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Factors Influencing Student Acceptance of Mobile Learning in Higher Education

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ABSTRACT

The purpose of this study was to explore the acceptance of mobile learning by students in a higher education setting. The unified theory of acceptance and use of technology (UTAUT) was extended to include hedonic motivation, operationalized as enjoyment, as well as social influence in a field study involving the adoption of iPad mobile devices. Survey data were collected from 171 college students and analyzed using partial least squares structural equation modeling (PLS-SEM). The results indicated that enjoyment and performance expectations were important factors influencing the acceptance of mobile learning in this context. For those engaged in the mobile learning pilot project upon which this study was based, the use of the UTAUT and the results provided a theory-based empirical approach to support an assessment that the pilot project goals were achieved. Overall, students perceived iPads to be useful and enjoyable tools for accomplishing educational tasks and improving learning outcomes.

KEYWORDS

Enjoyment; hedonic motivation; iPads; m-learning; mobile learning; UTAUT; Unified Theory of Acceptance and Use of Technology

Information technology has changed in myriad ways since the 1990s when scholars first began to study the electronic classroom and explore the transformational possibilities of technology-mediated distance learning made possible by the World Wide Web. Now, wireless mobile devices form an increasingly critical component in learning ecosystems by connecting educators, learners, and content anywhere and anytime (Wu et al., 2012). Mobile devices can allow users to easily access the learning management systems that support the rapid growth of online and blended/hybrid educational endeavors as well as enable novel capabilities such as context-aware learning applications (Hwang, Yang, Tasi, & Yang, 2009). While mobile devices can provide a wide range of benefits for educators, learners, and organizations (Zahrani & Laxman, 2016), a variety of challenges have also been identified that can hinder the efforts of innovators such that mobile devices are not always perceived by students as beneficial tools for their learning (Ting, 2012). As the use of mobile devices for learning

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(m-learning) evolves and continues to facilitate sweeping changes in education, a better understanding of the factors that influence the acceptance of mobile devices in learning environments will become increasingly important (Liaw & Huang, 2012).

In considering the factors that motivate human behavior, self-determination theory distinguishes between the role played by extrinsic motivation and intrinsic motivation (Deci & Ryan, 1985). Extrinsic motivation refers to performing an activity to achieve something in response to an external goal (e.g., to improve job performance) and, as such, reflects a utilitarian motive focused on achieving a valued functional outcome. The Technology Acceptance Model (TAM; Davis, 1989) and the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh, Morris, Davis, & Davis, 2003), which were developed to investigate acceptance of computers in a workplace context, incorporate extrinsic motivators as key constructs in their models (i.e., perceived usefulness and performance expectancy). Intrinsic motivation, on the other hand, involves engaging in an activity because it is felt to be enjoyable or interesting for its own sake. Given that a key appeal of mobile devices such as iPads for m-learning is the perception that they are enjoyable and fun to use as well useful (Rossing, Miller, Cecil, & Stamper, 2012), it is important to investigate the role that both extrinsic and intrinsic motivators play in their acceptance for m-learning. However, neither the TAM nor the UTAUT include measures of intrinsic motivation in their theoretical models.

Intrinsic motivation has been conceptualized in various ways including task interest, experience of enjoyment, and intention to continue an activity (Deci, 1992). Research on hedonic motivation spans a range of disciplines and focuses on the experience of enjoyment or pleasure and the role it plays in a wide range of human behavior (Waterman, Schwartz, & Conti, 2008) including information systems acceptance (Fagan, Neill, & Wooldridge, 2008). This study extends the UTAUT to include hedonic motivation, operationalized as enjoyment, in order to investigate the factors that influence student acceptance of mobile tablets. The participants were part of a field study at a public university in the southwestern United States involving undergraduate college students using iPads for m-learning in core general education classes which the state's higher education board requires all students to complete before earning an undergraduate degree. A better understanding of how perceptions of enjoyment along with extrinsic utilitarian motivations influence student attitudes toward iPads could enrich our understanding of the acceptance of iPads for m-learning and have practical implications for educators and developers seeking to support m-learning initiatives. In addition, since the UTAUT was originally developed to investigate the acceptance and use of work-related technology by

employees in an organizational context, this study can contribute to a better understanding of the generalizability and considerations for employing the UTAUT in other contexts.

