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Mobile Learning Technology Acceptance Among Saudi Higher Education Students

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MOBILE LEARNING TECHNOLOGY ACCEPTANCE AMONG SAUDI HIGHER EDUCATION STUDENTS

by

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DEDICATION

This dissertation is dedicated to my family. A special gratitude to my exceptional parents, Naseelah and Mohammed Alasmari, your prayers have been answered. My beloved wife, Intisar, who joined me patiently during my doctoral journey. My wonderful daughter, Kayan, whose smiles never stop strengthening me. My brothers and sisters, who never stopped caring about me.

I also dedicate this study to my friends and colleagues for their support and care.

God bless you all!

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CHAPTER 1: INTRODUCTION

1.1 Background

The rapid development in technology has encouraged the Ministry of Higher Education in Saudi Arabia to create a national plan called AFAQ (which means horizons in Arabic) to achieve excellence in science and technology. The AFAQ plan was established in 2010, and one of its goals is to facilitate the societal transformation toward a knowledge-based society. Therefore, Saudi Higher Education initiated three technology-focused projects: developing eLearning and distance education, employing information systems in all higher education institutions, and building a high-speed educational network among Saudi universities (Ministry of Higher Education, 2010). As a result, eLearning deanships among Saudi universities launched several projects to implement mobile learning within their colleges and adopt mobile technology in the learning process (King Abdulaziz University, 2014; Taif University, 2016).

However, the decision of mobile learning technology implementation in Saudi universities relies on authoritarian decision making by these institutions without much consideration for the targeted users. In this sense, few initiatives either by the organizations or individuals have been taken to explore the users' acceptance of mobile learning technology in Saudi Arabia. King Abdulaziz University (2014) has established a project that measure its faculty members and female students' readiness regarding blended learning and mobile learning. Only five percent of the population was investigated in this project, and male students were not included in this investigation. By the same token, the individual initiatives of mobile learning technology acceptance were limited either to faculty members or a specific college's students (Al-Hujran, Al-Lozi, & Al-Debei, 2014; Alfarani, 2014; Nassuora, 2012).

The authoritarian-decision paradigm combined with the attitude-intention paradigm in explaining technology usage need to be employed in the Saudi higher education context in order to strengthen the decision of implementing mobile learning technology. In addition, it is pivotal to involve all users of such technology rather than focus on faculty members or subgroups of students (Al-Hujran et al., 2014; Alfarani, 2014; Nassuora, 2012).

The literature of technology acceptance provides robust models that researchers can rely on in investigating specific technology acceptance among users. Nevertheless, some studies of mobile learning technology acceptance in Saudi Arabia disregard these models and develop their own data collection method without reference to the theoretical framework of acceptance (Alfarani, 2014; Narayanasamy & Mohamed, 2013). These studies fail in this area by ignoring important variables which affect users' acceptance. Likewise, other studies focus on a subset of variables of a model and ignore the rest of the model (Venkatesh, Thong, & Xu, 2012).

This unstable status of research in the acceptance of mobile learning technology in Saudi Arabia yields the need to investigate Saudi higher education students' acceptance of mobile learning technology on a large scale. This large scale includes students form different universities, majors, genders, regions, and levels of experiences in order to conclude more reliable findings that can be relied on in a decision-making process regarding mobile learning technology in Saudi Arabia. Thus, this study targets the population of Saudi higher education students that was estimated in the latest statistics to be 1,323,692 that includes students from twenty-eight different Saudi public universities, who are pursuing different degrees: associate, bachelor, and graduate degrees (Ministry Deputyship for Planning and Information, 2016). The following section provides a clarification of the research problem and its rationality in the Saudi context.

1.2 Problem Statement

Despite the Saudi government's effort towards technology integration into schools, there is a limited amount of studies that predicts technology acceptance in educational settings. Mobile learning technology as an emerging technology in Saudi education needs to be investigated and predicted in order to apply it effectively in that context (Alfarani, 2014; Nassuora, 2012). Many studies have been conducted in the Saudi context regarding mobile learning, but most of these studies focus primarily on teachers and students' attitudes and perspectives toward mobile learning without employing a specific acceptance model (Al-Fahad, 2009; Almutairy, Davies, & Dimitriadi, 2015; Alwraikat & Al Tokhaim, 2014). Hence, the investigation of mobile learning in Saudi Arabia should go beyond attitudes and perspectives to employ a well-defined acceptance model to explore all possible factors that affect the acceptance of mobile learning technology in the country. Therefore, Al-Hujran et al. (2014); Alfarani (2014); Nassuora (2012) have started to investigate the acceptance of mobile learning technology in Saudi Arabia; however, these studies are limited whether in their samples or their implementation of a subset of an acceptance model (Venkatesh et al., 2012).

Moreover, in the context of acceptance studies, Imtiaz and Maarop (2014) have found most of the research in technology acceptance in education focuses on eLearning while other technologies have been given less attention in the research. Therefore, this study investigates mobile technology acceptance among Saudi higher education students through using a proposed extension of Unified Theory of Acceptance and Use of Technology model (UTAUT) to provide university professors as well as policy and decision makers with scientific findings that help with making decisions regarding mobile learning technology in Saudi higher education.

1.3 Research Questions

1- Does learning expectancy have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?

2- Does effort expectancy have a significant effect on of Saudi higher education students' behavioral intention to use mobile learning technology?

3- Does social influence have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?

4- Do facilitating conditions have a significant influence on Saudi higher education students' use behavior of mobile learning technology?

5- Do mobile learning technology characteristics have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?

6- Does self-management of mobile learning technology have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?

7- How do age, gender, and eLearning experience moderate learning expectancy, effort expectancy, social influence, facilitating conditions, M-learning technology characteristics, and self-management of M-learning technology constructs to influence Saudi higher education students' behavioral intention and use behavior of M-learning technology?

1.4 Significance of the Study

The significance of this study stems from extending the literature of mobile learning technology acceptance through combining constructs that have been theoretically and empirically validated in the context of mobile learning technology. This study is theoretically based on various theories and models of technology acceptance in order to predict students' acceptance behavior of

mobile learning technology. In addition, the extension of UTAUT combines constructs from different studies to strengthen the prediction and explanation power of UTAUT. Moreover, this study contributes to the knowledge base of mobile learning technology by providing a new extension of UTAUT that suits mobile learning technology acceptance through focusing on mobile learning technology characteristics and self-management as requirements of mobile learning environments. The findings of this study will provide policymakers of Saudi higher education with tangible findings that can be relied on in making decisions regarding using mobile learning technology in Saudi higher education institutions. Finally, moderators such as gender, age, ELearning experience are expected to play major roles in influencing Saudi higher education students and that will guide the future practice of using mobile learning technology in the Saudi context by considering these moderators and their effects.

1.5 Key Terms and Definitions

Most definitions are adopted from Venkatesh, Morris, Davis, and Davis (2003) unless otherwise noted.

- Mobile learning technology acceptance

  Mobile learning technology acceptance can be defined as students' perceived intentions to use and engage in mobile learning and their abilities to explain these intentions in terms of learning expectancy, effort expectancy, social influence, facilitating conditions, M-learning technology characteristics, and self-management of M-learning technology (adopted from Davis, Bagozzi, & Warshaw, 1989).

- Learning expectancy

  Learning expectancy refers to the students’ beliefs that mobile learning technology will benefit them in performing learning tasks.

- Effort expectancy

  Effort expectancy refers to the level of ease of using mobile learning technology.

- Social influence

  Social influence is another construct in the UTAUT model that refers to an individual's perception regarding other important people in his or her life who believe in the importance of his or her use of mobile learning technology.

- Facilitating conditions

  Facilitating conditions refer to the extent to which an individual believes that the available infrastructure in his organization supports his use of mobile learning technology.

- Behavioral intention

  Behavioral intention means the extent that individuals construct a thought-based decision whether to perform or not to perform a specific behavior. Operationally, behavioral intention in this study refers to the individual's conscious decision regarding using mobile learning technology or not using it.

- Use behavior

  In the acceptance literature, this variable might be named “actual use” and refers to the level of performing the required behavior that results from an individual's intention to use a specific technology. In this study, use behavior will be the level of students' use of mobile learning technology as a translation of their previous intention to use this specific technology.

- Mobile learning technology

  Mobile learning technology refers to handheld and palmtop technologies that provide educational experiences anytime and anywhere that includes phones, smartphones, tablet PC, personal digital assistants (PDAs), iPads, and iPods (Traxler, 2005).

CHAPTER 2: LITERATURE REVIEW

2.1 Technology Acceptance

Several studies have been conducted to predict technology acceptance or adaptation, and sequentially many models have been produced in order to model the predictors of technology acceptance (Davis, 1989; Davis et al., 1989; Davis & Venkatesh, 2000; Venkatesh et al., 2003). These models stem from different perspectives–psychological, sociological, functional or technological. The Technology Acceptance Model (TAM), for example, is theoretically founded on self-efficacy theory, cost-benefit paradigm, adaptation of innovation, and evaluation of information reports (Davis, 1989; Venkatesh et al., 2003).

In contrast, Moore and Benbasat (1991) proposed a model that is grounded in sociology, namely in innovation diffusion theory where they, based on the characteristics of innovation, identified seven constructs that predict individual acceptance of technology. These constructs are: (a) relative advantage, (b) ease of use, (c) [self] image, (c) visibility, (d) compatibility, (e) results demonstrability, and (f) voluntariness of use. Due to the variation of theoretical bases of acceptance models, the independent variables that affect technology acceptance vary among these models as well. Hence, the next section will provide an overview of the theoretical bases of technology acceptance.

2.2 Diffusion of Innovation

In the early 1960s, Everett Rogers developed the theory of innovation diffusion that is based on sociology and social psychology. Rogers (2003) defines innovation as perceived new idea, practice, or object by an individual or group of adopters while he defines diffusion as a special type of communication system that communicates an innovation through certain channels among specific members of a social system. The innovation-decision process starts by gaining knowledge

regarding the innovation, persuading actions based on favorable or unfavorable attitudes from the knowledge stage, deciding to adopt or reject the innovation, putting the innovation in implementation to use or reinvention, then confirming the innovation-decisions based on feedback.

The general characteristics of an innovation determine its adoption by individuals and or organizations. These general characteristics are detailed as follows:

- Relative advantage – the extent that an innovation is better than other competing innovations
- Compatibility – the extent that an innovation is perceived as a consistent innovation with current values, previous experiences, and needs for potential adopters
- Complexity – the perceived level of difficulty of an innovation to be used and understood
- Trialability – the extent that an innovation may be experimented on a limited basis
- Observability – the extent that results of an innovation are visible to others

Rogers (2003) claims that these five general characteristics explain an individual's rating of an innovation. In other words, the more an individual perceives great degrees in these five characteristics, the more rapidly he or she adopts that specific innovation. Further, there are five categories of individuals involved in the adoption of an innovation. Those individuals are: inventors (venturesome), early adopters (opinion leaders), early majority (adopt before the average members of a social system), late majority (skeptical to adopt), and laggards (resistant to adopt).

Despite the momentum of diffusion of innovation studies, Lyytinen and Damsgaard (2001); Wolfe (1994) criticized diffusion of innovation for not differentiating between organizational and individual adoptions of innovations. Due to this limitation of diffusion of innovation, studies in organizational innovativeness concluded disappointing findings. In addition, diffusion of innovation simplifies innovations to the extent that it ignores complex and networked innovations

and technologies, and new constructs must be considered in order to predict adoption of complex innovations.

2.3 Theory of Reasoned Action

Theory of Reasoned Action (TRA) is based on social psychology where it predicts and explains human behaviors. Ajzen and Fishbein (1980) proposed this theory based on the assumption that individuals' attitudes and subjective norms indirectly influence behavioral intention, which ultimately guides actual behavior. Figure 1 describes TRA's elements.

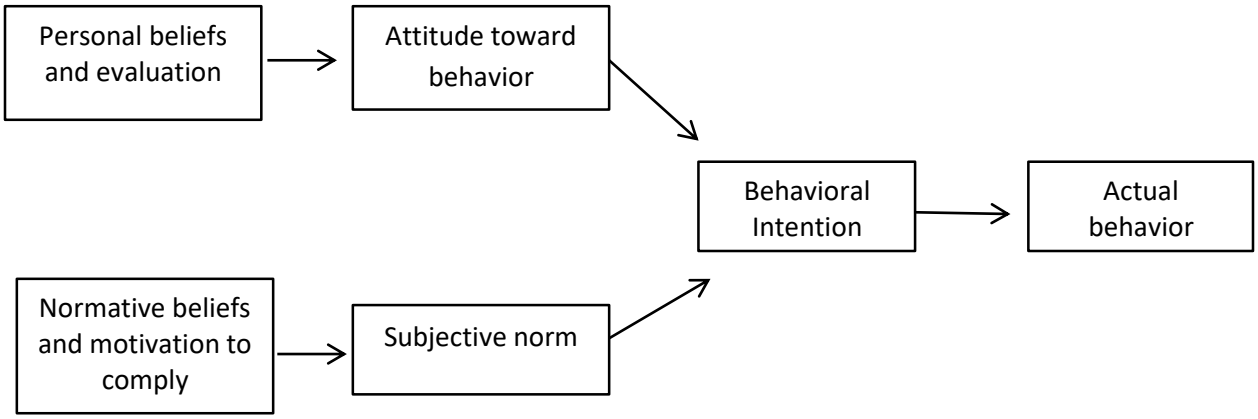

Figure 1: *Theory of Reasoned Action (Source: Ajzen and Fishbein, 1980)*

TRA defines attitude as a positive or negative personal evolution of performing a behavior, whereas subjective norms refers to the social perspective to perform or not to perform a behavior (Ajzen & Fishbein, 1980).

TRA has provided technology acceptance literature with two main determinants that directly influence an individual's acceptance of technology. The first determinant is behavioral intention, which refers to the conscious intention of an individual to perform specific behavior. The second determinant is use behavior or actual behavior, which refers to what an individual is doing regarding his or her behavioral intention. Behavioral intention and actual behavior were found significantly correlated (Davis et al., 1989; Venkatesh et al., 2003).

2.4 Theory of Planned Behavior

In the effort of accurate prediction of human behavior, Ajzen (1991) proposed Theory of Planned Behavior (TPB) as an extension of TRA. In this theory, perceived behavioral control is a new construct that was added as an indirect influencer of behavioral intention. Perceived behavioral control refers to personal perceptions regarding ease or difficulty of performing specific behavior. This construct is consistent with Bandura's self-efficacy term, which refers to the perceived individual capacity in executing required behaviors for intended performance. Figure 2 depicts the theory of planned behavior.

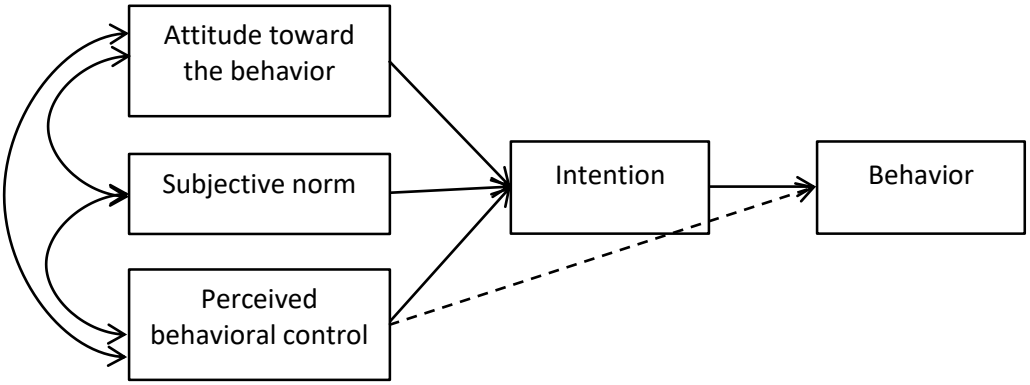

Figure 2: *Theory of Planned Behavior (Source: Ajzen, 1991)*

As shown in Figure 2, behavior is directly influenced by intention and perceived behavioral control. Further, perceived behavioral control influences individual intentions toward specific behavior. The remaining elements of the TPB are the same as TRA's elements.

TPB provides the literature of technology acceptance with very important constructs that are manifested later in many models; for instance, Technology Acceptance Models (TAM and TAM2), perceived ease of use construct rooted in TPB specifically, the perceived behavioral control construct (Davis et al., 1989; Davis & Venkatesh, 2000).

In brief, the underlying theories of technology acceptance are diffusion of innovation, theory of reasoned action, and theory of planned behavior. These three theories have been modeled

in several acceptance models to predict the behaviors of technology acceptance among individuals and organizations. The following section discusses the popular models in technology acceptance.

2.5 Technology Acceptance Model

Technology Acceptance Model (TAM) is one of the earlier technology acceptance models that was proposed by Davis et al. (1989). Based on the TRA, the two determinants of technology acceptance in TAM are behavioral intention to use a system and actual system use. These determinants are influenced by an individual's attitude toward using a system; however, the attitude toward using a system is influenced by two external variables: perceived usefulness and perceived ease of use. Perceived usefulness refers to the person's subjective probability that using a system will increase his/her job performance in an organizational context. Perceived ease of use, on the other hand, refers to the extent that an individual will use a system with less effort. The purpose of TAM is to explain the determinants of technology acceptance with a wide range of computer technologies combined with various uses. TAM differs from TRA in considering attitude as the only construct that influences behavior and accordingly actual system use. Moreover, two external variables; perceived usefulness and perceived ease of use are the only external variables that influence the attitude. Figure 3 summarizes the TAM model and its constructs.

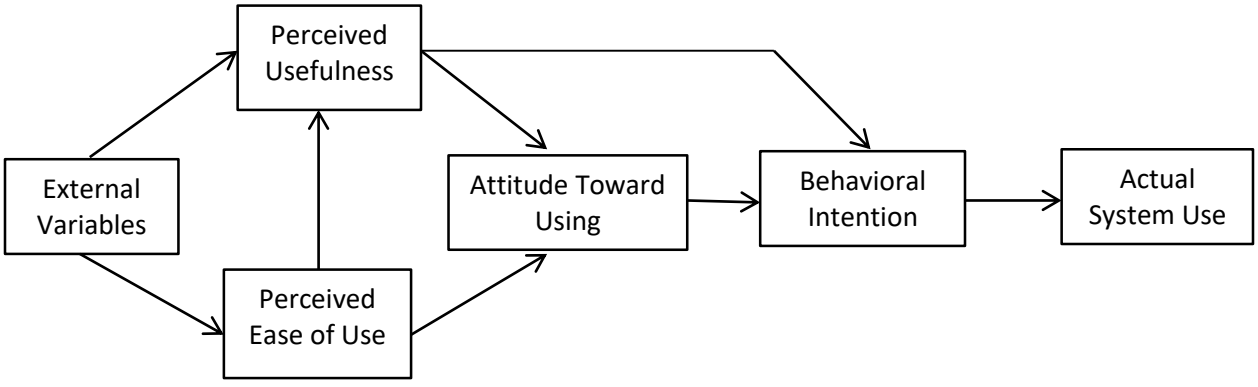

Figure 3: *Technology Acceptance Model (TAM)* *(Source: Davis et al.,1989)*

To measure the two new constructs—perceived usefulness and perceived ease of use—, Davis et al. (1989) developed a seven-point Likert scale that ranges from extremely likely to extremely unlikely statements that users rate themselves on.

Although TAM is a well employed model in the field of Information Science, Chun-Hua and Kai-Yu (2014) found TAM a less effective model in predicting technology acceptance behavior. In addition, Venkatesh et al. (2003) found the predictive validity of TAM with gender included as a moderator to be 52% while Davis and Venkatesh (2000) found that TAM explains only 40% of technology usage intentions and behaviors. In this sense, researchers extend TAM to include other constructs or moderators in order to increase its productivity validity (Davis & Venkatesh, 2000; Mohamed, Tawfik, Al-Jumeily, & Norton, 2011). The next section discusses the contribution of one of the popular extensions of TAM with the participation of one of TAM's original authors.

2.6 Extension of Technology Acceptance Model

Technology Acceptance Model 2 (TAM2) is a theoretical extension of TAM developed by Davis and Venkatesh (2000). In TAM2, the two constructs of TAM (perceived usefulness and perceived ease of use) remain major constructs of predicting intention to use technology and usage behavior. However, TAM2 builds upon the assumption that technology acceptance is based on social influence processes and cognitive instrumental processes. In the social influence processes, there are three new external variables directly affecting perceived the usefulness construct that lead to changes in individual's intentions to use technology. These external variables are subjective norm, image, and voluntariness. Subjective norms refer to the personal perceptions that important people have that influence an individual to think he/she should or should not use that technology. Image refers to the extent that using an innovation enhances an individual's social status within a

social system. The voluntariness variable plays a moderating role in TAM2 and refers to the usage type of an innovation labeled as non-mandatory usage.

Cognitive instrumental processes are the second component of TAM2 where acceptance external variables are cognitive in nature. These external variables are job relevance, output quality, and result demonstrability. Job relevance is defined as an individual's perception that the targeted technology is relevant to his/her job situation. Output quality refers to an individual's perceptions regarding how well the targeted technology performs in the assigned tasks. Result demonstrability refers to the level of obtaining tangible results in using a specific technology (Davis & Venkatesh, 2000). Figure 4 depicts TAM2 and its social and cognitive processes.

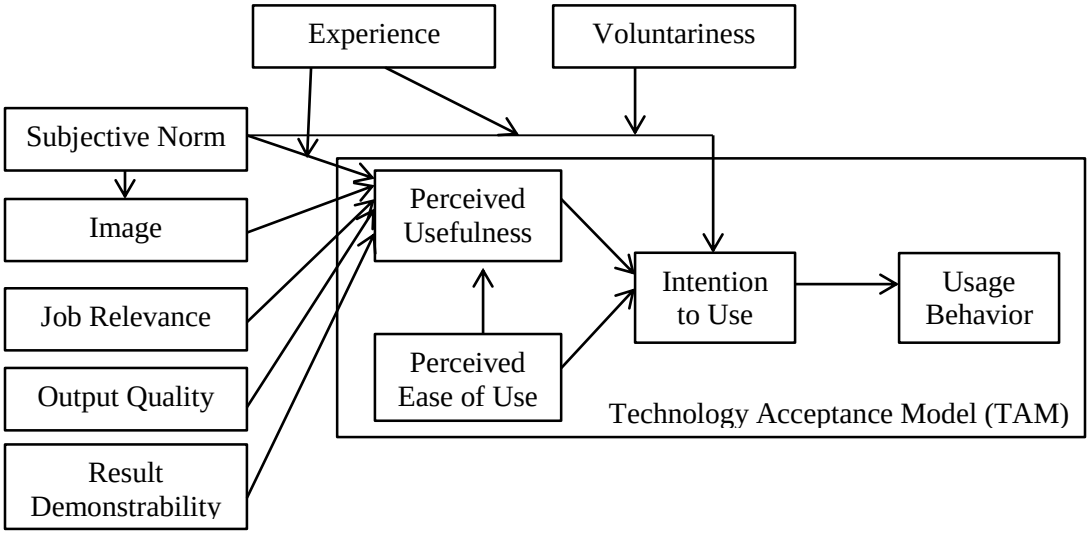

Figure 4: *Technology Acceptance Model 2 (TAM2) (Source: Davis & Venkatesh, 2000)*

As Figure 4 shows, experience and voluntariness play moderating roles where experience level moderates cognitive instrumental processes: job relevance, output quality, and result demonstrability. Contrarily, voluntariness moderates social influence processes: subjective norm and image (Davis & Venkatesh, 2000).

TAM2 expands the acceptance theoretical perspective to include social and cognitive variables. In addition, TAM2 draws attention toward the influence of moderators in acceptance

where difference in experience level, for example, yields various influences on an individual's intention and behavior to use a technology. TAM2 was developed to explain 60% of the variance in intentions and usage behaviors; however, Baker, Al-Gahtani, and Hubona (2011) found TAM2 explains only 40.3% of variance in behavioral intention among Saudi users. By comparing TAM2 to TAM, TAM2 is considered to have strong explanatory power. Thus, the effort of modeling technology acceptance continues to develop models with high explanatory and predictive power. The next section discusses Unified Theory of Acceptance and Use of Technology.

2.7 Unified Theory of Acceptance and Use of Technology (UTAUT)

Unified Theory of Acceptance and Use of Technology (UTAUT) is one of the well-studied models in the area of technology acceptance where it recorded 15482 citations in Google Scholar by November 22, 2016 (Google Scholar). It was developed by Venkatesh et al. (2003) after a robust review of eight common models in technology acceptance. The reviewed models are: theory of reasoned action (TRA), technology of acceptance model (TAM & TAM2), motivational model (MM), theory of planned behavior (TPB), combined TAM and TPB (C-TAM-TPB), model of PC utilization (MPCU), innovation diffusion theory (IDT), and social cognitive theory (SCT) (Venkatesh et al., 2003).

The four constructs that form the UTAUT model are: performance expectancy, effort expectancy, social influence, and facilitating conditions. The first three constructs are predictors of an individual's behavior intention while the facilitating condition construct is considered to have a strong influence on use behavior. In this sense, behavioral intention leads the use behavior/actual use as well as the facilitating conditions construct. Moreover, the moderators play key role in each construct to increase or decrease its influence. For instance, gender and age moderators moderate

the performance expectancy construct, which will be more significant among men and younger men (Venkatesh et al., 2003).

Performance expectancy in UTAUT refers to the personal belief that the intended technology will benefit that person in performing job tasks. Such expectancy influences the behavioral intention towards an intended technology; however, it is moderated by the individuals' genders and ages. The tested hypothesis in this model claims the influence of performance expectancy is stronger in men and younger men (Venkatesh et al., 2003).

The second construct is effort expectancy which refers to the level of ease of using the intended technology. This construct is mentioned in many other acceptance models under different names such as perceived ease of use in TAM and TAM2 or complexity in MPCU (Davis et al., 1989; Davis & Venkatesh, 2000; Venkatesh et al., 2003). Effort expectancy is moderated by gender, age, and experience. In other words, effort expectancy influences behavioral intention toward a technology more strongly among women, especially younger women with low level of experience (Venkatesh et al., 2003).

Social influence is another construct in the UTAUT model that refers to the level of an individual's perception regarding how much other important people in his or her life believe in the importance of his or her use of that intended technology to be. This construct has been named differently among models such as subjective norms in TAM and TAM2, [self] image in IDT, and MPCU has called this construct social factors. The social influence construct is moderated by gender, age, experience, and voluntariness. Back to the model hypothesis, social influence has a strong influence on behavioral intention among women of older ages with low level of experience in mandatory manners of use (Davis et al., 1989; Venkatesh et al., 2003).

Facilitating conditions is the fourth construct in the UTAUT model which refers to the extent an individual believes that the available infrastructure in his organization supports his use of the intended technology. This constructs influences use behavior directly rather than behavioral intention in the other three constructs. In addition, the facilitating conditions construct is moderated by age and experience, and that means, according to the UTAUT hypothesis, facilitating conditions construct has a significant influence on use behavior among older workers especially with advanced level of experience (Venkatesh et al., 2003).

To clarify the relationship among UTAUT model elements, Figure 5 depicts these relationships and indirect influences on acceptance determinants, behavioral intention and use behavior.

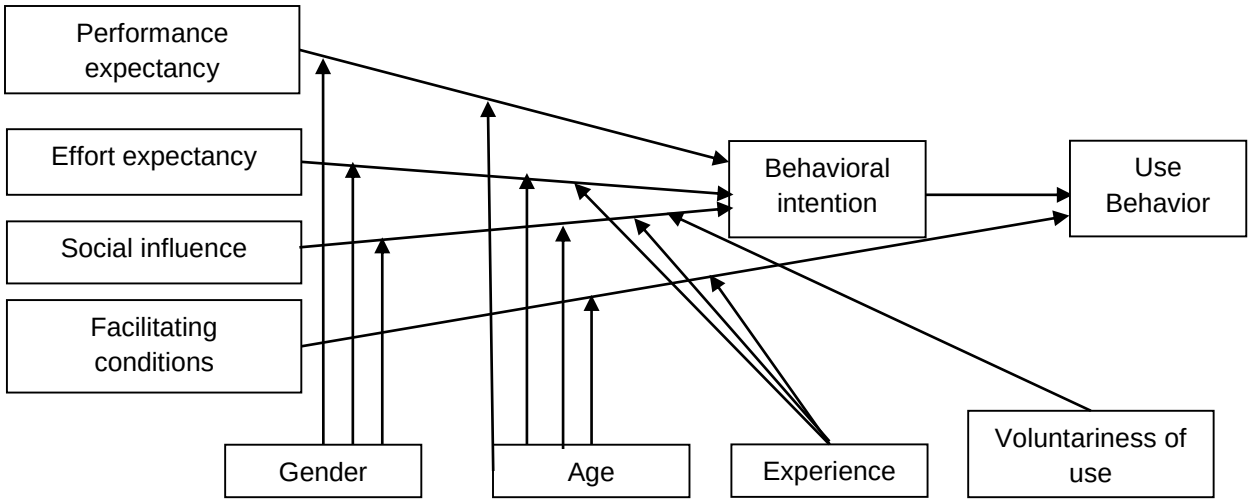

Figure 5: *Unified Theory of Acceptance and Use of Technology Model (UTAUT)*
Sourece: Venkatesh, et. al. (2003). User Acceptance of Information Technology: Toward a Unified View. MIS quarterly, 27(3), 425-478. Copyright © 2003, Regents of the University of Minnesota. Used with permission.

As all acceptance theories and models, UTAUT underlies the basic concept that an individual's attitudes and reactions influence his/her intention to use a technology and consequently influence his/her actual use of that technology. Further, an individual's reactions and attitudes toward a technology might directly influence his/her actual use of that technology without having intentions to use that technology. To illustrate, in mandatory use of technology, individual

may found himself/herself enforced to use a specific technology, and accordingly that shapes his/her actual use of that technology. Figure 5 depicts the basic concept underlying user acceptance models.

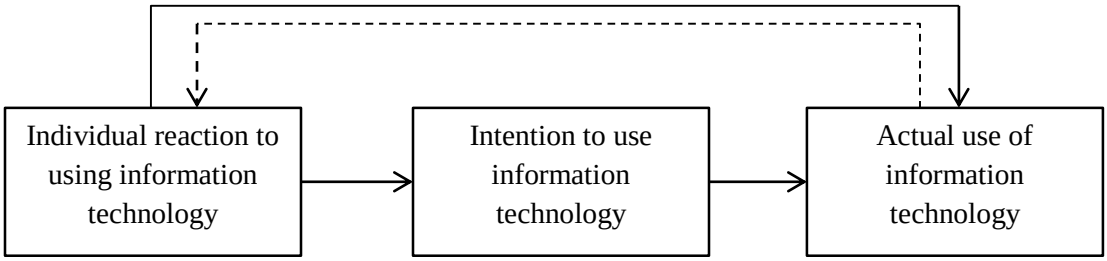

Figure 6: *Basic concept underlying user acceptance models (Source: Venkatesh et al., 2003)*

Several independent variables affect the two determinants: intention to use and actual use either in positive or negative manners. To illustrate, individual's attitude, subjective norms, social influence, perceived usefulness, and perceived ease of use are essential factors that influence one's behavioral intention toward specific technology. Therefore, most of the recent acceptance models are constructed around these two determinants, and then the variation manifests in the indirect variables' influence on the main two determinants: behavioral intention and actual behavior (Davis et al., 1989; Davis & Venkatesh, 2000; Venkatesh et al., 2003).

Other factors that have an indirect influence on the variables of acceptance of technology are mentioned in many models as moderating variables. In a revised version of TAM, TAM2 includes experience and voluntariness as moderators, whereas voluntariness distinguishes between two uses, mandatory and non-mandatory use (Davis & Venkatesh, 2000). Venkatesh et al. (2003) have extended these moderators to include age and gender differences based on the hypothesis that one or more of the technology acceptance variables will be moderated by: gender, age, experience, and/or voluntariness. The moderators are based on theoretical foundation (e.g. gender schema theory) and findings of job-related research (e.g. age differences). Thus, moderators interact in

different degree with independent variables of technology acceptance to influence an individual's behavioral intention and actual use.

2.7.1 UTAUT Significance

UTAUT has been empirically validated by conducting longitudinal field studies that were held in four different organizations from four different industries. Then, a questionnaire was developed based on all previous eight models' elements. After statistical analysis of the results, the UTAUT was proposed based on the significant elements among all eight models (Venkatesh et al., 2003). In addition, Chun-Hua and Kai-Yu (2014) have empirically tested five technology acceptance models and have found that UTAUT is the best model in the context of e-textbook acceptance which is a very similar context to the mobile learning technology context in this study. In addition, the efficiency of UTAUT model predication is 70% while other models have less success in predicting users' technology acceptance. TAM, for example, predicts only 30% of users' technology adoption and the newer version TAM2 predicts only 40% of users' technology adoption. The 32 items of the UTAUT questionnaire combines eight other models' variables and increases its efficient prediction to this high level over other acceptance models, especially with long-term studies (Davis & Venkatesh, 2000; Oye, A.Iahad, & Ab.Rahim, 2014). Therefore, this model suits this study's purposes due to it robustness and validity in the context of mobile learning technology.

