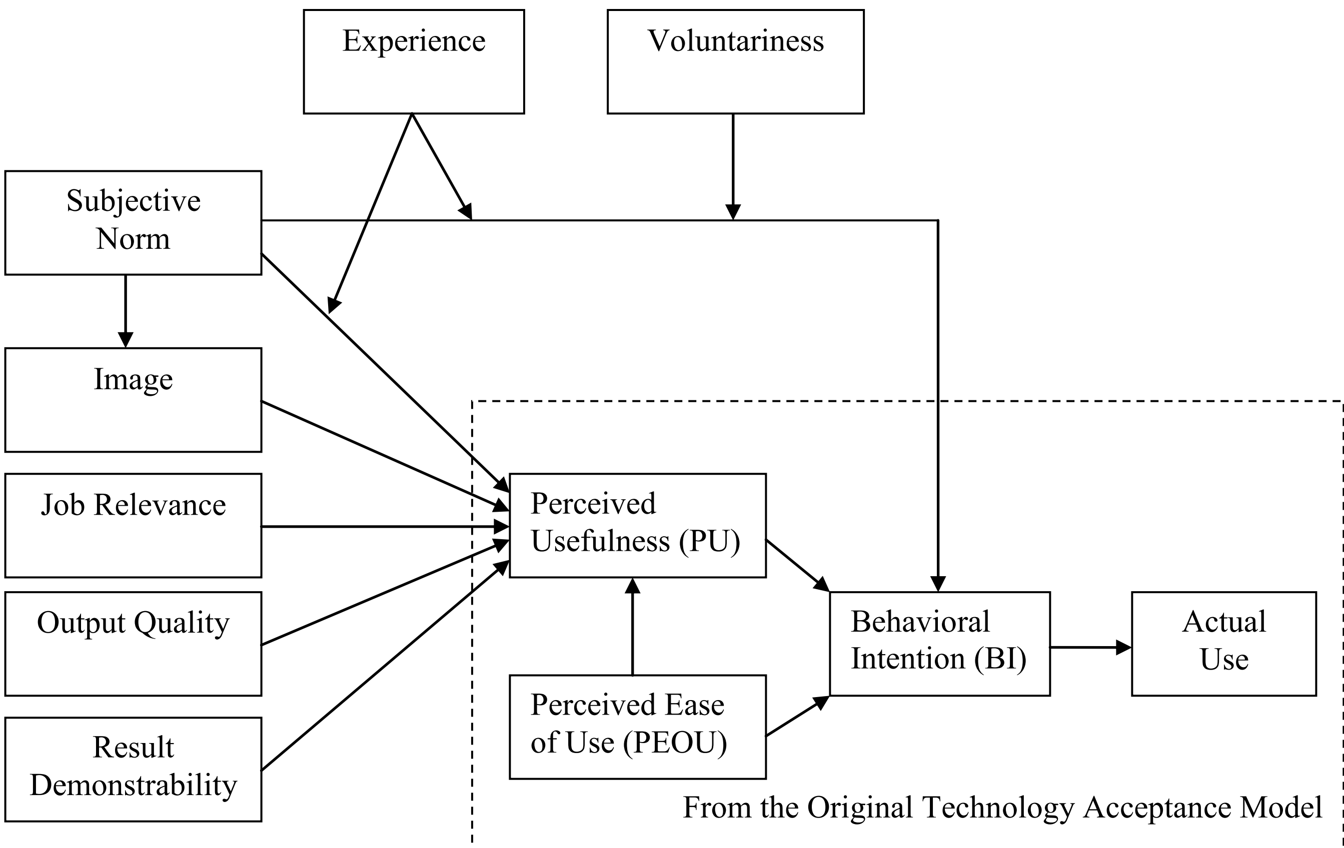


Figure 5. Technology Acceptance Model 2 (TAM2). Adapted from "A theoretical extension of the Technology Acceptance Model: Four longitudinal field studies" by V. Venkatesh and F.D. Davis, 2000, Management Science, 46, p. 190.

Other attempts to extend the original TAM have generally taken one of three general approaches: by introducing factors from related models, by introducing additional or alternative belief factors, and by examining antecedents and moderators of perceived usefulness and perceived ease of use (Wixom and Todd, 2005). Research by Wu, Cheng, Yen, and Huang (2011) compared the original TAM developed by Davis (Davis, 1989) and the parsimonious TAM2 model developed later (Davis, Bagozzi, & Warshaw, 1989) to gain an understanding of the determinants of user intention to use wireless technology. In their study, they found that either TAM framework, original or parsimonious, was sufficient to explain user intention to use wireless technology (Wu, Cheng, Yen, & Huang, (2011). Empirical research has proven the TAM to have the ability to predict technology usage however other studies have shown that further refinements to the model are warranted. For example, Dishaw and Strong (1999) presented research that indicated that the model's external validity may be influenced by the juxtaposition of technological and usage context factors and suggested that these factors be studied in greater depth. In a critical review of the TAM, Legris, Ingham, and Collerette (2003) concluded that there was a need to include other psychometric constructs as a means of providing a more comprehensive explanation of technology adoption.

The TAM only considers Perceived Ease of Use and Perceived Usefulness relative to the use of technology. The result is a particularly parsimonious theoretical model that leaves room for the model to be extended. Although the TAM has been applied in a large number of studies since it was initially developed, the model has also received considerable criticism. For example, some researchers suggest that the model is too generic (Bouwman et al., 2008). In addition, given that the TAM was originally developed as a tool to assess productivity-related IT innovations through the study of employee behavior in an organizational setting, the model may not be generalizable to innovation acceptance in other problem domains such as hedonistic or educational computing. However, considering its robustness and parsimoniousness, the TAM was adopted as the theoretical basis in the current study for investigating mobile learning adoption in a hybrid learning environment.

## TAM and Learning

The TAM model has been used in numerous studies that examined user acceptance of information systems including word processors (Davis, 1989), spreadsheet applications (Mathieson, 1991), e-mail (Szajna, 1996), web browsers (Morris & Dillon, 1997), telemedicine (Hu, Chau, Sheng, & Tam, 1999), and online sites (Koufaris, 2002). In a study involving engineering and computer science students, Avery, Castillo, Huiping, Jiang, Warter-Perez, Won, and Dong (2010) explored the use of tablets in a wide range of courses and developed a set of teaching strategies designed to foster heightened student-teacher collaboration and enhanced user acceptance of the technology. Although the TAM and TAM2 have been extensively tested and validated in a business context, it appears that there has been less research using this model dedicated to its use in an educational context. A primary cause for the lack of research in education appears to be the differences in the ways business and educational users respond to new technology. Unlike most business adopters, educational adopters (student and teachers alike) tend to exercise greater autonomy over the choice of technology and this latitude makes any study of acceptance factors more complex. Hu, Clark, and Ma (2003) suggested that institutions of higher learning have fundamentally different objectives for the use of technology than do businesses and that these differences often translate into less pressure to use technology caused by organizational mandate or peer pressure. Examples of the application of the TAM framework in education include research into Graphical User Interface, mainframe applications, accounting applications, and the Internet (Agarwal & Prasad, 1999; Dishaw & Strong, 1999; Jackson, Chow, & Leitch, 1997; Riemenschneider, Harrison, & Mykytn, 2003).

This TAM model has been studied under various conditions using diverse groups and technologies and has emerged as a powerful model for predicting behavior in the workplace Although the model has been used to effectively predict or explain the acceptance of workplace innovations, it can fall short when used as a framework for predicting technological acceptance using unique populations or when investigating the integration of highly specialized tools. For example, Hu, Chau, Liu, Sheng, and Tam (1999) employed the Technology Acceptance Model framework for research that focused on doctor's acceptance of remote technology used for telemedicine. In their study, they found a modest fit of the model in general, but they discovered that the impact of perceived ease of use on behavioral intention was insignificant. They postulated that ease of use concerns can be ignored by users when expedient as in the case where doctors were willing to use a technology that benefited their patients even though they themselves found the technology awkward to utilize. Similarly, the specialized population (students) and mobile technology may form comparable moderators when the Technology Acceptance Model is used to predict mobile technology acceptance in higher education. Although there may appear to be evidence supporting the notion that perceived usefulness can ameliorate the effects of ease of use, the question remains as to the relationship of perceived usefulness and previous experience with similar technology. The current research attempted to answer the question: how would these factors impact perceived ease of use and behavioral intention to use mobile technology for learning?

Although research has shown the efficacy of technology for learning in the classroom, the effective use of computer technology continues to present challenges for educators (Lim &

Khine, 2006). In a 2001 study, Becker found that although educators used drills and games to help learners, the use of technology was infrequent. Bayhan, Olgun, and Yelland (2002) noted that a large percentage of teachers in their study failed to use computer technology for teaching. They posited that the root causes for the lack of technology use may stem from poor professional development and a lack of confidence. Other barriers to the effective integration of technology in teaching and learning include a lack of technical support, teacher's and student's lack of confidence, and misconceptions about the advantages of using technology (Jones, 2004). Conversely, Scrimshaw (2004) suggested that factors such as the availability of resources, professional development, and effective technical support work to support the effective integration of technology for learning. Teachers are important stakeholders in the educational process and their perceptions with regard to technology significantly impact its use in the classroom. Just as important however, are the perceptions of students with regard to technology use. Student acceptance of technology will enhance the learning process and make it easier to assimilate information. Conversely, student reluctance to use technology forms a significant barrier to learning; regardless of the teacher's intentions.

## Benefit of Study to the Institution

The results of this study provide data that can be used to develop strategies for mobile adoption and can be used to help justify the investment of limited funds for the development of mobile-enhanced learning content and delivery services. The knowledge gained from this study can be used to enhance blended learning courses at Monroe Community College through the development of mobile-aware course content and content delivery mechanisms.

## Study Theoretical Framework

When evaluating novel technology, there is a general tendency for the vast majority of new users to view it positively. Consequently, organizations sometimes implement new technologies even when it is not to their advantage. Abrahamson (1991) explained this experience in terms of an often-unconscious bias toward modernization that can lead to the adoption of inefficient technologies that turn out to be expensive to implement and that have little to no return on investment. For any organization, the rationalization for implementing technological innovations in economic terms can be challenging due to their inability to fully anticipate implementation and maintenance costs; which can end up being larger than the cost of the technology alone. Even though there are models that facilitate the evaluation of the economic impact of new technology, they are only useful if the systems are actually used (Fichman, 2004). The implementation of m-learning systems requires a significant investment in resources, thus before investing in their development academic institutions should attempt to study how students will actually use mobile technology for learning.

Through the thoughtful integration of mobile technology into the fabric of the learning flow of the organization, an institution's ability to serve its stakeholders can be enhanced (Holley & Oliver, 2010; Keller, 2011; Köse, 2010). In addition, mobile technology provides opportunities for institutions to establish better relationships with students, to build loyalty, to increase service, and to establish their brand. To better understand how this can be done, more research is needed in the area of mobile learning adoption using alternative learning formats. Through rigorous empirical research, the Technology Acceptance Model (TAM) has been shown to be a powerful framework for explaining the psychological factors that impact user behaviors across a broad range of technologies and user contexts. The TAM specifies the causal relationships between perceived usefulness, perceived ease of use, and the user's attitude towards technology and correlates these factors to the user's behavioral intention to use the technology.