This paper proceeds as follows. Following a review of the theoretical literature, the study's conceptual model and hypotheses will be presented. Next, the method's results will be reported. The paper concludes with a discussion of the findings and conclusions.

Theoretical background

The UTAUT model builds upon the Technology Acceptance Model (TAM) (Davis, 1989), a theoretical model developed to study information technology user attitudes. Lee, Kozar, and Larsen (2003), in their review of 111 papers using the TAM published over 18 years, state that the TAM "is considered the most influential and commonly employed theory for describing an individual's acceptance of information systems" (p. 752). The TAM continues to be used today to study the acceptance of technology in many contexts, including education (Nikou & Economides, 2017). The Unified Theory of Acceptance and Use of Technology (UTAUT) model synthesized the TAM and seven other models that have frequently been used in the study of technology in order to develop a model that could support future technology acceptance research (i.e., the theory of reasoned action, motivational model, theory of planned behavior, combined hybrid TAM and theory of planned behavior model, personal computer use model, diffusion of innovation theory, and social cognitive theory). The UTAUT model theorizes that (a) performance expectancy, effort expectancy, and social influence are direct determinants of an individual's intention to accept technology and (b) facilitating conditions are a direct determinant of usage (Venkatesh et al., 2003). The UTAUT has been used to investigate the acceptance and use of technology in a range of contexts including the use of tablet devices (Wang, Wu, & Wang, 2009). A review of the literature suggests that "the UTAUT has become the most widely cited recent model of individual technology adoption and use" (Venkatesh, Sykes, & Zhang, 2011, p. 2).

The UTAUT was selected as the theoretical basis for this field study of m-learning since this model represents a synthesis of the most widely used theoretical models used to investigate technology acceptance and use. However the UTAUT, which was developed to investigate acceptance of technology in the workplace, does not include constructs and relationships that address intrinsic motivations to accept and use technology. Davis, Bagozzi, and Warshaw (1992) found that extrinsic motivation (operationalized as perceived usefulness) and intrinsic motivation (operationalized as enjoyment) explained 75% of the variance in intention in one study and

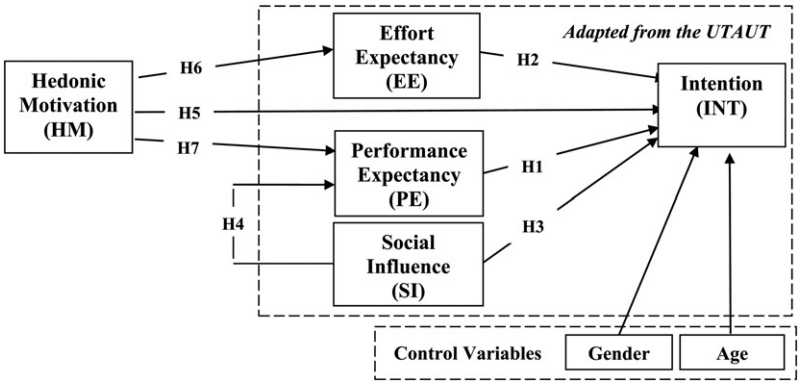

Figure 1. Conceptual model (adapted from Venketesh et al., 2003. © 2003, Regents of the University of Minnesota. With permission).

concluded that "usefulness and enjoyment together represent a simple yet powerful explanation of what influences usage intentions" (p. 1125). In a workplace context, studies have explored the role of intrinsic motivation, operationalized as enjoyment (Fagan et al., 2008) and operationalized as playfulness (Roca & Gagne, 2008). In order to extend the UTAUT, this study, building on the work of Deci (1992) and van der Heijden (2004), focuses on the conceptualization of intrinsic motivation as the experience of enjoyment (i.e., hedonic motivation) in extending the UTAUT in order to investigate the acceptance of mobile learning by students.