Although the UTAUT model is a widely adopted model in the information technology industry, other industries have adopted this model as well, such as banking, e-commerce, healthcare, customer service, and education (Al-Hujran et al., 2014). Teo (2011) mentioned the significance of acceptance research findings in education for not only students and teachers but

also administrators, policymakers and all stakeholders. Thus, the following section discusses the use UTAUT model in educational settings.

2.7.2 UTAUT in Educational Settings

The UTAUT model has been employed in many studies in education due to the momentum of technology that has emerged in the last decade; however, some studies claim UTAUT has received limited validation in the context of education (Wong, Teo, & Russo, 2013). The literature shows that educational technology applications give UTAUT model applicability with many technologies.

With the introduction of the interactive whiteboard, Raman, Don, Khalid, Hussin, et al. (2014); Wong et al. (2013) investigated its acceptance among teachers and student teachers through applying the UTAUT model. Their studies yielded mixed findings where the performance expectancy significantly influences the behavioral intention in both studies, but no effort expectancy had significant effect in one study while social influence and facilitating conditions had no significance in both studies. It is important to note the moderators' role in interpreting such study findings and in this sense, Wong et al.'s (2013) study included only experience moderator where the finding supports the influence of effort of expectancy on behavioral intention among less experienced workers. More information, such as age, gender, and voluntariness of use, is needed regarding the samples in both studies to interpret the findings with the UTAUT hypotheses.

In another form of technology, the acceptance of Moodle, a learning management system, has been investigated by Hsu (2012) and Raman, Don, Khalid, and Rizuan (2014) studies. The findings assert the influence of performance expectancy and social influence on behavioral intention. In contrast, other constructs have inconsistent findings in both studies; however, samples among the two studies vary greatly where Hsu's (2012) study conducted among EFL sophomore

students and Raman, Don, Khalid, and Rizuan (2014) conducted among postgraduate students. That means moderators, such as age and experience, might be varied.

With a broader term of technology, Attuquayefio and Addo (2014) and Oye et al. (2014) investigated Information and Communication Technology (ICT) acceptance and the findings are inconsistent with each other. Oye et al. (2014) found that all UTAUT constructs have a positive influence on behavioral intention where Attuquayefio and Addo (2014) found that effort expectancy construct to be the only construct that has a positive influence on behavioral intentions. Both studies were conducted among university teachers in two African countries: Ghana and Nigeria.

A cross-cultural study of educational technology acceptance was conducted in three European countries: Germany, Romania, and Turkey. UTAUT has been extended to include two cultural-related constructs: computer literacy and computer anxiety. The study integrated more cultural characteristics to the UTAUT model which yielded consistent findings with UTAUT hypotheses where performance expectancy was moderated by gender (masculinity in this study context).

Only Attuquayefio and Addo's (2014) study constructs its hypotheses according to the UTAUT model accurately where most of the mentioned studies investigate the influence of UTAUT's four constructs on behavioral intention and disregard the use behavior determinant (Hsu, 2012; Oye et al., 2014; Raman, Don, Khalid, & Rizuan, 2014). In this sense, only three constructs: performance expectancy, effort expectancy, and social influence directly influence the behavioral intention while the fourth construct, facilitating conditions, only influences the use behavior/ actual use.

2.7.3 UTAUT in the Context of Education with Mobile Technology

In the context of technology acceptance in educational settings, studies use adaptation and acceptance interchangeably although the models used in these studies are named as acceptance models, such as UTAUT and TAM (Nassuora, 2012; Seliaman & Al-Turki, 2012). Another important note from the literature is the use of mobile learning adoption or acceptance rather than mobile technology acceptance or adoption. Such use is not consistent with the literature of acceptance and adaptation in the information system discipline where this theory originated (Venkatesh et al., 2003).

UTAUT has undergone many modifications in mobile learning studies whether due to the nature of mobile technology that differs from any other technology or due to the local context of each study. Liew, Kang, Yoo, and You (2013); Wang, Wu, and Wang (2009) have proposed two constructs to UTAUT in regards to mobile technology: perceived playfulness and self-management of learning. Perceived playfulness refers to the degree of interest, curiosity, and enjoyment with mobile learning while self-management of learning refers to the extent of an individual's self-discipline and engagement in autonomous learning. These two activities/constructs are assumed to positively influence individuals' intentions to use mobile learning or mobile technology. The two newly proposed constructs were found significant in predating individual's intentions to use mobile learning and in both studies, they were found to be stronger predictors than UTAUT conventional constructs. Thus, the unique characteristics of mobile technology a play major role in its acceptance among learners from different cultures and contexts.

However, in the context of developing countries, the perceived playfulness construct has no significant effect on individual attention to use mobile learning. Socioeconomic factors as well

as demographic variables explain the inconsistent findings between developing countries and other countries. Likewise, the social influence construct was found to be negative but insignificant in affecting individuals' intentions to use mobile learning in developing countries (Iqbal & Qureshi, 2012). However, further studies are still needed in the same context to confirm or reject such findings. Taking into account developing countries, some studies did not propose major modifications or additions to UTAUT. For instance, Thomas, Singh, and Gaffar (2013) and Mtebe and Raisamo (2014) have investigated the utility of UTAUT in predicting the use of mobile learning in the African context. Consistently, the two studies found UTAUT able to predict and explain the use of mobile learning in their contexts.

The features of mobile learning have encouraged more studies to investigate individual traits such as variables of UTAUT to fit specific contexts. Arpaci (2015) investigated personal innovativeness as a construct of UTAUT in two different cultures: Turkey and Canada. The personal innovativeness construct refers to the degree of an individual's early adoption of a specific technology. Personal innovativeness affects the acceptance of mobile learning in developed countries more than in developing countries where cultures in developed countries are more likely to accept new ideas and try them in early stages. Interestingly, the social influence construct has more effect on the individuals' intention to use mobile learning technology in developing countries than in developed countries (Arpaci, 2015; Iqbal & Qureshi, 2012). Therefore, cultural differences play a significant role in accepting mobile learning technology due to various cultural factors that distinguish cultures. To illustrate, Turkey is a more collectivist culture while Canada is more of an individualistic culture; therefore, studying similar cultures should take into account variables like self-reliance and personal innovativeness which suit the Canada-like cultures. In contrast, social influence and collaborative variables suit Turkey-like cultures.

Few studies have been conducted in mobile learning technology acceptance in Saudi Arabia using the UTAUT model (Al-Hujran et al., 2014; Alfarani, 2014; Badwelan, Drew, & Bahaddad, 2016; Nassuora, 2012). Saudi students' intention to use mobile learning technology is influenced by social factors like peers and teachers' opinions and by the easiness of using mobile learning technology in their learning processes (Al-Hujran et al., 2014; Nassuora, 2012). For example, Shorfuzzaman and Alhussein (2016) studied peer influence on mobile learning in Gulf Cooperation Council (GCC) countries including Saudi Arabia and found that peers have significant influence on students' intentions to use mobile learning. Therefore, any future organizational adoption of mobile learning technology should take the advantage of the early adopter as a positive social influence and be aware of the complexity of the mobile learning application since the ease of use is a crucial factor for Saudi students. In a broader spatial perspective, Jawad and Hassan (2015) have found that UTAUT's six constructs along with perceived playfulness and self-management of learning significantly influence the intentions of Iraqi students to use mobile learning. The Saudi culture is a collectivist culture similar to the Turkish culture in the Arpaci (2015) study, and that explains the significance of the social influence construct in predicting the intention of mobile learning technology use. The expected benefits of mobile learning have inconsistent influence on Saudi students' intentions to use mobile learning technology, and further studies are needed here to confirm or reject the significance of this construct in the Saudi context. Studies have shown that the infrastructures and all other facilitating conditions have no significant influence on Saudi students' use of mobile learning technology. Therefore, this finding cannot be attributed to level of country development, as the literature suggested in Nassuora, 2012, because Saudi Arabia is a developing country as well as Pakistan in

the Iqbal and Qureshi (2012) study and the findings from these two countries contradict each other. Further investigation of the cultural differences might reveal interpretation for this phenomenon.

Another cultural barrier in the Saudi context is the separation between male and female students in different campuses. Hence, Alfarani (2014) proposed two constructs: change resistance and perceived social culture (social norms) that affect female teachers' acceptance of mobile learning. The Saudi higher education policymakers should take into account teachers' change resistance when applying mobile learning technology in Saudi higher education. Furthermore, Saudi social culture has a negative effect on teachers' use of mobile learning technology; therefore, any change towards using mobile learning technology in higher education should be supported not only by the government but by the social culture as well.

From reviewing the literature, the study of mobile learning technology acceptance is not well researched yet for the following reasons. First, there are inconsistent findings among studies regarding the conventional constructs of UTAUT. Second, cultural differences have different influences on the intention to use mobile learning technology among countries; therefore, researchers must empirically justify their extensions of the UTAUT model. Attuquayefio and Addo (2014) have Indicated the importance of choosing the correct combination of variables in studying UTAUT among cultures. Third, the Saudi context lacks studies in mobile learning technology acceptance using the UTAUT model where there are only three studies that are limited in their temporal, spatial limitations. Finally, it is important to investigate the mobile learning technology acceptance in Saudi Arabia at this time to see how the perceptions and attitudes toward mobile learning technology change overtime.

2.8 Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

UTAUT has gone through many extensions throughout studies, and these extensions can be summarized in three types. The first extension is in contexts where each study has a specific technology, population, and culture; therefore, new constructs or moderators might show up due such differences among studies and lead to the second extension, which is adding new constructs to fit a specific context. The third extension is the addition of external predictors that are theorized in the UTAUT framework (Venkatesh et al., 2012). According to Venkatesh et al. (2012), many UTAUT studies only applied a subset of the UTAUT model and dropped either some constructs or moderators. UTAUT studies in educational settings in Saudi Arabia confirmed Venkatesh et al.'s (2012) study findings where all studies of mobile learning technology acceptance employed a subset of UTAU and dropped others (Al-Hujran et al., 2014; Alfarani, 2014; Nassuora, 2012).

As a result, Venkatesh et al. (2012) proposed the new extension, UTAUT2, for the consumer use context. In this extension, three new constructs have been added to UTAUT: hedonic motivation, price value, and habit. Hedonic motivation refers to the level of pleasure caused by using a specific technology. Price value refers to the individual cost of using or buying specific technology. Habit in this context refers to individual's automaticity in performing the required behavior in order to use a specific technology. In addition to these three new constructs, the voluntariness of use moderator in UTAUT has been dropped in UTAUT2 and that because the consumer use context is voluntary not mandatory as in other contexts (e.g. work context); therefore, this moderator is not significant anymore in this context.

Since this study is conducted in educational settings that differ from consumer-oriented settings, the following section proposes a new extension of UTAUT based on collective empirical evidence.

2.9 A Proposed Extension of UTAUT

The literature of UTAUT provides many extensions and combinations of UTAUT with other models. The momentum of these extensions and combinations can be attributed to the variations in employed technology and contexts (Venkatesh et al., 2012). This study adds two new constructs of UTAUT and modifies two other constructs. The two added constructs are M-learning technology characteristics and self-management of M-learning. M-learning technology characteristics refer to any feature, component, capability, or function that provides a user with technical capacity to support his/her learning process. This construct is theoretically based on Goodhue and Thompson (1995) Task-Technology Fit model (TTF) where the underlying concept is that technology leads individual performance through a utilization process. Goodhue and Thompson (1995) found some technology characteristics, such as locatability, compatibility, and reliability, are significant predictors of task-technology fit. In the theoretical framework of Technology Acceptance Model 3 (TAM3), Venkatesh and Bala (2008) proposed system characteristics as determinants of technology acceptance that include perceived enjoyment and objective usability.

From an empirical perspective, Platzer and Petrovic (2010) surveyed seventy-three studies of mobile services acceptance to determine the success factors of mobile technology acceptance among these studies. The technology characteristics factor was found to be the third factor in influencing mobile technology acceptance after perceived usefulness and perceived easiness. In addition, Oliveira, Faria, Thomas, and Popovič (2014) found technology characteristics significantly influence performance expectancy compared to task characteristics construct, and technology characteristics contribute in predicting the overall behavioral acceptance in mobile banking. Moreover, there are studies of acceptance that construct each technological characteristic

as a separate construct that has direct influence on acceptance behaviors. Alrawashdeh, Muhairat, and Alqatawnah (2012), for instance, structured their proposed acceptance model with three constructs: system flexibility, enjoyment, and interactivity. All these constructs are characteristics of the used systems and significantly influence the acceptance behaviors. Thus, this study proposed the extension of UTAUT with the technology characteristics construct based on the theoretical and empirical mentioned above.

M-learning technology characteristics adopted from Chen, Kao, Sheu, and Chiang (2002). The characteristics of M-learning technology listed below as potential influencers in behavioral intention to use M-learning technology. M-learning technology characteristics as follow:

1. Urgency of learning need
2. Initiative of knowledge acquisition
3. Mobility of learning settings
4. Interactivity of learning process
5. Situating instructional activity
6. Integration of instructional content

The second new construct in this proposed extension of UTAUT is self-management of M-learning. Self-management of M-learning refers to the degree that the learner feels self-disciplined and has the ability to engage in learning autonomously (Smith, Murphy, & Mahoney, 2003). In mobile learning environments, students are expected to have a level of self-management to manage their own learning, especially in the absence of faculty and colleagues. Some of the tasks in self-management of M-learning include developing critical thinking, seting up learning objectives, evaluating learning resources, and conducting a self-evaluation (Liew et al., 2013; Wang et al., 2009).

Empirically, Liew et al. (2013); Lowenthal (2010); Wang et al. (2009) found self-management is a significant predictor of mobile learning technology acceptance. Therefore, this study proposed self-management as a construct that is assumed to influence Saudi higher education students' intentions to use M-learning technology.

The performance expectancy construct in UTAUT has been modified in this extension to fit the educational context. The proposed construct is learning expectancy, and the items that represent this construct will include cognitive expectancy adopted from Wen-Hong, Huan-Neng, Chen, Hui-Ru, and Chu (2010). Cognitive expectancy refers to the individual's perception that using M-learning technology benefits his/her cognitive domain. Perceived usefulness is another item of this construct as represented in UTAUT (Venkatesh et al., 2003).

Adding to the facilitating conditions construct of UATUT, perceived security and perceived privacy are adopted from Rao and Troshani (2007). The facilitating conditions construct was found to be an insignificant construct in predicting behavioral intention to use technology among studies; however, by adding privacy and security items, it is assumed that facilitating conditions will influence Saudi higher students' use behavior of M-learning technology. Figure 7 explains the proposed extension of UTAUT in this study.

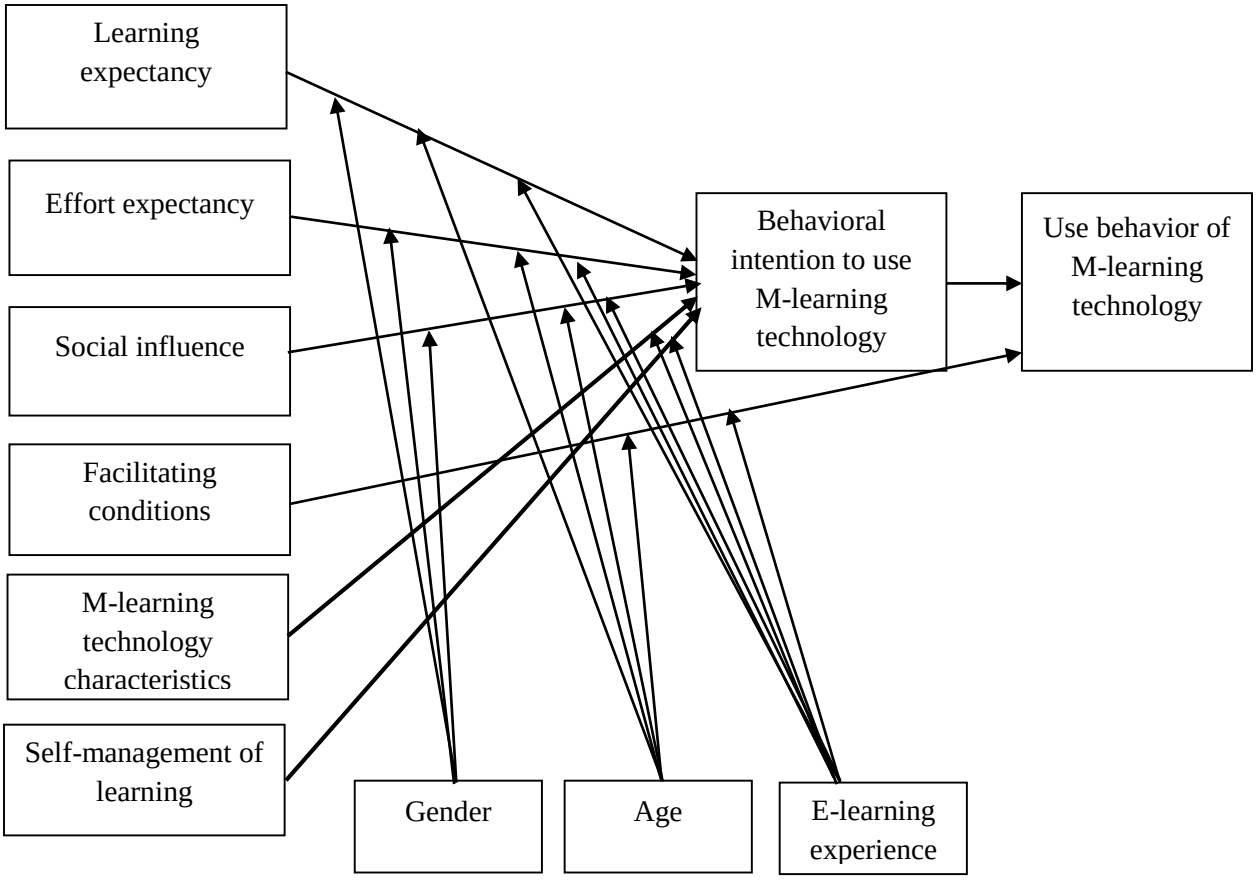

Figure 7: *Proposed Extension of UTAUT. (Adopted from Venkatesh et al., 2003).*

CHAPTER 3: METHODOLOGY

3.1 Introduction

This chapter provides an overview of the research design, including the rationale of employing a mixed method, and an extensive description of the populations and participants. It also provides the rationale of employing social networking sites to recruit participants supported by empirical findings from the Saudi context. In addition, this chapter covers data collection procedures, instrument development, validity and reliability of instruments and data analysis.

3.2 Variables and Hypotheses

By virtue of research questions and model, the independent variables of this study are: learning expectancy, effort expectancy, social influence, facilitating conditions, mobile learning characteristics, and self-management of learning. On the other hand, the dependent variables are: behavioral intention to use mobile learning technology and use behavior of mobile learning technology. It is important to note that since behavioral intention to use mobile learning technology predicts the use behavior of mobile learning technology, it also serves as an independent variable in predicting students' use behavior of mobile learning. In addition, gender, age, and eLearning experience play moderating role in the relationships between independent variables and dependent variables. Figure 8 depicts the independent and dependent variables and their relationships.

Based on the research questions supported by the literature, this study proposes the following hypotheses:

H1: Learning expectancy has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience such that the effect will be stronger for men, particularly younger men with high experience in eLearning.

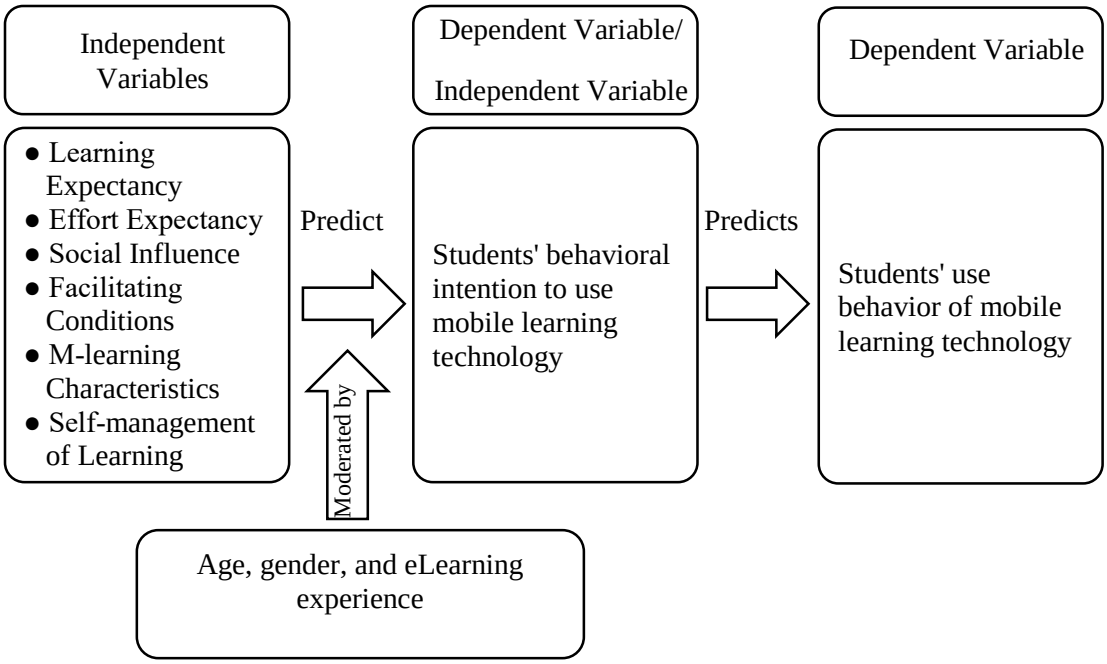

Figure 8: *Research Independent and Dependent Variables and Moderators*

H2: Effort expectancy has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience, such that the effect will be stronger for women, particularly younger women, with low experience in eLearning.

H3: Social influence has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience, such that the effect will be stronger for women, particularly older women, with low experience in eLearning.

H4: Facilitating conditions have a significant effect on students' use behavior of mobile learning technology moderated by age, and eLearning experience, such that the effect will be stronger for older students with high experience in eLearning.

H5: Mobile learning technology characteristics have a significant effect on students' behavioral intention to use mobile learning technology moderated by eLearning experience, such that the effect will be stronger for students with high eLearning experience.

H6: Self-management of learning has a significant effect on students' behavioral intention to use mobile learning technology moderated by eLearning experience, such that the effect will be stronger for students with high eLearning experience.

Figure 9 depicts the research hypotheses located on the research model.

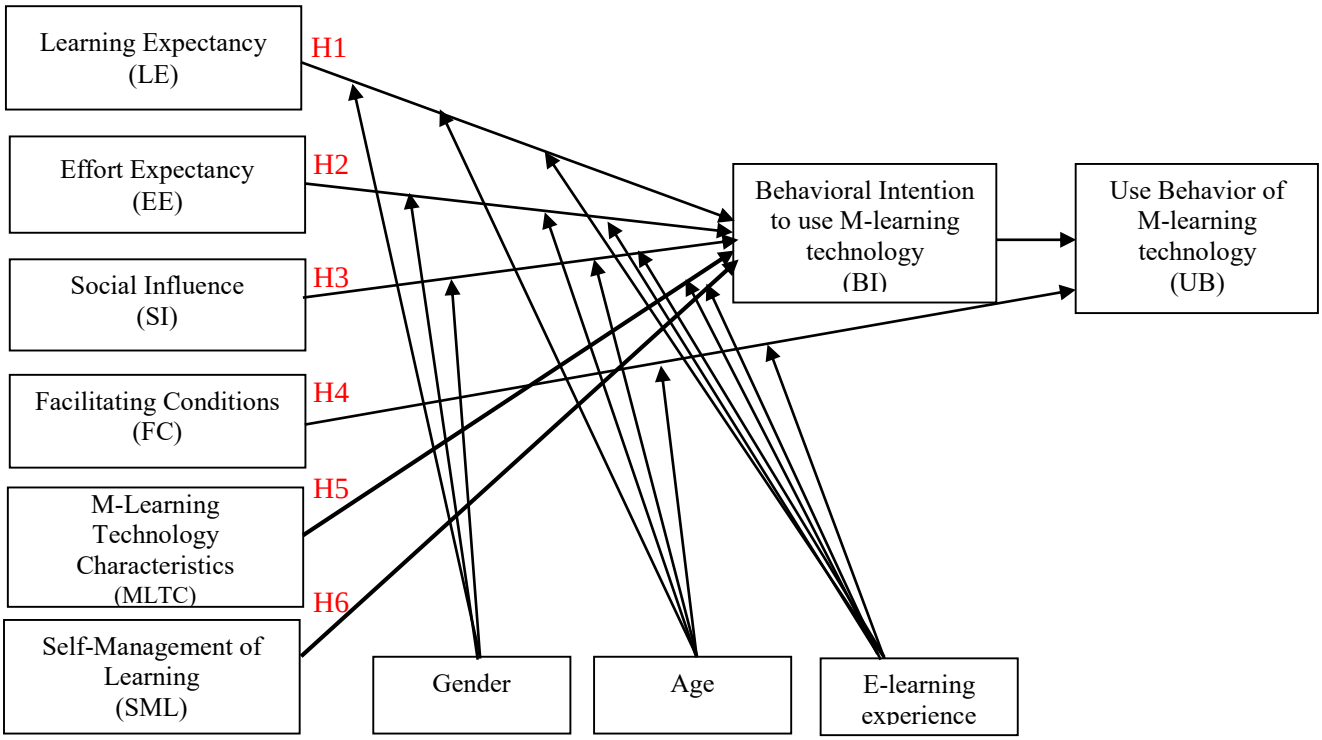

Figure 9: *Research Hypotheses on the Research Model*

3.3 Research Design

The nature of research questions seeks answers obtained through qualitative and quantitative methods. In the quantitative method, this study employed the survey method through the questionnaire as a data collection tool to explore the perceived influence of proposed acceptance constructs in participants' behavioral intentions and use behavior of mobile learning

technology. In the qualitative method, this study employed an interview as a data collection tool to deepen the exploration of the influence of proposed acceptance constructs in the study model. In this sense, this study employed a mixed method in order to answer its questions. According to Creswell (2014) the mixed method design combines quantitative and qualitative methods in a study where quantitative data tends to be closed-ended questions while qualitative data tends to open-ended questions. In this study, the questionnaire collected quantitative data through closed-ended questions while the interview collected qualitative data through open-ended questions. Further, among many designs of mixed methods, this study employed an explanatory sequential mixed method where the quantitative method was initially employed then the qualitative method was employed to explain the findings of the quantitative method in more details (Creswell, 2014).

3.4 Population

The population of this study is the Saudi higher education students enrolled all twenty-eight public universities in Saudi Arabia. According to Ministry Deputyship for Planning and Information (2016), the latest official statistics of Saudi higher education reveal that the total number of students enrolling in public universities is 1,323,692. Among these students, 3% are pursuing associate degrees, 92.3% are pursuing bachelor degrees, while 4.7% of the students are pursuing graduate degrees. In respect to gender, 47.7% of the population is male students while 52.3% of population is female students. The twenty-eight public universities are located in all thirteen Saudi provinces, and population is distributed among these provinces as described in the next page.

Table 1*: Saudi Higher Education Students by Province for the Academic Year (2014-2015)*

Province	**Number of Students**	**Percentage**
Riyadh Province	303,365	23%
Makkah Province	331,046	25%
Madinah Province	87,319	7%
Qassim Province	68,111	5%
Eastern Province	249,985	18.9%
Asir Province	74,341	5.6%
Hail Province	34,324	2.6%
Tabuk Province	33,110	2.5%
Al-Baha Province	25,734	1.9%
Northern Boarder Province	13,795	1%
Jazan Province	59,952	4.5%
Aljouf Province	27,330	2%
Najran Province	15,280	1%
Total	**1,323,692**	**100**

(Source: Ministry Deputyship for Planning and Information, 2016)

As shown in Table 1, three major provinces, Riyadh, Makkah, and Eastern, have approximately 67% of the population while the remaining ten provinces have approximately 33% of the population. Hence, the population with such a distribution needs to be defined and sampled carefully. Thus, the target population of this study is defined as all Saudi students enrolled in public universities in Saudi Arabia for the academic year 2016-2017. This population includes students from all genders, all degrees pursued, and all Saudi provinces.

3.5 Sample

The first challenge facing this study is determining the optimal sample size for the analyses that were to be used in testing the study's hypotheses. Each of these hypotheses was examined with a standard least squares multiple linear regression analysis in which either behavioral intention to use M-learning technology (BI) or actual use behavior of M-learning technology (UB) served as the dependent variable. Each analysis included three independent variables: (a) one of the antecedent constructs in the M-learning model presented in Chapter 2, i.e., LE, EE, SI, FC,

MLTC, or SML; (b) one moderator variable, i.e., gender, age, or eLearning experience, as an independent variable; and (c) in order to evaluate the moderating (or "interaction") effect of the moderator variable, each analysis included the antecedent construct x moderator variable interaction term as an independent variable. G*Power software (Faul, Erdfelder, Lang, & Buchner, 2007) was used to perform an *a priori* power analyses to estimate the levels of statistical power that were provided by the available sample of 1,203 cases in evaluating: (a) the overall significance of R2 (i.e., using all independent variables) and, (b) the significance of each of the three independent variables in the analyses (such as the antecedent x moderator variable interaction term). In evaluating the significance of the overall R2 value, the analysis estimated that a sample of the available size, N = 1,203, would provide statistical power (1 – β) of about 96% to detect even a small population effect (Cohen's f2 = .02) as statistically significant (α = .01). In evaluating the significance of a single regression coefficient the analysis estimated that the sample would provide statistical power (1 – β) of over 99% to detect even a small population effect (Cohen's f2 = .02) effect as statistically significant (α = .01). In sum, the available sample provided ample statistical power to detect even weak population effects even when using a stringent ($p < .01$) level of significance.

According to Hill, Dean, and Murphy (2013), this study drew its sample from social networking sites by employing two sampling techniques: river and network samplings. The river sampling technique is used when participants are recruited through many social networking sites while network sampling (also called snowball sampling) is used when participants are asked to recruit other participants in the study. Thus, the accessible population was determined by the rationale of using this method where this study used social networking sites to reach the required sample size.

Much empirical evidence supports the usage of social networking sites in recruiting participants in the Saudi context for this study purpose. For instance, Askool (2013) found that more than 56% of social media users in Saudi Arabia are 30 years old and younger. According to The Social Clinic (2015), 93% of Internet users in Saudi Arabia are on Facebook where 7.6 million out 8.4 million are using Facebook on their mobile devices, and the dominant ages are 18-30. Therefore, this age category matches most of the population in this study where 95.3% of the population are pursuing bachelors' degrees or less; it was found that majority of the population fell in this age category.

Another study by Aifan (2015) found that among 523 Saudi higher education students 99.1% reported their use of social networks. Moreover, Kutbi (2015) conducted a quasi-experimental study to use social networking sites in learning and found that 84% of Saudi female students liked to use social networks in their education. Hence, since more that 53% of the population was females, this study took the advantage of the convenience of the social networks to reach this part of the populations. In addition, due to Saudi cultural barriers, male and female campuses are isolated from each other, and it is forbidden for a male researcher to physically conduct a study on a female campus. Therefore, this study employed social networking sites to overcome this barrier and reach this huge percentage of the population. Moreover, Dimitrios and Alali (2014) reported the extremely heavy usage of social networking sites by Saudi males and females although females' usage is slightly higher than males' usage of social networking sites. In respect to social networking, Aifan (2015) found that WhatsApp is the most used social networking application among Saudi students; however, Askool (2013) concluded that YouTube, Facebook, and Twitter are the top three used applications by the society of Saudi Arabia.

Mirabeau, Mignerat, and Grange (2013) assert potential benefits of social networking sites on survey research where there is non-response bias, large sampling frame, and monitoring responses and adjusting the data pace. To this end, this study found that social networking sites were the optimal recruiting tools in order to reach a large number of the population. Thus, this study used Facebook, Twitter, and WhatsApp applications to optimize the sampling process.

3.6 Instruments

By virtue of the research questions, the researcher developed two instruments for collecting data. The first instrument is a questionnaire that included all proposed constructs hypothesized to influence intention and use of mobile learning technology. The second instrument is an interview protocol that was employed to explain in detail the nature of influence of the proposed constructs on Saudi students' intention and use of mobile learning technology.