The TAM formed the theoretical grounding for the current research. Specifically, the research endeavored to determine how students' prior experience with mobile technology influences perceived ease of use and behavioral intention to use mobile technology in a hybrid-learning environment. The insights gained from this study contribute to the ongoing conversation regarding the applicability of m-learning in higher education. The goal of this study was to fill the gap in current research related to the use of mobile technology for non-traditional learning in higher education. The diagram in Figure 6 illustrates the proposed research model.

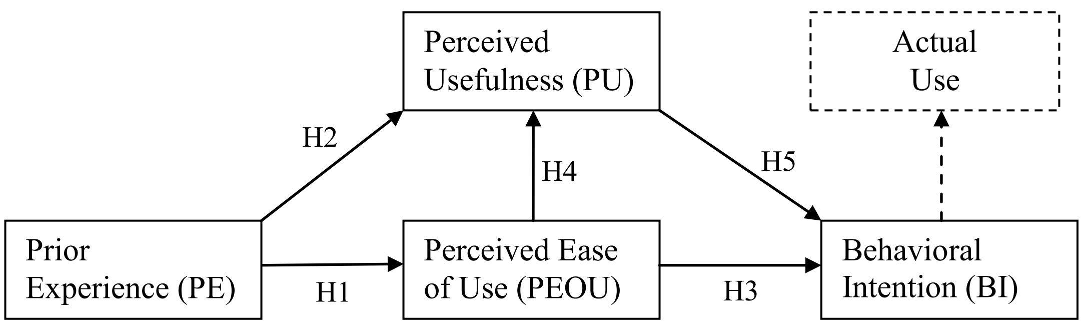


Figure 6. Proposed Study Theoretical Model.

## Summary

Over the past few years there has seen a substantial investment to make educational content accessible over the Internet and other electronic media by educational institutions as well as by publishers and other content providers (El-Hussein & Cronje, 2010; Magal-Royo, Montañana, Gimenez-López, & Alcalde, 2010; Okamoto, 2007). As an extension of traditional pedagogy, electronic or virtual learning has emerged as a viable platform for learning. Electronic-learning (e-learning) is the computer and electronically enabled transfer of skills and knowledge. E-learning applications and processes include Internet-based learning, computer-based learning, virtual classroom opportunities, digital collaboration, and others. With e-learning, content can be delivered via the Web, using intranet/extranet systems, audio or video recordings, television, and DVD. E-learning can be self-paced or instructor-led and includes media in the form of text, images, video, animation, and streaming technologies. However, innovations in mobile technology are putting pressure on institutions to keep up with the quickening pace of mobile adoption by students and other institutional stakeholders such as faculty and alumni (El-Hussein & Cronje, 2010; Keller, 2011). Mobile learning (m-learning) describes the use of mobile technology to access learning content outside of traditional learning boundaries. El-Hussein and Cronje (2010) and Keller (2011) suggest that there has not been much progress in the development of m-learning in higher education but that the pace is quickening as institutions become aware of the opportunities offered by providing content and services outside of the traditional learning space. In order to facilitate m-learning, perhaps institutions of higher education should begin to start thinking of student usage of mobile multimedia devices as production devices and not simply as consumption devices (Rodrigo, 2011).

Many educational institutions continue to regard mobile learning as ancillary to traditional learning environments and thus continue to deploy m-learning systems that are not designed for access using mobile technology (Keller, 2011). In a period of shrinking equipment budgets and greater competition for resources, institutions that fail to acknowledge and exploit the growing mobile landscape risk losing market share In addition, they risk losing prospective students and frustrating current learners who expect to be able to manage their learning by leveraging their experience using mobile technology. Faculty normally can be mandated to use a technology but students often have some choice to use technology or not. It can be postulated that if students feel comfortable using a technology and find it useful for learning, then they would be more likely to adopt it to meet their needs.

To facilitate the use of m-technology as an adjunct to learning, educational institutions must strive to fully integrate technology. Arguments for the use of mobile technology for learning primarily center on flexibility and the ability of learners to move through curriculum anytime, anywhere, and at their own pace. In addition, learners may adapt technology-enabled curriculum so as to gain access the material they need to learn at the moment and to eliminate other material. Technology-based learning must be designed to be interactive, learner-centered, and to facilitate self-directed learning.

For modern learners, independent student-based learning is becoming an attractive alternative to traditional pedagogy. Simultaneously, educational content delivery systems are moving away from the linear, textbook metaphor, and student access to learning is becoming more mobile. Personal computer usage is rapidly giving way to mobile technology and this paradigm shift represents an excellent opportunity for educational institutions to leverage existing learning content to meet student expectations of anytime-anywhere access to information. A technology acceptance study provided an excellent vehicle for gathering data that would aid in the development of m-learning best practices. The goal of this study was to provide data that would assist in the development of recommendations that could be used in the design of blended-learning systems. An understanding of how mobile devices impact student impressions of the utility of this technology for learning will assist educational institutions in the development of strategies for the design, financing, deployment, and support of blended-learning systems.

As educational institutions move toward offering more content via e-learning, the asynchronous nature of the online model would appear to require a corresponding shift from teacher-centered to learner-centered education. Mobile technology can enhance student access to content and services (Chapel, 2008; El-Hussein & Cronje, 2010). In addition, as the competition between educational institutions for students increases and as mobile technology becomes more ubiquitous, a well-planned m-learning model might allow an institution to more rapidly and effectively respond to consumer needs and to gain a competitive advantage in the marketplace. Through the thoughtful integration of mobile technology into the fabric of the information flow of the institution, the institution's ability to compete for students can be enhanced (Chuang, 2009; Keller, 2011). With careful planning and thoughtful implementation, blended learning has the potential to enhance students' learning experience (Garrison & Kanuka, 2004). In addition, mobile devices provide opportunities for institutions to establish better relationships with students, to build loyalty, to increase service, and to establish their brand. Research has shown that, if users find an information system difficult to use, then they may not readily accept the system (Glassberg, Grover, & Teng, 2006; Jeon, Hwang, Kim, & Billinghurst, 2006; Oakley & Park, 2009).

# CHAPTER 3. METHODOLOGY

## Study Participants

The study sample population for this research consisted of undergraduate students enrolled in hybrid courses at a medium-sized community college. In this inquiry, the use of students was integral to the research protocol given that the primary focus of the study was related to student learning. The research was relevant to the course subject matter since students enrolled in the course were required to use computer technology, with little guidance, in a hybrid environment as a means of developing a set of practical skills that were to be used to manage their course work in the course. To lessen the impact of a non-random convenience sample, all of students in each of the course sections were invited to participate in the study. Only students 18 years of age or older were solicited thus there was no need to secure parental or legal consent. No performance evaluations, grades, or other confidential student information were collected in the study. Study participants were given the option to withdraw from the study at any time. Students choosing to participate in the study received a link to an email letter that described the purpose of the study as well as contained instructions for completing the survey. Appendix C contains a draft of the Letter to Participants.

Course instructors disseminated an in-class general announcement to students as a group. Along with the general announcement, the initial invitation included a written description of the proposed study, a statement of the proposed student participation, and links to the Informed Consent Form. In addition, students were provided with contact information for a neutral third party that they may contact should they feel coerced at any time during this process. This same information will be posted on each course's LMS portal (see Appendix A). Prior to taking the survey, each potential participant will be required to complete and sign the Informed Consent Form posted online in the LMS. The Informed Consent Form will include written assurance that any information provided will remain completely confidential (see Appendix B).

Student participation in the study was voluntary and students were allowed to choose not to participate or to withdraw from the study at any time without penalty. No extra credit our other incentives were offered to students who chose to participate in the study. Involvement in the study was designed to enhance the students' learning experience by providing them with an opportunity to explore the possible benefits and challenges of using mobile technology for learning.

## Study Instrumentation

The use of surveys as a systematic tool for research is rooted in the social sciences (Bordens & Abbott, 1999). Today, surveys provide a powerful investigative tool and are used in various disciplines ranging from sociology to Information Technology (IT) (Bliuc, Goodyear, & Ellis, 2007; Fowler, 2009; Krosnick, 1999; Pinsonneault & Kraemer, 1993; Sun & Zhang, 2003; Swanson, 1994; Szanja, 1994; Taylor & Todd, 1995a). A survey is a type of ex post facto experiment and as such, it provides a retrospective study of a set of conditions in a given context and investigates the relationships among phenomena and outcomes. If the subject of interest is well defined and if the researcher has a thorough understanding of the relationship between variables, then surveys can provide an excellent tool to use to measure the constructs surrounding those relationships. This is due to the fact that surveys will confirm or describe the respondent's attitudes to the questions presented (Abareshi & Martin, 2008; Aiman-Smith &

Markham, 2004). The theoretical constructs used in the proposed study are well defined in prior research and the relationships among them have been extensively researched.

Survey research is designed to evaluate the attitudes, beliefs, intentions, and behaviors of a group of study participants (Aiman-Smith & Markham, 2004; Bartlett, Kotrlik, & Higgins, 2001; Bordens & Abbot, 1999, p. 174; Creswell, 2003; Krosnick, 1999). Surveys are designed to determine the pre-existing causal conditions that exist between groups and are useful for studying a large number of variables using a representative sample combined with rigorous statistical analysis techniques. Surveys use instruments, usually questionnaires, to gather data and the results of surveys are often used to predict or describe salient behavioral phenomena (Davis, 2005, p.146; Fowler, 2009; Krosnick, 1999; Swanson & Holton, 2005). Surveys are especially well suited for answering questions about what, how much, and how many, as well as questions about how and why (Pinsonneault & Kraemer, 1993; Sjoberg, Dyba, & Jorgensen, 2007). Unlike naturalistic observations and field studies, surveys require interaction with respondents and thus are a widely used data-gathering tool in IT research and thus this tool would be appropriate for use in the proposed study (Bordens & Abbot, 1999; Davis, 2005).

In the current study a questionnaire containing items that measured students' intention to employ mobile technology in a blended learning environment was used to gather data. Student participation in the study involved the completion of an online survey. The survey contained questions related to mobile device experience and perceptions of ease of use, utility, and intention to use the technology as an aid to learning in a blended environment. The multiple-choice questionnaire contained 28 items and took students an average of 4.5 minutes to complete. The majority of the questions on the survey instrument employed Likert scales to capture participant responses. Likert scales, a form of summated rating scales, produce interval data and are very reliable (Cooper & Schindler, 2008). Copper and Schindler suggest that larger number of items for Likert scales improve the reliability of the scale by increasing the discrimination power of the survey question (2008, p. 311). Unless otherwise noted, all survey items were on a scale of 1 to 7, where 1 was “Strongly Disagree” and 7 is “Strongly Agree.” This is consistent with scales used in similar research by Davis (1989) and Dishaw and Strong (1999). For the current study, a 3-point scale would not yield the requisite variability among the respondents. Conversely, although an 11-point scale may have provided greater reliability and sensitivity and thus may provide a better measurement of variability, this level of scale granularity is unwarranted for this research. The 7-point scale used in this survey was sufficient to obtain a good approximation of a normal response curve and to measure variability among respondents since this provided sufficient granularity to measure each participant’s attitude toward the use of mobile technology for learning. Other survey items were formed using suitable measurement scales. For example, items for gender (nominal), age (interval), and mobile technology experience (nominal, ordinal, and interval) were measured using appropriate measurement scales. The questionnaire that was used in this study can be found in Appendix D. The survey instrument contained established assessment measures for prior Experience, Perceived Ease of Use, Perceived Usefulness, and Behavioral Intention related to the respondent’s use of mobile technology in a blended learning environment. The study instrument contained additional questions related to respondent age and gender demographics. The instrument did not contain any items that would capture individually identifying information. The face validity of the survey was established using a field test in which four experts from the field of education and Information Technology evaluated the instrument. Each expert was provided with a copy of the instrument along with an overview of the study. They were asked to critique the instrument and to assess whether the questions would serve to adequately address the research question. Feedback from the experts was returned via email and resulted in modifications to the instrument that served to clarify the meaning of "mobile technology" and "blended learning" for participants.