Conceptual model and research hypotheses

Based upon the UTAUT, this study hypothesizes that effort expectancy, performance expectancy, and social influence will have significant positive relationships with intention to use an iPad for m-learning. This study also extends the UTAUT to predict that hedonic motivation will have a significant positive relationship to intention as well as a significant indirect relationship with effort and performance expectancy. In addition, drawing upon the TAM2 (Venkatesh & Davis, 2000) and related literature, this study hypothesizes that social influence will have a significant positive relationship with performance expectancy. The study's conceptual model is depicted in Figure 1. The remainder of this section provides an overview of relevant literature and states the research hypotheses.

Performance expectancy (PE)

In the UTAUT, performance expectancy is defined as "the degree to which an individual believes that using the system will help him or her attain gains in job performance" and is hypothesized to be a direct determinant

of intention (Venkatesh et al., 2003, p. 447). This construct is similar to perceived usefulness in the TAM (Davis, 1989). In the education literature, UTAUT-based research has reported a positive relationship between performance expectancy and intention in a variety of learning contexts (Althunibat, 2015; Dečman, 2015; Raman & Don, 2013; Tosuntas, Karadag, & Orhan, 2015; Wang et al., 2009). In the context of this study, performance expectancy is defined as the degree to which an individual believes that using an iPad for m-learning will be useful for educational activities. Based upon the literature, therefore, I hypothesize that *performance expectancy positively influences intention to use an iPad for m-learning* (H1).

Effort expectancy (EE)

In the UTAUT, effort expectancy is defined as "the degree of ease associated with use of the system" (Venkatesh et al., 2003, p. 450) and theorized to be a direct determinant of intention. This construct is similar to perceived ease of use in the TAM (Davis, 1989). In the education literature, UTAUT-based research has reported a positive relationship between effort expectancy and intention in a variety of learning contexts (Althunibat, 2015; Raman & Don, 2013; Tosuntas et al., 2015; Wang et al., 2009). In the context of this study, effort expectancy is defined as the degree to which an individual believes that an iPad will be easy to use. Based upon the literature, therefore, I hypothesize that *effort expectancy positively influences intention to use an iPad for m-learning* (H2).

Social influence (SI)

In the UTAUT, social influence is defined as "the degree to which an individual perceives that important others believe that he or she should use the new system" and is theorized to be a direct determinant of intention (Venkatesh et al., 2003, p. 451). This construct is similar to social norm in the TAM2 (Venkatesh & Davis, 2000). In the education literature, UTAUT-based research has reported a positive relationship between social influence and intention in a variety of learning contexts (Dečman, 2015; Raman & Don, 2013; Tosuntas et al., 2015; Wang et al., 2009). In the context of this study, social influence is defined as the degree to which individuals perceive that important others believe that they should use an iPad for m-learning. Based upon the literature, therefore, I hypothesize that *social influence positively influences intention to use an iPad for m-learning* (H3).

In the development of TAM2, an extended version of the TAM, social influence, conceptualized as subjective norm, was hypothesized to directly influence intention through a process of compliance (Venkatesh & Davis,

2000). In addition, the TAM2 theorized that subjective norm would have an indirect effect on intention through perceived usefulness as a result of internalization, a process whereby the beliefs of others become incorporated into an individual's beliefs about use of a system (Venkatesh & Davis, 2000). Support has been found for an indirect effect of social influence on intention through its effect on perceived usefulness, conceptualized as performance expectancy in the UTAUT (Karaali, Gumussoy, & Calisir, 2011; Karahanna & Straub, 1999). Based upon the literature, I therefore hypothesize that *social influence positively influences performance expectancy* (H4).