3.6.1 Constructing the Questionnaire

The process of developing the questionnaire started by critical review of seven published questionnaires that employed or adopted UTAUT. When Venkatesh et al. (2003) introduced UTAUT, they developed a 32-items questionnaire that covers all UTAUT constructs. This questionnaire was able to explain 70 percent of the variance in usage intention of a technology. Thus, this study employed the original questionnaire of UTAUT to explain the acceptance of mobile learning technology among Saudi higher education students in the following constructs: effort expectancy, social influence, and behavioral intention to use mobile learning technology. Furthermore, this study modified and rephrased the performance expectancy construct to fit the learning context more than the organizational context. This modification changed this construct to learning expectancy. It found by doing so, participants were able to relate this construct to their daily learning activities more that using the term of performance expectancy. The items of this

modified construct, learning expectancy, were adopted from Wen-Hong et al. (2010) where the used items reflect the cognitive process that students are involved in.

3.6.1.1 The New and Modified Construct

Many studies have found that the facilitating conditions construct is a less significant construct in explaining the use of technology; therefore, this study added items to this construct to explain the influence of perceived security and perceived privacy in using mobile learning technology. The added items under this construct were assumed to have a significant influence on students' use of mobile learning technology and were adopted from Rao and Troshani (2007).

Moreover, there were two new proposed constructs in this study: mobile learning technology characteristics and self-management of learning. The mobile learning characteristics construct was adopted from Chen et al. (2002). Technology characteristics have been found as significant influencer of technology acceptance in many studies (Al-Mahadeen, Thamer, & Bassam, 2013; Chaveesuk, Vongjaturapat, & Chotikakamthorn, 2013; Vongjaturapat & Chaveesuk, 2013). Since the characteristics vary among studies based on the technology used, this study adopted Chen et al.'s (2002) characteristics of mobile learning technology as common characteristics of mobile learning technology. Self-management of learning is another proposed construct in this study. The items of this construct were adopted from Liew et al. (2013), Donaldson (2010), Lowenthal (2010), and Wang et al. (2009). Thus, a five-point Likert scale questionnaire was developed; the items of the questionnaire are listed in the next page:

Table 2*: Questionnaire Items*

#	Item	Code
Learning Expectancy (Adopted from Donaldson, 2010)		**LE**
1	I find mobile learning technology useful in my learning.	LE_1
2	Using mobile learning technology enables me to accomplish learning activities more quickly.	LE_2
3	Using mobile learning technology increases my learning productivity/ achievement.	LE_3
4	If I use mobile learning technology, I will increase my chances to get a better grade.	LE_4
5	If I use mobile learning technology, the quality of my assignment will be better.	LE_5
Effort Expectancy (Adopted from Venkatesh et al., 2003)		**EE**
6	My interaction with mobile learning technology would be clear and understandable.	EE_1
7	It would be easy for me to become skillful at using mobile learning technology.	EE_2
8	I would find mobile learning technology easy to use.	EE_3
9	Learning to operate mobile learning technology would be easy for me.	EE_4
Social Influence (Adopted from Venkatesh et al., 2003)		**SI**
10	People who influence my behavior think that I should use mobile learning technology.	SI_1
11	People who are important to me think that I should use mobile learning technology.	SI_2
12	My professors have been helpful in the use of mobile learning technology.	SI_3
13	In general, my university has supported the use of mobile learning technology.	SI_4
Facilitating Conditions (Adopted from Rao and Troshani, 2007; Venkatesh et al., 2003)		**FC**
14	I have the necessary resources to use mobile learning technology.	FC_1
15	I have the knowledge necessary to use mobile learning technology.	FC_2
16	At my university, a specific person or group is available for assistance with mobile learning technology difficulties.	FC_3
17	I have concerns regarding my information security when I use mobile learning technology.	FC_4
18	I have concerns regarding my privacy when I use mobile learning technology.	FC_5
Mobile Learning Technology Characteristics (Adopted from Chen et al., 2002)		**MLTC**
19	In my study, if I need timely information or materials, I use mobile learning technology.	MLTC_1
20	My learning desires and needs initiate my use of mobile learning technology to seek information regarding my courses.	MLTC_2
21	I use mobile learning technology for learning in different settings not only in class settings.	MLTC_3
22	I use mobile learning technology to interact with peers, experts, and different learning martials such as videos, texts, pictures, etc.	MLTC_4
23	Mobile learning technology helps me to solve real life problems outside of school.	MLTC_5
24	In my study, mobile learning technology helps me to integrate many information sources for the same topic.	MLTC_6
Self-Management of Learning (Adopted from Liew et al., 2013; Donaldson, 2010; Lowenthal, 2010; Wang, We, and Wang, 2009)		**SML**
25	In my study, I am self-disciplined and find it easy to set aside reading and homework time.	SML_1
26	I am able to manage my study time effectively and easily complete assignments on time.	SML_2
27	In my study, I set goals and have a high degree of initiative.	SML_3
Behavioral Intention to Use Mobile Learning Technology (BI) (Adopted from Donaldson, 2010; Venkatesh et al., 2003)		**BI**
28	I intend to use mobile learning technology in the upcoming school year.	BI_1

#	Item	Code
29	I predict I would use mobile learning technology in the upcoming school year.	BI_2
30	I plan to use mobile learning technology in the upcoming school year.	BI_3
Use Behavior of Mobile Learning Technology (Adopted from Donaldson, 2010)		**UB**
31	How often you access the learning materials from your handheld mobile device?	

In addition, the questionnaire contained demographic variables that reflect the moderators part of the research model. The demographic variables were age (three categories: 18-22, 23-27, and above 28), gender (male or female), and eLearning experience (two categories: 0-3 years and more than 3 years). The final questionnaire is Appendix A.

3.6.2 Interview Protocol

By virtue of the research model, the interview protocol was developed containing eleven main questions. These questions were intended to deepen the exploration of the six main constructs: learning expectancy, effort expectancy, social influence, facilitating conditions, mobile learning technology characteristics, and self-management of learning in predicating students' behavioral intention and use of mobile learning technology. However, more attention was paid to the new constructs: mobile learning technology characteristics and self-management of learning. In addition, the modification that has been made in the facilitating conditions construct by adding security and privacy dimensions were only included in the interview questions. In this sense, this study hypothesized that these added variables to facilitating conditions would increase the significance of this construct in predicting students' use of behaviors regarding mobile learning technology. The interview protocol is in Appendix B.

3.6.3 Instruments Validity and Reliability

To validate the questionnaire, factor analysis was utilized while Cronbach's alpha (α) was utilized to measure the internal consistency and reliability of each construct of the questionnaire.

According to Hair, Black, Babin, and Anderson (2014), Cronbach's alpha is a reliability measurement ranging from 0 to 1, and the lower limit of acceptability is from .60 to .70.

On the other hand, factor analysis is a technique that is used to group questionnaire items under their related factors based on the high loading of each item on its factor, thus, reducing the large number of items into a small set of factors (Bryman & Cramer, 2001). The high loading of that item on its factor reflects high degree of association of that item and its factor. This study utilized exploratory factor analysis, which examined the relationships between variables without comparing them against a hypothetical model. The sample size needed cautious consideration when performing exploratory factor analysis; however, five participants per variable is the minimum requirement for exploratory factor analysis (Bryman & Cramer, 2001). To overcome the sample size threats, this study utilized Kaiser-Meyer-Olkin (KMO) sampling adequacy that ranges from 0 to 1 where the minimum value of this measurement is .5 and above (Kaiser, 1974).

Factor Loading was computed to determine the correlation between each item and its factor where each factor loading should be $\geq .4$ and preferably $\geq .7$, and factors less than that were extracted (Gorsuch, 1983).

Finally, content validity and face validity were utilized in validating the questionnaire as well as the interview. In the face validity, there were ten criteria that have been appropriately met based on expert reviews. The criteria for face validity were: clarity, wordiness, negative wording, overlapping responses, balance, use of jargon, appropriateness for responses listed, use of technical language, application to praxis, and relationship to problem (White & Simon, n.d.). The questionnaire has been revised in accordance with experts' reviews of the questionnaire's face validity. The experts suggested clarifying the facilitating conditions construct by adding the

intended context (e.g. university or school) to make items under this construct clearer for the participants.

In the content validity, an expert review panel revealed that most of the items exceeded the expectations and no modifications were required; however, the reviewers recommended rephrasing some items to ensure the consistency between items under each factor. In addition, some of the suggestions were word choices to suit the context of this study.

3.7 Instruments Translation

The two instruments, questionnaire and interview protocol, were all translated from English to Arabic by an official translator who notarized and certified all the translated documents. To ensure the accuracy of the translations, the researcher first reviewed the related literature in the Arabic language, and then worked with the translator to address all terminologies and technical words in appropriate forms. Further, face validation of the Arabic versions of the instruments was done by a Saudi assistant professor who is heavily working on the acceptance of information technology. The iterative process of face validity produced valuable suggests and comments such as rewording and rephrasing some of the questionnaire items. Both the expert and the official translator have contributed heavily in this process.

3.8 Data Collection Procedures

The first portion of collected data in this study was quantitative data obtained from the questionnaire. The questionnaire was published in Qualtrics®, private research platform, and four links for the questionnaire were produced to be available for participants who came from different social networking sites, Twitter, Facebook, WhatsApp and Email. According to Mirabeau et al. (2013), researchers could collect data using social networking sites through three main generic strategies: direct contact, referrals, and affiliations of social network users. Thus, the data of this

study was collected through four approaches. The first approach was posting the links of the questionnaire combined with a catch line in multiple social networking sites for Saudi universities student groups: Twitter, Facebook, and WhatsApp. The gatekeepers of student groups on social networking sites were contacted to facilitate posting the questionnaire in their groups. In the WhatsApp application, the group administrators were asked to encourage all group members to distribute the questionnaire to other students from their contact lists. The second approach of data collection was through the official accounts of Student Affairs Deanships on social networking sites. In this approach, personal communication with the Students Affairs deans among Saudi universities took a place to facilitate posting the questionnaire links on their Deanships' official social networking sites. The third approach of data collection was through contacting the Vice-Presidents of Graduate Studies and Research in Saudi universities to facilitate posting the questionnaire in their official networking sites. The fourth approach of data collection was through personal communication with the professors of Saudi universities to facilitate posting the questionnaire through their courses and their courses groups. Figure 10 depicts the four approaches of data collection procedures.

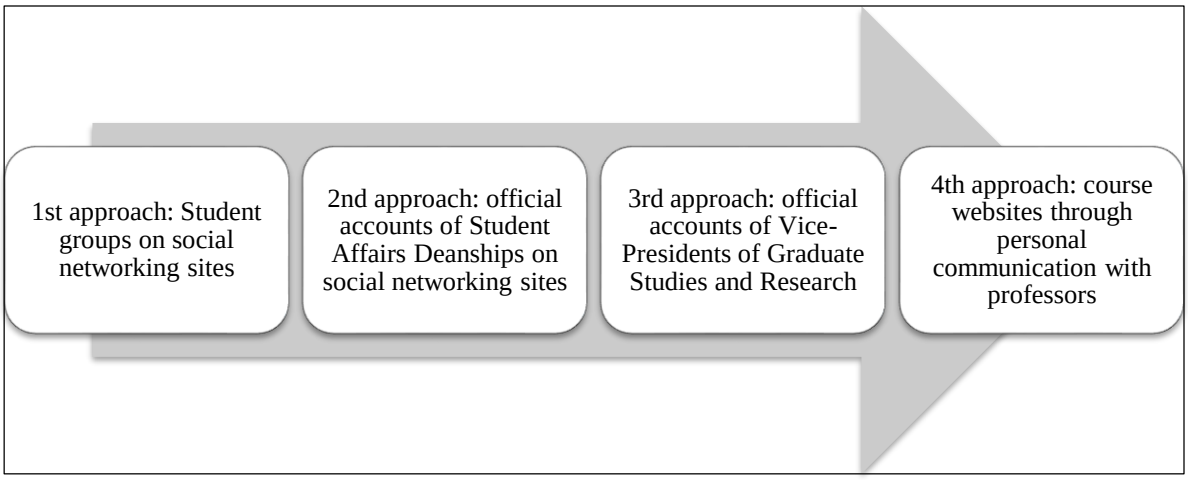

Figure 10: *The Four Approaches for Data Collection*

The second portion of collected data was through an in-depth qualitative data via semi-structured interview. The recruitment for the interview took place during the participant's responding to the questionnaire. Participants were asked if they were willing to participate in a later online interview over Skype to clarify their responses. The targeted number of interviewees was fifteen. All interviews were audiotaped, transcribed and rechecked for any typographical or wording errors. The interview protocol is in appendix (B).

3.9 Data Analysis

For the quantitative data collected through the questionnaire, the latest version of SPSS was used to perform a descriptive analysis regarding the demographic variables. Further, this study analyzed the effect of the six antecedent constructs on behavioral intention (BI) and use behavior (UB) as well as the moderating effects of gender, age, and eLearning experience using multiple regression analyses. For illustration the influence of learning expectancy (LE) on behavioral intention (BI) and the moderating influence of three moderators (gender, age, and eLearning experience) on this effect will be evaluated using three models. In all three models, the dependent variable is BI and in all three models one independent variable is LE. The three models differ in the remaining two independent variables. Model 1 includes gender and the gender x LE interaction term. Model 2 includes age and the age x LE interaction term. Model 3 includes eLearning experience and the eLearning experience x LE interaction term. Table 3 is a design matrix which summarizes the study design, data collection, and data analysis.

Bryman and Cramer (2001) mentioned that linear regression is widely used analysis that is useful in not only studying how single independent variables affect a dependent variable, but also enabling the study of the influence of multiple independent variables and interaction effects involving combinations of those variables.

Table 3: *Study Design Matrix*

Research Question	**Data Collection Method**	**Data Collection Instrument**	**Data Type**	**Data Analysis Method**
Does learning expectancy have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis
Does effort expectancy have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis
Does social influence have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis
Do facilitating conditions have a significant influence on Saudi higher education students' use behavior of mobile learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis
Do mobile learning technology characteristics have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis
Does self-management of mobile learning technology have a significant effect on Saudi higher education students' behavioral intension to use mobile learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis
How do age, gender, and eLearning experience moderate learning expectancy, effort expectancy, social influence, facilitating conditions, M-learning technology characteristics, and self-management of M-learning technology constructs influence Saudi higher education students' behavioral intention and use behavior of M-learning technology?	Survey	Questionnaire	Quantitative/ Numeric	Multiple linear regression
	Phenomenology	Interview	Qualitative/ Audio	Thematic analysis

For the qualitative data collected through the semi-structured interview, this study utilized deductive coding to analyze the collected data based on the proposed model. Using open-ended questions, the interview helped to relate the collected data to the six main constructs/predictions of students' intentions and uses of mobile learning technology. Table 4 explains the interview questions and their related constructs from the research model.

Table 4*: Research Constructs Related to the Interview Questions*

Constructs	**Interview Questions**
Learning Expectancy	In your study, does mobile learning technology help you to improve your learning? Why or Why not? How?
Effort Expectancy	During your study by using mobile learning technology: - How easy is mobile learning technology for you to use? Why? - If you lack skills in using mobile learning technology, what would you do? Why?
Social Influence	Who encouraged you to use mobile learning technology in your learning? Why? Do you think you have the efficient support to use mobile learning technology in you learning? Why or Why not?
Facilitating Conditions	During your study using mobile learning technology, do you have concerns regarding your: - Information security. Why and How? - Privacy. Why and How?
M-learning Characteristics	How do the following characteristics of mobile learning technology attract you to use mobile learning technology in your learning? - Getting timely information - Satisfying your personal needs and initiatives - Using mobile learning technology in different settings - Communicating with peers, professors, and experts - Finding different learning materials - Relating your learning with real life examples and issues - Integrating different learning materials with each other
Self-management of Learning	Does studying using mobile learning technology helps you: - To be self-disciplined in your learning. Why or why not and how? - To manage your study time effectively. Why or why not and how? - To achieve your learning goals. Why or why not and how?

CHAPTER 4: RESULTS

4.1 Introduction

Chapter Four presents the analyses and results from both quantitative and qualitative data. In accordance with the sequential mixed method employed in this study, the analysis of the quantitative data is introduced first, then the qualitative analysis is introduced second. To provide a clear understanding of the results contexts, each analysis commences with participants' profile.

In the quantitative analysis section, validity and reliability evaluation of the data collection tool, the questionnaire, was presented first then data screening against the basic assumptions of multiple linear regressions, such as univariate outliers and normality, was presented second. Additional assumption tests were included under each hypothesis. Next, testing of the study's hypotheses proceeded in the order previously listed in Chapter Three. Additional exploratory analysis was included at the end of the quantitative analysis.

The qualitative analysis section contained the process of deriving themes and generating categories. An overview of the interviews analysis and detailed results are presented at the end of the section.

4.2 Quantitative Analysis Results

4.2.1 Participants

Data were collected from 1,203 respondents. Three participants did not identify their type of enrollment (i.e., on-campus or distance education), but there was no other missing data. Interestingly, the participants were recruited through different social networks as follows, 819 participants through Twitter, 261 participants through WhatsApp, seventy-six participants through Facebook and forty-seven participants through email. Additional information about participants' demographic and other personal characteristics are summarized in Table 5.

Table 5: *Demographic and Personal Characteristics of Study Participants*

Variables		***F***	**%**
Gender			
	Male	591	49.1%
	Female	612	50.9%
	Total	1,203	100.0%
Age Range			
	18-22	749	62.3%
	23-27	331	27.5%
	28 and older	123	10.2%
	Total	1,203	100.0%
ELearning Experience			
	0-3 years	833	69.2%
	Over 3 years	370	30.8%
	Total	1,203	100.0%
Type of Enrollment			
	On campus	1,087	90.6%
	Distance education	113	9.4%
	Missing	3	0.2%
	Total	1,203	100.0%
Social Networks Sources			
	Twitter	819	68.1%
	Facebook	76	6.3%
	WhatsApp	261	21.7%
	Email	47	3.9%
	Total	1,203	100.0%

4.2.2 Psychometric Evaluations of Study Variables

Several constructs were measured in this study in order to test the model of M-learning technology presented in Chapter 2. Learning expectancy (LE), effort expectancy (EE), social influence (SI), mobile learning technology characteristics (MLTC), and self-management of mobile learning technology (SML), were all viewed as important antecedent constructs that influence an individual's actual M-learning technology use behavior (UB), working through the mediating construct of behavioral intention to use M-learning technology (BI). One antecedent construct, facilitating conditions (FC), was viewed as impacting directly on M-learning technology usage behavior.

A collection of 31 five-point Likert rating scale items were used to measure the study's antecedent constructs, mediating construct, and outcome construct: LE (five items), EE (four items), SI (four items), FC (five items), MLTC (six items), SML (three items), BI (three items), and UB (one item). Items measuring EE, SI, FC, and BI were adopted directly from Venkatesh et al. (2003), while items that originally measured the UTAUT construct of performance expectancy were adapted and rewritten for purposes of this study to measure learning expectancy (LE). Two new constructs believed to influence use of M-learning technology were introduced for evaluation in the present study: MLTC and SML. With the exception of the UB outcome, all other variables were measured using five-point Likert rating scales anchored as follows: 1 = *strongly disagree,* 2 = *somewhat disagree,* 3 = *neither agree nor disagree,* 4 = *agree,* 5 = *strongly agree.* The UB outcome variable was measured with a single item anchored as follows: 1 = *1-3 times per month,* 2 = *1-2 days per week,* 3 = *3-5 times per week,* 4 = *1-2 times per day,* 5 = *several times per day.* All rating scale data were treated in this study as interval scale variables following the recommendation of Meyers, Gamst, and Guarino (2006) who commented that, "…the vast majority of research published in the behavioral and social sciences over the past half century or more has used summative response scales [i.e., Likert scales] as though they met interval properties. In our view, this treatment…is acceptable, appropriate, and quite useful" (p. 23).

Three variables were treated as moderator variables in this study. Information about participants' gender and eLearning experience was collected using two categories (male/female and 0-3 years vs. over 3 years, respectively) and information about age was collected using three categories (18-22, 23-27, and 28 and older). Dichotomously-scored gender and eLearning experience moderator variables were treated as nominal scale variables in this study. The three-category age moderator variable could also have been treated as a nominal scale variable, but this

would have necessitated the use of dummy variable coding in order to include age in the multiple regression analyses. To avoid the interpretive complexity that would result from the use of multiple dummy variables and multiple interaction terms, age was treated instead as an interval scale variable. This decision was justified by the fact that although there were only three age categories, all of these categories were at least ordinally related, and the first two categories were equal-interval.

The validity and reliability of several variables (i.e., gender, age, eLearning experience, type of enrollment, and actual use behavior of M-learning technology) was assumed without formal evaluation. All of these variables showed strong face validity and, because each of the variables was measured using a single survey item, Cronbach's alpha coefficient could not be used to provide a more formal evaluation of reliability. Further, no provision was made in the design of the study to assess reliability using other methods such as test-retest reliability. However, constructs measured using multiple rating scales were subjected to a more thorough, formal psychometric evaluation as described in the following paragraphs.

Validity analyses. Psychometric evaluations began with a series of principal components type factor analyses of correlations among the items used to measure the study's antecedent and mediating constructs. Bryman and Cramer (1990) have explained the use of factor analysis in establishing measurement validity this way: "Factor analysis enables us to assess the factorial validity of the questions which make up our scales by telling us the extent to which they seem to be measuring the same concepts or variables" (p. 253). In other words, factor analysis can be useful in establishing which items measure the same thing (convergent validation) and which items measure different things (divergent validation).

PCA1. In the first of the principal components analyses (PCA1), all 30 variables used to measure antecedent and mediating constructs were included in the analysis. Before the factor analysis was performed, however, the factorability of the data was evaluated. Data were available for the analysis from 1,203 participants, creating an excellent cases-to-variables ratio of 40:1, four times the 10:1 ratio suggested by Warner (2008). Correlations among the items were examined next and are shown in Table 6. These correlations provided a good mixture of weak and strong correlations. As expected, nearly all correlations were positive, and correlations that were negative were all very weak. The large number of correlations in Table 6 made it unrealistic to perform a formal analysis of the assumption of linear relationships between all pairs of variables. Since there was no *a priori* reason to expect that any of the variables would show strongly nonlinear relationships, linearity was assumed. Bartlett's test of sphericity was statistically significant, $\chi^2(435) = 15{,}184.563$, $p < .001$, confirming that the variables were sufficiently correlated to support a valid analysis. The Kaiser-Meyer-Olkin measure of sampling adequacy, *KMO* = .937, was well in excess of the benchmark value .70 recommended by Meyers, Gamst, and Guarino (2013), which also confirmed the factorability of the matrix.

Table 6: *Correlations Among the 30 Items Measuring Antecedent and Mediating Constructs*

	LE_1	LE_2	LE_3	LE_4	LE_5	EE_1	EE_2	EE_3	EE_4	SI_1	SI_2	SI_3	SI_4	FC_1	FC_2	FC_3	FC_4	FC_5	MLTC_1	MLTC_2	MLTC_3	MLTC_4	MLTC_5	MLTC_6	SML_1	SML_2	SML_3	BI_1	BI_2	BI_3
LE_1	1.00	.525	.603	.554	.552	.463	.422	.512	.454	.287	.377	.251	.158	.298	.292	.165	-.039	-.050	.429	.499	.380	.367	.382	.511	.212	.221	.207	.552	.470	.542
LE_2	.525	1.000	.549	.542	.509	.469	.358	.436	.384	.282	.360	.199	.104	.270	.257	.162	-.008	-.032	.406	.432	.397	.381	.352	.460	.196	.228	.237	.460	.378	.435
LE_3	.603	.549	1.000	.583	.536	.467	.360	.456	.415	.303	.396	.264	.161	.289	.259	.224	.019	.008	.401	.487	.375	.369	.422	.528	.218	.251	.253	.519	.455	.513
LE_4	.554	.542	.583	1.000	.493	.420	.337	.397	.330	.333	.413	.261	.153	.229	.219	.204	.036	.037	.362	.457	.360	.297	.428	.451	.237	.264	.243	.497	.417	.492
LE_5	.552	.509	.536	.493	1.000	.445	.358	.419	.426	.233	.330	.202	.140	.297	.264	.184	-.019	-.024	.417	.422	.343	.340	.348	.493	.247	.257	.228	.442	.403	.413
EE_1	.463	.469	.467	.420	.445	1.000	.477	.512	.500	.283	.334	.201	.176	.333	.416	.220	-.098	-.084	.374	.403	.381	.363	.350	.430	.203	.240	.273	.442	.387	.428
EE_2	.422	.358	.360	.337	.358	.477	1.000	.475	.575	.212	.253	.176	.113	.345	.481	.161	-.099	-.076	.385	.325	.307	.358	.292	.388	.169	.178	.286	.378	.335	.333
EE_3	.512	.436	.456	.397	.419	.512	.475	1.000	.515	.223	.252	.193	.125	.319	.368	.166	-.088	-.075	.341	.368	.347	.338	.302	.412	.187	.212	.212	.395	.396	.421
EE_4	.454	.384	.415	.330	.426	.500	.575	.515	1.000	.185	.249	.181	.138	.360	.454	.155	-.078	-.076	.379	.337	.324	.311	.307	.416	.141	.205	.229	.403	.369	.365
SI_1	.287	.282	.303	.333	.233	.283	.212	.223	.185	1.000	.598	.236	.150	.131	.149	.226	.080	.058	.182	.265	.216	.208	.320	.261	.156	.183	.212	.303	.285	.300
SI_2	.377	.360	.396	.413	.330	.334	.253	.252	.249	.598	1.000	.292	.206	.203	.165	.259	.093	.083	.280	.339	.268	.236	.322	.303	.219	.207	.236	.371	.366	.371
SI_3	.251	.199	.264	.261	.202	.201	.176	.193	.181	.236	.292	1.000	.536	.174	.186	.459	.087	.036	.192	.227	.216	.231	.163	.194	.178	.190	.216	.328	.311	.269
SI_4	.158	.104	.161	.153	.140	.176	.113	.125	.138	.150	.206	.536	1.000	.132	.165	.422	.064	.052	.158	.182	.165	.182	.097	.117	.145	.117	.146	.281	.290	.267
FC_1	.298	.270	.289	.229	.297	.333	.345	.319	.360	.131	.203	.174	.132	1.000	.354	.138	-.073	-.042	.388	.267	.315	.302	.210	.313	.116	.106	.155	.279	.231	.253
FC_2	.292	.257	.259	.219	.264	.416	.481	.368	.454	.149	.165	.186	.165	.354	1.000	.166	-.134	-.139	.323	.237	.307	.305	.213	.311	.115	.182	.213	.289	.209	.266
FC_3	.165	.162	.224	.204	.184	.220	.161	.166	.155	.226	.259	.459	.422	.138	.166	1.000	.089	.058	.172	.203	.192	.198	.202	.214	.237	.215	.246	.258	.263	.249
FC_4	-.039	-.008	.019	.036	-.019	-.098	-.099	-.088	-.078	.080	.093	.087	.064	-.073	-.134	.089	1.000	.757	.031	-.019	.038	.001	.047	-.012	.071	.042	.089	-.025	-.002	-.041
FC_5	-.050	-.032	.008	.037	-.024	-.084	-.076	-.075	-.076	.058	.083	.036	.052	-.042	-.139	.058	.757	1.000	.023	-.014	.025	.001	.043	-.001	.101	.035	.084	-.054	.001	-.039
MLTC_1	.429	.406	.401	.362	.417	.374	.385	.341	.379	.182	.280	.192	.158	.388	.323	.172	.031	.023	1.000	.409	.423	.401	.283	.449	.181	.140	.235	.373	.323	.348
MLTC_2	.499	.432	.487	.457	.422	.403	.325	.368	.337	.265	.339	.227	.182	.267	.237	.203	-.019	-.014	.409	1.000	.344	.331	.352	.411	.213	.200	.228	.481	.421	.453
MLTC_3	.380	.397	.375	.360	.343	.381	.307	.347	.324	.216	.268	.216	.165	.315	.307	.192	.038	.025	.423	.344	1.000	.399	.282	.372	.174	.196	.200	.376	.350	.348
MLTC_4	.367	.381	.369	.297	.340	.363	.358	.338	.311	.208	.236	.231	.182	.302	.305	.198	.001	.001	.401	.331	.399	1.000	.215	.367	.126	.114	.220	.354	.312	.344
MLTC_5	.382	.352	.422	.428	.348	.350	.292	.302	.307	.320	.322	.163	.097	.210	.213	.202	.047	.043	.283	.352	.282	.215	1.000	.365	.205	.190	.214	.312	.257	.316
MLTC_6	.511	.460	.528	.451	.493	.430	.388	.412	.416	.261	.303	.194	.117	.313	.311	.214	-.012	-.001	.449	.411	.372	.367	.365	1.000	.205	.201	.245	.419	.369	.449
SML_1	.212	.196	.218	.237	.247	.203	.169	.187	.141	.156	.219	.178	.145	.116	.115	.237	.071	.101	.181	.213	.174	.126	.205	.205	1.000	.568	.441	.174	.192	.203
SML_2	.221	.228	.251	.264	.257	.240	.178	.212	.205	.183	.207	.190	.117	.106	.182	.215	.042	.035	.140	.200	.196	.114	.190	.201	.568	1.000	.401	.163	.201	.195
SML_3	.207	.237	.253	.243	.228	.273	.286	.212	.229	.212	.236	.216	.146	.155	.213	.246	.089	.084	.235	.228	.200	.220	.214	.245	.441	.401	1.000	.226	.235	.269
BI_1	.552	.460	.519	.497	.442	.442	.378	.395	.403	.303	.371	.328	.281	.279	.289	.258	-.025	-.054	.373	.481	.376	.354	.312	.419	.174	.163	.226	1.000	.647	.715
BI_2	.470	.378	.455	.417	.403	.387	.335	.396	.369	.285	.366	.311	.290	.231	.209	.263	-.002	.001	.323	.421	.350	.312	.257	.369	.192	.201	.235	.647	1.000	.647
BI_3	.542	.435	.513	.492	.413	.428	.333	.421	.365	.300	.371	.269	.267	.253	.266	.249	-.041	-.039	.348	.453	.348	.344	.316	.449	.203	.195	.269	.715	.647	1.000

The principal components analysis of 30 items extracted six factors meeting Kaiser's minimum criterion with eigenvalues $\geq$ 1.0. These factors explained 58.61% of the variance in the original 30 items with item communalities ranging from .39 to .85, so a reasonable percentage of variance was explained by the six-factor solution. An oblique rotation (direct oblimin) was used to simplify the factor structure and enhance the interpretability of the factors. This type of rotation allows the extracted factors to be correlated, and five of the 15 correlations between factors exceeded the benchmark value of $\pm$.30 suggested by Diekhoff (1992) as a criterion for choosing an oblique rotation over an orthogonal rotation. The pattern matrix from the analysis is shown in Table 7. Factor loadings from the six-factor solution clearly validated constructs LE, EE, and SML. Items representing each of these constructs loaded uniquely on three of the six factors that were extracted. Table 7 also shows all items representing the mediating construct BI and all items representing the antecedent construct LE loaded exclusively on the same factor. In a sense, this confirms one of the hypotheses of the M-learning acceptance model, i.e., that learning expectancy (LE) leads strongly to a behavioral intention (BI) to use M-learning technology. Therefore, the

pattern of loadings was accepted as validating both the LE and BI measures as well. Three constructs of the M-learning acceptance model were not validated by PCA1: SI, FC, and MLTC. Items intended to measure SI loaded on two different factors, and items intended to FC and MLTC loaded on three different factors.

PCA2. A second principal components analysis (PCA2) included only items representing the three constructs that had not been validated by the previous analysis: SI, FC, and MLTC. Bartlett's test of sphericity was significant, $\chi^2(105) = 5{,}032.682$, $p < .001$, and $KMO = .814$, both facts supporting the factorability of the matrix. The pattern matrix from the analysis is shown in Table 8. Constructs SI and FC showed loadings that were again spread quite evenly across two or three factors, so there was no support for the validity of the measures of those constructs. However, in PCA2 five of the six items representing MLTC loaded on a single factor, providing reasonably strong support for the validity of that construct.

PCA3. A third principal components analysis in the series (PCA3) examined only items representing the two remaining unvalidated constructs, SI and FC. Bartlett's test of sphericity was significant, $\chi^2(36) = 2{,}794.259$, $p < .001$, but $KMO = .647$ fell short of the .70 benchmark suggested by Warner (2008) and so the results of the analysis can only be taken as suggestive. Four factors were extracted with eigenvalues of ± 1.0 or larger which explained 74.21% of the variance, and communalities ranged from .579 to .880. Table 9 shows the pattern matrix from the oblique rotation. Loadings for items representing the SI construct were evenly distributed between two factors, and loadings for items representing the FC construct were distributed across three factors. This pattern did not support the validity of either construct.