Participant responsiveness was an important consideration when using a survey for this research (Bordens & Abbot, 1999; Krosnick, 1999; Swanson & Holton, 2005). In practice, participants may decide to take part in a survey for numerous reasons (Fowler, 2009; Swanson & Holton, 2005). For example, they may have a desire to effect change, to be part of the decision making process, or they may find the quality of the survey instrument (format, wording, delivery method) appealing. Conversely, there are potentially many reasons that participants may chose to refuse to respond to surveys. For instance, in the case of online surveys potential participants may not have access to the Internet. Other reasons might include their inability to perform the task due to illness, language barriers, or literacy limitations (Davis, 2005; Krosnick, 1999;). Additional reasons for participant unresponsiveness include: disagreement with the survey’s purpose, fear of reprisal or intimidation, perceived lack of quality of the survey instrument (format, wording, or delivery method), respondent apathy, and time constraints (Fowler, 2009; Krosnick, 1999; Swanson & Holton, 2005; Sjoberg, Dyba, & Jorgensen, 2007).

To minimize bias that could be caused by unresponsiveness in the proposed study every effort was made to maximize student access, to protect their anonymity, to familiarize them with the study’s intent, and to give them the option to opt out of the study if they so chose. Student access to the instrument did not pose a problem since the study questionnaire was administered electronically to students. The purpose of the survey was fully explained to participants and their participation was completely voluntary.  Refer to Appendices A, B, and C for the various communications that were provided to students regarding their participation in the study. To protect the students' anonymity, neither their email address nor the Internet Protocol (IP) address of the computer used to access the survey was recorded. Data from the completed surveys was collected and stored as a single flat file for subsequent processing. Participants were assured that all of the student data collected would be destroyed at the conclusion of the study.

**Instrument Item Reliability and Validity**

The goal of the survey instrument used in this study was to measure the characteristics of the participants. It was intended to measure each participant's overall orientation as a means of measuring attitudinal differences with respect to using mobile technology for blended learning. According to Fowler (2009), several phenomena could serve to effectively compromise question validity including: the lack of understanding of the question, the lack of domain knowledge, insufficient recall, and an unwillingness to respond (p. 105). In the current study, none of these phenomena appeared to negatively impact the sample group's ability to respond to the survey questions.

Survey reliability is related to the consistency of the responses to the instrument questions across multiple tests using the same instrument (Bordens & Abbott, 1999). The majority of questions on the instrument that was used in the current study were related to attitudes regarding technology acceptance and have been used consistently over time. Meta studies have shown that the data retrieved from TAM surveys appears consistent (reliable) across applications and problem domains (King & He, 2006; Schepers & Wetzels, 2007). The measures used to develop the questions in the present study can be considered relatively stable given that the results of several studies have demonstrated consistent measurement results with repeated applications (King & He, 2006).

Construct validity is the extent to which a set of measured items actually reflects the theoretical latent construct that they are designed to measure (Bordens & Abbot, 1999). Previous studies that employed TAM constructs firmly established the content and criterion-based validity of the items used to measure them (Davis, 1989; Davis & Venkatesh, 1995; Dishaw & Strong, 1999). For example, in previous TAM studies the survey questions used to measure the PEOU, PU, PE, and BI variables made sense to participants and these items demonstrated adequate face validity. Thus, previous research has shown that these items are appropriate for research related to technology acceptance (Davis, 1989; Dishaw & Strong, 1999). Research has also shown that the item scales used to measure PEOU and PU constructs exhibit high degrees of convergent and discriminant validity (Davis & Venkatesh, 1995). Consequently, it can be surmised that since the items employed in the questionnaire for the current study originated from previous TAM studies that the criteria for the internal and external validity of the instrument is firmly established.

## Research Hypotheses

In the proposed study, a set of null hypotheses will be used for inferential testing. Although the null hypotheses will be tested computationally, the alternate hypotheses are described below as supplements to the null hypotheses and will be used to describe the relationships among the model constructs.

*Research Question #1*:

To what extent is a learner's prior experience with mobile technology a significant predictor of their perceived ease of use (effort expectancy) of the technology to support their learning in a blended environment?

*$H1_0$: A learner's Prior Experience using mobile technology will not be a significant predictor of his/her Perceived Ease of Use of mobile technology for blended learning.*

*$H1_A$: A learner's Prior Experience using mobile technology will be a significant predictor of his/her Perceived Ease of Use of mobile technology for blended learning.*

*Research Question #2*:

To what extent is a learner's experience with mobile technology a significant predictor of the learner's perceived usefulness (utility) of mobile technology to support their learning in a blended environment?

*$H2_0$: A learner's Prior Experience using mobile technology will not be a significant predictor of his/her Perceived Usefulness of mobile technology for blended learning.*

*$H2_A$: A learner's Prior Experience using mobile technology will be a significant predictor of his/her Perceived Usefulness of mobile technology for blended learning.*

*Research Question #3*:

To what extent is a learner's perceived ease of use (effort expectancy) with mobile technology a significant predictor of their intention to use the technology to support their learning in a blended environment?

*$H3_0$: A learner's Perceived Ease of Use of mobile technology will not be a significant predictor of his/her Behavioral Intention to use mobile technology for blended learning.*

*$H3_A$: A learner's Perceived Ease of Use of mobile technology will be a significant predictor of his/her Behavioral Intention to use mobile technology for blended learning.*

*Research Question #4*:

To what extent is a learner's perceived ease of use (effort expectancy) with mobile technology a significant predictor of his/her perceived usefulness (utility) of the technology to support his/her learning in a blended environment?

*$H4_0$: A learner's Perceived Ease of Use of mobile technology will not be a significant predictor of his/her Perceived Usefulness (utility) of mobile technology for blended learning.*

*$H4_A$: A learner's Perceived Ease of Use of mobile technology will be a significant predictor of his/her Perceived Usefulness (utility) of mobile technology for blended learning.*

*Research Question #5*:

To what extent is a learner's perceived usefulness (utility) with mobile technology a significant predictor of his/her intention to use the technology to support their learning in a blended environment?

*$H5_0$: A learner's Perceived Usefulness (utility) of mobile technology will not be a significant predictor of his/her Behavioral Intention to use mobile technology for blended learning.*

*$H5_A$: A learner's Perceived Usefulness (utility) of mobile technology will be a significant predictor of his/her Behavioral Intention to use mobile technology for blended learning.*

**Operationalization and Measurement of Study Constructs**

Recently, the TAM has been used to investigate the effect of a variety of student technology acceptance factors. These factors include students' satisfaction with online learning, textbook online companion sites, technical support, as well as pre-service teacher attitudes about technology use in education (Drennan, Kennedy, & Pisarski, 2005; Gao, 2005; Ngai, Poon, & Chan, 2007). A critical review of the TAM by Legris, et al. (2003) reveals the need to consider this model in other contexts and to investigate the contribution of other factors such as experience so as to provide a more comprehensive view of user acceptance and as a result offer an expanded explanation of technology acceptance in higher education. The current study explored technology acceptance using the original Technology Acceptance Model psychometric constructs along with the addition of a experience component similar to the one found in the TAM2.

## Definition of Measures

The theoretical constructs for the current study were operationalized using validated items from previous studies (Agarwal & Karahanna, 2000; Chau, 1996; Igbaria et al., 1995; Igbaria et al., 1996; Igbaria et al., 1997; Legris et al., 2002; van der Heijden, 2000; Venkatesh & Davis, 2000). The TAM scales for Perceived Usefulness, Perceived Ease of Use, and Behavioral Intention were adapted from Davis, at al. (1989) and Chau (1996). Perceived Usefulness measured the student's perception of how mobile technology would them accomplish learning tasks more quickly, improve their performance, and how it serves to increase their productivity and effectiveness in a blended learning environment. Perceived Ease of Use measured the amount of effort required to learn to use mobile technology to access what was needed for learning, interacting with the technology in a clear and concise manner, the flexibility of the technology, and the student's ability to become skillful using the technology in the given context. Behavioral Intention to use mobile technology was modeled as the planned utilization of mobile technology for blended learning in the future (Agarwal & Karashanna, 2000; Chau, 1996). This study employed the Venkatesh and Davis (2000) measures focusing on future Behavioral Intentions. The experience construct was operationalized from the research of Venkatesh and Davis (1996, 2000) and Legris, et al. (2002). In this study, the user's experience with various types of commonly available mobile devices will be measured as a function of both the length of time and frequency of use with respect to mobile technology.

### Experience

The proposed theoretical model hypothesizes attitudinal relationships similar to the original Technology Acceptance Model but includes an experiential component similar to the construct used in TAM2. Previous studies have shown experience to be a useful antecedent to perceived ease of use, usefulness, and behavioral intention (Dishaw & Strong, 1999; Gardner & Amoroso, 2004). In contrast, the current study focused on the direct effect of experience on perceived ease of use and perceived usefulness. In the context of this study, experience refers to the amount of previous exposure to a given technology. It can be postulated that prior experience is a significant measure in acceptance technology research given that, generally, users of technology tend to depend on the knowledge acquired through their previous experiences to shape their behavioral goals to use similar technology in the future. Ajzen and Fishbein (1975) conjectured that users who were engaged in the use of novel technology that was in some way similar to systems that they had used in the past would assimilate new information about using the new system more quickly since it would be easy to link the new technology with earlier information.

A significant number of studies employing the Technology Acceptance Model have been conducted in workplace settings the majority of which focused primarily on the controlled implementation of new technology in a production environment (King & He, 2006; Schepers & Wetzels, 2007; Taylor & Todd, 1995b; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010). An assumption made in many of these studies was that among all of the participants there would be a consistent level of prior experience among users with respect to similar technology. However, Venkatesh and Davis (2000) discovered that even across diverse professions, ranging from retail sales to accounting, the other psychometric factors that affect technology acceptance such as perceived ease of use and usefulness, appear to vary as a function of the user's prior experience with the technology. For example, their research established that higher degrees of experience appeared to explain more of the variation in perceived ease of use (60%) than at lower user experience levels (40%). The results of this study seem to support the notion that the character of the link between the user and the technology varies as a function of user's experience with the technology. This study also supports the idea that intrinsic user characteristics become increasingly more important to user acceptance than technological distinctiveness as users gain experience.

Similarly, in a lengthy study of email users Szajna (1996) developed further support for the Technology Acceptance Model. However, she noted what appeared to be an "experience component" that was not accounted for in the original TAM framework. In her study, it was found that perceived ease of use was positively correlated with experience but that ease of use was not necessarily predictive of intention when experience levels were elevated. Similarly, Igbaria, Zinatelli, Cragg, and Cavaye (1997) found that experience and education were both positively related to user perceptions of ease of use and usefulness, and concluded that user expertise was a significant predictor of technology use. According to Dishaw and Strong (1999), Perceived Ease of Use of a technology can be determined, to some extent, by the functionality provided by the technology as well as by the user's experience with the tool. In particular, users may find that a technology with elaborate functionality may likely be more difficult to use. However, as users acquire more experience with the tool, it becomes easier for them to use. The current study model posited that a student's behavioral intention to use mobile technology is mitigated by the experience has a direct effect on both on the student's perceived ease of use as well his/her perceived utility of the technology to learn.