Hedonic motivation (HM)

The UTAUT predicts that effort expectancy, performance expectancy, and social influence will have a direct effect on intention and that when these constructs are present in the model all other constructs will be nonsignificant in predicting intention (Venkatesh et al., 2003). However, hedonic motivation, operationalized as enjoyment, has been identified as an important factor in systems acceptance and has been hypothesized to have a direct effect on intention (Brown & Venkatesh, 2005; van der Heijden, 2004). In the UTAUT2, an adaptation of the UTAUT for consumer contexts, hedonic motivation, defined as "the fun or pleasure derived from using a technology", was hypothesized to be a direct determinant of intention (Venkatesh, Thong, & Xu, 2012, p. 161). In TAM-related research, enjoyment, defined as "the extent to which the activity of using the computer is perceived to be enjoyable in its own right, apart from any performance consequences that may be anticipated" was hypothesized to have a direct effect on usage intentions (Davis et al., 1992, p. 1113). In the education literature, support has been found for a positive relationship between enjoyment and intention in a number of learning contexts (Lewis, Fretwell, Ryan, & Parnham, 2013; Raman & Don, 2013; Wang et al., 2009. In this study, hedonic motivation is defined as the enjoyment associated with using an iPad for m-learning. Based upon the literature, therefore, I hypothesize that *hedonic motivation is positively related to intention to use an iPad for m-learning* (H5).

In addition to the theorized direct effect of hedonic motivation on intention, hedonic motivation has been theorized to have a significant positive relationship with effort expectancy (EE) and performance expectancy (PE). In the TAM-related research, hedonic motivation, conceptualized as enjoyment, was found to have a significant relationship with perceived ease of use, conceptualized as effort expectancy in the UTAUT (Venkatesh & Speier, 1999; Venkatesh, 2000). In addition, a review of the literature indicates that hedonic motivation can also influence the acceptance of

technology indirectly through perceived usefulness, conceptualized as performance expectancy in the UTAUT (Gerow, Ayyagari, Thatcher, & Roth, 2009). In the education literature, support has been found for a positive relationship between hedonic motivation and perceptions of usefulness in regard to a learning management system (Yi & Hwang, 2003). Based upon the literature, I therefore hypothesize that *hedonic motivation positively influences effort expectancy* (H6) and *hedonic motivation positively influences performance expectancy* (H7).

Control variables

The UTAUT hypothesizes that gender and age moderate the relationships in the model (Venkatesh et al., 2003). In this study's context, age and gender are not hypothesized to moderate the relationships. However, given the importance of gender and age in the UTAUT model, this study included age and gender as control variables in order to help "demonstrate that the effects of control variables on relationships of interest are unlikely" (Spector & Brannick, 2011, p. 298).

Method

Participants and procedures

Participants were 437 undergraduate students at a Texas public university enrolled in a core curriculum class where iPads were provided to students as part of a pilot mobile learning initiative and instructors' integrated iPad use into their course learning activities. These core curriculum classes, which all students must complete in order to earn an undergraduate degree, included freshman and sophomore courses in English, economics, math, and biology. As part of this field study, students were emailed a link to an online survey. One hundred-ninety students consented to participate in the study, making a response rate of 54%. Of these responses, 19 surveys were incomplete and excluded from the final sample such that 171 participant responses were included in the sample used for the analysis. Among them, 100 (58.5%) were female and the mean age was 21.07 years ($SD = 5.69$).

Measures

A self-reported questionnaire was used for this study. Participants responded to items requesting their demographic information. The theoretical constructs were operationalized by adapting items from prior research for the context of this study (see Appendix). The scales for the theoretical constructs of effort expectancy, performance expectancy, social influence,

and behavioral intention were operationalized by adapting items from the TAM2 and UTAUT prior research (Venkatesh & Davis, 2000; Venkatesh et al., 2003; Venkatesh et al., 2012). The scale for hedonic motivation was operationalized by adapting items used in measuring enjoyment, attitudes toward using technology, and hedonic motivation in the development of the UTAUT and UTAUT2 (Venkatesh, 2000; Venkatesh et al., 2003; Venkatesh et al., 2012). These items were rated on a 7-point Likert scale, ranging from 1 *(strongly disagree)* to 7 (*strongly agree*). The two individual level control variables were gender (1 = female; 2 = male) and age (1 = younger than 21 years; 2 = 21 years and older).