Table 7: *Pattern Matrix from PCA1: Obliquely Rotated Six-Factor Principal Components Analysis of 30 Items Measuring LE, EE, SI, FC, MLTC, SML, and BI*

	Component					
	1	2	3	4	5	6
LE_1	.671					
LE_2	.538					
LE_3	.638					
LE_4	.611					
LE_5	.545					
EE_1					.464	
EE_2					.704	
EE_3					.447	
EE_4					.653	
SI_1						.922
SI_2						.794
SI_3			-.716			
SI_4			-.793			
FC_1					.674	
FC_2					.791	
FC_3			-.628			
FC_4		.910				
FC_5		.914				
MLTC_1					.512	
MLTC_2	.573					
MLTC_3					.407	
MLTC_4					.483	
MLTC_5						.444
MLTC_6	.431					
SML_1				.873		
SML_2				.858		
SML_3				.662		
BI_1	.784					
BI_2	.738					
BI_3	.800					

Note. Factor loadings less than ±.40 were suppressed.

Table 8: *Pattern Matrix from PCA2: Obliquely Rotated Principal Components Analysis of Items Measuring SI, FC, and MLTC*

	Component			
	1	2	3	4
SI_1				-.870
SI_2				-.796
SI_3			-.802	
SI_4			-.844	
FC_1	.681			
FC_2	.600			
FC_3			-.711	
FC_4		.929		
FC_5		.935		
MLTC_1	.761			
MLTC_2	.471			
MLTC_3	.662			
MLTC_4	.648			
MLTC_5				-.520
MLTC_6	.610			

Note. Factor loadings less than ±.40 were suppressed.

Table 9: *Pattern Matrix from PCA3: Obliquely Rotated Principal Components Analysis of Items Measuring SI and FC*

	Component			
	1	2	3	4
SI_1			.917	
SI_2			.860	
SI_3	.807			
SI_4	.857			
FC_1				.860
FC_2				.779
FC_3	.739			
FC_4		.928		
FC_5		.943		

Note. Factor loadings less than ±.40 were suppressed.

Item-Total Analyses of SI and FC. The two constructs that remained unvalidated, SI and FC, were viewed as too central to the M-learning acceptance model to be eliminated from the study, and so an effort was made to improve the psychometric characteristics of these constructs using item analyses. An item analysis produces two useful products. First, corrected item-total correlations from the item analysis are correlations between ratings on each item in a subscale and total scores formed by summing ratings on the other items in that subscale. Items which are not internally consistent with the other items in the subscale, i.e., items that do not measure what the other items measure as a set, will show low corrected item-total correlations and can be identified and eliminated. Second, an item analysis identifies items that detract from the reliability of the subscale by indicating what the value of Cronbach's alpha would be for the scale if the item was eliminated. An iterative series of item analyses was used in this study to identify items in the SI and FC constructs that detracted from the internal consistency of those constructs and needed to be removed. In the first iteration, the weakest item (the one that detracted the most from internal consistency) was identified and removed. In the second iteration, the weakest item in the remaining collection was identified and removed. This process proceeded through multiple iterations until no weak items remained and Cronbach's alpha for the items that remained was acceptable.

The first item analysis focused on the four items representing the SI construct. As the analysis began, none of the corrected item-total correlations stood out as marking any single item as a good candidate for elimination, nor did any of the items stand out as especially salient detractors from the subscale's beginning Cronbach's alpha value, $\alpha = .665$. In fact, the elimination of any item would actually lower Cronbach's alpha. However, if the construct was to be salvaged, one or more items had to be eliminated. The first item to be dropped, therefore, was SI_4 because this item showed the lowest corrected item-total correlation ($r_{it} = .407$) and was therefore doing the poorest job of any of the items of measuring what the other items measured as a set. With SI_4 eliminated, Cronbach's alpha was .630. In the next iteration, with SI_4 already removed, SI_3 showed the weakest corrected item-total correlation ($r_{it} = .296$) and was removed, raising Cronbach's alpha for the remaining items to $\alpha = .748$. Having achieved an acceptable level of internal consistency, the item analysis process stopped with two items remaining to represent the SI construct: SI_1 and SI_2. To avoid confusion between the original SI construct and the abbreviated construct developed through the item total process described, the notation SI_{abb} will be used subsequently to identify the abbreviated version.

The next series of item analyses focused on the five items representing the FC construct. As the analysis began, Cronbach's alpha was .429. All corrected item-total correlations were low, but the lowest value was associated with item FC_2 ($r_{it} = .049$) and so this item was removed. Cronbach's alpha for the remaining four items was .468. At the second iteration FC_1 showed the weakest corrected item-total correlation ($r_{it} = .011$) and was removed. Cronbach's alpha for the remaining three items was .562. At the third iteration, item FC_3 showed the weakest corrected item-total correlation ($r_{it} = .078$) and was removed. Cronbach's alpha for the remaining two items, FC_4 and FC_5, was quite good, $\alpha = .862$, and so the item analysis stopped. To avoid confusion

between the original FC construct and the abbreviated construct developed through the item total process described, the notation FC_{abb} will be used subsequently to identify the abbreviated version.

PCA4. To conclude the validity portion of the psychometric evaluation, PCA4 was performed using only the items representing SI_{abb} and FC_{abb} that survived the item analyses. Bartlett's test of sphericity was significant, $\chi^2(6) = 1565.429$, $p < .001$, but with only four items in the analysis, the KMO measure of sampling adequacy was quite poor, *KMO* = .508. The results of the obliquely rotated principle components analysis, however, were quite interpretable. Two factors were extracted with eigenvalues of ± 1.0 or greater which explained 83.89% of the variance. Communalities were also high, ranging from .798 to .879. As seen in Table 10, items representing the abbreviated SI_{abb} and FC_{abb} measures now loaded on two separate factors in a pattern supporting the validity of those abbreviated measures.

Table 10: *Pattern Matrix from PCA4: Obliquely Rotated Principal Components Analysis of Items SI_1, SI_2, FC_4, and FC_5*

	Component	
	1	2
SI_1		.895
SI_2		.892
FC_4	.936	
FC_5	.939	

Summary of validity analyses. A traditional factor analytic approach to validating the subscales of an instrument uses one analysis and provides one opportunity for the items to group in a manner that is consistent with the expectations of the instrument designer. In the present study, a much more liberal approach was taken in an effort to provide every possible opportunity for all constructs to be validated. Specifically, a series of three obliquely rotated principal components analyses was performed on several different subsets of the items that were used in this study to measure the constructs LE, EE, SI, FC, MLTC, SML, and BI. Taken collectively, the results of the

analyses provided validity support for measures of LE, EE, MLTC, SML, and BI. Measures of constructs SI and FC were not validated in those three principal components analyses. Given the importance of the SI and FC constructs, however, item analyses were performed on the SI and FC measures in an effort to identify and eliminate the items that were damaging the psychometric properties of those two subscales. Those item analyses left only two items remaining to represent each construct, but the items that remained showed acceptable levels of Cronbach's alpha. A final principal components analysis of the items representing the SI_{abb} and FC_{abb} subscales found that the items representing those constructs loaded nicely on two different factors in a manner supporting the validity of SI_{abb} and FC_{abb}.

Reliability. The reliability of a measuring instrument refers to the degree to which that instrument produces the same score each time it encounters the same amount of the attribute being measured. An unreliable instrument can be expected to produce different scores each time it is administered, even when the attribute being measured has not changed. In that case, which of the scores would be considered valid? Demonstrating that the measures used in this study are reliable is important because measurement reliability limits the validity of the study's findings.

Cronbach's alpha is not only used to evaluate the internal consistency of a collection of items. It is also the most commonly reported measure of instrument reliability. When used for the purpose of measuring instrument reliability, Miller, Lovler, and McIntire (2013) have suggested that Cronbach's alpha can be usefully thought of as the average of all possible split-half reliability correlations. Cronbach's alpha coefficient was used to measure the reliability of each of the validated construct measures in the present study, LE, EE, SI_{abb}, FC_{abb}, MLTC, SML, and BI. Cronbach's alpha coefficients were calculated for each of the constructs in the study using data from the 1,203 survey respondents and are provided in Table 11. According to Kline (2000),

Cronbach's alpha values in the .80's are considered "good," and values in the .70's are considered "acceptable." All values of Cronbach's alpha listed in Table 11 exceeded .70. Table 11 also provides descriptive statistics for total scores on each of the constructs. Total scores were calculated by averaging ratings across the items that represented each construct. Calculated in this way, total scores on each of the constructs can be interpreted using the same anchors that were used in rating the individual items.

Table 11: *Values of Cronbach's Alpha Reliability Coefficient for LE, EE, SI_{abb}, FC_{abb}, MLTC, SML, and BI Measures*

Scale	Cronbach's Alpha	*N*	Min	Max	*M*	*SD*	Skewness	Kurtosis
Learning Expectancy (LE)	.855	1,203	1	5	4.32	0.73	-1.64	3.56
Effort Expectancy (EE)	.805	1,203	1	5	4.44	0.64	-1.87	5.00
Social Influence (SI_{abb})	.748	1,203	1	5	3.63	0.99	-0.49	-0.13
Facilitating Conditions (FC_{abb})	.862	1,203	1	5	3.17	1.25	-0.24	-1.08
M-Learning Technology Characteristics (MLTC)	.760	1,203	1	5	4.41	0.59	-1.92	6.23
Self-Management of M-Learning Technology (SML)	.728	1,203	1	5	3.92	0.86	-0.82	0.31
Behavioral Intention to Use M-Learning Technology (BI)	.775	1,203	1	5	4.16	0.92	-1.21	1.22

Note. Measures of SI_{abb} and FC_{abb} are abbreviated to include only two items each based on the item analyses of the two constructs.

4.2.3 Data Screening

Standard least-squares multiple regression analyses were used in testing the study hypotheses, but these analyses were preceded by tests of the statistical assumptions upon which the regression analyses are based. The validity of findings from multiple regression analyses are questionable and reported significance levels can be distorted if the assumptions are not met. While multiple regression analysis is fairly robust with respect to violations of some assumptions, particularly when sample sizes are large, Osborne and Waters (2002) and Tabachnick and Fidell (2013) have pointed to several assumptions that are more critical. First, relationships between continuous independent variables and dependent variables are assumed to be linear. When

relationships are strongly nonlinear, multiple regression analyses underestimate the strength of the relationships between independent and dependent variables. Second, dependent variables are assumed to be normally distributed. When they are not, tests of the significance of effects are compromised. Independent variables do not need to be normally distributed (for example, consider the fact that dichotomously scored independent variables are allowed in multiple regression). Third, it is assumed that the data have been screened for both univariate and multivariate outliers. Outliers of both types exert a disproportion influence on the outcome of the analysis and are not representative of the rest of the sample. Fourth, relationships between independent and dependent variables are assumed to be homoscedastic, i.e., the variance of the prediction errors is similar at all levels of the independent variable. Finally, it is assumed that the independent variables do not display excessive levels of multicollinearity, where nearly all of the variance in one independent variable is explained by the other independent variables in the analysis. High levels of multicollinearity result in a confounding of the effects of the different independent variables, making it difficult to reliably interpret the explanatory importance of each of the independent variables. Multicollinearity also causes unstable regression weights, such that even small changes in sample size can cause large changes in the regression weights.

Data screening is a useful first step in ensuring that the statistical assumptions of the multiple regression analyses are met, and so the data collected in this study were screened in the sequence described by Tabachnick and Fidell (2013). Discussed first below are the results of preliminary data screening measures that dealt with issues common across all subsequent multiple regression analyses. Additional data screening measures specific to each analysis are described in the context of those analyses.

Univariate outliers. Screening for univariate outliers was accomplished by standardizing scores on all variables used in subsequent multiple regression analyses and searching for *z*-scores exceeding ± 3.3 ($p < .001$ in a normal distribution). Variables gender, age, eLearning experience, and UB were excluded from this screening process because the way in which these variables were measured prevented the occurrence of outliers. However, the following variables were examined: BI, LE, EE, SI, FC, MLTC, and SML. A total of 79 univariate outliers were identified on BI (18 cases), LE (20 cases) EE (20 cases), MLTC (15 cases), and SML (6 cases). There were no univariate outliers on SI_{abb} or FC_{abb}. The 79 outlying scores were produced by 42 study participants (3.5% of the sample). Individuals with outlying scores were only eliminated from analyses that involved variables on which those individuals were outliers. They were retained in analyses involving variables on which their scores were more moderate.

Normality. Two variables, BI and UB, served as dependent variables in tests of the study hypotheses. The normality of these variables was evaluated visually by examining frequency histograms, and statistically by calculating measures of skewness and kurtosis. Table 12 provides descriptive statistics for BI and UB, including measures of skewness and kurtosis. Figure 11 shows frequency histograms which illustrate the distribution of scores on the two dependent variable constructs. Normal curves are superimposed.

Table 12: *Descriptive Statistics for Dependent Variables BI and UB*

		BI	UB
N	Valid	1185	1203
	Missing	18	0
Mean		4.2070	3.03
Std. Deviation		.84334	1.442
Skewness		-.986	.022
Std. Error of Skewness		.071	.071
Kurtosis		.358	-1.322
Std. Error of Kurtosis		.142	.141
Minimum		1.33	1
Maximum		5.00	5

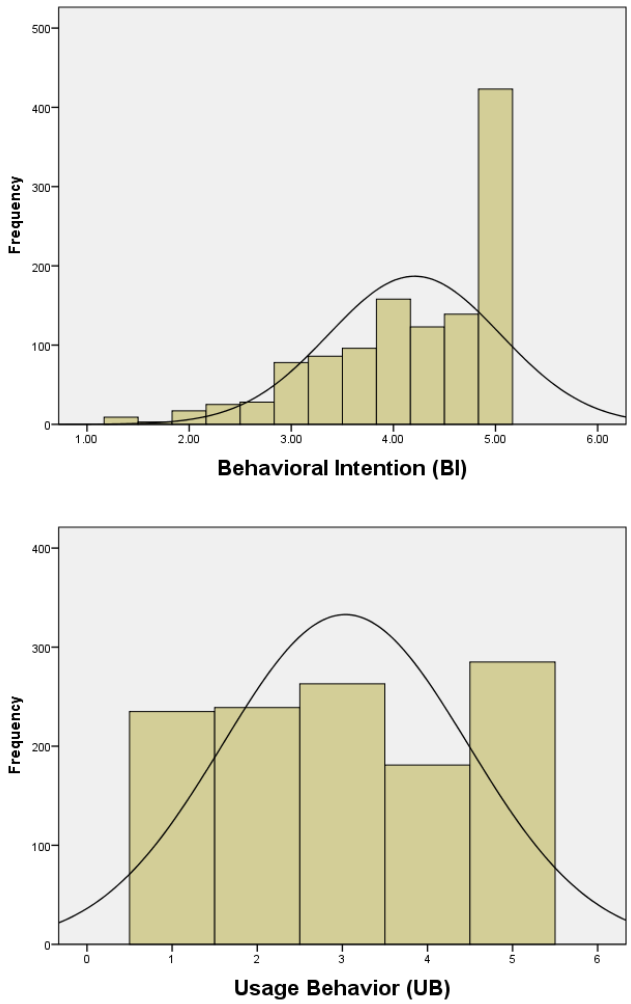

Figure 11: *Frequency histograms showing the distributions of scores on BI and UB*

Behavioral Intention (BI). Scores on BI were negatively skewed. The severity of skewness was evaluated using the *z*-score method described by Warner (2008): The skewness statistic is divided by the standard error of skewness to produce a *z*-score. That *z*-score is then evaluated for significance against the normal curve using a stringent significance level ($p < .001$). In this case, $z = -0.986/0.071 = -13.89$, $p < .001$. Kurtosis was also evaluated using the *z*-score method, which produced a nonsignificant *z*-score of 2.52. Several data transforms (i.e., square-root, log19, and reciprocal) were explored in an attempt to normalize the distribution of scores on BI. Although the reciprocal transform reduced skewness to a nonsignificant level, that transform also caused the distribution to become excessively platykurtic (flat). In the absence of an effective normalizing data transform, it was decided that BI scores would be analyzed in their raw score form, i.e., with no data transform, but that a more stringent level of statistical significance ($p < .01$) would be used in evaluating multiple regression equations involving the BI dependent variable.

Usage Behavior (UB). In Table 12 and Figure 11 it is apparent that scores on the UB construct were strongly platykurtic (i.e., flatter than a normal curve). The *z*-score method of assessing kurtosis confirmed this impression, ($p < .001$). No common data transforms are effective in normalizing a platykurtic distribution. Consequently, it was determined that multiple regression analyses involving the UB dependent variable would use raw scores and that effects would evaluated for statistical significance using a more stringent level of significance ($p < .01$).

4.2.4 Tests of the Study's Hypotheses

The study's hypotheses were each tested using multiple regression analyses as described in the next several sections of this chapter. Tests of the statistical assumptions underlying multiple regression analysis were performed prior to each of the analyses. First among these was a screening for multivariate outliers on the variables in that particular analysis. Multivariate outliers were

screened by calculating for each case the Mahalanobis distance statistic (*d*) using the variables in the analysis. The obtained values of *d* were then evaluated for significance against the chi-square distribution with $df = k$ (where k = the number of variables used to calculate *d*) and using a stringent level of significance ($p < .001$). Second, the assumption that continuous variables in the analysis are linearly related was evaluated by generating scatterplots depicting relationships between all pairs of those continuous variables in the analysis, fitting both a line and a quadratic curve through the scatterplots, and comparing the goodness-of-fit for the lines and curves (using R^2 to measure goodness-of-fit). Relationship linearity was assumed if a line and curve provided equal or nearly equal goodness-of-fit. The assumption of homoscedasticity was evaluated by creating a scatterplot of residuals (on the Y-axis) against predicted scores on the dependent variable (on the X-axis) for the analysis. A roughly rectangular scatterplot was taken as an indication that the homoscedasticity assumption was met by showing that the size of prediction errors was fairly constant across all values of the dependent variable being predicted (Tabachnick & Fidell, 2013). Finally, data were screened for excessive multicollinearity using tolerance statistics generated in each multiple regression analysis. The tolerance value for an independent variable indicates the proportion of variance in that variable that is *not* explained by the other independent variables taken collectively. Meyers et al. (2013) recommend eliminating any independent variable with a tolerance value less than .01.

Hypothesis 1: Learning expectancy has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience such that the effect will be stronger for men, particularly younger men, with high experience in eLearning.

Hypothesis 1 was investigated using a series of three multiple regression analyses. The dependent variable in each was BI, and LE served as the primary independent variable. The first analysis included gender as a moderator variable, the second used age as a moderator, and the third used eLearning experience as the moderator. Moderators were evaluated in separate analyses rather than in a single model to allow a clearer view of how each variable functions.

LE and BI, moderated by gender. The first analysis began with an evaluation of some of the statistical assumptions of the model that were not considered previously. Four multivariate outliers were identified with *d* values exceeding the critical value of $\chi^2 = 16.266$ and were eliminated entirely from the multiple regression analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 1 as it relates to the gender moderator. Following listwise deletion of cases identified as univariate or multivariate outliers, 1,172 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 13. The variables LE, gender, and the LE x gender interaction term explained 35.0% of the variance in BI, $F(3, 1168) = 209.21$, $p < .001$. The interaction term contributed almost nothing to this total, in fact, only about 0.007%. Table 14 summarizes the analysis and provides *t*-tests to assess the significance of each of the independent variables. These *t*-tests evaluated the degree to which each independent variable explained variance in the dependent variable that was *not* explained by the other variables. The LE construct explained a significant portion of unique variance in BI ($t = 17.358$, $p < .001$), but neither gender nor the LE x gender interaction effects were significant. Figure 12 shows plots of

the simple slopes (i.e., separate regression lines for men and women summarizing the relationship between BI and LE.) As can be seen from the diagram, men and women showed very similar levels of BI, and the relationship between LE and BI was virtually the same for both gender groups.

Table 13: *Correlations among BI, LE, and Gender*

		BI	LE	Gender
BI	Pearson Correlation	1	.586**	-.084**
	Sig. (2-tailed)		.000	.004
	N	1172	1172	1172
LE	Pearson Correlation	.586**	1	-.006
	Sig. (2-tailed)	.000		.833
	N	1172	1172	1172
Gender	Pearson Correlation	-.084**	-.006	1
	Sig. (2-tailed)	.004	.833	
	N	1172	1172	1172

Notes. ** Correlation is significant at the 0.01 level (2-tailed). Gender was coded 0 = female, 1 = male.

Table 14: *Regression of BI on LE with Gender as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.944	.195		4.840	.000
	LE	.765	.044	.577	17.358	.000
	Gender	-.225	.277	-.139	-.815	.415
	LE x Gender	.022	.063	.059	.345	.730

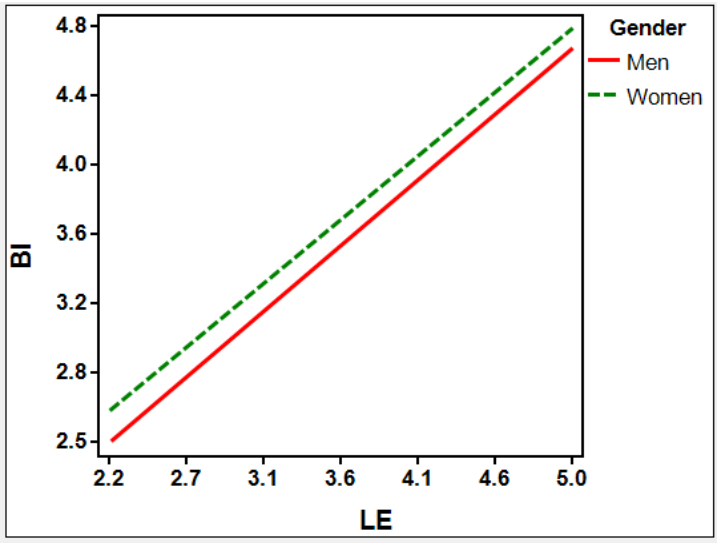

Figure 12*: Plot of the simple slopes of the regression line of BI on LE for men and women*

LE and BI, moderated by age. The second in the series of three multiple regression analyses that addressed Hypothesis 1 examined the regression of BI on LE with age as a moderator variable. The analysis began with an evaluation of the statistical assumptions that were not considered previously.

Multivariate outliers. Four multivariate outliers were identified whose values of *d* exceeded the critical value of χ^2 = 16.266 and were eliminated entirely from the subsequent multiple regression analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 1 as it relates to the age moderator. Following listwise deletion of cases identified as univariate or multivariate outliers, 1,172 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 15. The variables LE, age, and the LE x age interaction term explained 33.9% of the variance in BI, $F(3, 1168) = 199.340$, $p < .001$. The interaction term contributed almost nothing to this total, however, only about 0.03%. Table 16 summarizes the analysis and provides tests of the significance of each of the independent variables. The LE construct explained a significant portion of unique variance in BI ($t = 9.266$, $p < .001$) but neither age nor the LE x age interaction effects were significant. Figure 13 summarizes the results by showing plots of the simple slopes (i.e., separate regression lines individuals reporting their ages in each of the three age ranges on which age information was collected). This diagram shows that the relationship between LE and BI was nearly the same for all three age groups and that there were no substantial differences in BI as a function of age.

Table 15: *Correlations among BI, LE, and Age*

		BI	LE	Age
BI	Pearson Correlation	1	.581**	.028
	Sig. (2-tailed)		.000	.334
	N	1172	1172	1172
LE	Pearson Correlation	.581**	1	.091**
	Sig. (2-tailed)	.000		.002
	N	1172	1172	1172
Age	Pearson Correlation	.028	.091**	1
	Sig. (2-tailed)	.334	.002	
	N	1172	1172	1172

Notes. ** Correlation is significant at the 0.01 level (2-tailed). Age information was collected using a 3-point rating scale but was treated as an interval scale variable.

Table 16: *Regression of BI on LE with Age as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.077	.349		3.084	.002
	LE	.730	.079	.547	9.266	.000
	Age	-.184	.227	-.153	-.811	.418
	LE x Age	.035	.051	.137	.683	.494

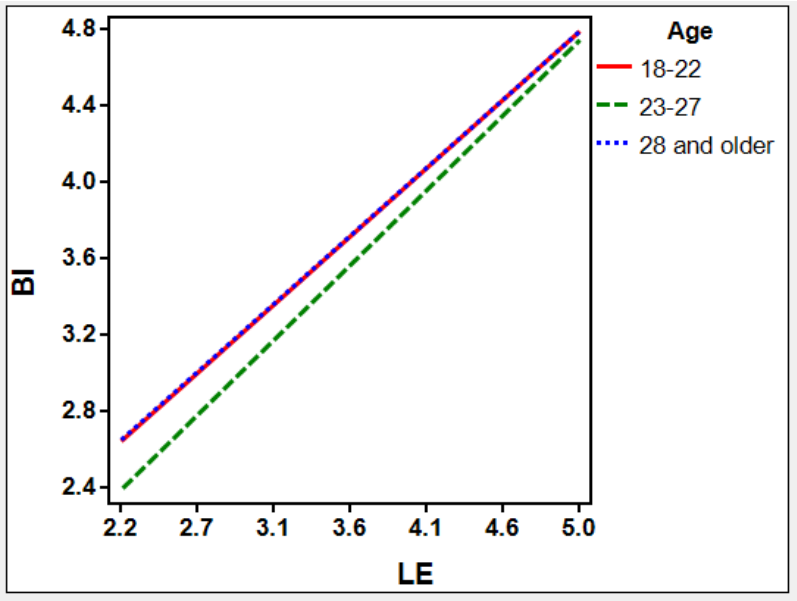

Figure 13: *Plot of the simple slopes of the regression line of BI on LE for individuals aged 18-22, 23-27, and 28 and older*

LE and BI, moderated by eLearning experience. The third in the series of three multiple regression analyses that addressed Hypothesis 1 examined the regression of BI on LE with eLearning experience as the moderator variable. The analysis began with an evaluation of the statistical assumptions that were not examined previously. Three multivariate outliers were identified whose values of *d* exceeded the critical value of $\chi^2 = 16.266$ and were eliminated entirely from the subsequent multiple regression analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 1 as it relates to the eLearning Experience moderator. Following listwise deletion of cases identified as univariate or multivariate outliers, 1,173 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 17. The variables LE, eLearning experience, and the LE x eLearning experience interaction term explained 34.7% of the variance in BI, $F(3, 1169) = 207.380$, $p < .001$. The interaction term contributed almost nothing (only about 0.07%) to this total. Table 18 summarizes the analysis and provides tests of the significance of each of the independent variables. The LE construct explained a significant portion of unique variance in BI ($t = 6.915$, $p < .001$), but neither eLearning experience nor the LE x eLearning experience interaction effects were significant. Figure 14 shows plots of the simple slopes (i.e., separate regression lines for individuals reporting 0-3 years and over 3 years of eLearning experience).

Table 17: *Correlations among BI, LE, and eLearning Experience*

Correlations		BI	LE	eLearning Experience
BI	Pearson Correlation	1	.582**	.141**
	Sig. (2-tailed)		.000	.000
	N	1173	1173	1173
LE	Pearson Correlation	.582**	1	.090**
	Sig. (2-tailed)	.000		.002
	N	1173	1173	1173
eLearning Experience	Pearson Correlation	.141**	.090**	1
	Sig. (2-tailed)	.000	.002	
	N	1173	1173	1173

Notes. ** Correlation is significant at the 0.01 level (2-tailed). eLearning experience was coded 1 = 0-3 years and 2 = over 3 years.

Table 18*: Regression of BI on LE with eLearning Experience as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.131	.424		2.670	.008
	LE	.661	.096	.497	6.915	.000
	eLearning Experience	-.199	.317	-.113	-.628	.530
	LE x eLearning Experience	.081	.071	.224	1.134	.257

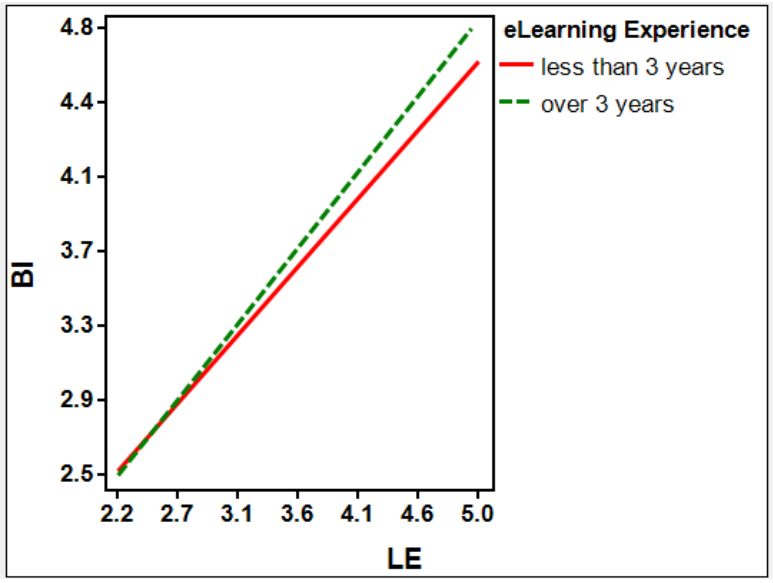

Figure 14: *Plot of the simple slopes of the regression line of BI on LE for individuals with less than 3 years eLearning experience and over 3 years eLearning experience*

Hypothesis 2: Effort expectancy has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience, such that the effect will be stronger for women, particularly younger women with low experience in eLearning.

Hypothesis 2 was investigated using a series of three multiple regression analyses. The dependent variable in each was BI, and EE served as the primary independent variable. The first analysis included gender as a moderator variable, the second used age as a moderator, and the third used eLearning experience as the moderator. Moderators were evaluated in separate analyses rather than in a single model to allow a clearer view of how each variable functions.

EE and BI, moderated by gender. The first analysis began with an examination of some of the statistical assumptions of the model that were not evaluated previously. Two multivariate outliers were identified whose values of *d* exceeded the critical value of $\chi^2 = 16.266$ and these cases were eliminated entirely from the subsequent multiple regression analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 2 as it relates to the gender moderator. Following listwise deletion of cases identified as univariate or multivariate outliers, 1,171 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 19. The variables EE, gender, and the EE x gender interaction term explained 21.9% of the variance in BI, $F(3, 1167) = 108.966$, $p < .001$. The interaction term contributed almost nothing (only about 0.02%) to this total. Table

20 summarizes the analysis and provides tests of the significance of each of the independent variables. The EE construct explained a significant portion of unique variance in BI (t = 12.144, p < .001), but neither gender nor the EE x gender interaction effects were significant. Figure 15 summarizes the results by showing plots of the simple slopes (i.e., separate regression lines for men and women). This diagram shows that the relationship between EE and BI was nearly the same for both gender groups and that there were no substantial differences in BI as a function of gender.

Table 19: *Correlations among BI, EE, and Gender*

		BI	EE	Gender
BI	Pearson Correlation	1	.458**	-.094**
	Sig. (2-tailed)		.000	.001
	N	1171	1171	1171
EE	Pearson Correlation	.458**	1	-.001
	Sig. (2-tailed)	.000		.967
	N	1171	1171	1171
Gender	Pearson Correlation	-.094**	-.001	1
	Sig. (2-tailed)	.001	.967	
	N	1171	1171	1171

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

Table 20: *Regression of BI on EE with Gender as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.250	.253		4.937	.000
	EE	.680	.056	.443	12.144	.000
	Gender	-.367	.360	-.226	-1.020	.308
	EE x Gender	.048	.080	.134	.603	.546

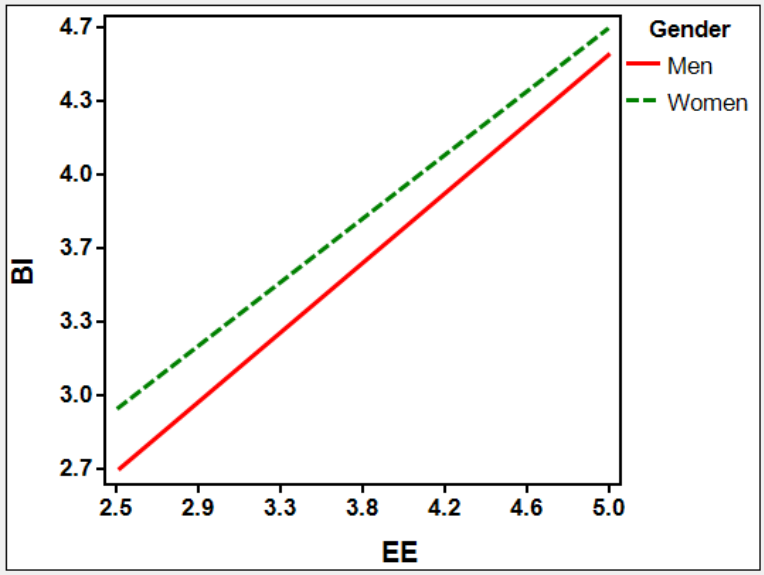

Figure 15: *Plot of the simple slopes of the regression line of BI on EE for men and women*

EE and BI, moderated by age. The second in the series of three analyses that addressed Hypothesis 2 began with an evaluation of some of the statistical assumptions of the model that were not considered previously. Four multivariate outliers were identified whose values of *d* exceeded the critical value of χ^2 = 16.266 and these cases were eliminated entirely from the subsequent multiple regression analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 2 as it relates to the age moderator. Following listwise deletion of cases who were identified as univariate or multivariate outliers, 1,169 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 21. The variables EE, age, and the EE x age interaction term explained 20.9% of the variance in BI, $F(3, 1165) = 102.783$, $p < .001$. The interaction term contributed almost nothing (only about 0.03%) to this total.