For this study, two hypotheses were made relative to the effect that the student's prior exposure to mobile technology would have on his/her acceptance of mobile technology for learning. Hypotheses H1 and H2 refer to the effect of experience on ease of use, perceived usefulness, and perceived usefulness, respectively.

*$H1_A$: A learner's Prior Experience using mobile technology will be a significant predictor of his/her Perceived Ease of Use of mobile technology for blended learning.*

The proposed model includes a path from experience to perceived ease of use and will investigate whether experienced users will rate mobile technology as easier to use for learning than inexperienced users.

*$H2_A$: A learner's Prior Experience using mobile technology will be a significant predictor of his/her Perceived Usefulness of use mobile technology in a blended learning environment.*

The proposed model includes a path from experience to perceived usefulness and will investigate whether or not experienced users will rate mobile technology as more useful for learning than inexperienced users.

In the present study, the experience score was derived from a set of items that polled students on their historical use of various mobile technologies. A set of questions focused on the ways respondents used mobile technology as an aggregate as opposed to their use of individual tools. For example, respondents were asked the question "On average, how many times per week do you use mobile technology?" and they could respond with "less than once a day", "between 1 and 3 times", or "more than 3 times." Given that functional overlap of mobile devices (shared applications, common interfaces, etc) these questions were related to the user's total mobile device usage. Each question on the instrument related to experience was measured using an appropriate scale.

The experience subscale used in this study was a measure of the amount of prior use of mobile technology. The Prior Experience items were derived from similar items used in research conducted by Dishaw and Strong (1999). In that study, items related to experience had a Cronbach's Alpha rating of 0.72. Although the items in the current study will closely align with similar items in the Dishaw and Strong (1999) study, the wording of the questions used was modified slightly to reflect their objective of measuring mobile acceptance in a blended learning environment. Table 1 describes the Experience items that were used in this study.

Table 1

Proposed Study Item Scale for Mobile Technology Prior Experience

| Item No. | Candidate item psychometric measures for Prior Experience |
|---|---|
| PE1 | How much experience do you have using mobile technology? |
| PE2 | How frequently do you use mobile technology? |
| PE3 | How many total hours have you used mobile technology? |

Note: Adapted from "Extending the technology acceptance model with task technology-fit constructs," b y M. T. Dishaw and D. M. Strong, 1999, *Information & Management, 36*, pg. 19.

**Perceived Usefulness**

Perceived Usefulness is the belief that a particular technology will help the user realize their work goals. In the current study, the student's work goal was increased academic performance. A version of the ten-question Perceived Usefulness measure originally developed by Davis (1989) was used in this study. The items in the study closely mirrored similar items in the Davis (1989) study however the wording of the questions used was modified slightly to reflect the research objective of measuring mobile acceptance in a blended learning environment.

In his 1993 study, Davis found that the Perceived Usefulness scale proved to be highly reliable and yielded a Cronbach's alpha reliability coefficient of 0.97 (p. 480). Similarly, in a study by Dishaw and Strong (1999) these items were rated at 0.98 (p. 19). In the current study, the questions in this area asked the user to rate the usefulness of mobile learning in terms of improving grades, increasing productivity, and overall effectiveness in their academic work. As an example, respondents were presented with the question "Using mobile technology makes me more productive" (see Table 2).

*$H5_A$: A learner's Perceived Usefulness (utility) of mobile technology will be a significant predictor of his/her Behavioral Intention to use mobile technology for blended learning.*

The study examined whether experienced student's perceived mobile technology to be more useful for learning.

Table 2

Proposed Study Item Scale for Perceived Usefulness

| Item No. | Candidate item psychometric measures for Perceived Usefulness |
|---|---|
| PU1 | Using mobile technology for learning would improve the quality of my learning in a blended learning environment. |
| PU2 | Using mobile technology would give me greater control over my learning in a blended learning environment |
| PU3 | Mobile technology would allow me to accomplish learning tasks more quickly. |
| PU4 | Mobile technology would support critical aspects of my learning in a blended setting. |
| PU5 | Using mobile technology to study would increase my productivity in a blended learning environment. |
| PU6 | Using mobile technology would improve my academic performance. |
| PU7 | Using mobile technology would allow me to accomplish more work in a blended course than would otherwise be possible. |
| PU8 | Using mobile technology would enhance my effectiveness in a blended learning setting. |
| PU9 | Using mobile technology would make it easier for me to perform as a student in a blended environment. |
| PU10 | I would find mobile technology useful in a blended learning setting. |

Note: Adapted from "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts," b y F. D. Davis, 1993, *International Journal of Man-Machine Studies, 38*, p. 486.

Research by Davis (1989) and Chau (1996) found that the relationship between Perceived Usefulness and actual usage was stronger and more consistent than other TAM model constructs. Gardner and Amoroso (2004) conjectured that users evaluate the consequences of their usage behavior in terms of Perceived Usefulness and then they base their behavioral choices on the desirability of the usefulness. In several additional studies, Perceived Usefulness has been found to be the most important factor affecting user acceptance of new technology (Igbaria et al., 1997; Sun, 2003; Szajna, 1996).

## Perceived Ease of Use

Perceived Ease of Use is defined as the degree to which the user believes that the use of the technology is free from effort (Davis, 1989). In a subsequent study, Davis (1993) found that the Perceived Ease of Use scale used proved to be highly reliable and had a Cronbach's alpha coefficient of 0.91 (p. 480). In a study that focused on the introduction of new technology in the workplace, Venkatesh, Morris, and Ackerman (2000) concluded that the most significant determinant of an employee's attitude toward adopting and using a new technology was their belief in the usefulness of the technology. They noted that Perceived Ease of Use typically explained approximately 30to 35% of the observed variance in Behavioral Intent.

In the original TAM, there is a relationship between Perceived Ease of Use and Perceived Usefulness. In that model, Perceived Usefulness is influenced by Perceived Ease of Use. This study conjectured that through its influence on Perceived Ease of Use, increased experience with the mobile technology may lead to increased Perceived Usefulness as the student develops an understanding of how the functionality of the technology can be used to accomplish learning tasks. The current research presents a new model of technology acceptance that includes the effects of the student's prior experience on their intention to use similar technology. The purpose of this study was to examine and better understand the effects of user experience on the Perceived Ease of Use and Behavioral Intention constructs defined in the Technology Acceptance Model without changing the nature of their existing relationships to one another.

This research explored the notion that students are much more likely to adopt a mobile system for learning when they believe that it will help them achieve their learning goals.

*$H4_A$: A learner's Perceived Ease of Use of mobile technology will be a significant predictor of his/her Perceived Usefulness (utility) of mobile technology for blended learning.*

*$H5_A$: A learner's Perceived Ease of Use of mobile technology will be a significant predictor of his/her Behavioral Intention to use mobile technology for blended learning.*

This study examined whether experienced students rated mobile technology easier to use for learning than inexperienced students and the relationship of this perception on their intention to use the technology.

In this study, several survey items were used to measure the amount of effort required to use the system and the perceived degree of difficulty involved with understanding the technology. These questions were adaptations of the Perceived Ease of Use scale developed by Davis, Bagozzi, and Warshaw (1989). The wording of the questions in this study was modified slightly to apply specifically to student's use of mobile technology. Examples for this measure include "Using mobile technology does not require a great deal of mental effort" and "Mobile technology is easy to use." For this research, Perceived Usefulness was assessed with a seven-item scale that has been used consistently in previous studies that employed the Technology Acceptance Model. The survey items that were used to gather student responses related to Perceived Ease of Use are outlined in Table 3.

Table 3

Proposed Study Item Scale for Perceived Ease of Use

| Item No. | Candidate item psychometric measures for Perceived Usefulness |
|---|---|
| PEOU1 | I would find mobile technology cumbersome to use for learning in a blended setting. |
| PEOU2 | Learning to operate mobile technology for blended learning would be easy for me. |
| PEOU3 | Interacting with mobile technology in a blended environment would be frustrating for me. |
| PEOU4 | I would find it easy to get mobile technology to do what I want to do in a blended learning setting. |
| PEOU5 | Mobile technology would be rigid and inflexible to interact with in a blended setting. |
| PEOU6 | It would be easy for me to remember how to perform tasks using mobile technology for learning. |
| PEOU7 | Interacting with mobile technology for blended learning would require a lot of effort. |
| PEOU8 | My interaction with mobile technology would be clear and understandable in a blended learning environment. |
| PEOU9 | I would take a lot of effort to become skillful using mobile technology for blended learning. |
| PEOU10 | I would find mobile technology easy to use in a blended learning setting. |

Note: Adapted from "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts," b y F. D. Davis, 1993, *International Journal of Man-Machine Studies*, 38, p. 487.

In previous research into technology acceptance, Perceived Ease of Use has been found to influence Perceived Usefulness, Behavioral Intention, and actual use (Chau, 1996). For example, Davis et al. (1989) found that Perceived Ease of Use both directly and indirectly affects usage through its impact on Perceived Usefulness. Similarly, Chau's (1996) study discovered that Perceived Ease of Use appeared to significantly impact near-term usefulness, but did not significantly impact intention to use. In other research, Venkatesh and Davis (2000) found that Perceived Ease of Use in the TAM2 framework had the same direct determinant on Perceived Usefulness as was described in the original TAM.

## Behavioral Intention

Research into technology acceptance has shown that the user's prior experience with a particular technology is a determinant of behavior (Ajzen & Fishbein, 1977). The results of numerous previous studies lend empirical support to the notion that behavioral intention is an excellent predictor of actual usage of novel technology (Davis et al., 1989; Taylor and Todd, 1995; Venkatesh and Davis, 2000). Davis et al. (1989) concluded that a user's use of technology can be predicted reasonably well from their intentions and suggest that those acceptance factors that influence actual usage do so indirectly through Behavioral Intention. Other studies have found that there appear to be significant differences among experienced and inexperienced users in terms of system usage (Gardner & Amoroso, 2004). For example Taylor and Todd (1995) noted that there was a strong correlation between intention and actual usage among experienced users. In addition, the results of their study also indicated that Perceived Usefulness was the strongest predictor of Behavioral Intention for inexperienced users. The outcome of Taylor and Todd's (1995) study of inexperienced and experienced users confirmed that there appeared to be a significantly positive relationship between behavioral intention and actual usage for experienced users (Gardner & Amoroso, 2004).

In the current study students will be asked to indicate the likelihood that they would use mobile technology to access blended learning course content. The participant's Behavioral Intention to use mobile technology will be measured using slightly modified versions of similar items developed by Dishaw and Strong (1999). In that study, it was determined that scale used to measure Behavioral Intention proved to be highly reliable and had a Cronbach's alpha coefficient of 0.92 (p. 19). The survey items that will be used to gather data related to Behavioral Intention in the current study are outlined in Table 4.

Table 4

Proposed Study Item Scale for Behavioral Intention

| Item No. | Candidate item psychometric measures for Perceived Usefulness |
|---|---|
| BI1 | Assuming I have access to mobile technology, I intend to use it for learning in a blended environment. |
| BI2 | Given that I have access to mobile technology, I predict that I would use it for schoolwork in a blended learning setting. |

Note: Adapted from "Perceived usefulness, perceived ease of use, and end user acceptance of information technology," b y F. D. Davis, 1989, *MIS Quarterly, 13*(3), p. 339.