Data analysis

Data were analyzed using the partial least squares structural equation modeling (PLS-SEM), a composite-based SEM approach popularized by Wold (1985). PLS-SEM is well suited for exploratory research, is robust in the face of smaller sample sizes, and is a non-parametric method that makes no distributional assumptions about the underlying data (Hair, Hult, Ringle, & Sarstedt, 2017). Following the recommendations in the literature (Schumacker & Lomax, 2010), a two-step approach was used to analyze the model in SmartPLS 3.2.4 (Ringle, Wende, & Becker, 2015). The required sample size is 109 for detecting statistical power of at least 0.8 at an α-level of 0.05. Thus, the relevant effect in my research model can be detected with the sample size of 171 (Cohen, 1992; Nitzl, 2016). The data had very few missing values (less than 1% of the indicator values), and therefore mean value replacement was used to handle missing values (Hair, Black, Babin, & Anderson, 2010).

Results

Measurement model analysis

The measurement model was assessed in terms of internal consistency reliability, convergent validity, and divergent validity. To assess internal consistency reliability, composite reliability (CR), as well the traditional criterion for internal consistency, Cronbach's alpha (CA), was evaluated. All measures exceeded the 0.70 minimum threshold recommendations (Nunnally, 1978), indicating satisfactory reliability. To assess convergent validity, the outer loading of the indicators and average variance extracted (AVE) were evaluated. All standardized outer loadings met the threshold of 0.708 or higher and all AVE values exceeded the threshold expectation of 0.50, indicating satisfactory convergent validity (Hair et al., 2017).

Table 1. Discriminant validity assessment.

	INT	EE	HM	PE	SI
1. Intention (INT)	**0.975**				
2. Effort expectancy (EE)	0.354	**0.892**			
3. Hedonic motivation (HM)	0.733	0.471	**0.963**		
4. Performance expectancy (PE)	0.819	0.447	0.844	**0.919**	
5. Social influence (SI)	0.498	0.359	0.580	0.640	**0.911**

Discriminant validity was evaluated using the Fornell-Larcker criterion by comparing the square root of the average variance extracted (AVE) for a construct with the construct's correlations with all other constructs in the study (Fornell & Larcker, 1981). As shown in Table 1, the square root of the AVE of each construct (shown on the diagonal) is greater than any of the between-construct correlations, providing support for the discriminant validity of the constructs (Henseler, Ringle, & Sarstedt, 2015). In addition, the heterotrait-monotrait ratio (HTMT), another recommended criterion for assessing discriminant validity, was applied (Hair et al., 2017). All HTMT values were below the relevant threshold value of 0.90 and the confidence interval of the HTMT statistics did not include the value of 1 for all combinations of constructs (Hair et al., 2017), providing additional support for the discriminant validity of the constructs. Analysis of the cross-loadings of the items shows that all items load the highest on their related construct.

Finally, common method variance could be an issue as the responses for all items were self-reported by respondents in one survey (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). SPSS was used to assess the possible effects of common method variance using Harman's (1976) one-factor test. One construct accounted for only 32.6% of the covariance among all the constructs, suggesting that the effects of CMV were minimal in this study (Podsakoff & Organ, 1986).

Structural model analysis

Since testing of the measurement model indicated satisfactory quality, bootstrapping with the no sign change option with 5,000 bootstraps with the bias-corrected (BCa) procedure was performed to assess the model following the steps outlined by Hair et al. (2017). The first step in the assessment of the structural model was to check for collinearity issues. None of the variance inflation factor (VIF) measures were above the threshold of 5 and, as a result, no multicollinearity problems were identified (Hair et al., 2017). Then, the structural model path coefficients, which represent the hypothesized relationships in the model, were assessed. There were no significant relationships between the age and gender control variables and intention, the outcome variable. Following the recommendations of Becker (2005),