Table 22 summarizes the analysis and provides tests of the significance of each of the independent variables. The EE construct explained a significant portion of unique variance in BI (t = 6.608, p < .001), but neither age nor the EE x age interaction effects were significant. Figure 16 summarizes the results by showing plots of the simple slopes (i.e., separate regression lines for individuals aged 18-22, 23-27, and 28 and older). This diagram shows that the positive relationship between EE and BI was nearly the same for all age groups.

Table 21: *Correlations among BI, EE, and Age*

		BI	EE	Age
BI	Pearson Correlation	1	.457**	.033
	Sig. (2-tailed)		.000	.265
	N	1169	1169	1169
EE	Pearson Correlation	.457**	1	.029
	Sig. (2-tailed)	.000		.320
	N	1169	1169	1169
Age	Pearson Correlation	.033	.029	1
	Sig. (2-tailed)	.265	.320	
	N	1169	1169	1169

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

Table 22: *Regression of BI on EE with Age as a Moderator*

		Unstandardized Coefficients		Standardized Coefficients		
Model		B	Std. Error	Beta	t	Sig.
1	(Constant)	1.280	.447		2.866	.004
	EE	.650	.098	.419	6.608	.000
	Age	-.161	.286	-.134	-.564	.573
	EE x Age	.041	.063	.160	.650	.516

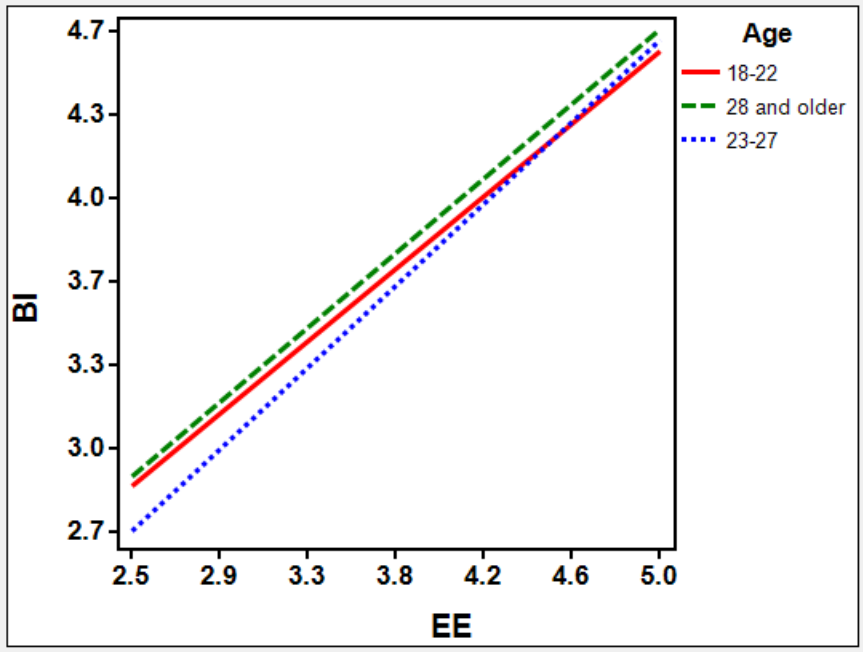

Figure 16: *Plot of the simple slopes of the regression line of BI on EE for individuals aged 18-22, 23-27, and 28 and older*

EE and BI, moderated by eLearning experience. The third in the series of three analyses that addressed Hypothesis 2 began with an evaluation of some of the statistical assumptions of the model that were not considered previously. Three multivariate outliers were identified whose values of *d* exceeded the critical value of $\chi^2 = 16.266$, and these cases were eliminated from the subsequent multiple regression analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 2 as it relates to the eLearning experience moderator. Following listwise deletion of cases who were identified as univariate or multivariate outliers, 1,170 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 23. The variables EE, eLearning experience, and the EE x eLearning experience interaction term

explained 21.4% of the variance in BI, $F(3, 1166) = 105.667$, $p < .001$. The interaction term contributed almost nothing (only about 0.04%) to this total. Table 24 summarizes the analysis and provides tests of the significance of each of the independent variables. The EE construct explained a significant portion of unique variance in BI ($t = 4.824$, $p < .001$), but neither eLearning experience nor the EE x eLearning experience interaction effects were significant. Figure 17 summarizes the results by showing plots of the simple slopes (i.e., separate regression lines individuals with 0-3 years and over 3 years of eLearning experience). This diagram shows that the relationship between EE and BI was nearly the same regardless of eLearning experience and that there were no substantial differences in BI as a function of eLearning experience.

Table 23: *Correlations among BI, EE, and eLearning Experience*

		BI	EE	eLearning Experience
BI	Pearson Correlation	1	.451**	.149**
	Sig. (2-tailed)		.000	.000
	N	1170	1170	1170
EE	Pearson Correlation	.451**	1	.112**
	Sig. (2-tailed)	.000		.000
	N	1170	1170	1170
eLearning Experience	Pearson Correlation	.149**	.112**	1
	Sig. (2-tailed)	.000	.000	
	N	1170	1170	1170

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

Table 24: *Regression of BI on EE with eLearning Experience as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.324	.561		2.360	.018
	EE	.597	.124	.382	4.824	.000
	eLearning Experience	-.148	.421	-.084	-.352	.725
	EE x eLearning Experience	.071	.092	.199	.773	.440

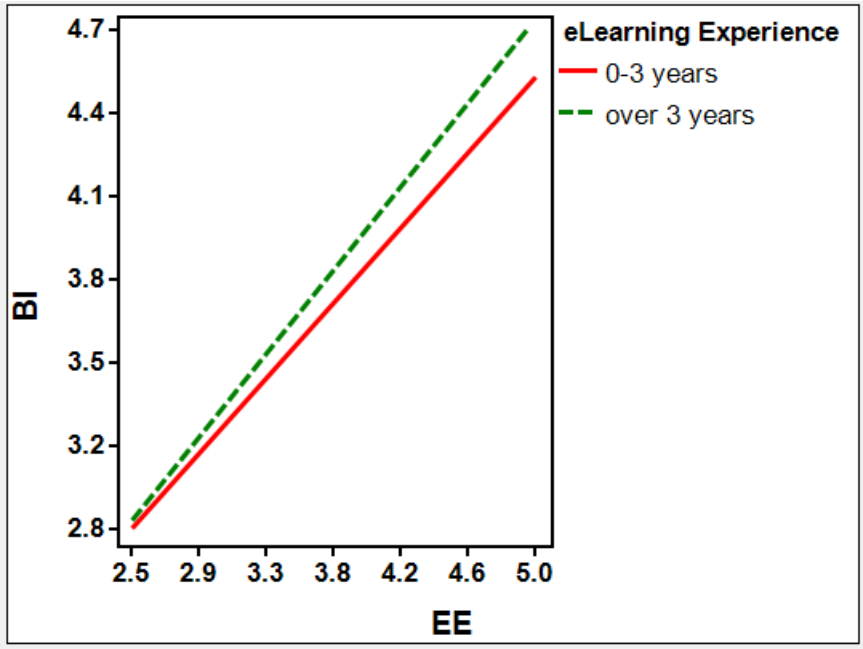

Figure 17: *Plot of the simple slopes of the regression line of BI on EE for individuals with 0-3 years of eLearning experience and over 3 years of eLearning experience*

Hypothesis 3: Social influence has a significant effect on students' behavioral intention to use mobile learning technology, moderated by gender, age, and eLearning experience, such that the effect will be stronger for women, particularly younger women with low experience in eLearning.

Hypothesis 3 was investigated using a series of three multiple regression analyses. The dependent variable in each was BI, and SI_{abb} served as the primary independent variable. The first analysis in the series of three used in testing Hypothesis 3 included gender as a moderator variable, the second used age as a moderator, and the third used eLearning experience as the moderator. Moderators were evaluated in separate analyses rather than in a single model to allow a clearer view of how each variable functions.

SI_{abb} and BI, moderated by gender. The first in the series of three multiple regression analyses that addressed Hypothesis 3 examined the regression of BI on SI_{abb} with gender as the moderator variable. The analysis began with an evaluation of the statistical assumptions that were

not examined previously. No multivariate outliers were identified whose values of *d* exceeded the critical value of χ^2 = 16.266. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 3 as it relates to the gender moderator. Following listwise deletion of cases identified as univariate outliers, 1,185 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 25. The variables SI_{abb}, gender, and the SI_{abb} x gender interaction term explained 15.9% of the variance in BI, $F(3, 1181) = 75.524$, $p < .001$. The interaction term contributed about 0.60% to this total. Table 26 summarizes the analysis and provides tests of the significance of each of the independent variables. Both of the main effects and the interaction effect were statistically significant. The significant interaction effect ($t = 2.897$, $p = .004$) indicated that the strength of the relationship between SI_{abb} and BI was significantly different for men and women. In other words, gender moderated the relationship between SI_{abb} and BI. Figure 18 captures the nature of this significant moderator effect by graphing the simple slopes, i.e., the separate regression lines for men and women. It can be seen from Figure 18 that the relationship between SI_{abb} and BI was positive for both men and women, but opposite to the prediction, this relationship was stronger for men than for women. Table 27 provides additional information about each of the simple slopes, including regression constants, regression weights, and *t*-tests for the significance of the regression weights. The table also provides Pearson correlations between SI_{abb} and BI calculated separately for men and for women.

Table 25: *Correlations among BI, SI_{abb}, and Gender*

		BI	SI(abb)	Gender
BI	Pearson Correlation	1	.379**	-.085**
	Sig. (2-tailed)		.000	.003
	N	1185	1185	1185
SI(abb)	Pearson Correlation	.379**	1	.053
	Sig. (2-tailed)	.000		.070
	N	1185	1185	1185
Gender	Pearson Correlation	-.085**	.053	1
	Sig. (2-tailed)	.003	.070	
	N	1185	1185	1185

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

Table 26: *Regression of BI on SI_{abb} with Gender as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.302	.121		27.199	.000
	SI(abb)	.270	.033	.310	8.313	.000
	Gender	-.672	.176	-.399	-3.810	.000
	SI(abb) x Gender	.135	.047	.316	2.897	.004

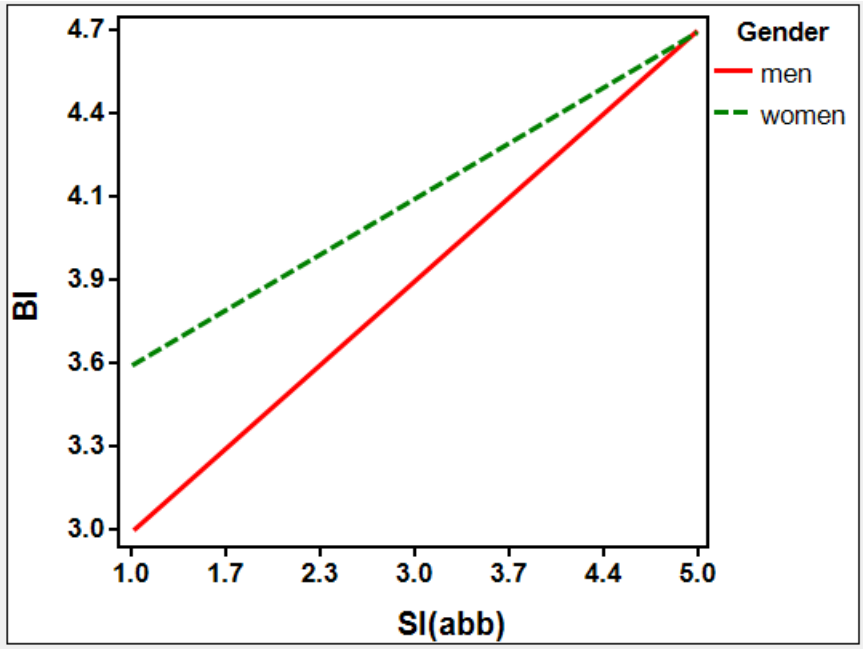

Figure 18: *Plot of the simple slopes of the regression line of BI on SI_{abb} for men and women*

Table 27: *Tests of the Significance of the Simple Slopes for the Regression of BI on SI_{abb} for Men and Women*

Gender	*n*	*r*	Constant	b	SE_b	*t*	*df*	Sig. (two-tailed)
Men	579	.450	2.63	0.405	0.033	12.12	1181	<.001
Women	606	.321	3.30	0.270	0.033	8.31	1181	<.001

SI_{abb} and BI, moderated by age. The second in the series of three multiple regression analyses that addressed Hypothesis 3 examined the regression of BI on SI_{abb} with age as the moderator variable. The analysis began with an evaluation of the statistical assumptions that were not examined previously. One multivariate outlier was identified whose value of *d* exceeded the critical value of $\chi^2 = 16.266$ and was eliminated from the analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 3 as it relates to the age moderator. Following listwise deletion of cases identified as univariate or multivariate outliers, 1,184 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 28. The variables SI_{abb}, age, and the SI_{abb} x age interaction term explained 14.1% of the variance in BI, $F(3, 1180) = 64.718$, $p < .001$. The interaction term contributed almost nothing (about 0.001%) to this total. Table 29 summarizes the analysis and provides tests of the significance of each of the independent variables. The SI_{abb} construct explained a significant portion of unique variance in BI ($t = 5.840$, $p < .001$), but neither age nor the SI_{abb} x age interaction effects were significant. Figure 19 shows plots of the simple slopes (i.e., separate regression lines for individuals in the three age ranges). This plot

shows that SI_{abb} was directly related to higher levels of BI, that this relationship was similar for all age groups, and that BI did not differ as a function of age.

Table 28*: Correlations among BI, SI_{abb}, and Age*

		BI	SI(abb)	Age
BI	Pearson Correlation	1	.376**	.038
	Sig. (2-tailed)		.000	.187
	N	1184	1184	1184
SI(abb)	Pearson Correlation	.376**	1	.142**
	Sig. (2-tailed)	.000		.000
	N	1184	1184	1184
Age	Pearson Correlation	.038	.142**	1
	Sig. (2-tailed)	.187	.000	
	N	1184	1184	1184

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

Table 29: *Regression of BI on SI_{abb} with Age as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.007	.220		13.676	.000
	SI(abb)	.336	.058	.386	5.840	.000
	Age	.001	.146	.001	.006	.995
	SI(abb) X Age	-.005	.037	-.019	-.139	.889

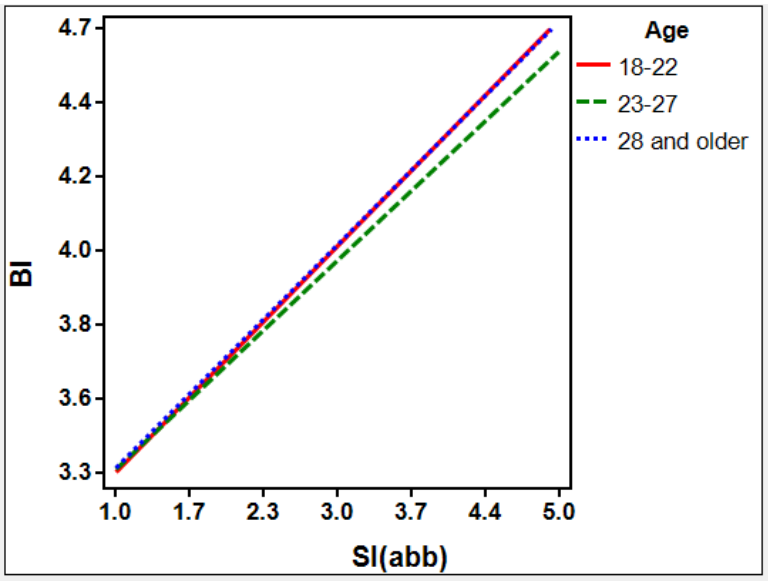

Figure 19*: Plot of the simple slopes of the regression line of BI on SI_{abb} for individuals aged 18-22, 23-27, 28 and older*

SI_{abb} and BI, moderated by eLearning experience. The third in the series of three multiple regression analyses that addressed Hypothesis 3 examined the regression of BI on SI_{abb} with eLearning experience as the moderator variable. The analysis began with an evaluation of the statistical assumptions that were not examined previously. No multivariate outliers were identified. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 3 as it relates to the eLearning Experience moderator. Following listwise deletion of cases who were identified as univariate outliers, 1,185 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 30. The variables SI_{abb}, eLearning experience, and the SI_{abb} x eLearning experience interaction term explained 15.4% of the variance in BI, $F(3, 1181) = 71.876$, $p < .001$. The interaction term contributed relatively little (only about 0.12%) to this total. Table 31 summarizes the analysis and provides tests of the significance of each of the independent variables. The SI_{abb} construct explained a significant portion of unique variance in BI ($t = 5.829$ $p < .001$): BI increased as a direct function of SI_{abb} increases. BI also increased as a direct function of eLearning experience. This effect was significant at the traditional .05 level of significance ($t = 2.158$, $p = .031$), but this analysis used the more stringent .01 significance level to guard against distortions in reported significance levels that might be caused by the non-normal distribution of scores on the BI dependent variable and any violation of the homoscedasticity assumption. The SI_{abb} x eLearning experience interaction effect was nonsignificant. Figure 20 shows plots of the simple slopes (i.e., separate regression lines

for individuals reporting 0-3 years and over 3 years of eLearning experience). As shown in that figure, BI increased as a function of SI_{abb} and the strength of this relationship was about the same at both levels of eLearning experience. The graph also shows that BI was generally higher for individuals with more eLearning experience than those with less experience, but this effect did not reach the required .01 level of significance to be considered reliable and replicable.

Table 30: *Correlations among BI, SI_{abb}, and eLearning Experience*

		BI	SI(abb)	eLearning Experience
BI	Pearson Correlation	1	.379**	.126**
	Sig. (2-tailed)		.000	.000
	N	1185	1185	1185
SI(abb)	Pearson Correlation	.379**	1	.078**
	Sig. (2-tailed)	.000		.007
	N	1185	1185	1185
eLearning Experience	Pearson Correlation	.126**	.078**	1
	Sig. (2-tailed)	.000	.007	
	N	1185	1185	1185

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

Table 31: *Regression of BI on SI_{abb} with eLearning Experience as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.473	.267		9.277	.000
	SI(abb)	.410	.070	.470	5.829	.000
	eLearning Experience	.419	.194	.229	2.158	.031
	SI(abb) x eLearning Experience	-.065	.050	-.174	-1.290	.197

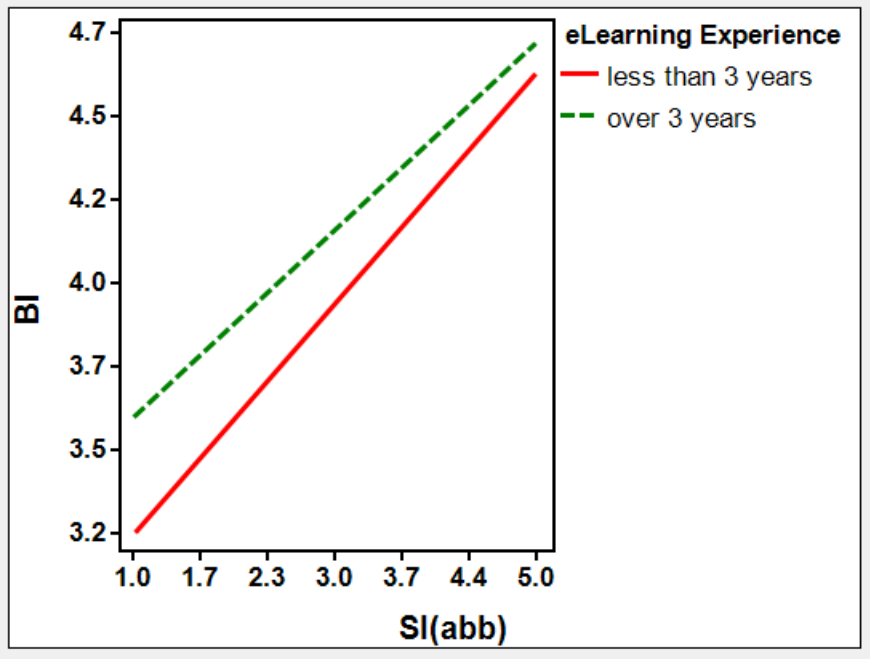

Figure 20: *Plot of the simple slopes of the regression line of BI on SI_{abb} for individuals with less than 3 years of eLearning experience and over 3 years of eLearning experience*

Hypothesis 4: Facilitating conditions have a significant effect on students' use behavior of mobile learning technology moderated by age and eLearning, such that the effect will be stronger for older students with high experience in eLearning.

Hypothesis 4 was investigated using two multiple regression analyses. The dependent variable in each was UB, and FC_{abb} served as the primary independent variable. The first analysis included age as a moderator variable, and the second used eLearning experience as a moderator. Moderators were evaluated in separate analyses rather than in a single model to allow a clearer view of how each variable functions.

FC_{abb} and UB, moderated by age. The first analysis began with an evaluation of some of the statistical assumptions of the model that were not considered previously. No multivariate outliers were identified whose values of *d* exceeded the critical value of $\chi^2 = 16.266$. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable

approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 4 as it relates to the age moderator. As there were no univariate or multivariate outliers and no cases with missing values on the variables in this analysis, all 1,203 cases in the sample were available for the analysis. Correlations among the variables in the analysis are shown in Table 32. The variables FC_{abb}, age, and the FC_{abb} x age interaction term explained 1.1% of the variance in UB. This was an extremely weak effect, but the large sample size resulted in its being found statistically significant, $F(3, 1199) = 4.572$, $p = .003$. The interaction term contributed about half of this total, about 0.49%. Table 33 summarizes the analysis and provides tests of the significance of each of the independent variables. Using the more stringent .01 level of significance to compensate for the non-normal dependent variable, the main effect of age was statistically significant, $t = 3.279$ $p = .001$: As age increased, so did UB. The importance of this main effect, however, was somewhat overshadowed by a marginally significant FC_{abb} x age interaction effect, $t = -2.448$, $p = .015$. (While the interaction effect reached significance beyond the traditional .05 level, a more stringent .01 significance level was required in this analysis due to the non-normal distribution of scores on the UB dependent variable.) This interaction effect is illustrated in Figure 21 which shows plots of the simple slopes (i.e., separate regression lines for individuals in the three age ranges.) This plot shows that UB was generally higher for the middle and oldest age groups than for the youngest age group, but only when FC_{abb} was low. The plot of simple slopes also shows that the relationship between FC_{abb} and UB was positive (but not significantly so) for the youngest age group (18-22), but negative (again, not significantly so) for the middle (23-27) and oldest (28 and older) age groups. Table 34 provides additional information

about each of the simple slopes, including regression constants, regression weights, and *t*-tests for the significance of the regression weights. The table also provides Pearson correlations between FC_{abb} and UB calculated separately for men and for women.

Table 32: *Correlations among UB, FC_{abb}, and Age*

		UB	FC(abb)	Age
UB	Pearson Correlation	1	-.010	.079**
	Sig. (2-tailed)		.732	.006
	N	1203	1203	1203
FC(abb)	Pearson Correlation	-.010	1	.047
	Sig. (2-tailed)	.732		.103
	N	1203	1203	1203
Age	Pearson Correlation	.079**	.047	1
	Sig. (2-tailed)	.006	.103	
	N	1203	1203	1203

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

Table 33: *Regression of UB on FC_{abb} with Age as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	2.258	.274		8.229	.000
	FC(abb)	.164	.080	.143	2.037	.042
	Age	.558	.170	.261	3.279	.001
	FA(abb) x Age	-.120	.049	-.255	-2.448	.015

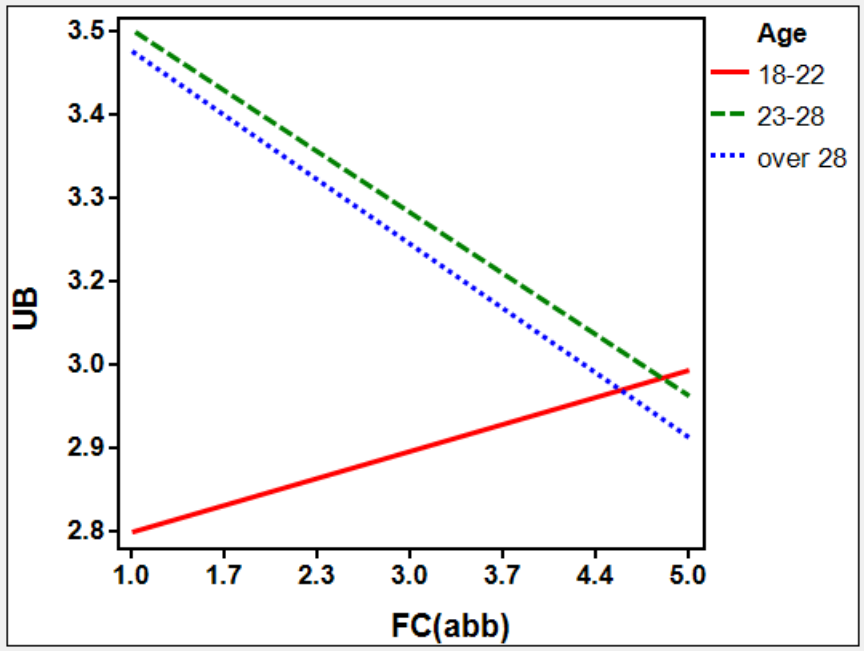

Figure 21: *Plot of the simple slopes of the regression line of BU on FC_{abb} for individuals aged 18-22, 23-27, 28 and older*

Table 34: *Tests of the Significance of the Simple Slopes for the Regression of UB on FC_{abb} for Individuals*

Age Group	*n*	*r*	Constant	b	SE_b	*t*	*df*	Sig. (two-tailed)
18-22	749	.046	2.77	0.053	0.042	1.25	1197	.211
22-28	331	-.106	3.60	-0.120	0.061	-1.96	1197	.050
Over 28	249	-.105	3.58	0.270	-0.127	-1.22	1197	.224

FC_{abb} and UB, moderated by eLearning experience. The second in the series of two multiple regression analyses that addressed Hypothesis 4 examined the regression of UB on FC_{abb} with eLearning experience as the moderator variable. The analysis began with an evaluation of the statistical assumptions that were not examined previously. No multivariate outliers were identified. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No

independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 4 as it relates to the eLearning Experience moderator. As there were no univariate or multivariate outliers and no cases with missing values on the variables in this analysis, all 1,203 cases in the sample were available for this analysis. Correlations among the variables in the analysis are shown in Table 35. The variables FC_{abb}, eLearning experience, and the FC_{abb} x eLearning experience interaction term explained 1.0% of the variance in UB. This was an extremely weak effect, but the large sample size resulted in its being found statistically significant, $F(3, 1199) = 3.976$, $p = .008$. The interaction term contributed 0.31% of this total. Table 36 summarizes the analysis and provides tests of the significance of each of the independent variables. Using the more stringent .01 level of significance to compensate for the non-normal distribution of scores on the dependent variable, only the main effect of eLearning experience was statistically significant, $t = 2.845$, $p = .005$: UB was higher among individuals with more eLearning experience and lower among those with less eLearning experience. Neither the main effect of FC_{abb} nor the FC_{abb} x eLearning experience interaction effect was significant. Figure 22 shows plots of the simple slopes (i.e., separate regression lines for individuals with 0-3 years and over 3 years' experience with eLearning). This plot shows that the relationship between FC_{abb} and UB was positive for those with less than three years' experience with eLearning, $r(831) = .026$, and negative for those with more than three years' experience, $r(368) = -.095$. But it should be remembered that this effect is visually exaggerated in Figure 22. Evaluated statistically, the effect was extremely weak, statistically nonsignificant, and unreliable.

Table 35: *Correlations among UB, FC_{abb}, and eLearning Experience*

		UB	FC(abb)	eLearning Experience
UB	Pearson Correlation	1	-.010	.081**
	Sig. (2-tailed)		.732	.005
	N	1203	1203	1203
FC(abb)	Pearson Correlation	-.010	1	.021
	Sig. (2-tailed)	.732		.475
	N	1203	1203	1203
eLearning Experience	Pearson Correlation	.081**	.021	1
	Sig. (2-tailed)	.005	.475	
	N	1203	1203	1203

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

Table 36: *Regression of UB on FC_{abb} with eLearning Experience as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	2.168	.338		6.409	.000
	FC(abb)	.168	.099	.146	1.693	.091
	eLearning Experience	.695	.244	.222	2.845	.005
	FC(abb) x eLearning Experience	-.138	.071	-.221	-1.937	.053

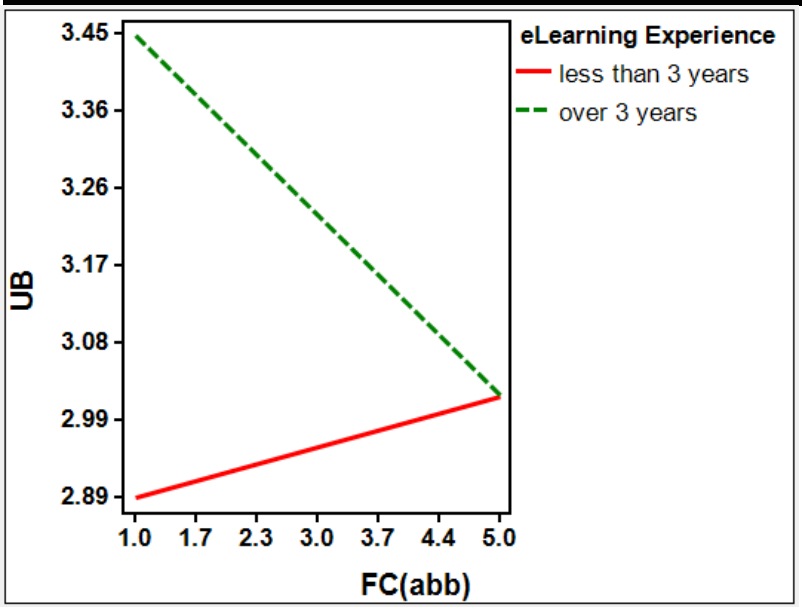

Figure 22*: Plot of the simple slopes of the regression line of BU on FC_{abb} for individuals with less than 3 years of eLearning experience and over 3 years of eLearning experience*

Hypothesis 5: Mobile learning technology characteristics have a significant effect on students' behavioral intention to use mobile learning technology moderated by eLearning experience, such that the effect will be stronger for students with high eLearning experience.

Hypothesis 5 was investigated using a single multiple regression analysis. The dependent variable in the analysis was BI, the primary independent variable was MLTC, and eLearning experience was the moderator variable. The analysis began by evaluating statistical assumptions that were not previously examined. Eleven multivariate outliers were identified whose values of *d* exceeded the critical value of $\chi^2 = 16.266$ and were excluded from the analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 5. Following deletion of cases identified as univariate or multivariate outliers, 1,166 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 37. The variables MLTC, eLearning experience, and the MLTC x eLearning experience interaction term explained 29.5% of the variance in BI, $F(3, 1162) = 162.302$, $p < .001$. The interaction term contributed relatively little to this total, however, only about 0.04%. Table 38 summarizes the analysis and provides tests of the significance of each of the independent variables. The MLTC construct explained a significant portion of unique variance in BI ($t = 6.259$ $p < .001$), but neither the main effect of eLearning experience nor the MLTC x eLearning experience interaction effects were statistically significant. Figure 23 shows plots of the simple slopes (i.e., separate regression lines for individuals reporting 0-3 years and over 3 years of eLearning

experience). As shown in that figure, BI was a direct function of MLTC, as predicted by the model. However, contrary to Hypothesis 5, the strength of the relationship between MLTC and BI was about the same at both levels of eLearning experience.