**Study Hypotheses Summary**

The five hypotheses outlined previously provide a framework to address the main question posed in this study: *How does the learner's prior experience with mobile technology support his/her learning in a blended-learning environment?* Table 5 summarizes these five hypotheses.

Table 5

Hypotheses Summary

| Hypothesis | Construct Relationships |
|---|---|
| $H1_A$: | Prior Experience is positively correlated with Perceived Ease of Use |
| $H2_A$: | Prior Experience is positively correlated with Perceived Usefulness |
| $H3_A$: | Perceived Ease of Use is positively correlated with Perceived Usefulness |
| $H4_A$: | Perceived Ease of Use is positively correlated with Behavioral Intention |
| $H5_A$: | Perceived Usefulness is positively correlated with Behavioral Intention |

This study forwards the notion that a student's intention to use mobile technology for hybrid learning can be described by correlating the student's perceptions related to the usefulness and ease of use of mobile technology with his/her prior experience. In previous studies, users that have experience using similar technology rate a novel technology as being easier to use than do their less experienced counterparts (Davis, 1989; Adams et al., 1992; Taylor & Todd, 1995a; Venkatesh et al., 2003). In a similar vein, Venkatesh and Morris (2000) posited that as direct experience with technology increases over time, individuals are better able to assess the benefits and costs associated with using that technology. Igbaria et al. (1995) found that prior experience and training were positively associated with perceived ease of use and perceived usefulness. Agarwal and Prasad (1999) conjectured that there is a strong correlation between a user's prior experience with similar technologies and their intention to use that technology. Finally, Szakna (1996) reported that as a user becomes more experienced with a technology, the Perceived Usefulness of the technology directly determines not only their Behavioral Intention to use it but also their actual usage behavior. Figure 7 below illustrates how the prior experience variable was employed in the current research's theoretical model to augment the existing Technology Acceptance Model.

## Study Procedure

To describe the main features of the participants in this study, descriptive statistics were used. In addition, multivariate analysis was used as a means of determining the structure of the construct relationships described in the theoretical model. The measurement scales used for the survey instrument items all had equal intervals and findings from previous TAM studies indicate that the relationships between these items are linear. The scales used to measure variables in the study are interval and metric and thus are appropriate for examination using quantitative techniques (Cooper & Schindler, 2008).

**Quantitative Methodology**

All of the statistics for this study were computed using SPSS 20 for Windows configured with the AMOS Structured Equation Modeling (SEM) module. Structured Equation Modeling (SEM) combined with Confirmatory Factor Analysis (CFA) was used to test the overall fit of the proposed theoretical model with empirical data gathered from the survey (Hoyle, 1995). Previous research using TAM has shown SEM and CFA to be useful strategies for validating theories related to user acceptance of technology (Khong & Song, 2003; King & He, 2006; Polancic, Hericko, & Rozman, 2010; Sumak, Hericko, Pusnik, & Polancic, 2009). SEM is a statistical hypothesis-testing tool used to assess model fit and CFA is a statistical technique used to verify the factor (relational) structure of a set of observed variables. This technique uses theoretical knowledge, prior empirical research, or both, to develop hypotheses that postulate the relationship pattern a priori, to develop data gathering instrumentation, and then to statistically test how well the data gathered fits with the theoretical model (Davis, 2005; Hoyle, 1995). In the current study, CFA served as a confirmatory analysis tool to test how the operationalized variables PEOU, PU, BI, and PE are related and how well the proposed model fit with the data gathered from the survey instrument. As a deductive inferential technique, CFA facilitated testing the study hypotheses by specifying a relationship between observed variables and theoretical constructs. The result of this analysis were used to develop an explanation of the causal assumptions (not causal conclusions) that describes the relationships between the participants experience using mobile technology, how easy and helpful they think mobile technology is to use for learning, and their intention to use mobile technology for learning in a blended environment.

SEM can be thought of as the analysis of two distinct models: a structural model based upon a priori theory and hypotheses that is used to specify the causal relationships among the constructs, and a measurement model that describes the relationships between the observed and latent variables. In developing models to test using SEM, theory, prior experience, and the research objectives is used to identify and develop hypotheses about which independent variables predict each dependent variable. The measurement model will be estimated using Confirmatory Factor Analysis (CFA) to test whether the proposed constructs are sufficiently valid and reliable. The measurement model is a visual representation that describes the theoretical model's constructs, indicator variables, and interrelationships. The structural model is a set of dependence relationships that link the hypothesized model's constructs. SEM determines whether relationships exist between the model constructs and when combined with CFA, provides a basis for accepting or rejecting a set of hypotheses. For the current study, Figure 7 represents the structural model and Figure 8 depicts the measurement model.

In this study, the rationale for using SEM is to test whether PEOU, PU, PE, and BI are interrelated by way of a set of linear relationships by exploring the variances and co-variances of these variables. To model the proposed relationships, SEM describes two different kinds of variables: exogenous and endogenous. The difference between these types of variables is whether one variable regresses on another variable or not. As in other regression methods, the dependent variable (DV) regresses on the independent variable (IV), meaning that the DV is being predicted by the independent variable. In SEM, other variables in the model regress on exogenous variables. In this study's theoretical model shown in Figure 7, exogenous variables can be recognized as the variables sending out arrowheads to those variables they are predicting. A variable that regresses on a variable is always an endogenous variable; irrespective of the fact that that this same variable could also used as a variable to be regressed on. Endogenous variables in the model are recognized as the receivers of an arrowhead. In the proposed model, Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Behavioral Intention (BI) are endogenous dependent variables and Perceived Ease of Use (PEOU), Perceived Usefulness (PU), and Prior Experience (PE) are exogenous independent variables. The exogenous variables PE, PU, and PEOU form predictors (independent variables) in the model whereas endogenous variables PEOU, PU, BI represent regressors (dependent variables). In this model all variables are considered free. That is, they were expected to represent estimates from the observed data gathered during the survey and were used to represent hypothesized but unknown relationships. The SEM structural model depicted in Figure 7 describes dependencies between endogenous and exogenous variables and the measurement model shown in Figure 8 describes the relationship between latent variables and their indicators.

CFA provides quantitative measures that can be used to assess both the validity and reliability of the theoretical model. In previous TAM studies various measures were used to gauge the model's validity and reliability (Ai-Lim Lee, Wong, Fung, 2010; Cheng, Wang, Moormann, Olaniran, & Chen, 2012; Cheng, Wang, Yang, & Kinshuk, 2011; Hung, Chang, & Hwang, 2011; Koufaris, 2002; Sumak, Hericko, Pusnik, & Polancic, 2009). Similar measures were employed in this study. For example, Average Shared Variance (AVE) measures convergent validity and was be used to determine the extent to which indicators variables for a particular construct “converge” or share a high proportion of variance in common. The calculation for AVE is shown in Equation 1.

$$AVE = \frac{\sum(factor\ loadings)^2}{number\ of\ constructs} \tag{1}$$

Similar to the method employed by Sumak et al (2009) internal consistency (reliability) was used to measured using Composite Reliability (Cr). The calculation for Cr is shown in Equation 2.

$$Cr = \frac{(\sum factor\ loadings)^2}{(\sum factor\ loadings)^2 + \sum measurement\ error} \tag{2}$$

The final step in the SEM process was to determine the validity of the SEM model. After assessing the validity and reliability of the measurement model, various goodness-of-fit tests were applied to the structural model including the Chi-Square to df ratio ($\chi^2$/df), the Goodness-of-Fit index (GFI) and the Adjusted Goodness-of-Fit index (AGFI).

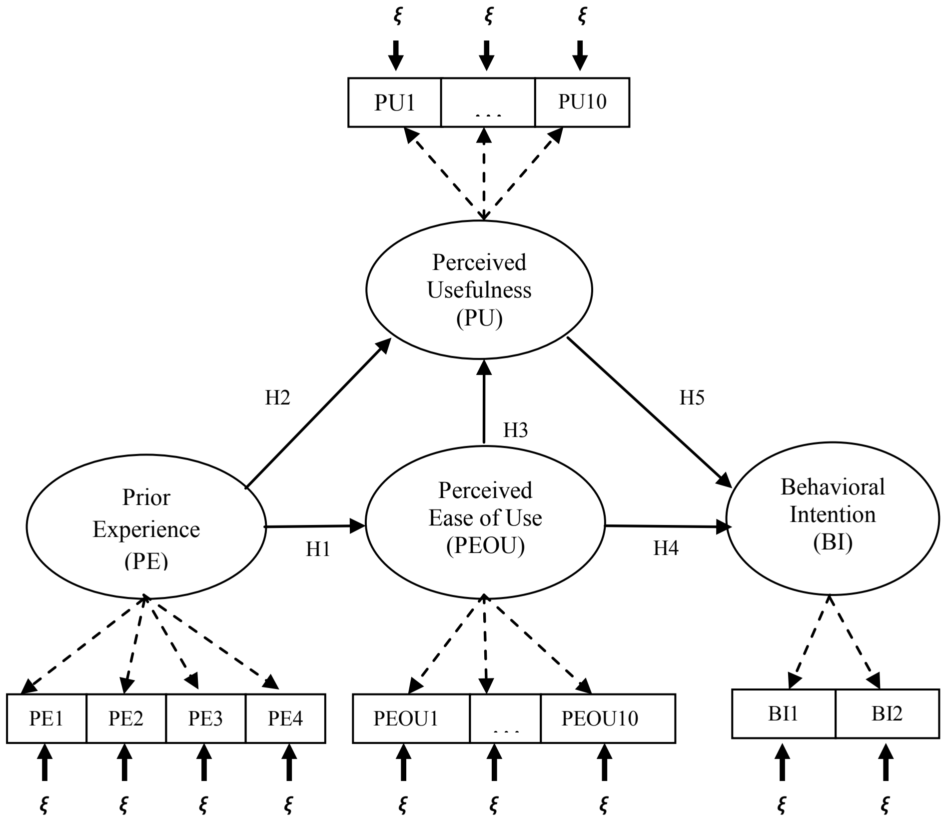


Figure 8. SEM Measurement Model.

## Methodology Limitations

Structural Equation Modeling (SEM) is a multivariate statistical analysis method used to explore the structural relationships found in the data. SEM is also referred to as casual modeling because its methods test the proposed causal relationships articulated in the research hypotheses. However, it is import to note that a structural equation model is merely an approximation of reality since structural models utilize linear relations (Hoyle, 1995). Linear relations are mathematical constructs that do not automatically reflect the realities of real world phenomena. Usually, nonlinear patterns best describe the relationships between real-world variables.

Therefore it is important to note that SEM models will not be a perfect “fit” with reality but goal is to generate a model that fits well enough to represent a useful approximation of reality and offer a reasonable explanation of the trends in the data (Hoyle, 1995).

Merely because a model fits the data does not guarantee that the model is correct or that it is unique (Cooper & Schindler, 2008). Indeed, it is not possible to prove that a given model is correct. An entirely different measurement model might also fit the data equally well and we have no way of knowing if one model is more accurate than the other.  If a particular model is true, it would be expected to fit the data gathered using the survey instrument. However, the SEM model that fits the data might not be the only correct model. Any number of models could fit the data gathered, and it could be argued that only one of them is "true" in the absolute sense of the word. However, despite the fact that linearity is not the norm in the real world, SEM is adequate for finding a reasonable model fit for the data set (Hoyle, 1995).