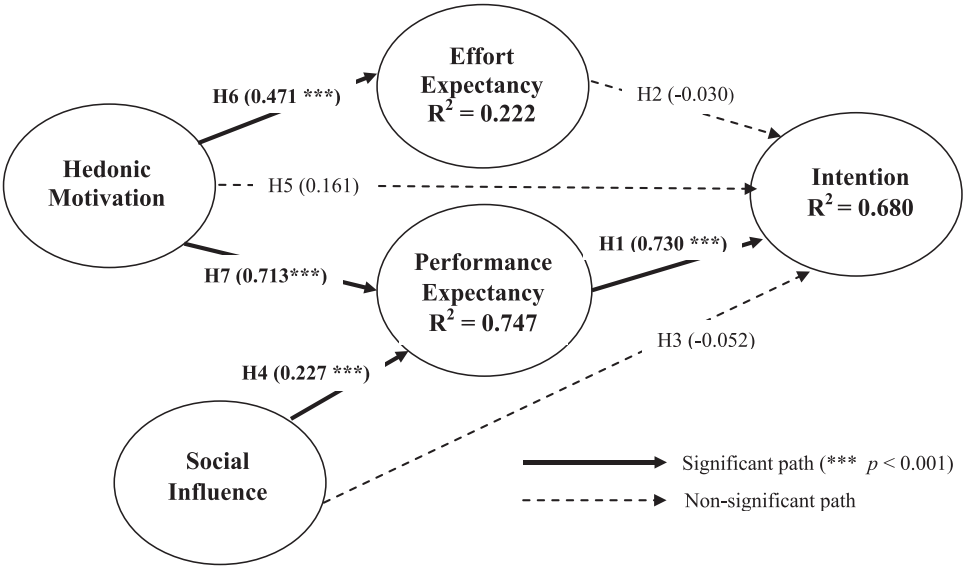

Figure 2. Structural model results.

these non-significant controls were not included in the subsequent analysis and reported results.

Based upon the significance of the path coefficients, four of the study hypotheses were supported (H1, H4, H6, and H7). Next, the coefficient of determination (R^2), a common measure used to evaluate the predictive power of structural model, was assessed. While assessment of R^2 values depends upon the discipline, R^2 values of 0.75, 0.55 and 0.25 can be thought of as indicating substantial, moderate, and weak effects (Hair et al., 2017). In the structural model, intention had a moderate R^2 value of 0.68, performance expectancy had a more substantial R^2 value of 0.747, and effort expectancy had a weak R^2 value of 0.222. Figure 2 shows the structural model results.

Hypothesis testing and mediation analysis

The results of hypotheses testing show that four of seven hypotheses were supported ($p < 0.001$; Table 2). This study found a significant positive relationships between performance expectancy and intention (H1), social influence and performance expectancy (H4), hedonic motivation and effort expectancy (H6), and hedonic motivation and performance expectancy (H7).

Multiple mediation analysis was conducted to investigate the effect of constructs that have hypothesized relationships with more than one mediating variable according to the procedures recommended by Hair et al. (2017), Cepeda, Nitzl, and Roldan (2017), and Nitzl, Roldan, and Cepeda

Table 2. Hypothesis testing results.

Hypotheses	Path coefficient	*p* value	Results
H1: Performance Expectancy (PE) → Intention (INT)	0.730	0.000***	Supported
H2: Effort Expectancy (EE) → Intention (INT)	−0.030	0.615	Not supported
H3: Social Influence (SI) → Intention (INT)	−0.052	0.439	Not supported
H4: Social Influence (SI) → Performance Expectancy (PE)	0.227	0.000***	Supported
H5: Hedonic Motivation (HM) → Intention (INT)	0.161	0.109	Not supported
H6: Hedonic Motivation (HM) → Effort Expectancy	0.471	0.000***	Supported
H7: Hedonic Motivation (HM) → Performance Expectancy (PE)	0.713	0.000***	Supported

Note: ***Significant at $p < 0.001$.

Table 3. Mediation analysis.