Table 37: *Correlations among BI, MLTC, and eLearning Experience*

		BI	MLTC	eLearning Experience
BI	Pearson Correlation	1	.536**	.146**
	Sig. (2-tailed)		.000	.000
MLTC	Pearson Correlation	.536**	1	.110**
	Sig. (2-tailed)	.000		.000
eLearning Experience	Pearson Correlation	.146**	.110**	1
	Sig. (2-tailed)	.000	.000	

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

Table 38*: Regression of BI on MLTC with eLearning Experience as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	.473	.575		.822	.411
	MLTC	.799	.128	.471	6.259	.000
	eLearning Experience	-.185	.432	-.106	-.427	.669
	MLTC x eLearning Experience	.075	.095	.208	.785	.433

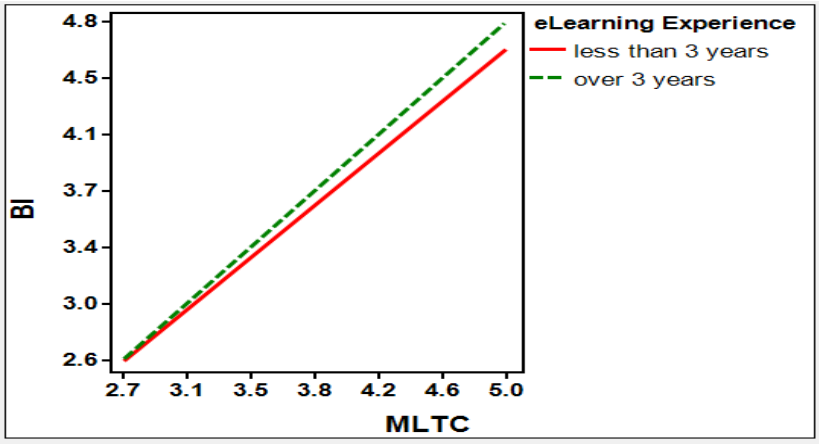

Figure 23: *Plot of the simple slopes of the regression line of BI on MLTC for individuals with less than 3 years eLearning experience and over 3 years eLearning experience*

Hypothesis 6: Self-management of learning has a significant effect on students' behavioral intention to use mobile learning technology, moderated by eLearning experience, such that the effect will be stronger for students with high eLearning experience.

Hypothesis 6 was investigated using a single multiple regression analysis. The dependent variable in the analysis was BI, the primary independent variable was SML, and eLearning experience was the moderator variable. The analysis began by evaluating statistical assumptions that were not previously examined. Two multivariate outliers were identified whose values of *d* exceeded the critical value of $\chi^2 = 16.266$ and were eliminated from the analysis. Goodness-of-fit measures for lines and curves supported the assumption that continuous variables were linearly related. The scatterplot of residuals against predicted scores on the dependent variable approximated a rectangle, supporting the assumption of homoscedasticity. No independent variables showed tolerance values less than .01 indicating that excessive multicollinearity was not a problem.

Test of Hypothesis 6. Following deletion of cases identified as univariate or multivariate outliers, 1,179 cases remained in the analysis. Correlations among the variables in the analysis are shown in Table 39. The variables SML, eLearning experience, and the SML x eLearning experience interaction term explained 8.4% of the variance in BI, $F(3, 1175) = 36.146$, $p < .001$. The interaction term contributed relatively little to this total, however, only about 0.13%. Table 40 summarizes the analysis and provides tests of the significance of each of the independent variables. Although R^2 was statistically significant, neither of the main effects (SML, eLearning experience) nor the interaction effect approached statistical significance. This pattern indicates that the independent variables, including the interaction term, explained the same component of variance in the BI dependent variable. That fact also accounts for the finding that even though none of the

independent variable regression weights were significant, the bivariate correlations between independent and dependent variables were significant. The bivariate correlations measure the degree to which each of the independent variables explains variance in the dependent variable. Tests of the regression weights, on the other hand, measure the degree to which an independent variable explains *unique* variance in the dependent variable, i.e., variance *that wasn't explained by the other independent variables.* Although neither the main nor interactions effects were significant, Figure 24 provides a plot of the simple regression lines, i.e., regression lines of BI on SML for individuals with low and high levels of eLearning experience. This plot shows that as SML increased, BI also increased, and the Pearson correlation found this relationship to be significant. However, variance in BI that is explained by SML was also explained by eLearning experience and the SML x eLearning experience interaction effect, causing the main effect of SML to be found nonsignificant.

Table 39: *Correlations among BI, SML, and eLearning Experience*

		BI	SML	eLearning Experience
BI	Pearson Correlation	1	.271**	.133**
	Sig. (2-tailed)		.000	.000
	N	1179	1179	1179
SML	Pearson Correlation	.271**	1	.131**
	Sig. (2-tailed)	.000		.000
	N	1179	1179	1179
eLearning Experience	Pearson Correlation	.133**	.131**	1
	Sig. (2-tailed)	.000	.000	
	N	1179	1179	1179

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

Table 40: *Regression of BI on SML with eLearning Experience as a Moderator*

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	3.377	.350		9.647	.000
	SML	.154	.086	.153	1.787	.074
	eLearning Experience	-.160	.268	-.088	-.596	.551
	SML x eLearning Experience	.084	.065	.229	1.290	.197

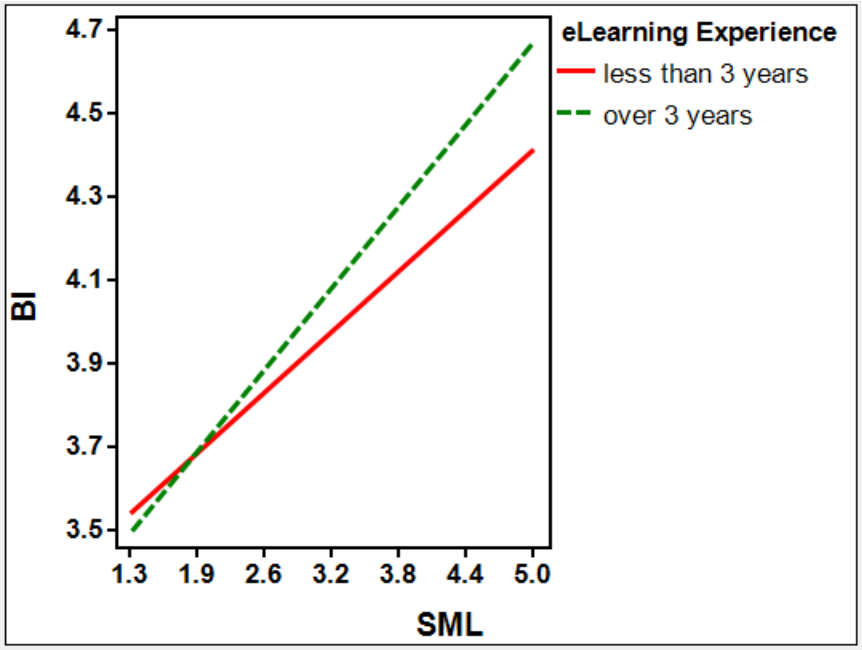

Figure 24: *Plot of the simple slopes of the regression line of BI on SML for individuals with less than 3 years eLearning experience and over 3 years eLearning experience*

The Relationship Between Behavioral Intention to Use M-Learning Technology (BI) and Use Behavior of M-Learning Technology (UB)

The final element of the model of M-learning technology that was tested in this dissertation concerns the relationship between BI and UB. Specifically, the model indicates that UB varies directly as a function of BI, i.e., that the two constructs are positively correlated. That relationship was formally evaluated in this study by calculating a Pearson correlation between the two constructs. Prior to calculating that correlation, however, univariate outliers (on the BI variable) and bivariate outliers on BI and UB (identified using Mahalanobis distances evaluated against the chi-square distribution with $df = 2$ and $p < .001$) were eliminated. Following those deletions, there were 1,183 cases remaining in the analysis. The relationship was also evaluated for linearity using scatterplots through which both a line and quadratic curve were fitted. A curve provided only a slightly better fit than a line, and so the relationship was concluded to be predominantly linear.

The correlation between BI and UB was quite weak, but, consistent with the model, it was statistically significant and positive, $r(1,181) = .175$, $p < .001$.

Behavioral Intention to Use M-learning Technology (BI), Use Behavior of M-learning Technology (UB), and Type of Enrollment

A large majority of students who participated in this study (n = 1,087, 90.6%) were enrolled on-campus, but a minority of students (n = 113, 9.4%) were distance education students. Although no predictions were made regarding these two groups of students, the data provided an opportunity to compare their levels on the BI and UB constructs.

BI as a function of type of enrollment. In the first comparison, BI served as the dependent variable, and type of enrollment was the grouping variable. Before the enrollment groups were compared, outliers on the BI variable were eliminated, leaving 1,185 cases in the analysis (n = 1,069 in the on-campus group and n = 113 in the distance learning group). A Mann-Whitney U test was used to compare the groups because two of the assumptions of the independent-samples t-test were violated. First, the dependent variable was previously determined to be non-normal (negatively skewed), and second, Levene's test for homogeneity of variance was significant, $F(1, 1180) = 7.672$, $p = .006$, indicating a violation of the assumption of homogeneous group variances. The Mann-Whitney U test indicated that the enrollment groups differed significantly, U = 51,941.50, $p = .012$ (two-tailed), with distance education students expressing higher levels of BI ($M = 4.40$, $SD = 0.72$) than on-campus students ($M = 4.19$, $SD = 0.85$).

UB as a function of type of enrollment. In the second comparison, UB served as the dependent variable and type of enrollment was the grouping variable. There were no outliers on the UB variable, so there were 1,203 cases in the analysis (1,087 enrolled on-campus and 113 distance learning students). Another Mann-Whitney U test was used to compare the groups

because the distribution of scores on UB was non-normal (platykurtic) and Levene's test for homogeneity of variance was significant, $F(1, 1198) = 11.324$, $p = .001$. Although distance education students showed somewhat higher scores on UB ($M = 3.19$, $SD = 1.61$) than did on-campus students ($M = 3.01$, $SD = 1.42$), this difference was not statistically significant, $U = 57{,}461.00$, $p = .249$ (two-tailed).

In brief, all the six hypothesis of this study were quantitatively answered through the former analysis. An exploratory analysis was provided in regards to the relationship between students' type of enrollment and their behavioral intentions and use behaviors toward mobile learning technology. Next, the qualitative analysis is introduced to explore the quantitative portion in depth.

4.3 Qualitative Analysis Results

The qualitative method was employed in this study to deepen the understanding of the qualitative results by virtue of this study model. Therefore, a semi-structured interview was developed, then a Saudi assistant professor who works in the field of information technology acceptance, helped in establishing face validity for the interview protocol. Fifteen students were interviewed in order to collect this qualitative data. Fifteen interviews were transcribed manually because there was no available voice recognition software for the Arabic language that reaches a satisfying level of transcription. The interview transcriptions were checked and rechecked to correct any misspelling or grammar errors; however, some of the transcribed words were in local dialects, but that was overcome by the manual analysis process. In addition, because of the small number of interviewees, the analysis of the qualitative data was conducted manually by using Microsoft Office Excel software.

Later, this study employed member checking technique to establish more credibility for the qualitative analysis. Member checking is defined as a process of enabling participants in a

qualitative study to recheck and approve the interpretation of the data that they gave (Carlson, 2010). As a result, themes, categories, and initial qualitative analysis were sent to selected interviewees alongside their transcribed interviews. No changes were made regarding the transcriptions, and they felt their meanings were fully represented and well-addressed in the themes as well as the initial analysis. Interestingly, members showed high interest in discussing other participants' quotes throughout the analysis where they found them eye-openers for new perspectives. After addressing the valuable comments and suggestions made through the member checking process alongside face validation of the interview, this study considers credibility and validity of the qualitative analysis were established. The following sections introduce the profile of the interview participants.

4.3.1 Participants

The recruitment of the interview participation was through the questionnaire in which a single question was asked whether the participant wanted to participate in a later interview or not. 265 respondents agreed to participate in the later interview; however, because of the limitation of this study and the low response to the interview invitation, fifteen respondents volunteered to participate in the interview: eight males and seven females. No further characteristics were collected because this is outside of the qualitative portion's scope of this study.

4.3.2 Themes

The primary purpose of the qualitative method in this study was to deepen the understanding of students' acceptance of mobile learning technology by virtue of the proposed model; therefore, the themes were directly derived from the study model. The first draft of the developed themes was to define them accurately according to the literature review of this study,

then names of the evolved themes were checked in terms of consistency and accuracy in representing themes.

Twenty-two themes were derived from the study model, then these themes were examined and re-examined based on the available data from the interviews. As a result, only twenty themes were identified through the interview transcriptions, and two themes were eliminated due to their lack of representation in the interview transcriptions. Table 41 outlines the evolving themes and their numbers of sources, references and weights throughout the interviews.

Table 41: *Identified Themes and their Sources, References and Weights*

Themes	Number of Sources	Number of References	Weight
Usefulness-Academic	15	15	100%
Expeditious Accomplishment	13	18	120%
Increase Productivity	1	1	7%
Grade Improvement	4	4	27%
Ease of Use	15	21	140%
Learnability	15	15	100%
Encouragement	15	15	100%
Support	14	14	93%
Concerns-Information Security	10	10	67%
Concerns-Privacy	7	7	47%
Timely Access of Information	15	24	160%
Personal Learning Satisfaction	14	14	93%
Learning Mobility	15	18	120%
Communication	15	16	107%
Resources Multiplicity	15	16	107%
Learning Authentication	13	13	87%
Integration of Multiple Resources	13	13	87%
Self-Discipline	12	12	80%
Time Management	11	11	73%
Goal Achievement	15	15	100%

Based on the proposed model in this study, the twenty themes were found to fit in six main categories category representing one construct of the proposed model of mobile learning technology acceptance. Four categories were based on the UTAUT original model from Venkatesh et al. (2003) while the two new proposed constructs, mobile learning characteristics and self-

management of learning, were represented in ten themes. However, facilitating condition construct from the original model were modified to include concerns of information security and privacy; therefore, these two additions were represented by two themes in this analysis. Hence, the literature of UTAUT guided the thematic analysis process through employing a deductive approach to generate proper themes and place them in the model properly. Table 42 maps the constructs and themes used in the qualitative analysis.

Table 42*: Categories and Themes from Qualitative Analysis*

Category/ Construct	Theme
Learning Expectancy	Usefulness-Academic
	Expeditious Accomplishment
	Increase Productivity
	Grade Improvement
Effort Expectancy	Ease of use
	Learnability
Social Influence	Encouragement
	Support
Facilitating Conditions	Concerns-Information Security
	Concerns-Privacy
Mobile Learning Technology Characteristics	Timely Access of Information
	Personal Learning Satisfaction
	Learning Mobility
	Communication
	Resources Multiplicity
	Learning Authentication
	Integration of Multiple Resources
Self-Management of Learning	Self-Discipline
	Time Management
	Goal Achievement

The following section introduces the themes as influencing factors of mobile learning technology acceptance among Saudi higher education students.

4.3.3. Categories and Themes

The interviews were interpreted using a deductive approach due to two reasons. First, the intention of employing the qualitative method in this study is to deepen the understanding of the

quantitative data collected and interpreted according to the study model. Second, the consistency between qualitative and qualitative analyses required a unified theoretical base to interpret the data. Hence, this study model defined the categories and themes to generate descriptive statements used in interpreting the acceptance of mobile learning technology in Saudi higher education.

Learning Expectancy

According to the proposed study model, learning expectancy is the level of Saudi higher education students' personal belief that using mobile learning technology is benefiting them in performing learning tasks. This category includes four themes derived from the literature: usefulness-academic, expeditious accomplishment, increase productivity, and grade improvement. To identify this category, the researcher asked the interviewees the following broad question: *In your study, does mobile learning technology help you to improve your learning? Why or Why not? How?* The answers to these questions were broken down as follows:

Usefulness-Academic. It means that a participant found mobile learning technology helpful in performing his or her learning activities. All fifteen participants reported the usefulness of mobile learning technology in their learning activities. The participants identified the following reasons for finding mobile learning technology useful in their learning: saving time and effort, quick access and multiple resources.

Expeditious Accomplishment. It refers to how mobile learning technology enables students to perform their learning activities quickly. Thirteen participants reported their benefits of using mobile learning technology in speeding up their learning accomplishments; however, expeditious were mentioned eighteen times in the interviews. Sample quotes were "[mobile learning technology] shortened my study time from nine hours to one hour … almost 90% of my study time." (Interviewee 10, Lines 63-64); "After [using] mobile learning technology,

comprehension takes lees time. Everything is clear and I move forward quickly." (Interviewee 11, Lines 76-77). In contrast, one participant reported the effect of mobile learning technology on slowing her learning accomplishment while another participant did not report her answer.

Increase Productivity. One participant found mobile learning technology increasing his productivity in a project-based course (Interviewee 11). The rest did not report any increase in their productivity after using mobile learning technology.

Grade Improvement. Four participants reported increase in their grades after using mobile learning technology. Sample quotes include "I was getting more information … and raising my GPA through [this] technology." (Interviewee 15, Lines 90-92) and "my grades were great when I used it." (Interviewee 12, Line 3). The rest did not address grade improvement in their answers.

Effort Expectancy

According to effort expectancy construct in UTAUT, the likelihood of using mobile learning technology in students' learning will increased if they believe using mobile learning technology is easy to use (Venkatesh et al., 2003). The effort expectancy category includes two themes: ease of use and learnability.

Ease of Use. The participants were asked *During your study by using mobile learning technology, how easy is mobile learning technology for you to use? Why?* All fifteen participants reported the ease of using mobile learning technology in their learning and the ease of use theme recurred twenty-one times in the interviews. Sample quotes include "For me, it was very easy because of my technological background or my proficiency in using computer." (Interviewee 8, Line 9) and "It is too easy! When you practice it continuously, you will get used to it." (Interviewee 15, Line 8).

Learnability. According to UTAUT, if students believe learning to operate mobile learning technology is easy for them, they will likely use it in their learning (Venkatesh et al., 2003). Therefore, participants were asked *During your study by using mobile learning technology, if you lack skills in using mobile learning technology, what would you do? Why?* All fifteen participants reported the easiness of learning using mobile learning technology where six of them reported self-learning as a method of overcoming any lack of use skills. Nine participants reported asking peers or experts as a method of learning if they lacked any skills in using mobile learning technology. Sample quotes include "[I will] go to the Distance Learning Department in my university … because they are in charge of the system." (Interviewee 14, Lines 10,13) and "I will learn it from someone who went through the same experience before." (Interviewee 3, Lines 14-15). One participant mentioned "I will Google it first … because I prefer self-learning." (Interviewee 2, Lines 22,24).

Social Influence

According to UTAUT, if the important people in students' lives believe he or she should use mobile learning technology in his or her learning, the likelihood of his or her use of mobile learning technology will increase (Venkatesh et al., 2003). The social influence category includes two themes: encouragement and support.

Encouragement. To identify students' social influencers to use mobile learning technology, participants were asked *Who encouraged you to use mobile learning technology in your learning? Why?* All fifteen participants reported their encouragement to use mobile learning technology in their learnings. Five participants indicated their universities, professors, or peers as encouraging factors of using mobile learning technology in their learning. Three participants mentioned self-encouragement as a main factor of using mobile learning technology such as

"technological passions" (Interviewees 8,13) and "personal needs" (Interviewee 11). Three participants reported the characteristics of mobile learning technology as main encouraging factors of their use of mobile learning technology such as "easiness" (Interviewee 6), "proliferation of information" (Interviewee 4) and "time-saving" (Interviewee 15). Family and society were each reported twice as a main encouraging factor of using mobile learning technology in learning (Interviewee 1,2,10,14).

Support. Participants were asked *Do you think you have efficient support to use mobile learning technology in your learning? Why or Why not?* Fourteen participants indicated they have support to use mobile learning technology in their learning; however, eleven participants mentioned "private" or "individual" support. The rest indicated institutional support with phrases like "somewhat", "rarely" and "relatively". One participant stated "Yes! All devices and connection tools are available to me." (Interviewee 6, Line 19).

Facilitating Conditions

According to UTAUT, students' use of mobile learning technology will increase if they believe the available infrastructure supports mobile learning technology (Venkatesh et al., 2003). This category proposed two new themes: concerns about information security and privacy.

Concerns-Information Security. Participants were asked *During your study using mobile learning technology, do you have concerns regarding your information security? Why and how?* Ten participants reported their concerns regarding information security when using mobile learning technology in learning. Sample quotes include "Of course, information security has many threats, whether my security or my information security. My device might breakdown and I will lose my information." (Interviewee 8, Lines 29-30) and "I feel the risk when I work in a group because there is no full confidentiality, but when I work with my professors or my university, I do

not feel there is a risk." (Interviewee 14, Line 24-25). In contrast, five participants reported no concerns regarding information security when using mobile learning technology. Sample quotes includes "No! Never! I trust my university, and there are other educational websites not affiliated with my university that I feel trust when I access them." (Interviewee 6, Line 25-26) and "No! I don't think so. I have no important information to worry about." (Interviewee 7, Line 27).

Concerns-Privacy. Participants were asked *During your study using mobile learning technology, do you have concerns regarding your privacy? Why and how?* Seven participants indicated their privacy concerns when using mobile learning technology. Some concerns include "colleagues access private information" (Interviewee 5) and "Internet blackmail" (Interviewee 8). Eight participants indicated they have no concerns when dealing with mobile learning technology. Sample quotes include "I have no concerns because I have a strong protection system." (Interviewee 2, Line 37,34) and "I am not worried about my privacy too much because I am confident it cannot be reached." (Interviewee 4, Lines 36, 39).

Mobile Learning Technology Characteristics

In consonance with proposed extension of UTAUT in this study, the mobile learning technology characteristics category generated seven themes based on the literature (Chen et al., 2002). The derived themes are: timely access of information, personal learning satisfaction, learning mobility, communication, resource multiplicity, learning authentication and integration of multiple resources. The following sections explains the analysis of these themes through the interviews.

Timely Access of Information. Participants were asked *How does getting timely information characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* All fifteen participants reported timely access of information is an

attractive characteristic for them to use mobile learning technology. This characteristic recorded twenty-four references throughout the interviews. Thirteen participants describe it with positive phrases such as “best characteristic” (Interviewee 2, Line 47), “Main reason for me to use mobile learning technology” (Interviewee 3, Line 42), “The most important characteristic ever” (Interviewee 6, Line 43), “The reason for this technology success” (Interviewee 4, Line 44), “Biggest motivation for me” (Interviewee 8, Line 43), “If it is not available, I won’t use mobile learning technology” (Interviewee 12, Line 26) and “Sure! [It is] the most important advantage of mobile learning” (Interviewee 11, Line 42). Ten participants indicated this characteristic enabled them to save time and access information easily.

Personal Learning Satisfaction. Participants were asked *How does the satisfying personal needs and initiatives characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* Fourteen participants reported this characteristic as an attracting factor to use mobile learning technology. Sample uses of this characteristic are participation in research courses and information confirmation outside of classes. One participant reported this characteristic as a non-attracting feature where mobile learning technology is similar to all other available technologies in this quality (Interviewee 8).

Learning Mobility. Participants were asked *How does the using mobile learning technology in different settings characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* All fifteen participants indicated the importance of this quality in attracting them to use mobile learning technology, and this quality was mentioned eighteen times through the interviews. Sample quotes include “learning became like chatting” (Interviewee 7, Line 50), “most of information we obtained through conventional methods became not enjoyable and not beneficial” (Interviewee 9, Lines 44-45) and “whenever things popped in

my mind, I always search through my cellphone even in my school research." (Interviewee 12, Line 30).

Communication. Participants were asked *How does the communicating with peers, professors, and experts characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* All fifteen participants reported the attractiveness of this characteristic in using mobile learning technology, and it is mentioned sixteen times during the interviews. Communication with professors through mobile learning technology indicated by eight participants while communication with peers was mentioned six times. Sample quotes for this usage include "It is possible to have an exam tomorrow and I can communicate with my professor tonight" (Interviewee 1, Line 115).

One participant indicated "It is a super quality! When a professor asks us to do an assignment or research, since we are still students, it is normal to have some mistakes and they usually notify us through email to fix our work… I only communicate with two professors through email and the rest of them through WhatsApp." (Interviewee 13, Lines 45-48).

Another participant reported that "Of course with experts, it is hard to get their phone numbers, but through mobile learning [technology] it is easy!" (Interviewee 8, Lines 56-57).

Resources Multiplicity. Participants were asked *How does the finding different learning materials characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* All fifteen participants found this characteristic attractive to use mobile learning technology. Two participants indicated this quality as a satisfying quality for different learning styles needs: visual, verbal and logical, etc. (Interviewees 2,8). All mentioned usages of this characteristics are outside of class uses such as "understanding theoretical subjects",

"laboratory courses", "clarification" and "seeking more information". YouTube and Google are namely mentioned throughout the interviews.

Learning Authentication. Participants were asked *How does the relating your learning with real life examples and issues characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* Thirteen participants described this characteristic as attractive to use mobile learning technology. Six participants reported and provided examples of situations where mobile learning technology helped them go back to course materials when dealing with real problems at hand; however, one participant mentioned rechecking with professors or peers as a confirmation method. Two health major participants indicated frequent use of this characteristic. One participant preferred to ask a professor rather than use mobile learning technology in such a situation while the participant provided reluctant answer "Maybe! It might help me moderately.".

Integration of Multiple Resources. Participants were asked *How does the integrating different learning materials with each other characteristic of mobile learning technology attract you to use mobile learning technology in your learning?* Thirteen participants were able to integrate different learning materials when using mobile learning technology, and they report it as an attractive characteristic; however, two participants mentioned time-consuming and distraction as drawbacks of this quality where they took a long time to figure out how to integrate all these materials; they found textbooks much easier in integrating different learning materials. A sample quote is "Of course. This point attracted me. Sometimes I find the textbook author is beating around the bush… here is where mobile learning technology excels. Through one website, you find different learning formats … with no boredom, you come up with 90% understanding level." (Interviewee 8, Line 84-89).

Self-management of Learning

According to the proposed extension of UTAUT in this study, if students are able to engage in learning autonomously and have a degree of self-discipline, they will likely accept using mobile learning technology. The self-management of learning category generated three themes: self-discipline, time management and goal achievement. The following paragraphs present results for the analysis of these themes.

Self-Discipline. Participants were asked *Does studying by using mobile learning technology help you to be self-disciplined in your learning? Why or why not and how?* Twelve participants reported the helpfulness of mobile learning technology in being self-disciplined. The organization of coursework and course materials were reported by nine participants as the most self-disciplined tool when using mobile learning technology. Sample quotes include "I became more self-disciplined! We finish in less time.", Now, no binders! After mobile learning [technology], I organize my files in seconds." (Interviewee 8, Lines 94-96), "Yes, learning became enjoyable! Not boring like the textbook… now, I am excited to study and seeking more information." (Interviewee 2, Line 92-94) and "I feel self-disciplined! I find my assignments organized on BlackBoard… my class attendance is available in BlackBoard as well." (Interviewee 6, Lines 81-84). In contrast, three participants mentioned that mobile learning technology did not help them to become self-disciplined because of "time waste" (Interviewee 5, Line 75), "less reliance on mobile learning technology" (interviewee 4, Line 90) and "laziness effect of reliance on mobile learning technology" (Interviewee 14, Lines 71-72).

Time Management. Participants were asked *Does studying by using mobile learning technology help you to manage your study time effectively? Why or why not and how?* Eleven participants reported that mobile learning technology helped them in managing their study time.

Eight participants indicated reductions in study time after using mobile learning technology. Sample quotes include “My study time became three times less than before mobile learning technology.” (Interviewee 8, Lines 104-105), “It saved 50% of study time.” (Interviewee 12, Line 58) and “the study time started to become less because of the multiple resources… I save three quarters of my time.” (Interviewee 13, Lines 78-80). An opposing view were reported by four participants where mobile learning technology did not help them to manage their study times. Sample responses include “because it is available all the time, I became careless to the time issue.” (Interviewee 3, Line 78), “It takes a long time... because I do not accept any answer. I search for one, two and three for confirmation.” (Interviewee 4, Line 100-101) and “No, I feel it is not helping me because, as I told you, the main reason is because it takes a longer time than searching for the required information… learning tasks are interrupted with irrelevant tasks.” (Interviewee 5, Lines 79-80).

Goal Achievement. Participants were asked *Does studying by using mobile learning technology help you to achieve your learning goals? Why or why not and how? All* fifteen participants reported the helpfulness of mobile learning technology in achieving their learning goals. Five participants indicated the contribution of mobile learning technology in their self-development through “learning new things” (Interviewees 10,13,14), “working, studying and taking care of family at the same time” (Interviewee 1) and “improving performance on the job” (Interviewee 5). Three participants mentioned “GPA and grade” improvement as learning goals (Interviewees 2,6), while two other participants attributed their improvement in “English”, “research” and “job interviews” to the use of mobile learning technology (Interviewees 9,11,14).

CHAPTER 5: FINDINGS AND DISCUSSION

5.1 Introduction

Chapter Five provides an overview of the study results combined with detailed discussion for the results by virtue of the literature. Future research and recommendations also are presented in this chapter. A conclusion of the study is presented at the end of this chapter.

5.2 Learning Expectancy

The first question in this study was *Does learning expectancy have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?* This question was partially combined with question seven where the question *was How do age, gender, and eLearning experience moderate learning expectancy to influence Saudi higher education students' behavioral intention to use M-learning technology?* To answer this, Hypothesis One was proposed as follows: *Learning expectancy has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience such that the effect will be stronger for men, particularly younger men with high experience in eLearning.*

Learning expectancy is defined as the degree to which students' believe that mobile learning technology will benefit them in performing learning tasks. The first result of this study did not support Hypothesis One where the influence of learning expectancy on students' behavioral intention to use mobile learning technology did not differ between gender groups, age groups, and eLearning experience groups. In other words, the learning expectancy construct contributed significantly and positively in students' behavioral intention to use mobile learning technology regardless of their genders, ages, and eLearning experiences. Compared to the literature, this finding contrasts where learning expectancy, named performance expectancy in the model, found

influencing behavioral intention to use technology moderated by gender and age more significantly in younger men (Venkatesh et al., 2003).

This finding is consistent with findings from previous studies by Wang et al. (2009), Donaldson (2010), Nassuora (2012), Liew et al. (2013), Thomas et al. (2013), Al-Hujran et al. (2014), Mtebe and Raisamo (2014) and Arpaci (2015) where performance expectancy, modified learning expectancy in this study, found to significantly influence behavioral intention to use mobile learning technology disregarding the moderators' effects: age and gender.

The insignificance of moderator effects in the first finding might be interpreted as resulting from very limited variability in the moderator variables, at least for age and eLearning experience. To illustrate, the age moderator was measured using only three fairly broad categories—18-22, 23-27, and above 28—which failed to capture the full variety of participants' ages. Similarly, the eLearning experience moderator was coded into only two categories-- 0-3 years and over 3 years—which also restricted the variance on the variable. Anything that limits the freedom of a variable to vary across its full range will also limit that variable's capacity to covary, and thus, correlate with other variables in an analysis. If age and eLearning experience data had been collected in a manner that allowed these moderator variables to show greater variability, such as using a larger number of narrower categories, age and eLearning experience would have had a greater chance to emerge as significant moderator variables. The absence of moderator effects has strengthened this finding's generalizability by showing no significant difference between genders, ages and eLearning experiences on the significant relationship between learning expectancy and behavioral intention to use mobile learning technology. This result reveals that Saudi higher education students believed in the usefulness of mobile learning technology in performing their learning tasks regardless their genders, ages and level of eLearning experience.

This is supported by the qualitative result where all students found mobile learning technology useful in their academic endeavors. Expediting accomplishments and improving grades through mobile learning technology were found to be helpful by interview participants. Therefore, this combined finding suggests that administrators and faculties should take advantage of the perceived usefulness of mobile learning technology among Saudi higher education students and provide them with learning opportunities that facilitate the use of mobile learning technology to support learning. For example, faculty could incorporate mobile learning technology when delivering contents to students and preparing them for exams or quizzes. Administrators also could push to use mobile learning technology by employing mobile-friendly learning management systems to expedite students' performance in learning.

5.3 Effort Expectancy

The second question in this study was *Does effort expectancy have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?* This question was partially combined with question seven, *How do age, gender, and eLearning experience moderate effort expectancy to influence Saudi higher education students' behavioral intention to use M-learning technology?* To answer this, Hypothesis Two proposed that *Effort expectancy has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience such that the effect will be stronger for women, particularly younger women with low experience in eLearning.*

Effort expectancy is defined as the level of ease of using mobile learning technology as perceived by Saudi higher education students. The second result of this study did not support Hypothesis Two. Although effort expectancy was consistently found to contribute directly to higher levels of behavioral intention of using mobile learning technology, this effect was not

significantly moderated by gender, age, or eLearning experience, nor did gender, age, or eLearning experience exert any significant main effects on students' behavioral intentions despite the consistent direct contribution of effort expectancy in students' behavioral intention to use mobile learning technology. Contrary to Venkatesh et al. (2003); Donaldson (2010); Liew et al. (2013); and Thomas et al. (2013), this study found that effort expectancy has a significant influence on Saudi higher students' behavioral intentions regardless their genders, ages and eLearning experiences. The literature suggests that effort expectancy moderated by gender, age and experience influences the individuals' behavioral intentions to use technology and such influence will be stronger form women, especially younger women with less experience (Venkatesh et al., 2003).