The directionality in relationships between variables cannot be tested with SEM. Although directional arrows are often used in a structural equation model, the direction simply represents the implied causal relationships expressed by the research hypotheses.  In addition, the choice of variables and relationships in the model will limit the ability of the structural equation model to recreate the sample covariance and variance patterns that have been observed in the data. This implies that any one of several models might fit the data equally as well.

Irrespective of these limitations, SEM is a powerful technique for understanding the relational data of multivariate systems (Swanson & Holton, 2005). SEM is an excellent technique for distinguishing between the direct and indirect relationships between variables and is a superb quantitative approach for analyzing the relationships between hypothesized variables.

## Summary

The current research presents a quantitative, explanatory study designed that extends our understanding of the relationship between mobile device experience and self-directed student behavior related to the use of mobile technology for learning. The theoretical model for the study was derived from the original TAM with the addition of an Experience component similar to the TAM2. Unlike the TAM2 however, the relationship between Experience, Perceived Ease of Use, and Intention was measured directly as opposed to indirectly as in the TAM2, thus yielding a more parsimonious model compared to the TAM2. The theoretical constructs for the current model were derived from well-researched and validated psychometric constructs that were used in previous TAM studies.

The study sample consisted of first-year, undergraduate students enrolled in hybrid courses at a community college. Student anonymity was protected throughout the study and strict recruitment policies were implemented so as to avoid harming participants in any way. After consenting to participate in the study, students went online to anonymously fill out a questionnaire containing 28 items that were operationalized from the study model latent constructs. After the data was collected, a data file containing student responses was used to develop a set of descriptive statistics for the model constructs. Confirmatory Factor Analysis will then be used to. Structured Equation Modeling (SEM) Confirmatory Factor Analysis (CFA) was then used to determine the relationships between the PE, PEOU, PU, and BI variables. Unlike other multivariate techniques, which cannot represent more than one relationship between dependent and independent variables, SEM can be used to estimate multiple interrelated dependencies and can be used to represent latent variables (Cooper & Schindler, 2008, p. 556). The results of this model were used to ascertain the internal validity and reliability of the constructs described in Figure 7 relative to the research hypotheses as well as to determine how well the observed data fit the study model.

# CHAPTER 4. RESULTS

## Introduction

This chapter presents the results of the analysis of the survey data. It begins with descriptive statistics and discussions on sample size, reliability, and validity. This section also includes an analysis of the Structured Equation Modeling (SEM) and factor analysis used to validate the study's theoretical model. The model results are discussed in light of the proposed study hypotheses.

### Descriptive Statistics

A total of the 685 undergraduate students were invited to participate in this study. Of these, 161 (23.5%) filled out the online survey. A total of 152 (94.4%) of the 161 surveys were complete while nine (5.6%) had missing data and were not included in this analysis. Of the 152 respondents, 72 (47.4 %) were female, and 80 (52.6%) were male. The participants' ages ranged from 18 to over 60 years with a majority 82 (53.9%) falling within the 18 to 25 year old age range. With respect to prior mobile experience, over 90% of the survey respondents claimed that they had more than a one year's experience using mobile technology. Most of the respondents reported that they used mobile technology several times per day (72.4%). A major portion of the respondents stated that they had used mobile devices for more than 300 hours (70.4%). Table 6 provides a summary of the respondents' gender, age, and prior experience.

Table 6

Study Descriptive Statistics (N = 152)

| Measure | Item | Frequency | Percentage |
| --- | --- | --- | --- |
| Gender | Female | 72 | 47.4 |
| | Male | 80 | 52.6 |
| Age | < 18 yrs | 1 | 0.7 |
| | 18 - 20 | 43 | 28.3 |
| | 21 - 25 | 39 | 25.7 |
| | 26 - 30 | 17 | 11.2 |
| | 31 - 40 | 20 | 13.2 |
| | 41 - 50 | 18 | 11.8 |
| | 51 - 60 | 11 | 7.2 |
| | > 60 | 3 | 2.0 |
| Years of Experience | < 1 year | 14 | 9.2 |
| | 1 – 3 years | 23 | 15.1 |
| | 3 – 5 years | 34 | 22.4 |
| | 5 – 7 years | 22 | 14.5 |
| | 7 – 10 years | 28 | 18.4 |
| | > 10 years | 31 | 20.4 |

Table 6

Study Descriptive Statistics (N = 152)

| Measure | Item | Frequency | Percentage |
|---|---|---|---|
| Frequency | Not at all | 4 | 2.6 |
| | Less than once a week | 3 | 2.0 |
| | About once a week | 4 | 2.6 |
| | 2 or 3 times a week | 10 | 6.6 |
| | Several times a week | 11 | 7.2 |
| | About once a day | 10 | 6.6 |
| | Several times each day | 110 | 72.4 |
| Total Hours | < 50 hours | 36 | 5.3 |
| | 50 – 99 hours | 12 | 7.9 |
| | 100 – 199 hours | 11 | 7.2 |
| | 200 – 299 hours | 14 | 9.2 |
| | 300 – 399 hours | 8 | 23.7 |
| | > 400 | 71 | 46.7 |

**Sample Size**

Of the 685 students registered for hybrid courses who were invited to participate in the study, the actual return rate from the online survey was 161 with 152 useable cases. The Kaiser-Meyer-

Olkin (KMO) measure of sampling adequacy (MSA) was used to describe the degree to which items in the instrument used in this study were related as well as whether the partial correlations across all of the items was significant. The KMO-MSA test is a standard test procedure used to determine the adequacy of the sample prior to factor analysis. For this study, a KMO –MSA value of 0.907 was calculated across the 152 surveys collected. This value exceeded the recommended cutoff of 0.8 and confirmed the adequacy of the sample for factor analysis (Dziuban & Shirkey, 1974).

**Reliability and Validity**

The operationalization of the theoretical constructs for this research paralleled that of previous research using the Technology Acceptance Model (TAM) framework. The questions used in the survey instrument were adapted from similar items used in prior studies. Those studies established the reliability and validity of each measurement and their corresponding scales while confirming their psychometric properties. The Cronbach's alpha coefficients for the items used in this study ranged from 0.637 to 0.960. Consistent with the prior research, the PU and BI measurement scales used in the current study exhibited high reliability while the PEOU and PE measurement scales displayed adequate reliability. Composite reliability for all of the latent variables was adequate. However, while the AVE measurements for PE and PU were above 0.5 and thus adequate, scores for PEOU and BI proved to be marginal (see Table 7).

Table 7

Measurement Reliability

| Construct | Number of Items | Cronbach's α | AVE | CR |
|---|---|---|---|---|
| Prior Experience | 3 | 0.770 | 0.613 | 1.743 |
| Perceived Utility | 10 | 0.960 | 0.671 | 7.809 |
| Perceived Ease of Use | 10 | 0.637 | 0.298 | 2.555 |
| Behavior Intention | 2 | 0.887 | 0.207 | 0.836 |

The validity of the constructs in this study was verified using confirmatory factor analysis. Using Principal Components Analysis with Varimax rotation, a total of four components were extracted from the data. Table 8 shows how individual items loaded on each factor. Each construct could be distinguished by a unique component with an eigenvalue above 1.0. PU loaded high on the first component and accounted for 44.1% of the total variance. BI loaded higher than the other constructs on the second component and explained 12.8% of the total variance. PEOU loaded highest on the third component accounted for 7.6% of the total variance but exhibited relatively weak and unstable factor loadings compared to the loadings of the other variables in the model. Although the negative PEOU loadings were relatively insignificant, they nonetheless added to the overall instability of the loadings across the factor. Finally, PE loaded high on the fourth component and accounted for 4.3% of the total variance. Table 8 shows that the inter-item correlations were high for components 1, 2, and 4 and were moderate for the third component.

Table 8

Confirmatory Factor Analysis

| | Component | | | |
|---|---|---|---|---|
| | 1 (44.1%) | 2 (12.8%) | 3 (7.6%) | 4 (4.3%) |
| PE1 | ------- | ------- | ------- | .748 |
| PE2 | ------- | ------- | ------- | .805 |
| PE3 | ------- | ------- | ------- | .793 |
| PU1 | .832 | ------- | ------- | ------- |
| PU2 | .863 | ------- | ------- | ------- |
| PU3 | .846 | ------- | ------- | ------- |
| PU4 | .859 | ------- | ------- | ------- |
| PU5 | .833 | ------- | ------- | ------- |
| PU6 | .784 | ------- | ------- | ------- |
| PU7 | .789 | ------- | ------- | ------- |
| PU8 | .785 | ------- | ------- | ------- |
| PU9 | .801 | ------- | ------- | ------- |
| PU10 | .795 | ------- | ------- | ------- |
| PEOU1 | ------- | ------- | .679 | ------- |
| PEOU2 | ------- | ------- | -.152 | ------- |
| PEOU3 | ------- | ------- | .815 | ------- |
| PEOU4 | ------- | ------- | -.072 | ------- |
| PEOU5 | ------- | ------- | .819 | ------- |
| PEOU6 | ------- | ------- | -.051 | ------- |
| PEOU7 | ------- | ------- | .787 | ------- |
| PEOU8 | ------- | ------- | -.046 | ------- |
| PEOU9 | ------- | ------- | .707 | ------- |
| PEOU10 | ------- | ------- | -.162 | ------- |
| BI1 | ------- | .462 | ------- | ------- |
| BI2 | ------- | .447 | ------- | ------- |

Extraction Method: Principal Component Analysis.
Rotation Method: Varimax with Kaiser Normalization.

## Analysis of the SEM Model

Structural equation modeling (SEM) was used to capture the fitness of the entire model. This technique also provided a means for describing the direct and indirect effects of each construct from the standpoint of the entire model. The fitness of the model was computed using the Chi-Square to degrees-of-freedom ratio ($\chi^2$/df), the Goodness-of-Fit index (GFI), the Adjusted Goodness-of-Fit index (AGFI), and the root mean square error of approximation (RMSEA). For the current model, the chi-square value was statistically significant ($\chi^2$ of 423.968 with 267 degrees of freedom, $p < 0.001$). In further support of the model's guaranteed fit, the GFI was 0.956, the AGFI was 0.946, and the RMSEA was 0.066: all were within acceptable limits (see Table 9). The final model and the computed standardized path coefficients are shown in Figure 9.

Table 9

Recommended and Observed Model Fit Indices

| | Model Fit Index | | | |
|---|---|---|---|---|
| | $\chi^2$/df | GFI | AGFI | RMSEA |
| Recommended Value: | < 3 | > 0.9 | > 0.8 | < 0.08 |
| Observed Value: | 1.59 | 0.956 | 0.946 | 0.066 |

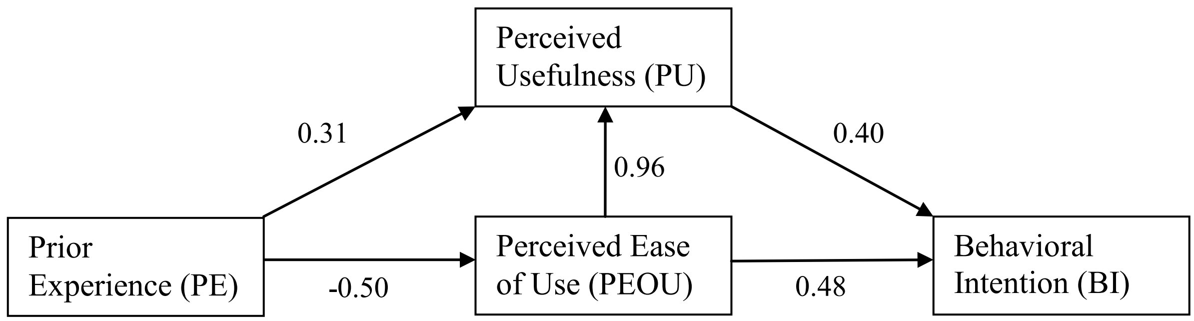


Figure 9. SEM Structural model.