	Total effect	Direct effect	Indirect effect	*p* value	Confidence intervals bias corrected		Results
					2.50%	97.50%	
HM -> INT via EE	0.147***	0.161^{ns}	−0.014^{ns}	0.659	−0.070	0.054	No mediation effect
HM -> INT via PE	0.681***	0.161^{ns}	0.520***	0.000	0.379	0.662	Full mediation
SI -> INT via PE	0.114^{ns}	−0.052^{ns}	0.166***	0.000	0.084	0.265	Full mediation

Note: ***Significant at $p < 0.001$; ns = not significant; HM = Hedonic motivation; INT = Intention; SI = Social influence.

(2016). In SmartPLS 3.2.4., the procedure requires assessing the significance of each specific indirect effect via the mediator variable. As shown in Table 3, two of the specific indirect effects in the model are significant ($p < .001$), a prerequisite to establish a mediation effect. Continuing the mediation analysis procedure outlined by Hair et al. (2017), the significance of the direct effects is assessed in order to determine the type of mediation effect. The direct effect must be non-significant for full mediation. Since the direct effect of hedonic motivation on intention and the direct effect of social influence on intention are not significant, the mediation analysis indicates that performance expectancy fully mediates the effect of hedonic motivation and social influence on intention. The total effect of hedonic motivation on intention was 0.989 and significant (0.147*** and 0.681***)(Cepeda et al., 2017).

Discussion and conclusion

Understanding the factors associated with student acceptance of mobile devices such as iPad tablets is important in order to support m-learning initiatives. In this study the UTAUT was extended to incorporate hedonic motivation (operationalized as enjoyment), a key factor expected to influence student acceptance of iPads for m-learning in a higher education context. Hedonic motivation was hypothesized to have a direct effect on behavioral intention as well as an indirect effect through its relationship to effort and performance expectancy. As hypothesized based upon the UTAUT, the study found that performance expectancy had a significant

direct effect on intention to use iPads for m-learning (H1). This finding is consistent with the large body of UTAUT and TAM literature indicating that a key factor in acceptance of any technology is the user's perception that the technology is useful in accomplishing the activities for which it is intended. The hypothesized direct effect of hedonic motivation on intention was not supported (H5) but, as hypothesized, the study found that hedonic motivation had a significant positive relationship with performance expectancy (H7) and effort expectancy (H6). Mediation analysis found that the total effect of hedonic motivation on intention was significant and that the effect of hedonic motivation on intention was fully mediated by performance expectancy.

Mediation analysis facilitates the investigation of the relationship between an exogenous variable (e.g., hedonic motivation) and a mediator (e.g., performance expectancy) in order to better understand their influence on an endogenous variable in the model (e.g., intention). Research that provides insight into the process whereby one variable affects another can suggest ways in which interventions could affect user perceptions such that a positive effect is found in desired outcomes such as technology acceptance and use. The results of this study suggest that hedonic motivation, operationalized as enjoyment, is a central driver in m-learning acceptance but only when performance expectancy is also high. In this study, the fact that the effects of hedonic motivation and social influence were fully mediated by performance expectancy raises the possibility that intentional efforts to influence perceptions of enjoyment and perceptions of the opinions of significant others might influence performance expectancy and, as a result, intention and usage. Venkatesh and Speier (1999), who used an experimental design to assess how changes in mood during training influenced intentions, provided one example of how future research might investigate the mediating effects found in this study. The significance of performance expectancy as a direct effect on intention and as a mediator reinforces the importance of educators' efforts to help students see the ways in which tablet devices such as iPads improve learning outcomes.

In addition, the UTAUT was extended to reflect the role that social influence was expected to play both through its direct effect on intention, based upon the UTAUT, as well as through its hypothesized indirect effect on performance expectancy, based upon the TAM2. The TAM2 posits that social influence, through a process of internalization, will have a significant positive relationship with performance expectancy. The UTAUT-based hypothesis that social influence would have a significant positive relationship with intention was not supported (H3). However, as hypothesized, this study found support for this TAM2-based hypothesis regarding the relationship between social influence and performance expectancy (H4). In

addition, mediation analysis found that the effect of social influence on intention was fully mediated by performance expectancy. These results provide insight into the role that social influence can play in positively influencing performance expectancy and, through this relationship, intention.