This finding is consistent with findings from Al-Hujran et al. (2014); Arpaci (2015); Badwelan et al. (2016); Nassuora (2012); Shorfuzzaman and Alhussein (2016); Wang et al. (2009) where effort expectancy influences behavioral intention of Saudi higher education students to use mobile learning technology. The generalizability of this finding increases with absence of moderators' significance in influencing the significant and direct relationship between effort expectancy and students' behavioral intentions.

The qualitative analysis reveals robust support of these findings where all interview participants indicated the ease of use and learnability of mobile learning technology. The ease of use theme weighted 140% and was mentioned twenty-one times. This frequent appearance of the ease of use theme throughout interviews manifests the high perceived ease of use of mobile learning technology. Learnability is another theme representing effort expectancy where all participants found mobile learning technology easy to learn and which increases the influence of effort expectancy on students' behavioral intentions to use mobile learning technology. This study

found that computer proficiency and regular practice are the main reasons for perceiving mobile learning technology as easy to use. The available self-learning resources such as YouTube or Google, increase the learnability of mobile learning technology. This finding asserts the perceived ease of use as an essential predictor of students' acceptance of mobile learning technology. Thus, this finding suggests that instructional designers as well as instructor should take into account the ease of use and learnability when designing or utilizing instructional materials. Administrators and eLearning deans in Saudi universities should consider ease of use and learnability when making decisions regarding purchasing or designing learning management systems in order to increase acceptance among students through mobile learning technology.

5.4 Social Influence

The third question in this study is *Does social influence have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?* This question was partially extended in question seven, *How do age, gender, and eLearning experience moderate social influence to influence Saudi higher education students' behavioral intention to use M-learning technology?* To answer this, Hypothesis Three proposed as follows *Social influence has a significant effect on students' behavioral intention to use mobile learning technology moderated by gender, age, and eLearning experience such that the effect will be stronger for women, particularly older women with low experience in eLearning.*

This study defines social influence as students' perceptions regarding other important people in their lives who believe in the importance of students' use of mobile learning technology. The social influence construct has four items represented in the questionnaire; however, due to internal inconsistency, two items of social construct eliminated. That leaves social construct with two items represented (SI_1 and SI_2 in Table 2). The third result of analysis did not support

Hypothesis Three where social influence was consistently found to contribute directly to higher levels of behavioral intention, but none of the hypothesized moderating effects involving gender, age, or eLearning experience were supported. In fact, contrary to Hypothesis Three, the relationship between social influence and behavioral intention was stronger for men (r = .450) than for women (r = .321). Unlike a previous study done by Venkatesh et al. (2003), this finding suggests that social influence has significant influence on students' behavioral intention to use mobile learning technology moderated only by gender, and such effect is stronger for men than women.

This finding is consistent with findings from Wang et al. (2009) where social influence has a significant influence on students' behavioral intention to use mobile learning, and such influence was stronger for men than women. Another part of this finding is the significant influence of social influence on students' behavioral intention regardless their ages and eLearning experiences. This obtained finding is in a line with the findings from Al-Hujran et al. (2014); Iqbal and Qureshi (2012); Nassuora (2012) where they found social influence insignificantly influencing students' behavior to use mobile learning technology disregarding students' ages and experiences.

Such a contrary finding between the present study and previous studies could be attributed to differences between the studies in how the social influence construct was measured. This study found that in order to create an internally consistent subscale, two out of the four original items had to be eliminated. If social influence was fully represented by all items, that could yield a more consistent finding with the literature. Another reason for the appearance of this contrast could be associated with the restriction of variability in the age and eLearning experience variables that were discussed previously. The collection of data on age and eLearning experience uses narrower ranges which might have resulted in greater consistency between findings among studies.

The qualitative analysis for interview data provides two important themes: encouragement and support. All interview participants reported their encouragement in using mobile learning technology. The most encouragement sources came from universities, professors and peers while self-encouragement and technology functions were found to be less encouraging factors to use mobile learning technology. Which indicates use of mobile learning technology by professors and peers exhibits usefulness and ease of use of this technology, and exposes students to social influence to construct positive intentions to use mobile learning technology.

Support is another theme in the social construct where all interview participants respectively relied on their private support in order to use mobile learning technology. Students found no or insufficient institutional support to use mobile learning. Therefore, this finding suggests policymakers of mobile learning in Saudi higher education should create a supportive social environment before implementing mobile learning technology. Such an environment would include peers and professors as early adopters who lead the majority adopters in later phases (Rogers, 2003). Such an encouraging surrounding environment will positively influence students' behavioral intention to try out this new technology (Tan, Ooi, Sim, & Phusavat, 2012). Additionally, eLearning and distance learning deanships among Saudi universities should offer on-campus and online support for students to overcome challenges and difficulties in using mobile learning technology.

5.5 Facilitating Conditions

The fourth question in this study is *Do facilitating conditions have a significant influence on Saudi higher education students' use behavior of mobile learning technology?* This question was partially extended in question seven: *How do gender and eLearning experience moderate facilitating conditions to influence Saudi higher education students' use behavior of mobile*

learning technology? To answer this, Hypothesis Four proposed: *Facilitating conditions have a significant effect on students' use behavior of mobile learning technology moderated by age and eLearning experience such that the effect will be stronger for older students with high experience in eLearning.*

As mentioned in Chapter Four, the five items used to measure the construct of facilitating conditions were found internally inconsistent and required eliminating three items in order to validate this construct, leaving the facilitation conditions construct with only two representative items (FC_4 and FC_5 in table 2). Consistent with literature, the facilitation conditions construct is the only construct that proposed to directly influence students' use behaviors rather than behavioral intentions.

The fourth result of the analysis did not support Hypothesis Four where the facilitating conditions construct was not found to be significantly correlated with use behavior. Although the moderating effect of age on the facilitating conditions-use behavior relationship was marginally significant, the correlation between facilitating conditions and use behavior was found to be *negative* (r = -.105) among older students (not positive as hypothesized), and the relationship was only very slightly positive among younger students (r = .046). The prediction that students with more eLearning experience would show a stronger positive correlation between facilitating conditions and use behavior than students with less eLearning experience also was not supported, as eLearning experience did not significantly moderate the relationship between facilitating conditions and use behavior.

Contrary to the original UTAUT model (Venkatesh et al., 2003), the facilitating conditions construct in the present study did not significantly influence Saudi students' use behavior of mobile learning technology. This finding is very likely due to the elimination of three items from the

measure of facilitating conditions in this study due to their detraction from internal consistency. The construct of facilitating conditions was measured very differently in this study than in previous studies. Greater similarity in measures of the construct might have produced results that were more consistent with previous findings in the literature. The failure of age and eLearning experience to fulfill their predicted roles as moderators might again be attributed to restricted variability in both of these variables.

This finding is in line with Arpaci's (2015) study where the facilitating conditions construct is not significant in Turkish culture. This is a very similar culture to the Saudi culture where Saudi Arabia and Turkey are both collectivist countries while the original UTAUT was implemented in an individualist country, United States.

Thus, the two proposed items that were used to measure the facilitating conditions construct in the present study, perceived information security and privacy, were found to not significantly influence use behavior of Saudi higher education students toward mobile learning technology. This finding is supported by findings from the qualitative analysis where interview participants were confused between information security and privacy in mobile learning technology. Although the researcher clarified these terms to each single interviewee, some participants' answers addressed privacy concerns as the same as information security concerns.

Regarding information security, hacking through permission access to the devices is the greatest concern for the participants when visiting non institutional websites and protection systems and applications is the most useful perceived way to encounter such a threat. In the privacy concerns, fewer participants reported concerns about their privacy when using mobile learning technology due to the limited private data that they made available. Evidently, those participants either underestimated or lacked sufficient understanding of security and privacy in mobile learning

technology. Thus, this misconception or underestimation potentially contributes to the inconsistency of this finding with the literature. Hence, this finding suggests that administrators as well as faculty should inform students about potential threats of information security and privacy threats when using mobile learning technology. Librarians also should work with students to alter their current resources with more academic, secured and trusted resources.

5.6 Mobile Learning Technology Characteristics

The fifth question in this study is: *Do mobile learning technology characteristics have significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?* This question was partially extended in question seven: *How does the eLearning experience moderate mobile learning technology characteristics to influence Saudi higher education students' behavioral intention to use M-learning technology?* To answer this, Hypothesis Five proposed: *Mobile learning technology characteristics have a significant effect on students' behavioral intention to use mobile learning technology moderated by eLearning experience such that the effect will be stronger for students with high eLearning experience.*

The fifth result of the analysis did not support Hypothesis Five. Mobile learning characteristics were found to be positively correlated with behavioral intention, as expected, but the data did not support the hypothesis that the strength of that relationship would be moderated by eLearning experience. Specifically, individuals at both levels of eLearning experience showed about equal relationship between mobile learning characteristics and behavioral intention. Therefore, this finding suggests that mobile learning characteristics significantly influences Saudi students’ behavioral intentions to use mobile learning technology disregarding their eLearning experience levels.

The absence of the eLearning experience moderating effect in the present study could be interpreted again as resulting from the use in this study of only two, very broad categories to measure eLearning experience. The first category includes students with no experience up to three years of experience while the other category includes students with more than three years eLearning experience. Using a larger number of narrower categories, and especially separating students with no eLearning experience, might have revealed different findings; however, more studies are still needed to investigate the moderating effects of eLearning experience on influencing the relationship between mobile learning characteristics construct and students' behavioral intentions.

Since the present study employs a whole new set of mobile learning characteristics, these characteristics provide UTAUT literature with a promising construct especially in the area of mobile learning technology acceptance. Hao, Dongsheng, Jianming, and Yongqin (2010) included the situation relevance characteristic of mobile technology under different effort expectancy construct and found it significant in predicting users' acceptance of mobile technology. Although technology characteristics would appear more relevant to performance expectancy, the present study suggests proposing technology characteristics as a distinct construct to track its function in influencing users' acceptance.

The results from the qualitative analysis revealed that interview participants heavily and frequently reported their answers on the construct of mobile learning technology characteristics than other constructs. Respectively, all participants perceived all mobile learning characteristics as major contributors to their acceptance of mobile learning technology. Participants highly perceived the benefits of mobile learning technology when they are in situations that need on time access of information, mobilized learning settings, interactive communication and multiple

resources. That suggests administrators and faculty should take advantage of their students' perceptions toward mobile learning technology through offering multiple learning resources, interactive communication channels and learning on-the-go strategies, such as flipped classroom.

Participants found mobile learning technology to somewhat stratifying their peroneal learning needs and initiatives in limited situations especially in research when they need to participate frequently or confirm information. This finding could be attributed to students' level of engagement with mobile learning technology where they describe it as voluntary use. When faculty push toward the use of mobile learning technology, more satisfaction of personal learning is accordingly expected. In learning authentication, participants had difficulties identifying situations for such usage of mobile learning technology in their learning, which required more clarifications of this question. The present study deduced that the popularity of lecture-based learning strategy hinders students to situate their learning experiences in real life. Only health major students reported the significance of this characteristic in their learning where authentic /clinical learning took place (AlHaqwi, van der Molen, Schmidt, & Magzoub, 2010). This finding suggests that academic departments, instructional designers and faculty should consider alternative learning strategies when approaching any subject that enables students to relate learning to their lives and to put their knowledge in practice.

Overall, the present study successfully extended UTAUT to include the mobile learning technology characteristics construct; however, more moderating factors should be considered in future research to understand in depth the influence of the antecedent construct on the acceptance of mobile learning technology. Such moderating factors may include type of use, voluntary or mandatory, level of engagement with mobile learning technology and students' academic majors.

5.7 Self-management of Mobile Learning

The sixth question in this study is: *Does self-management of mobile learning technology have a significant effect on Saudi higher education students' behavioral intention to use mobile learning technology?* This question was partially extended in question seven: *How does eLearning experience moderate self-management of mobile learning technology to influence Saudi higher education students' behavioral intention to use M-learning technology?* To answer this, Hypothesis Six proposed: *Self-management of learning has a significant effect on students' behavioral intention to use mobile learning technology moderated by eLearning experience such that effect will be stronger for students with high eLearning experience.*

The sixth result of the analysis did not support Hypothesis Six where the multiple regression analysis used to explore it failed to produce a significant main effect of self-management of learning. In addition, and also contrary to Hypothesis Six, eLearning experience was not found to significantly moderate the relationship between self-management of learning and behavioral intention, i.e., there was no substantial difference in the nature of the relationship between self-management of learning and behavioral intention as a function of eLearning experience.

Both the present study and Donaldson (2010) found that self-management of learning has no significant influence on students' behavioral intentions to use mobile learning technology. Conversely, Badwelan et al. (2016); Jawad and Hassan (2015); Liew et al. (2013); Wang et al. (2009) have found that self-management of learning is a significant predictor of students' behavioral intentions toward using mobile learning. This contradictory finding could be interpreted in the slight differences in the wording of items between the Arabic and English versions of the questionnaire. This is supported by the interviews where the participants experienced difficulties

in understanding the Arabic translation of the self-discipline term due to its unpopularity. Donaldson (2010) reported the same difficulty with English-speaking college students who were unfamiliar with the self-directed and self-discipline terms; therefore, it is concluded that this difficulty is not a translation issue as much as unpopularity of the term itself especially if are taken into-account face and content validations of the Arabic versions of the instruments.

Interestingly, the qualitative analysis reveals some reluctance about self-management of learning compared to other constructs. Although the majority of participants reported the benefits of mobile learning in self-discipline, others drew attention toward serious consequences of mobile learning on their self-discipline such as encouraging laziness. More than one participant found mobile learning technology encouraging laziness in academic endeavors where other important resources such as textbooks and libraries were neglected. Another consequence is time waste where students found study times through mobile learning technology interrupted with irrelevant tasks such as browsing or chatting. However, these consequences did not outweigh the benefits of mobile learning technology in self-disciplines where all participants perceived mobile learning technology as a helpful technology in achieving their goals either in school or work. This finding suggests that there is a need for more investigations of the influence of self-management of learning on students' behavioral intentions toward mobile learning technology. Such investigations will add to the literature important input regarding the merit of this construct in UTAUT.

5.8 Additional findings

As stated in Chapter Three, behavioral intention plays the role of dependent and independent variable. The aforementioned results investigated behavioral intention as a dependent variable of the six antecedent constructs; however, it is an independent variable when influencing

students' use behavior of mobile learning technology. Both the present study and Venkatesh et al. (2003) found that behavioral intention of Saudi higher education student toward mobile learning technology significantly influence their use behavior of mobile learning technology. Thus, the more students have positive behavioral intentions toward mobile learning technology, the more they use mobile learning technology.

Interestingly, this study found that the level of behavioral intention toward using mobile learning technology differs significantly between distance education students and on-campus students. Saudi distance education students expressed a higher level of behavioral intention to use mobile learning technology than on-campus students. This finding could be interpreted by the difference between expectations among the two groups where distance education students expect more facilitation in terms of content accesses and communication with faculty and colleagues. On the other hand, on-campus students expect more physical appearance on-campus in order to attend classes and communicate with professors and peers.

Regarding use behavior, this study found that there is no significant difference between distance education students and on-campus students in terms of their actual uses of mobile learning technology. This finding could be interpreted by insufficient infrastructure and support that brought the two groups to a similar level of use. This is supported by the qualitative analysis where all participants respectively relied on their private support in order to use mobile learning technology because of the absence of institutional support.

5.9 Implications

The study findings present implications for different stakeholders. It is crucial to understand the factors that influence students' acceptance of mobile learning technology for not

only faculty, but also for policy and decision-makers, universities administrators and instructional designers.

Policy and Decision Makers

The AFAQ national plan in Saudi higher education is a promising plan that has yielded several projects; however, policy and decision-makers in Saudi higher education should consider students' acceptance of any mobile learning technology initiative before the implementation process. The findings from this study could serve as evidence to support such initiatives where students of Saudi public universities exhibited high intentions toward using mobile learning technology. On the other hand, the actual use of this technology is hindered by the lack of institutional support and facilitating conditions. Moving forward requires reliable infrastructure such as wireless networks and high speed Internet. These requirements need to be facilitated by the Saudi Ministry of Education alongside other governmental bodies such as the Ministry of Communication and Information Technology.

Universities Administrators

Participants in this study expressed low levels of engagement with mobile learning technology because of the incompatibility of the current technological systems with mobile technology. Therefore, IT departments should consider mobile access of their systems as well in order to meet all stakeholders' needs. Some of these systems are learning management systems, enrollment systems, email, and libraries. In addition, eLearning and distance education deanships could help students by offering help desks to assist students to overcome any challenges using mobile learning technology either on campus or remotely. That will encourage students to be more involved in mobile learning and support on-the-go learning. Another support for mobile learning technology is through establishing educational policy regarding the use of mobile learning

technology on campus where some students experienced difficulties with their professors regarding its use in classrooms. By doing so, professors as well as students will realize the benefits of mobile learning technology in teaching and learning.

Faculty

Faculty are primary stakeholders of mobile learning technology, so they should incorporate mobile learning technology in their course either in blended or fully online fashion. That requires more communication with students out of class through forming collaborative learning activities. Another finding in this study is that students experienced difficulties in relating their learning to real life problems; therefore, it is the faculty's role to implement learning strategies that help students to put their knowledge in practice through well-established learning strategies such as problem-based learning. To do so, faculty may work with Quality and Development Deputyships in their colleges to get the required resources to alter their conventional teaching strategies. In addition, faculty should express more flexible procedures to accommodate in-class usage of mobile learning technology since their students show high interest in this technology and perceive its benefits for their learning. Moreover, it is pivotal for students' learning to provide a rich learning environment through incorporating multiple learning resources to meet different learning needs; therefore, faculty should offer access to multiple resources and facilitate learning through them. Learning management systems, for example, enable faculty to incorporate multiple resources in one place and track students' engagements with these resources. Finally, faculty should consider mobile learning technology in their assessment and evaluation processes, which requires replacement of the conventional examination with mobile friendly ones.

Instructional Designers

One of the primary tasks of instructional designers is the analysis of their clients' needs. This study found that students of Saudi public universities show high interest and acceptance of mobile learning technology. Therefore, developing mobile-friendly contents might increase success if any instructional intervention in such an environment. However, this study recruited its participants only through social networking sites and applications, so it is recommended at this stage to design mobile-friendly instructional materials alongside current instructional materials. Effort expectancy or ease of use was found to be significant in influencing students' behavioral intentions toward using mobile learning technology; thus, instructional designers should take into account the ease of use of their designs when developing contents for Saudi public universities. Further, this study found mobile learning technology characteristics are significant in predicting students' acceptance of this technology. Accordingly, instructional designers should functionalize these characteristics in their mobile-friendly designs, specifically enabling timely access of information, multiplicity of resources and interactivity of communication where these characteristics were highly perceived by students. Overall, instructional designers should work with all stakeholders (i.e., students, faculties and administrators) to address their needs in any mobile learning technology project.

5.10 Limitations

This study was restricted by many limitations which are stated hear to inform future research to address them properly. First, this study is limited to one acceptance model, UTAUT, and the literature of acceptance is growing rapidly; therefore, future research could conduct compression studies between acceptance models and investigate each model's ability to explain the acceptance variance in a specific context.

Second, this study is a cross-sectional study designed to investigate the acceptance variables at a single point; however, behavioral intentions and perceptions change over time, so future research could consider conducting longitudinal studies to explore the changes in acceptance intentions and behaviors. Third, the present study employed a social network sampling method to recruit its participants; however, students with no social networking access were not represented in this study. Therefore, a combination of conventional and social networking sampling techniques will be beneficial for future studies.

In the instrumentation, this study employed a restricted variability of the two moderating variables: age and eLearning experience. With a broader variability, results could differ. Additionally, the two instruments used to collect data in this study are self-reported, which allows a bias effect to occur. Finally, this study is geographically limited to Saudi Arabia, and generalization of findings is limited to this spatial limitation.

5.11 Future Research

With the growth of the literature in mobile learning technology acceptance, findings are still inconsistent among studies and require more attention toward any addition or modification of the current models and constructs. There are still many findings that need to be confirmed through future research. The following section provides a recommendation list for future research.

1. UTAUT needs to be rephrased and rewritten to fit the educational context. The original model by Venkatesh et al. (2003) was developed in organizational settings; therefore, proposing and validating an educational version of this model will help the implementation of this model in educational settings. This study rephrased only one construct, learning expectancy; however, students needed more clarifications with

some questionnaire items in order to answer them appropriately. This an opportunity for exploration through future research.

2. The addition of new constructs should be aligned properly with the current model of UTAUT. This study found, among the literature, many added constructs misplaced or not well-aligned with UTAUT. For example, social influence and facilitating conditions may overlap if they are extended to include more items. Social influence is more related to the subjective influences on acceptance while the facilitating conditions construct represents objective influences on acceptance.
3. The moderating variables were restricted in their variations in this study; therefore, future research could employ a wider range of ages and eLearning experience.
4. Future research could include voluntariness of use as a moderator to investigate its influence on students' acceptance of mobile learning technology.
5. Other variables could be proposed in future research. For example, type enrollment was included in this as a demographic variable; however, it yielded significant findings. Thus, future research could merge this moderator to the UTAUT model and investigate its influence on other constructs as a moderating variable.
6. Self-management of learning construct has yielded inconsistent findings among studies of UTAUT. There is still need for more research to confirm findings of this construct; however, the present study and Donaldson (2010) have reported wording difficulties with this construct; thus, future research should consider more simplified language to be easily understood by students.

7. This study pioneered the construct of mobile learning technology characteristics in the proposed form. More research is needed to confirm the validity and reliability of this construct addition into UTAUT.
8. Future research could include private universities students to explore the difference between acceptance behavior of mobile learning technology in these two different settings.

5.12 Conclusion

This study aimed to explore the acceptance of mobile learning technology by students in Saudi public universities. Among acceptance models, unified theory of acceptance and use of technology, UTAUT, was utilized to guide the exploration in this study. The result of the study revealed that UTUAT's six constructs (learning expectancy, effort expectancy, social influence, facilitating conditions, mobile learning characteristics, and self-management of learning) explained 58.61% of variance in students' behavioral intention and use behavior of mobile learning technology. This is lower than the original UTAUT model by Venkatesh et al. (2003) where it was found to explain 70% of variance in behavioral intention and use behavior and were also lower than Donaldson (2010) where UTAUT explained 75% of variance in behavioral intention. However, this cumulative explained variance is consistent with Wang et al. (2009) where UTAUT was found to explain 58% of variance in students' behavioral intention and with Thomas et al. (2013) who found UTAUT explained 59.3% of variance in students' behavioral intention. In contrast, this value is higher than studies done by Iqbal and Qureshi (2012); Liew et al. (2013); Mtebe and Raisamo (2014) where most found UTAUT explained less than 30% of variance in students' behavioral intentions to use mobile learning technology.

The findings from this study assert that learning expectancy, effort expectancy, social influence, mobile learning characteristics are significant predictors of students' intentions to use mobile learning technology regardless the moderating effects of gender, age, and eLearning experience. Unexpectedly, the social influence construct is the only construct that was moderated by gender where men show a stronger behavioral intention to use mobile learning than women. Facilitating conditions and self-management of learning in this study were found insignificant constructs in predicting students' behavioral intention and use behavior of mobile learning technology. These findings are justified in the literature of UTAUT. The exploratory analysis revealed an interesting finding that distance education students showed significantly higher intentions to use mobile learning technology than on-campus students, but there was no significant difference between them in the actual use of mobile learning technology.

This study has partially succeeded in extending UTAUT to include one new significant construct which is mobile learning technology characteristics. Also, it succeeded to signify the rephrased and rewritten learning expectancy construct. On the contrary, another proposed construct, self-management of learning, needs further investigation in future research in order to justify its evolvement in UTAUT and confirm its significance to predict behavioral intentions toward mobile learning technology.

Finding from this study can be used by policy and decision-makers in Saudi higher education when planning for mobile learning technology initiatives. University administrators and faculty can use these findings as well to facilitate mobile learning and meet their students' expectations. Finally, instructional designers should move forward and consider mobile-based interventions since most students showed high intentions of using mobile learning technology.

APPENDIX A: THE QUESTIONNAIRE ITEMS

Name (optional): _____. **Gender**: ☐ Male ☐ Female

Age: ☐ 18-22 ☐ 23-27 ☐ above 28.

ELearning experience: ☐ 0- 3 years ☐ More than 3 years

Type of enrollment: ☐ On campus ☐ Distance education

Do you want to participate in a later interview regarding this questionnaire?

☐ Yes, please write your email in the following box to receive the invitation

☐ No

Q1: kindly, choose answer that applies. (1 answer for each item)

Items	Strongly agree	Somewhat agree	Neither agree nor disagree	Somewhat disagree	Strongly disagree
I find mobile learning technology useful in my learning.	❍	❍	❍	❍	❍
Using mobile learning technology enables me to accomplish learning activities more quickly.	❍	❍	❍	❍	❍
Using mobile learning technology increases my learning productivity/achievement.	❍	❍	❍	❍	❍
If I use mobile learning technology, I will increase my chances to get better grade.	❍	❍	❍	❍	❍
If I use mobile learning technology, the quality of my assignment will be better.	❍	❍	❍	❍	❍
My interaction with mobile learning technology would be clear and understandable.	❍	❍	❍	❍	❍
It would be easy for me to become skillful at using mobile learning technology.	❍	❍	❍	❍	❍

I would find mobile learning technology easy to use.	❍	❍	❍	❍	❍
Learning to operate mobile learning technology would be easy for me.	❍	❍	❍	❍	❍
People who influence my behavior think that I should use mobile learning technology.	❍	❍	❍	❍	❍
People who are important to me think that I should use mobile learning technology.	❍	❍	❍	❍	❍
My professors have been helpful in the use of mobile learning technology.	❍	❍	❍	❍	❍
In general, my university has supported the use of mobile learning technology.	❍	❍	❍	❍	❍
I have the necessary resources to use mobile learning technology.	❍	❍	❍	❍	❍
I have the knowledge necessary to use mobile learning technology.	❍	❍	❍	❍	❍
At my university, a specific person or group is available for assistance with mobile learning technology difficulties.	❍	❍	❍	❍	❍
I have concerns regarding my information security when I use mobile learning technology.	❍	❍	❍	❍	❍
I have concerns regarding my privacy when I use mobile learning technology.	❍	❍	❍	❍	❍
In my study, if I need timely information or materials, I use mobile learning technology.	❍	❍	❍	❍	❍
My learning desires and needs initiate my use of mobile learning technology to seek information regarding my courses.	❍	❍	❍	❍	❍
I use mobile learning technology for learning in different settings not only in class setting.	❍	❍	❍	❍	❍
I use mobile learning technology to interact with peers, experts, and different learning materials such as videos, texts, pictures …etc	❍	❍	❍	❍	❍

Mobile learning technology helps me to solve real life problems outside of school.	❍	❍	❍	❍	❍
In my study, mobile learning technology helps me to integrate many information sources for the same topic.	❍	❍	❍	❍	❍
In my study, I am self-disciplined and find it easy to set aside reading and homework time.	❍	❍	❍	❍	❍
I am able to manage my study time effectively and easily complete assignments on time.	❍	❍	❍	❍	❍
In my study, I set goals and have a high degree of initiative.	❍	❍	❍	❍	❍
I intend to use mobile learning technology in the upcoming school year.	❍	❍	❍	❍	❍
I predict I would use mobile learning technology in the upcoming school year.	❍	❍	❍	❍	❍
I plan to use mobile learning technology in the upcoming school year.	❍	❍	❍	❍	❍

Q31: How often do you access the learning materials from your handheld mobile device?

- ❍ 1 - 3 times per month
- ❍ 1 -2 days per week
- ❍ 3 - 5 days per week
- ❍ 1 -2 times per day
- ❍ Several times per day

الملحق (أ) الاستبانة (النسخة العربية)

الاسم (اختياري) _____ . الجنس: ☐ ذكر ☐ أنثى

العمر: ☐ 18 – 22 سنة ☐ 23- 27 سنة ☐ فوق 28 سنة.

الخبرة في التعلم الإلكتروني: ☐ صفر – 3 سنوات ☐ أكثر من ثلاث سنوات.

نوع الدراسة: ☐ انتظام ☐ انتساب/ تعليم عن بعد

هل تود المشاركة في مقابلة لاحقاً حول هذه الاستبانة؟

☐ نعم، الرجاء كتابة بريدك الإلكتروني لتصلك دعوة للمشاركة في المقابلة

☐ لا

السؤال الأول: فضلاً اختر الإجابة المناسبة لك (إجابة واحدة لكل فقرة)

الفقرة	موافق بشدة	موافق إلى حدٍ ما	محايد	غير موافق إلى حدٍ ما	غير موافق بشدة
أَجدُ أن استخدام تقنيات التعلم المحمول مفيدة في تعلمي	○	○	○	○	○
استخدام تقنيات التعلم المحمول يمكنني من إنجاز أنشطة تعلمي بسرعة أكبر	○	○	○	○	○
استخدام تقنيات التعلم المحمول تزيد من إنتاجيتي وإنجازي خلال عملية التعلم	○	○	○	○	○
استخدام تقنيات التعلم المحمول يزيد من فرص حصولي على درجات أفضل	○	○	○	○	○
استخدام تقنيات التعلم المحمول يزيد من جودة واجباتي ومشاريعي التعليمية	○	○	○	○	○
أتوقع أن يكون تعاملي مع تقنيات التعلم المحمول واضحاً ومفهوماً	○	○	○	○	○
أتوقع أنه من السهل علي أن أصبح ماهراً في استخدام تقنيات التعلم المحمول	○	○	○	○	○
أتوقع أن تكون تقنيات التعلم المحمول سهلة الاستخدام	○	○	○	○	○
إن تعلُّم استخدام تقنيات التعلم المحمول سيكون سهلاً بالنسبة لي	○	○	○	○	○

الأشخاص الذين يؤثرون في سلوكي يعتقدون أنه يجدر بي استخدام تقنيات التعلم المحمول	○	○	○	○	○
الأشخاص المُهمُّونَ بالنسبة لي يعتقدون أنه يجدر بي استخدام تقنيات التعلم المحمول	○	○	○	○	○
أساتذتي يساعدونني على استخدام تقنيات التعلم المحمول	○	○	○	○	○
بشكل عام، جامعتي تدعم استخدام تقنيات التعلم المحمول	○	○	○	○	○
لدي الموارد الضرورية لاستخدام تقنيات التعلم المحمول (مثل الهواتف الذكية، شبكات الإنترنت ...إلخ)	○	○	○	○	○
أمتلك المعرفة اللازمة لاستخدام تقنيات التعلم المحمول	○	○	○	○	○
في جامعتي، يتوفر لدي شخص (أو مجموعة معينة) لمساعدتي في استخدام تقنيات التعلم المحمول	○	○	○	○	○
لدي مخاوف تجاه أمن معلوماتي حين أستخدم تقنيات التعلم المحمول	○	○	○	○	○
لدي مخاوف تجاه خصوصيتي حين أستخدم تقنيات التعلم المحمول	○	○	○	○	○
حينما أحتاج لمعلومات سريعة ومناسبة خلال دراستي فإنني أستخدم تقنيات التعلم المحمول	○	○	○	○	○
رغباتي وحاجاتي التعليمية هي ما يدعوني لاستخدام تقنيات التعلم المحمول	○	○	○	○	○
أستخدم تقنيات التعلم المحمول في أماكن متعددة وليس فقط داخل قاعة الدراسة	○	○	○	○	○
أستخدم تقنيات التعلم المحمول للتفاعل والتواصل مع زملائي أو المختصين في المقررات أو الوصول لمحتويات متعددة الوسائط (مثل فيديو، صور، خرائط، ملخصات ... إلخ)	○	○	○	○	○
تقنيات التعلم المحمول تساعدني في حل مشكلات الحياة الحقيقية خارج قاعة الدراسة	○	○	○	○	○
تقنيات التعلم المحمول تساعدني في دمج العديد من مصادر المعرفة المرتبطة بموضوع واحد	○	○	○	○	○
أنا منضبط ذاتيا في دراستي وأجد من السهل أن أحدد جانباً من وقتي للمذاكرة وحل الواجبات	○	○	○	○	○

لدي القدرة على إدارة وقت دراستي بشكل فعالٍ وبسهولة أكمل واجباتي في الوقت المحدد	○	○	○	○	○
أضع أهدافاً خلال دراستي ولدي مستوى عالٍ من المبادرة	○	○	○	○	○
أنوي استخدام تقنيات التعلم المحمول خلال العام الدراسي القادم	○	○	○	○	○
أتوقع أن أستخدم تقنيات التعلم المحمول خلال العام الدراسي القادم	○	○	○	○	○
أُخططُ لاستخدام تقنيات التعلم المحمول خلال العام الدراسي القادم	○	○	○	○	○

السؤال 31: في الغالب، كم مرةً تدخل إلى محتويات تعليمية من خلال هاتفك المحمول:

- ○ 3-1 مرات في الشهر
- ○ 2-1 مرات في الأسبوع
- ○ 5-3 مرات في الأسبوع
- ○ 2-1 مرات في اليوم
- ○ العديد من المرات في اليوم الواحد

APPENDIX B: INTERVIEW PROTOCOL

Interview Questions

1. In your study, does mobile learning technology helps you to improve your learning? Why or Why not? How?
2. During your study by using mobile learning technology:
    - How easy is mobile learning technology for you to use? Why?
    - If you lack skills in using mobile learning technology, what would you do? Why?
3. Who encouraged you to use mobile learning technology in your learning? Why?
4. Do you think you have the efficient support to use mobile learning technology in you learning? Why or Why not?
5. During your study using mobile learning technology, do you have concerns regarding your information security. Why and How?
6. During your study using mobile learning technology, do you have concerns regarding your privacy. Why and How?
7. How do the following characteristics of mobile learning technology in your learning attract you to use mobile learning technology?
    - Getting timely information
    - Satisfying your personal needs and initiatives
    - Using mobile learning technology in different settings
    - Communicating with peers, professors, and experts
    - Finding different learning materials
    - Relating your learning with real life examples and issues
    - Integrating different learning materials with each other

8. Does studying by using mobile learning technology help you to be self-disciplined in your learning. Why or why not and how?