In the resultant structural model, the standardized SEM estimates correspond to effect-size estimates. All of the effect sizes in the model were significant, and the majority of the proposed hypotheses were supported. However, according to the model, hypothesis $H1_A$ was not supported given that PE is negatively correlated with PEOU (-0.50). This suggests that although students may have experience using mobile technology, they did not necessarily know whether mobile technology is easy to use for learning in a hybrid environment. Conversely, PE is positively correlated with PU (0.31). This supports hypothesis $H2_A$ and suggests that students believe that their prior experience using mobile technology would make the technology useful in a hybrid learning environment. Similarly, PEOU is positively correlated with BI (0.48) thus supporting hypotheses $H3_A$. This suggests that if students find mobile technology easy to use, then they would be more likely to use it to augment their studies in a hybrid environment. In addition, PEOU is positively correlated with PU (0.96) which supports hypotheses $H4_A$ and suggests that if students find mobile technology easy to use, then they will believe it to be useful for learning in a hybrid environment. Finally, the model implies that PU is positively correlated with BI (0.41) which supports hypothesis $H5_A$. This suggests that if students find mobile technology useful, then they intent to use it for learning in a hybrid environment.

Table 10

Model Hypotheses Summary

| Hypothesis | Construct Relationships | Path Coefficients* | Supported? |
|---|---|---|---|
| $H1_A$: | PE is positively correlated with PEOU | -0.50 | No |
| $H2_A$: | PE is positively correlated with PU | 0.31 | Yes |
| $H3_A$: | PEOU is positively correlated with PU | 0.96 | Yes |
| $H4_A$: | PEOU is positively correlated with BI | 0.48 | Yes |
| $H5_A$: | PU is positively correlated with BI | 0.40 | Yes |

*$p < 0.05$

## Summary

In the resultant SEM model, PE was found to be a significant predictor of PU (0.31) and not a significant predictor of PEOU (-.50), both of which were significant predictors of students' intention to use mobile technology for hybrid learning. With the exception of the negative correlation between experience and perceived ease of use, the results were largely consistent with those reported in the previous TAM studies. Taken as a whole, the results of this study suggest that the proposed theoretical model does indeed provide insights into the role of PE as an antecedent to the determinants of the adoption of mobile technology for hybrid learning.

# CHAPTER 5: CONCLUSIONS AND RECOMMENDATIONS

## Introduction

This chapter provides a project summary and discussion of the results described in Chapter 4. More specifically, it examines the acceptance factors affecting community college students' perceptions of the value of mobile technology for learning in a hybrid environment using the well-established technology acceptance model (TAM) as a theoretical basis. It focuses on important findings as they relate to the research questions, explains limitations of the study, and discusses prospective directions for future research.

## Overview of Study

This dissertation is primarily an attempt to learn more about the relationship between student acceptance of mobile learning in a blended learning environment and  endeavors to identify factors effecting acceptance of mobile learning at two-year institutions. In particular, this research puts forth the notion that the Technology Acceptance Model constructs, perceived Ease of Use and Perceived Usefulness, coupled with an antecedent variable, Prior Experience, would act as significant predictors of the behavioral intention of community college students to use mobile technology to augment their studies in a blended learning environment. Comprehensive research that explains how mobile technology can be used for learning is only recently beginning to emerge in the literature (Zeng & Luyegu, 2011). To date, a full understanding of the factors that influence student adoption of mobile technology in higher education continues to remain elusive. To facilitate this research, literature covering several research domains was studied. These domains included mobile technology, mobile learning, blended learning, and technology acceptance theory. Sources included research published in refereed journals, trade magazines, Internet sources, and books.

The current research presents a quantitative, explanatory study design that extends our understanding of the relationship between mobile device experience and self-directed student behavior related to the use of mobile technology for learning. The theoretical model for this study was derived from the original TAM with the addition of an Experience component similar to that used in the TAM2. The TAM is a well- documented framework for studying the effects of introducing new technology. The research model developed for the current study was motivated by similar models used in other studies that investigated TAM in such areas as online banking (Gu, Lee, & Suh, 2009; Lai & Li, 2005; Lichtenstein & Williamson, 2006; Lu, Cao, Wang, & Yang, 2011), e-learning (Al-lawati, Al-Jumeily, Lunn, & Laws, 2011; Chen, 2010; Cheng, Wang, Moormann, Olaniran, & Chen, 2012; Hu, Clark, & Ma, 2003; Shih, Munoz, & Sanchez, 2006), and mobile learning (Cavus, 2011; Evans, 2008; Gronlund & Islam, 2010; Liaw, Hatala, & Huang, 2010; Schilit, 2011; Theys, 2005). In these studies it was demonstrated that the TAM was a powerful tool for determining user acceptance of new technology. In this study however, the relationship between Experience, Perceived Ease of Use, and Perceived Usefulness was measured directly as opposed to being measured indirectly as in the TAM2. This approach yielded a more parsimonious model .An analysis of the model using SEM confirmatory factor analysis determined that the model fit the data and that the theoretical constructs were both reliable and valid.

## Discussion

As described in the SEM model shown in Figure 9, the majority of the proposed causal relationships between the TAM constructs were positive with the exception of the relationship between Prior Experience and Perceived Ease of Use. In particular, it was found that Prior experience was positively correlated with Perceived Utility. In addition, consistent with findings in other technology adoption studies, Perceived Ease of Use proved to be highly correlated with Perceived Utility. Both Perceived Utility and Perceived Ease of Use were shown to be positively correlated with Behavioral Intention. These results were expected and supported by previous studies (Davis, 1989; King & He, 2006;Lai & Li, 2005; Schepers & Wetzels, 2007; Turner, Kitchenham, Brereton, Charters, & Budgen, 2010; Venkatesh & Davis, 2000). In this research, the relationship between prior experience using mobile technology and the students' perception that the technology would be easy to use in a hybrid-learning context was expressed by hypothesis $H1_A$ that posited Prior Experience was positively correlated with Perceived Ease of Use. In contrast with other studies, the empirical results of this research suggest that students' prior experience can have a negative impact on their opinion that mobile technology would be easy to use for hybrid learning. This finding contradicts the results of several studies that found a significant positive relationship between previous experience and perceived ease of use (Schwarz, Junglas, Krotov, & Chin, 2004; Shih, Munoz, & Sanchez, 2006). Indeed, prior research has found past experience with a technology to be a key determinant of its future adoption and that experienced students were more likely to readily adopt new technology (Davis & Vankatesh, 1996; Saade & Kira, 2009; Schwarz, et al. 2004; Shih, Munoz, & Sanchez, 2006; Yung-Ming, 2011).Conversely, the notion that past experience with technology is positively correlated with acceptance was contradicted in a study conducted by Lu and Viehland (2008) in which the authors failed to find support for the idea that prior experience with technology influenced student acceptance of mobile technology. Likewise, a meta-analysis of TAM research by Turner et al. (2010) raised doubts about the ability of perceived utility and perceived ease of use to predict actual usage outside of the context (email and text editor usage) within which the original TAM model was validated. The results of the current study lend support to the notion that context, in this case the intention to use mobile technology in a hybrid-learning environment, is an important determinant for the adoption of new technology.

From the results of this study, it can be conjectured that while students with prior experience using mobile devices could be expected to have a different opinion of the ease of use and utility of mobile technology than inexperienced students, perhaps the negative relationship shown in the current model can be explained by the fact that while students who participated in the study had significant experience using mobile technology and were enrolled in hybrid learning courses, they did not have any direct experience using mobile devices in this context. Several studies have shown that the learning curve and acceptance factors for learning and applying new applications for technology are quite steep (Schwarz, Junglas, Krotov, & Chin, 2004; Turner, et al, 2010). Thompson et al. (1994) examined the impact of prior experience on various factors related to technology utilization. In that study, the authors concluded that although prior experience influenced technology utilization directly, it also acted as a moderator of the relationships between utilization and most of its antecedents. Consequently, it can be hypothesized that students in the current study may have found through experience that mobile technology was easy to use, but they nonetheless did not understand how to transfer that experience to a hybrid-learning context.

## Significance of the Study

The findings of this research provide support for the idea that prior experience can be an important contributor to the future adoption of mobile technology for hybrid learning. The relationships discovered in the technology adoption model employed in this study suggest that as an antecedent to perceived usefulness, prior experience using mobile technology can have a positive influence on the intention of students to adopt mobile technology for hybrid learning. A clearer understanding of the utility of m-learning from the students' perspective will aid in the development of an implementation framework for hybrid mobile learning. Such a framework could be used as the foundation for the adoption, financing, implementation, and support for m-learning in a community college environment. As competition for students increases and as mobile technology becomes more ubiquitous, a blended, m-learning model might allow individual institutions of higher learning to more rapidly and effectively respond to consumers' (students and faculty) needs and to gain a competitive advantage in the global educational marketplace.

The purpose of this study was to provide a richer understanding of the utility of m-learning from the students' perspective. This study has extended the knowledge of the field by adding clarity to the notion that prior experience with mobile technology does influence the level of mobile technology acceptance by community college students for hybrid learning. The results of this study expand existing technology acceptance theory by explaining how prior experience impacts students' perceptions about the ease of use of the technology for learning as well as the impact it has on their intention to use the technology for learning. In addition to adding to the technology acceptance theoretical body of knowledge, this study has implications for practice as well.  Advances in learning management system frameworks are causing educational content delivery systems to move away from a linear textbook metaphor; just as student access to learning becomes more mobile. Indeed, advances in cloud-based educational content delivery systems are causing a shift away from traditional learning models toward a dynamic hypermedia model (Köse, 2010; Parry, 2011; Twigg, 2003). Setting and time-independent student-focused learning is becoming an attractive alternative to traditional pedagogy for modern learners, both young students well versed in mobility as well as practitioners with limited time to devote to traditional education. This shift in learning delivery models also appears to coincide with an explosion in the use of mobile technology around the globe (Köse, 2010; Liu, Li, & Carlsson, 2010; Schwarz, Junglas, Krotov, & Chin, 2004). Traditional computer usage is rapidly being replaced by mobile access and this paradigm shift represents an excellent opportunity for educational institutions to leverage existing learning content to meet students' expectations for "anytime-anywhere" and "everytime-everywhere" access to information (Schwarz, Junglas, Krotov, & Chin, 2004).