The UTAUT-based hypothesis that effort expectancy would have a significant positive relationship with intention was not supported (H2). In another study of m-learning acceptance, "a general feeling that m-learning is easy to use" was suggested as a reason why ease of use was an insignificant predictor of m-learning intention (Liu, Li, & Carlsson, 2010, p. 1217). Further research, preferably longitudinal, could investigate the conditions under which this UTAUT-based hypothesis is supported in an m-learning context.

This study was based upon cross-sectional data and therefore caution should be used in inferring any causal relationships. In the future, a longitudinal research design would enable investigation of causal relationships between the variables over time. In addition, the sample consisted of undergraduate students in the USA, and thus care should be taken in generalizing the results to other groups and cultures.

Overall, the study's results indicate that the students in this field study perceived iPads to be useful and enjoyable tools for accomplishing educational tasks and improving learning outcomes. For those engaged in the iPad m-learning pilot project which was the subject of this study, the use of the UTAUT and the results provided a theory-based empirical approach to support an assessment that the pilot project goals were achieved. The study provided partial support for the UTAUT and suggests that additional research would be useful to investigate and confirm the role enjoyment/hedonic motivation may play in the acceptance of mobile devices such as iPads in mobile learning and, as well, in other technology adoption contexts.

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Appendix

Table A.1. Survey items/descriptive analysis.

Construct/associated items		Mean	*SD*	Excess kurtosis	Skewness
Effort Expectancy (EE)					
EE1	Learning to use an iPad would be easy for me.	6.082	1.147	2.034	−1.382
EE2	Interacting with an iPad would not require a lot of mental effort.	5.725	1.275	0.27	−0.871
EE3	I would find an iPad easy to use.	6.129	1.085	1.045	−1.202
EE4	It would be easy to become skillful at using an iPad.	6.205	1.014	0.748	−1.168
Performance Expectancy (PE)					
PE1	I would find an iPad to be useful in my studies.	5.661	1.176	0.636	−0.708
PE2	Using an iPad would improve my learning.	5.146	1.384	−0.441	−0.292
PE3	If I used an iPad for learning, it would increase my chances of earning a better grade.	4.994	1.387	−0.181	−0.308
PE4	Using an iPad would increase my productivity in my studies.	5.106	1.435	−0.012	−0.573
PE5	Using an iPad in my studies would help me accomplish tasks more quickly.	5.269	1.367	0.541	−0.663
Social Influence (SI)					
SI1	People who are important to me think that I should use an iPad for learning.	4.509	1.403	0.042	0.027
SI2	People who influence my behavior think I should use an iPad for my studies.	4.502	1.407	0.014	−0.004
SI3	Using an iPad for my studies is a status symbol among people who are important to me.	3.942	1.618	−0.436	−0.114
SI4	People whose opinions I value think that I should use an iPad for learning.	4.345	1.576	−0.151	−0.132
Hedonic Motivation (HM)					
HM1	Using an iPad for learning would enjoyable.	5.643	1.259	1.815	−1.054
HM2	Using an iPad for learning would be pleasurable.	5.606	1.266	1.563	−0.96
HM3	Using an iPad for learning would be fun.	5.602	1.268	1.335	−0.918
HM4	Using an iPad for learning would be entertaining.	5.614	1.234	1.097	−0.849
HM5	Using an iPad for learning would interesting.	5.673	1.251	1.419	−0.985
Intention (INT)					
BI1	Assuming I had an iPad, I would use it for learning activities.	5.614	1.258	2.508	−1.212
BI2	Given that I had an iPad, I predict I would use it in the future for learning activities.	5.614	1.258	2.258	−1.171
BI3	If I had an iPad, I predict that I would use it frequently for learning activities.	5.488	1.370	1.417	−1.046