9. Does studying by using mobile learning technology help you to manage your study time effectively. Why or why not and how?

10. Does studying by using mobile learning technology help you to achieve your learning goals. Why or why not and how?

الملحق (ب) بروتوكول المقابلة (النسخة العربية)

أسئلة المقابلة

1. خلال دراستك هل ساعدتك تقنيات التعلم المحمول في تحسين وتطوير تعلمك؟ لماذا؟ وكيف؟
2. خلال دراستك باستخدام تقنيات التعلم المحمول:
   - ما مدى سهولة استخدام تقنيات التعلم المحمول؟ لماذا؟
   - إذا نقصتك مهارات في استخدام تقنيات التعلم المحمول ما الممكن أن تفعل؟ لماذا؟
3. من الذي شجعك على استخدام تقنيات التعلم المحمول في تعلمك، ولماذا؟
4. هل تعتقد أن لديك الدعم الكافي لاستخدام تقنيات التعلم المحمول في تعلمك، ولماذا؟
5. خلال دراستك باستخدام تقنيات التعلم المحمول هل لديك مخاوف تجاه أمن معلوماتك؟ لماذا؟ وكيف؟
6. خلال دراستك باستخدام تقنيات التعلم المحمول هل لديك مخاوف تجاه خصوصيتك؟ لماذا؟ وكيف؟
7. كيف جذبتك الخصائص التالية لتقنيات التعلم المحمول لاستخدامها في تعلمك:
   - الحصول على المعلومة بالسرعة وفي الوقت المناسب.
   - إرضاء حاجاتك التعليمية الشخصية ومبادراتك.
   - استخدام تقنيات التعلم المحمول في أكثر من مكان وليس فقط داخل قاعة الدراسة.
   - التواصل مع الزملاء والأساتذة والخبراء في المادة العلمية
   - الحصول على مواد تعليمية مختلفة ومتعددة
   - ربط ما تتعلمه بمشكلات وقضايا من واقعك اليومي
   - دمج العديد من مصادر ومحتويات التعلم مع بعض مثل الفيديو والصور والنصوص
8. هل التعلم من خلال تقنيات التعلم المحمول ساعدك على أن تكون منظماً ذاتياً خلال تعلمك ودراستك؟ لماذا؟ وكيف؟
9. هل التعلم من خلال تقنيات التعلم المحمول ساعدك على إدارة وقت دراستك ومذاكرتك بشكل أكثر فعالية؟ لماذا؟ وكيف؟
10. هل التعلم من خلال تقنيات التعلم المحمول ساعدك على تحقيق أهدافك الدراسية؟ لماذا؟ وكيف؟

APPENDIX C: TWEET FOR RECRUITMENT

Are you student in one of the Saudi public universities? Do you know someone who is?

You are invited to answer a short survey for my dissertation. Please click the link below!

الملحق (ج) الدعوة للمشاركة في الاستبانة عبر فيسبوك

هل أنت طالب بإحدى الجامعات الحكومية السعودية؟ هل تعرفُ أحداً يدرس في إحدى الجامعات السعودية؟

أنت مدعو للإجابة على استبانة قصيرة. الرجاء الضغط على الرابط التالي

APPENDIX D: TWEET FOR RECRUITMENT

Student at a Saudi public university? Know someone who is? Short survey for my dissertation at

الملحق (د) تغريدة للدعوة للمشاركة في الاستبانة عبر تويتر

هل أنت طالب بجامعة حكومية سعودية؟ أو تعرف من هو كذلك؟ هذه استبانة قصيرة لك

APPENDIX E: WHATSAPP MESSAGE FOR RECRUITMENT

Hi,

Are you students at one of the Saudi public universities? Do you know someone who is? You are invited to answer short survey about mobile learning technology. Please click the link below!

الملحق (هـ) رسالة للدعوة للمشاركة في الاستبانة عبر واتساب

هل أنت طالب بإحدى الجامعات الحكومية السعودية؟ هل تعرفُ أحداً يدرس في إحدى الجامعات السعودية؟

أنت مدعو للإجابة على استبانة قصيرة. الرجاء الضغط على الرابط التالي

APPENDIX F: EMAIL FOR INTERVIEW RECRUITMENT

Dear Saudi Student,

I am Talal Alasmari, a Ph.D. candidate in Instructional Technology at Wayne State University. You received this email because you have agreed to participate in a later interview in a study that titled " Mobile Learning Technology Acceptance Among Saudi Higher Education Students".

In this interview, I am interested in increasing the understanding of acceptance of mobile learning technology among Saudi higher education students. The interview will be 30 minutes long and it will be conducted over Skype. No personal information such as name, gender, or age will be collected through this interview. Simply, I have a few questions regarding your thought and perception regarding mobile learning technology.

There is no cost to you to participate in this interview and no compensation for participation; however, the information you provide in this interview will be very helpful for this research and future studies. Therefore, I am attaching a copy of the interview questions to give you a chance to go through them and have an idea about the nature of this interview. If you are still interested in participating in this study, please email me your Skype ID to add you to Skype's contact. Also, please email me your preferred time to conduct this interview over Skype. Thank you for your participation!

Primary Investigator,
Talal Alasmari
Wayne State University

الملحق (و) رسالة البريد الإلكتروني للدعوة إلى المقابلة

عزيزي الطالب،

أنا طلال الأسمري، طالب مرشح لنيل درجة الدكتوراه في تقنيات التعليم بجامعة وين ستيت الأمريكية. تم إرسال هذه الرسالة لك لأنك قد وافقت مبدئياً على المشاركة في إجراء مقابلة معي حول دراستي التي بعنوان "تقبل طلاب التعليم العالي في السعودية لتقنيات التعلم المحمول".

اهتمامي في هذه المقابلة يتركز على زيادة فهم تقبل طلاب التعليم العالي في السعودية لتقنيات التعلم المحمول، وستكون مدة المقابلة نصف ساعة، كما أنه سيتم إجراؤها عبر برنامج سكايب (Skype). لن يتم جمع أي معلومات شخصية خلال المقابلة من مثل الاسم، والعمر، والجنس. فقط لدي القليل من الاستفسارات حول تصورك عن تقبل تقنيات التعلم المحمول.

لا يترتب على المشاركة في هذه الدراسة أي خسائر مالية عليك، كما أنه لن تحصل على تعويض جراء مشاركتك في هذه الدراسة، ومع ذلك فإن المعلومات التي تقدمها ستكون مفيدة لهذا البحث وللبحوث المستقبلية. لقد تم إرفاق نسخة من أسئلة المقابلة لتتمكن من الاطلاع على طبيعة الأسئلة خلال هذه المقابلة. إذا كنت لا تزال راغباً في المشاركة في هذه الدراسة، فضلاً أرسل إليَّ حسابك على برنامج سكايب (Skype) لتتم إضافتك، كما أود منك أن ترسل لي الوقت المفضل لديك لإجراء هذه المقابلة والذي تكون فيه متصلا عبر برنامج سكايب (Skype).

شُكراً لمشاركتك.

الباحث الرئيس

طلال الأسمري

جامعة وين ستيت

APPENDIX G: COVER LETTER FOR QUESTIONNAIRE RECRUITMENT

Dear university Student,

I would like to invite you to participate in an online survey about acceptance of mobile learning technology among Saudi higher education students. This survey is available in both Arabic and English languages. It will take approximately 10 - 20 minutes to complete this survey.
In order to participate, you must be a student at one of the Saudi public universities. If you are so, I would like to ask for your participation by following this link:

This study is voluntary, so you may withdraw at any time. Your responses will be kept confidential. There is no compensation for participation.

- You may use your mobile device or computer to access the questionnaire and answer it; however, it is recommended when using mobile version of the questionnaire to use the horizontal view in order to view the questionnaire properly on mobile devices. If you have any questions about participating in or learning more about this dissertation study, please reach me at talalsmari1[at]Gmail[dot]com or (404) 542-6331.

Thank you in advance for your participation.
Talal Alasmari
Doctoral Candidate- Instructional Technology Program
Wayne State University

عزيزي الطالب:
السلام عليكم ورحمة الله وبركاته
أدعوكم للمشاركة في هذه الدراسة حول تقبل طلاب التعليم العالي في السعودية لتقنيات التعلم المحمول. هذه الاستبانة متوفرة باللغتين العربية والإنجليزية.
كي تشارك يجب أن تكون طالباً أو طالبة بأي جامعة سعودية حكومية.
مشاركتك في هذا الاستبانة تطوعية، ويمكنك الانسحاب في أي وقت .جميع البيانات سوف تحفظ بكل سرية.

- يمكنك استخدام هاتفك المحمول أو حاسوبك الشخصي لإكمال الاستبانة، وفي حالك كنت تستخدم هاتفك المحمول؛ فالأفضل أن تفعّل الوضع الأفقي لعرض الشاشة.

إذا كان لديك أية استفسارات، يرجى التواصل من خلال الايميل talasmari1[at]Gmail[dot]com
للمشاركة في الاستبيان، أو يمكنك الاتصال بي على الرقم التالي 6331- 542 (404) 1+ يرجى الدخول من خلال الرابط التالي

أشكر وأقدر لكم تعاونكم.
طلال الأسمري
تقنيات التعليم - جامعة وين ستيت الأمريكية

APPENDIX H: RESEARCH INFORMATION SHEET

Title of Study: *Mobile Learning Technology Acceptance Among Saudi Higher Education Students*

Principal Investigator (PI): Talal Alasmari

Instructional Technology

(404)542-6331

Purpose:

You are being asked to be in a research study of the acceptance of mobile learning technology among Saudi higher education students because you are a student in one of the Saudi public universities. This study is being conducted at Wayne State University. **Please read this form and ask any questions you may have before agreeing to be in the study.**

This research study aims to investigate the acceptance of mobile learning technology by Saudi public universities' students. This will help in making decision regarding mobile learning technology in Saudi public universities.

Study Procedures

If you take part in the study, you will be asked to complete an online questionnaire related to this study about the acceptance of mobile learning technology.

The participation in this study is voluntary, so you may withdraw at any time. Your responses will be kept confidential. There is no compensation for your participation. 10-20 minutes are needed to complete the survey (there are three sections).

- The questions will ask you to provide some basic demographic information (name, gender, age, experience with eLearning, your enrollment type), and seek your opinions about accepting mobile learning technologies for learning and in general,
- There is a question that asks about if you want to participate in a later interview about this questionnaire. If you are interested in, please write your email and you will receive invitation to an online interview. You may withdraw at any time of the interview.
- It is optional to provide your name in answering the questionnaire and you can proceed the questionnaire without answering this question.

- The questionnaire must be completed in one session; it cannot be saved and returned to later.
- Mobile learning technology means any hand held device that provide an educational experience anytime and anywhere (e.g. Smartphone, iPad, iPod, Tablet…etc.).

Benefits

As a participant in this research study, there will be no direct benefit for you; however, information from this study may benefit other people now or in the future.

Risks

There are no known risks at this time to participation in this study; however, unanticipated problem with breach of confidentiality might occur such as:

- Loos of storing devices
- Use of unsecured networks
- Stolen or hacked passwords

All these risks of breach of confidentiality will be minimized through using cloud computing instead of storing on hard devices with strong passwords, accessing data from secured networks.

Costs

There will be no costs to you for participation in this research study.

Compensation

You will not be paid for taking part in this study; however, information of your participation will help in this research as well as future researches.

Confidentiality:

All information collected about you during this study will be kept without any identifiers.

Voluntary Participation /Withdrawal:

Taking part in this study is voluntary. You are free to only answer questions that you want to answer. You are free to withdraw from participation in this study at any time.

Questions

If you have any questions about this study now or in the future, you may contact Talal Alasmari at the following phone number (404)542-6331. If you have questions or concerns about your rights as a research participant, the Chair of the Institutional Review Board can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone

other than the research staff, you may also call the Wayne State Research Subject Advocate at (313) 577-1628 to discuss problems, obtain information, or offer input.

Participation

By completing the survey, you are agreeing to participate in this study. Participation in this research is for students enrolling any Saudi public university; if you are not a student enrolling a Saudi public university, please do not complete this survey.

الملحق (ز): ورقة معلومات البحث

عنوان الدراسة: قبول تقنيات التعلم المحمول بين طلبة التعليم العالي السعودي

المحقق الرئيسي: طلال الأسمري
التقنيات التعليمية
(404)542-6331

الغرض:

يتم طلب مشاركتك في دراسة بحثية لقبول تقنيات التعلم المحمولة بين طلاب التعليم العالي السعودي لأنك طالب في إحدى الجامعات الحكومية السعودية. وتجري هذه الدراسة في جامعة وين ستيت. **الرجاء قراءة هذا النموذج وطرح أية أسئلة قد تكون لديك قبل الموافقة على كونك في هذه الدراسة.**

تهدف هذه الدراسة البحثية إلى التحقيق في قبول تقنيات التعلم المحمول بين طلبة الجامعات الحكومية السعودية. وسوف يساعد هذا على اتخاذ قرار بشأن تقنيات التعلم المحمول في الجامعات الحكومية السعودية.

إجراءات الدراسة

إذا كنت تشارك في الدراسة، سوف يطلب منك استكمال استبيان على الإنترنت عن هذه الدراسة حول قبول تقنيات التعلم المحمول.

إن المشاركة في هذه الدراسة طوعية، لذلك يجوز لك أن تنسحب في أي وقت وسوف يتم الحفاظ على سرية إجاباتك، علماً بأنه لا يوجد تعويض لمشاركتكم. يستغرق استكمال الاستبيان 10-20 دقيقة (هناك ثلاثة أقسام).

- سوف تطلب منك الأسئلة تقديم بعض المعلومات الديموغرافية الأساسية (الاسم، الجنس، السن، الخبرة في التعليم الإلكتروني، نوع التحاقك) سعياً إلى آرائك حول قبول تقنيات التعلم المحمول بالنسبة للتعلم بصفة عامة،
- هناك سؤال يسأل عما إذا كنت ترغب في المشاركة في مقابلة لاحقة حول هذا الاستبيان. وفي تلك الحالة، يرجى كتابة بريدك الإلكتروني وسوف تتلقى دعوة لمقابلة على الإنترنت. يجوز لك أن تنسحب من المقابلة في أي وقت.
- إن توفير اسمك في الرد على الاستبيان اختياري ويمكنك المباشرة في الاستبيان دون الإجابة على هذا السؤال.
- يجب استكمال الاستبيان في جلسة واحدة إذ لا يمكن حفظه ومعاودته في وقت لاحق.
- يقصد بتقنيات التعلم المحمول أي جهاز محمول باليد يوفر تجربة تعليمية في أي وقت وفي أي مكان (مثل الهاتف الذكي والآيباد والآيبود والكمبيوتر اللوحي ... إلخ.).

الفوائد

كمشارك في هذه الدراسة البحثية، لن تكون هناك أية فائدة مباشرة لك؛ ومع ذلك، قد تفيد المعلومات من هذه الدراسة الآخرين الآن أو في المستقبل.

المخاطر

لا توجد مخاطر معروفة حالي اً للمشاركة في هذه الدراسة؛ ومع ذلك، قد تحدث مشكلة غير متوقعة في انتهاك السرية مثل:

- فقدان أجهزة التخزين
- استخدام شبكات غير آمنة
- سرقة أو اختراق كلمات المرور

سوف يتم تقليل كافة مخاطر انتهاك السرية هذه إلى أقصى حد عن طريق استخدام حوسبة كلاود بدلاً من تخزينها على أجهزة بكلمات مرور قوية والولوج إلى البيانات من شبكات آمنة.

التكاليف

لن تتأتى عليك أية تكاليف عن المشاركة في هذه الدراسة البحثية.

التعويض

أنت لا تدفع للمشاركة في هذه الدراسة؛ ومع ذلك، سوف تساعد معلومات مشاركتك في هذا البحث، فضلاً عن الأبحاث المستقبلية.

السرية:

سوف يتم الاحتفاظ بكافة المعلومات التي تم جمعها عنك أثناء هذه الدراسة دون أي مع ر فات.

المشاركة الطوعية / الانسحاب:

إن المشاركة في هذه الدراسة طوعية وأنت حر في الإجابة فقط على الأسئلة التي تود الإجابة عليها. كذلك أنت حر في الانسحاب من المشاركة في هذه الدراسة في أي وقت.

الأسئلة

إذا كان لديك أية أسئلة حول هذه الدراسة الآن أو في المستقبل، فبإمكانك الاتصال بي: طلال الأسمري على الرقم التالي 404-542-6331. إذا كانت لديك أسئلة أو مخاوف حول حقوقك كمشارك في هذا البحث، فبإمكانك التواصل مع رئيس مجلس المراجعة المؤسسية على الرقم 1628-775 (313). أما إذا كنت غير قادر على التواصل مع الباحث أو تريد التحدث مع شخص آخر غير الباحث، فبإمكانك الاتصال على الرقم 1628-775 (313) لمناقشة المشاكل أو الحصول على المعلومات أو تقديم المدخلات.

المشاركة

باستكمال الاستبيان، أنت توافق على المشاركة في هذه الدراسة. إن المشاركة في هذا البحث هو فقط للطلبة الملتحقين بأي جامعة سعودية حكومية؛ إذا لم تكن طالباً ملتحقاً بجامعة حكومية سعودية، الرجاء عدم استكمال هذا الاستبيان.

APPENDIX I: INTERVIEW SCRIPT

Online Interview- Audio Taped

Interview Agenda

- Get the permission to record the interview,
- Introduce the research and its purpose,
- Assure confidentiality to interviewee,
- Explain expectations of Participation (Rights, withdrawal, benefits, etc.),
- Interview questions,
- Thank participants for their participation.

Script

Thank you again for accepting the invitation to participate in this study. This interview is about students' acceptance of mobile learning technology in Saudi higher education. This will take approximately 30 minutes of your time. The entire interview will be recorded, and in fact it is already on and recording. You have been selected because of your enrollment to one of the Saudi public universities. In this interview, I hope to obtain your insights about your acceptance of mobile learning technology in your learning while enrolling one of Saudi public universities. I will ask you some questions and seek your deep insights and reflection about mobile learning technology acceptance. The questions will be the same questions I sent you through email recently. I will just go over them in order.

There is no cost to you to participate in this interview and no compensation for participation; however, the information you provide in this interview will be very helpful for this research and

future studies. If you have any questions while conducting this interview, you may stop me at any time and ask. Your answers will be completely confidential. Data from this interview will be reported in aggregate form without identifiers. The interview will be transcribed and the information you provide will be a part of this study. Please keep in mind that there are no right or wrong answers and that you have your own views on accepting mobile learning technology, and I need that from your own perspective. Please explain your thoughts with examples, points, etc.

If you have any questions about this study now or in the future, you may contact me: Talal Alasmari at the following phone number 404-542-6331. If you have questions or concerns about your rights as a research participant, the Chair of the Institutional Review Board can be contacted at (313) 577-1628. If you are unable to contact the research staff, or if you want to talk to someone other than the research staff, you may also call (313) 577-1628 to ask questions or voice concerns or complaints.

You have had a chance to look at the questions that I sent you through email, do you have any questions before proceeding and starting the interview?

As we have discussed the agenda and rules of this interview, we will get started with the questions, and please answer them with as much details as you can.

Interview Questions

1. First question: In your study, does mobile learning technology helps you to improve your learning? Why or Why not? How?
2. Second question: During your study by using mobile learning technology:
    - How easy is mobile learning technology for you to use? Why?
    - If you lack skills in using mobile learning technology, what would you do? Why?

3. Third question: Who encouraged you to use mobile learning technology in your learning? Why?
4. Fourth question: Do you think you have the efficient support to use mobile learning technology in you learning? Why or Why not?
5. Fifth question: During your study using mobile learning technology, do you have concerns regarding your information security. Why and How?
6. Sixth question: During your study using mobile learning technology, do you have concerns regarding your privacy. Why and How?
7. Seventh question: How do the following characteristics of mobile learning technology attract you to use mobile learning technology in your learning?
    - Getting timely information
    - Satisfying your personal needs and initiatives
    - Using mobile learning technology in different settings
    - Communicating with peers, professors, and experts
    - Finding different learning materials
    - Relating your learning with real life examples and issues
    - Integrating different learning materials with each other
8. Eighth question: Does studying by using mobile learning technology help you to be self-disciplined in your learning. Why or why not and how?
9. Ninth question: Does studying by using mobile learning technology help you to manage your study time effectively. Why or why not and how?
10. Final question: Does studying by using mobile learning technology help you to achieve your learning goals. Why or why not and how?

If you have any other concerns, suggestions, or comments about mobile learning technology acceptance in Saudi higher education, please share them with me before ending this interview.

Final comments

Thank you very much for your participation in this study. This was a very successful interview. Again, I really appreciate your contribution to this study. Have a great day.

Interview Probes

 Neutral agreement or acknowledgement:

- Okay.

- I see.

 Asking for more information:

- Could you please tell me more about …?

- Would you please explain this … a bit further?

- Would you please give an example of what you mean?

 Asking for clarification :

- It sounds like you're saying . . .

- What else happened?

- How would you do that?

- What were the consequences of …?

 Asking for an opinion

- What do you think about this…?

الملحق (ح): سيناريو المقابلة

مقابلة عبر الإنترنت – مسجلة صوتيا

أجندة المقابلة

الحصول على الإذن بتسجيل المقابلة،

تقديم البحث والغرض منه،

ضمان سرية مقابلته،

توضيح التوقعات من المشاركة)الحقوق، الانسحاب، الفوائد، إلخ.(،

أسئلة المقابلة،

اشكر المشاركين على مشاركتهم.

السيناريو

أشكركم مجدداً على قبول الدعوة للمشاركة في هذه الدراسة. تدور هذه المقابلة حول قبول الطلاب لتقنيات التعلم المحمول في التعليم العالي السعودي. سوف يتم تسجيل المقابلة الكاملة صوتياً، ولقد بدأ التسجيل بالفعل. سوف تستغرق المقابلة حوالي 03 دقيقة من وقتك. ولقد تم اختيارك بسبب التحاقك بإحدى الجامعات السعودية الحكومية. وفي هذه المقابلة، أنا على أمل الحصول على تصوراتك حول موافقتك على تقنيات التعلم المحمول أثناء التحاقك بإحدى الجامعات السعودية الحكومية. سوف أطرح عليك بعض الأسئلة وألتمس أفكارك وتصوراتك العميقة حول قبول تقنيات التعلم المحمول. وسوف تكون الأسئلة نفس تلك التي أرسلتها إليك عبر البريد الإلكتروني مؤخر اً وسوف أتناولها بالترتيب.

لا تترتب على المشاركة في هذه الدراسة أي تكلفة عليك، كما أنه لن تحصل على أي تعويض جراء مشاركتك في هذه الدراسة، ومع ذلك فإن المعلومات التي تقدمها ستكون مفيدة جد اً لهذا البحث وللبحوث المستقبلية. إذا كانت لديك أية أسئلة أثناء إجراء هذه المقابلة، فبإمكانك إيقافي في أي وقت والسؤال، وستحظى كل إجاباتك على السرية والخصوصية وسوف يتم جمع وتحليل كل بيانات هذه المقابلة بشكل كلي وبدون أية مع ر فات يمكن أن تدل على هويتك وستتم إعادة كتابة هذه المقابلة حرفياً والمعلومات التي تقدمها ستكون جزء اً من هذه الدراسة. أرجو أن تضع في اعتبارك أنه لا توجد إجابة خاطئة وأخرى صائبة، بل لديك تصورات ووجهة نظرك الخاصة حول تقبل تقنيات التعلم المحمول؛ ولذلك فإنني أود الحصول على تصوراتك الخاصة، كما أرجو أن تشرح إجاباتك بالتفصيل بالأمثلة والنقاط، إلخ.

إذا كان لديك أية أسئلة حول هذه الدراسة الآن أو في المستقبل، فبإمكانك الاتصال بي: طلال الأسمري على الرقم التالي 404-542-6331. إذا كانت لديك أسئلة أو مخاوف حول حقوقك كمشارك في هذا البحث، فبإمكانك التواصل مع رئيس مجلس المراجعة المؤسسية على الرقم 1628-775 (313). أما إذا كنت غير قادر على التواصل مع الباحث أو تريد التحدث مع شخص آخر غير الباحث، فبإمكانك الاتصال على الرقم 1628-775 (313) لطرح أسئلتك أو التحدث عن اهتماماتك أو التقدم بشكوى.

لقد حصلت على فرصة الاطلاع على الأسئلة التي أرسلتها إليك عبر البريد الإلكتروني؛ فهل لديك أي سؤال قبل المباشرة والبدء في المقابلة؟ كما أشرنا في أجندة المقابلة، سنبدأ بطرح الأسئلة ويرجى منك الإجابة عليها بالتفصيل ما أمكنك ذلك.

أسئلة المقابلة

السؤال الأول: خلال دراستك، هل ساعدتك تقنيات التعلم المحمول على تحسين وتطوير تعلمك؟ لماذا؟ وكيف؟

السؤال الثاني: خلال دراستك باستخدام تقنيات التعلم المحمول:

ما مدى سهولة استخدام تقنيات التعلم المحمول؟ لماذا؟

إذا نقصتك مهارات في استخدام تقنيات التعلم المحمول، ماذا يمكنك أن تفعل؟ لماذا؟

0. السؤال الثالث: من الذي شجعك على استخدام تقنيات التعلم المحمول في تعلمك، ولماذا؟

السؤال الرابع: هل تعتقد أن لديك الدعم الفعال لاستخدام تقنيات التعلم المحمول في تعلمك، ولماذا؟

السؤال الخامس: خلال دراستك باستخدام تقنيات التعلم المحمول، هل لديك مخاوف تجاه أمن معلوماتك؟ لماذا؟ وكيف؟

السؤال السادس: خلال دراستك باستخدام تقنيات التعلم المحمول، هل لديك مخاوف تجاه خصوصيتك؟ لماذا؟ وكيف؟

السؤال السابع: كيف جذبتك الخصائص التالية لتقنيات التعلم المحمول لاستخدامها في تعلمك:

الحصول على المعلومة بالسرعة وفي الوقت المناسب.

إرضاء حاجاتك التعليمية الشخصية ومبادراتك.

استخدام تقنيات التعلم المحمول في أكثر من مكان.

التواصل مع الزملاء والأساتذة والخبراء.

الحصول على مواد تعليمية مختلفة.

ربط ما تتعلمه بمشكلات وقضايا من واقعك اليومي.

دمج العديد من مصادر ومحتويات التعلم مع بعضها البعض.

السؤال الثامن: هل ساعدك التعلم من خلال تقنيات التعلم المحمول على انضباطك الذاتي خلال تعلمك ودراستك؟ لماذا؟ وكيف؟

السؤال التاسع: هل ساعدك التعلم من خلال تقنيات التعلم المحمول على إدارة وقت دراستك بشكل أكثر فعالية؟ لماذا؟ وكيف؟

. السؤال الأخير: هل ساعدك التعلم من خلال تقنيات التعلم المحمول على تحقيق أهدافك الدراسية؟ لماذا؟ وكيف؟ 10

هل لديك أية مخاوف أو تعليقات أو اقتراحات حول تقبل تقنيات التعلم المحمول في التعليم العالي السعودي؟ فضلاً شاركني هذه التعليقات قبل إنهاء هذه المقابلة.

تعليقات أخيرة

شكراً لمشاركتك في هذه الدراسة. لقد كانت هذه المقابلة ناجحة جداً. مجدداً أنا أقدر مشاركتك وإضافتك لهذه الدراسة، وأتمنى لك يوماً سعيداً.

عبارات استقصائية

الموافقة بحياد أو الإقرار

تمام.

فعلاً.

السؤال عن المزيد من المعلومات:

هل من الممكن أن تخبرني أكثر عن ..؟

فضلاً هل تشرح هذه .... بمزيد من التفصيل؟

هل من الممكن أن تعطي مثالاً على ما تقصد؟

السؤال عن المزيد من الإيضاح:

يبدو أنك تقول...

ماذا حدث أيضاً؟

كيف من الممكن أن تفعل ذلك؟

ما الذي ترتب على ...؟

السؤال عن الرأي:

ما رأيك في هذا ...؟

APPENDIX J: PERMISSION TO USE AND ADAPT UTAUT

MIS Quarterly
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May 24, 2016

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ABSTRACT

MOBILE LEARNING TECHNOLOGY ACCEPTANCE AMONG SAUDI HIGHER EDUCATION STUDENTS

by

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May 2017

Advisor: Dr. Ke Zhang

Major: Instructional Technology

Degree: Doctor of Philosophy

The rapid development of technology has encouraged Saudi universities to establish initiatives to improve learning. Mobile learning technology is one of the technologies targeted by eLearning and distance education deanships among Saudi universities. However, few studies have been done in investigating mobile learning technology acceptance in the Saudi context. This study aims to provide policy and decision makers in the Saudi higher education with reliable data in order to employ mobile learning technology in learning process. Therefore, this study modified Unified Theory of Acceptance and Use of Technology (UTAUT) to investigate students' acceptance of mobile learning technology. To this end, seven questions were proposed to explore the effect of learning expectancy, effort expectancy, social influence, facilitating conditions, mobile learning technology characteristics, and self-management of learning on students' behavioral intentions and use behaviors of mobile learning technology. In addition, age, gender, and eLearning experience were proposed to moderate such an effect. This study employed sequential mixed method to procced the exploration. A questionnaire and semi-structured interview were developed to collect the data. 1203 participants were included in the quantitative data collection while fifteen participants were included in the qualitative data collection. Multiple

regression analyses were used in the quantitative analysis and thematic analysis was used in the qualitative analysis.

The results of this study assert that learning expectancy, effort expectancy, social influence, and mobile learning characteristics are significant predictors of students' intentions to use mobile learning technology regardless the moderating effects of gender, age, and eLearning experience. Unexpectedly, the social influence construct is the only construct that was moderated by gender where men show a stronger behavioral intention to use mobile learning than women. Facilitating conditions and self-management of learning in this study were found insignificant constructs in predicting students' behavioral intention and use behavior of mobile learning technology. These findings are justified in the literature of UTAUT. The exploratory analysis revealed an interesting finding that distance education students showed significantly higher intentions to use mobile learning technology than on-campus students, but there was no significant difference between them in the actual use of mobile learning technology.

AUTOBIOGRAPHICAL STATEMENT

Talal Alasmari is an assistant professor in Instructional Technology Department in the College of Education at Jeddah University, Saudi Arabia. He earned his PhD in Instructional Technology at Wayne State University, Detroit, Michigan. He received his Master's in Instructional Technology at Taibah University, Saudi Arabia. He also received a degree in Bachelor of Education at Abha Teachers' Collage, Saudi Arabia. His professional work started with Royal Commission at Yanbu Industrial City, Saudi Arabia, where he served in the educational services as a teacher for elementary schools. Later, he was promoted for a lecturer position in the College of Education at King Abdul-Aziz University, Jeddah, Saudi Arabia. During his PhD, he worked as instructional designer intern at Spirit Airlines, Detroit, Michigan. Also, he worked as instructional designer intern in eLearning and Instructional Support Department (eLIS) at Oakland University, Rochester, Michigan, where he contributed in establishing instructional design services for online faculty. Talal is interested in researching in mobile learning technology environments especially in higher education. Another research interest is in performance and quality improvement in organizational settings. Talal is a certified consultant in Six Sigma green belt and black belt form Lawrence Technological University, Southfield, Michigan. He joined Association for Educational Communication and Technology (AECT) and the American Educational Research Association (AERA). Talal can be reached at talasmari@uj.edu.sa or fm5751@wayne.edu