This study provides insight into the influence students' prior experience with mobile technology has on the technology acceptance factors that impact their learning in a mobile-enhanced, blended-learning model. The goal of this study is to develop recommendations that could be used in the design of effective and cost-effective m-learning systems. As an aid to practice, this study provides knowledge that could assist institutions in the efficient allocation of scarce resources. The results of this study contribute to the ongoing conversation about the future of m-learning in higher education and can help educational institutions justify the investment of limited funds for the development of mobile-enhanced learning content and delivery services

## Study Limitations

This study investigated the use of mobile devices in a blended learning environment in higher education. This research did not incorporate actual usage behavior in the proposed model because most of the students had no experience using mobile technology for hybrid learning neither were the hybrid courses built to offer content using mobile devices. However, this is not a serious limitation given that substantial empirical support for the causal link between intention and behavior was supported by Venkatesh and Davis (2000). Consequently, in light of previous research, the current study's results and discussion should be viewed as only a snapshot of the technology acceptance phenomenon related to mobile technology and hybrid learning and any generalization of this research needs to be approached cautiously. The limitations of this research provide the foundation for future research to improve the understanding the factors that affect student acceptance of mobile technology for learning. This research was conducted under certain assumptions and as a consequence is subject to the following limitations:

1. The results of the study and their implications come from a single community college located in the Northeastern United States. Consequently, the results of this study may not be generalizable to other types of institutions or to other countries. To ameliorate this limitation, future research could be conducted using clusters of community colleges both in the United States and at similar institutions abroad to ascertain the degree to which the study findings can be replicated.
2. This study relied on a convenience sample that may potentially introduce bias. This may have limited the generalizability of the results.

3. The sample consisted of students who were not actually using mobile technology for learning thus there was no link between actual usage in a hybrid context and their perceptions about the usefulness of the technology. Technology acceptance studies that involve students that are actually using mobile devices for learning may provide better insight into the usefulness of mobile technology in education.
4. Participant responses were limited by their ability to recall their experience with mobile technology as well as their willingness to honestly self-report. Random sampling could be useful in future studies as a means of offsetting this limitation.
5. The research included only commonly available mobile devices such as smartphones, tablets, notebook computers, E-readers, laptops, and personal data assistants (PDAs). As users become much more experienced with these devices and as new mobile devices emerge, future research would need to account for the subsequent changes in both user perceptions and user experience.
6. Hybrid m-learning in other educational settings such as corporate training or K-12 was not examined in this study. Future studies could target a broader range of student learning environments as a way of generating more generalizable results.
7. This study was not longitudinal in scope. Previous studies have shown that user perceptions change over time as they become more experienced (Mathieson, Peacock, & Chin, 2001; Venkatesh, Morris, Davis, & Davis, 2003). Cross-sectional studies make challenging to attempt to justify explanations of causality between predictors such as user perception that may vary over time. This limitation could be addressed in future studies by collecting and analyzing longitudinal data related to the use of mobile technology for learning.

8. The TAM constructs used in this study formed a parsimonious model. However, the technology acceptance predictors used in this study may not be sufficient for other studies and future research may benefit from the inclusion of other factors such as social influence and effort expectancy as predictors of student acceptance of mobile technology for hybrid learning.

## Conclusion

This research was based upon pertinent research related to the mobile technology, hybrid learning and the Technology Acceptance Model. Using technology acceptance theory as a conceptual framework, this study explored how students' prior experience with mobile technology impacted their intention to use the technology to support Internet-enabled learning. This research provides useful information regarding the relevance of students' prior experience with mobile technology with respect to the integration of mobile technology in a hybrid-learning environment.

Notwithstanding the growth of research into mobile enhanced learning, research on mobile learning in a hybrid environment using technology acceptance as the theoretical foundation is limited. Institutions must be mindful with regard to the integration of mobile technology into their information and learning systems. Done properly, an institution's ability to serve students and to help them learn can be enhanced through the use of technology. Mobile devices in particular provide opportunities for institutions to establish better relationships with students, to offer enhanced service, and to establish their brand as they align with the cultural shift towards ubiquitous, anytime-anywhere communication. However, these same institutions should be careful to avoid making assumptions about the transferability of student experience with mobile technology when considering implementing mobile learning policies on their campuses such as bring-your-own-device (BYOD). Other considerations include the impact on students without access to mobile technology should these institutions institute mandatory policies for m-learning. Mobile technology has become an integral part of our daily lives and most users are comfortable using the technology.

## Recommendations

A series of general recommendations emerged as a result of this research. These recommendations coincide with three major aspects of the study: the study context, the sample population, and the transferability of prior experience using mobile technology.

The results of this study brought into sharp focus the need for further study with regard to the impact prior experience has on students' beliefs related to the efficacy of mobile technology for learning. A limitation of this study was that it required students to speculate on the use of mobile technology for learning. To more accurately gauge the impact of prior experience on their intention to use mobile technology in their course work, research is needed on the relationship between students' experience and their perceptions related to ease of use in an environment where students are actually using the technology for learning. Such a study might yield more accurate results about student opinions on the usefulness of m-learning under real-world working conditions than could be achieved simply by having students speculate on their intentions. In addition, rather than taking a cross-section of a population, future studies might employ longitudinal methodologies to gather more precise student perceptions as related to actual mobile device usage given that research has shown that user perceptions vary over time (see Mathieson et al., 2001; Venkatesh et al. 2003).

Community college student populations tend to be heterogeneous. The general population can consist of traditional students, adult students, students with varying degrees of preparation, as well as incumbent and dislocated workers. Each of these sub-groups may acclimate to new technology with different goals and objectives. For example, research has shown that adult students perform better in online courses than traditional students (Boghikian-Whitby & Mortagy, 2008). This might suggest that adult students are apt to view technology as an enabling tool that augments self-learning. More research should be done to narrow the description of successful m-learning students as a means of targeting specific groups or programs. While the current study employed a very narrow population definition, future studies might differentiate on these different demographic groups in an effort to more precisely determine what role factors such as age or life circumstances play both in terms of students' experience and with respect to the development of their perceptions of m-learning.

In light of the results of this study, additional research could focus on whether students' casual (non-learning oriented) experience using mobile technology is transferable to their mobile learning usage in the context of higher education. As an aide to developing m-learning systems, institutions may need to address the question: Is it correct to assume that because most students have experience using mobile technology (i.e. smartphones, tablets, laptops, portable game playing devices, etc.,) that they will intuitively understand how to use it for learning? Additionally institutions could ponder the question: How does hedonistic (game playing) and work-related experience with mobile technology relate to mobile learning? Future studies could seek answers to these questions and may determine the relationship of students' casual use of mobile devices and their level of acceptance of mobile technology for learning.

## Summary

Mobile technology represents the convergence of computing and telephony and offers the potential for institutions to add new capabilities for students to access online learning content. However, despite the ubiquitous nature of mobile technology, current online course content is not formatted for access on small video screens and its linear structure is not conducive to devices with limit storage and computing power. Likewise, while students can use handheld devices such as smartphones for email, texting, and voice communication, these devices are not designed to access dense learning content. Regardless of their previous experience, students would need an orientation to mobile learning in order to familiarize them with the nuances of using mobile technology for learning combined with training to help them develop competence in its use for online learning. To make use of this technology for learning would require student and faculty training, a reworking or retooling of course content to fit these devices, and an institutional awareness of the challenges of implementing m-learning frameworks.

The success of mobile learning in higher education hinges on a thorough understanding of the determinants of student acceptance of mobile technology for learning. With respect to the community college environment, this study affirms the importance of students' previous experience using mobile technology and confirms its ability to predict student perceptions of the usefulness of mobile technology for hybrid learning. To that end this dissertation adds to the body of knowledge surrounding mobile learning and technology acceptance and provides a foundation for future research.

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**APPENDIX**

**MOBILE TECHNOLOGY SURVEY**

Questions 3 through 6 were adapted with permission from "Extending the technology acceptance model with task technology-fit constructs," b y M. T. Dishaw and D. M. Strong, 1999, *Information & Management, 36*, pg. 19.

Questions 7 through 26 were adapted with permission from "User acceptance of information technology: system characteristics, user perceptions and behavioral impacts," b y F. D. Davis, 1993, *International Journal of Man-Machine Studies, 38*, p. 486-487.

Questions 27 and 28 were adapted with permission from "Perceived usefulness, perceived ease of use, and end user acceptance of information technology," b y F. D. Davis, 1989, *MIS Quarterly, 13*(3), p. 339.

# Mobile Technology Survey

To help us develop mobile learning systems that meet your learning needs, please complete the survey below. Thank You!

**<u>Instructions:</u>** Please select the response to each question that best matches your opinion about using mobile technology.

1. What is your gender?

[ ] Female [ ] Male

2. What is your age?

[ ] less than 18 years old
[ ] 18 – 20 years old
[ ] 21 – 25 years old
[ ] 26 – 30 years old
[ ] 31 – 40 years old
[ ] 41 – 50 years old
[ ] 51 – 60 years old
[ ] over 60 years old

3. How much experience do you have using mobile technology?

[ ] Less than 1 year
[ ] 1 – 3 years
[ ] 3 – 5 years
[ ] 5 – 7 years
[ ] 7 – 10 years
[ ] Over 10 years

4. At school, how many times per week do you use mobile technology?

[ ] Not at all
[ ] Less than once a week
[ ] About once a week
[ ] 2 or 3 times a week
[ ] Several times a week
[ ] About once a day
[ ] Several times each day

5. Outside of school, how frequently do you use mobile technology?

[ ] Not at all
[ ] Less than once a week
[ ] About once a week
[ ] 2 or 3 times a week
[ ] Several times a week
[ ] About once a day
[ ] Several times each day

6. How many total hours have you used mobile technology?

[ ] Less than 50 hours
[ ] Between 50-99 hours
[ ] Between 100-199 hours
[ ] Between 200-299 hours
[ ] Between 300-399 hours
[ ] More than 400 hours

| | Strongly Disagree | | | Neutral | | | Strongly Agree |
|---|---|---|---|---|---|---|---|
| 7. Using mobile technology for learning would improve the quality of my learning in a blended learning environment. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 8. Using mobile technology would give me greater control over my learning in a blended learning environment | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 9. Mobile technology would allow me to accomplish learning tasks more quickly. (i.e. respond to email, interact with students and instructor, etc) | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 10. Mobile technology would support critical aspects of my learning in a blended setting. (i.e. access course material, take exams, etc) | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 11. Using mobile technology to study would increase my productivity in a blended learning environment. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 12. Using mobile technology would improve my academic performance. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 13. Using mobile technology would allow me to accomplish more work in a blended course than would otherwise be possible. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 14. Using mobile technology would enhance my chance to earn a desired grades in a blended learning setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 15. Using mobile technology would make it easier for me to perform as a student in a blended environment. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 16. I would find mobile technology useful in a blended learning setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 17. I would find mobile technology cumbersome to use for learning in a blended setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 18. Learning to operate mobile technology for blended learning would be easy for me. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 19. Interacting with mobile technology in a blended environment would be frustrating for me. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 20. I would find it easy to get mobile technology to do what I want to do in a blended learning setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 21. Mobile technology would be rigid and inflexible to interact with in a blended setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 22. It would be easy for me to remember how to perform tasks using mobile technology for learning. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 23. Interacting with mobile technology for blended learning would require a lot of effort. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 24. The ways that I could use mobile technology in a blended learning environment would be clear and understandable. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 25. I would take a lot of effort to become skillful using mobile technology for blended learning. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 26. I would find mobile technology easy to use in a blended learning setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 27. Assuming I have access to mobile technology, I intend to use it for learning in a blended environment. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |
| 28. Given that I have access to mobile technology, I predict that I would use it for schoolwork in a blended learning setting. | **1** | **2** | **3** | **4** | **5** | **6** | **7** |

Comments: ______________________________________________