

Factors Influencing Intention to Use Mobile Technologies for Learning among Technical Universities Students

¹Ng Kim-Soon, ²Mohamud Ahmed Ibrahim, ³Abd Rahman Ahmad, ⁴Ng Mei Xin Sirisa
^{1,2,3} Fakulti Pengurusan Teknologi dan Perniagaan, Universiti Tun Hussein Onn
Malaysia, Malaysia

⁴Faculty of Arts and Social Science, Universiti Tunku Abdul Rahman, Malaysia

¹Email: ksng@uthm.edu.my; gaani121@gmail.com; arahman@uthm.edu.my;
sirisa.utar@gmail.com

Abstract

Mobile technologies offer more than just calling. There are number of innovative features that are crucial and impactful to educational purpose. Despite the importance of understanding factors influencing mobile technologies for learning, this area has received limited research. Thus, the aim of this study is to investigate factors influencing intention to use m-learning among students at Malaysian technical universities. The research framework for this research has been adopted from unified theory of acceptance and use of technology (UTAUT) to achieve research objectives. A total of 400 set of data was collected from four Malaysia technical universities using purposeful structured random sampling and self-administrated survey questionnaire. AMOS was performed to test whether the model of its good fit to test hypotheses formulated. The results revealed that performance expectancy and self-management of learning are significant related to behavioral intention to use m-learning while effort expectancy, social influence and perceived playfulness do not indicate significant relationship with intention to use mobile technologies for learning among students at Malaysia technical universities. The findings of this study added new understanding as regard to factors influencing students' intention to use m-learning in higher education.

Keywords: mobile technologies, intention to use m-learning, UTAUT, Malaysian Technical Universities Network (MTUN), AMOS

1.0 Introduction

The use of mobile technologies devices has been growing and making rapid changes in the Malaysia. Mobile technologies offer more than calling. They are classified servers, laptop computers, tablet computers, smart phones, pocket computers, portable media players, MP3 players, video player. (Korucu and Alkan, 2011). There are numerous innovative features and a study on the impact for educational purpose is crucial. Among the important innovative features provided by m-learning are their portability, immediacy, individuality, connectivity and accessibility anywhere (Ally, 2009). Alzaza and Yaakub (2011) surveyed 261 Malaysian higher education students about students' awareness and requirements of mobile learning services and found that students have adequate knowledge and possess awareness to use mobile technologies in their learning environment. Joosten (2010) reported that mobile technologies devices has impact on learning process experience such as learning satisfaction, student learning engagement and learning performance. He concluded that mobile learning devices are useful tools in promoting learning process. Ayoade (2015) argued that there is a need to determine factors that contribute towards learners' acceptance of mobile learning in education in

order to facilitate adoption and usage of mobile learning. It is increasingly tough to ignore the case how crucial mobile learning can enhance learning especially in higher education. Therefore, this study was carried out to investigate the intention to use mobile technologies for learning among students at the Malaysian technical universities.

2.0 Literature Review

The definition of m-learning is still not clearly defined. Alharbi and Drew (2014) argued that m-learning this could be due to whether to focus its definition on the mobility of the device or the mobility of the learner. Kambourakis et al., (2004) defined that m-learning can be considered as any learning and teaching activity that takes place through mobile technologies devices or in settings where mobile equipment is available. Cheon et al., (2012) stated that m-learning is referred to as any mobile device that is portable, has instant connectivity and context sensitivity, can be taken anywhere anytime, can be accessed and gathers variety of information without a fixed place. Rosman (2008) described m-learning as an array of ways that people learn or stay connected with their learning environments including their instructors and classmates while going with mobile devices. In general, m-learning refers to student interaction with educational materials at anytime and anywhere through the use of mobile technologies and Internet wireless devices, such as personal digital assistants (PDAs), smart phones, mobile phones, and digital audio players (Wang et al., 2009). Researchers has also refer m-learning as the next stage of e-learning. Georgiev et al., (2004) defined m-learning as a new stage of e-learning having the ability to learn everywhere at every time through use of mobile and portable devices. Pinkwart et al., (2003) defined m-learning as an e-learning that uses mobile devices and wireless transmission devices.

A number of theories have been formulated to examine individual's acceptance and intention to use information technology system. Technology Assessment Model (TAM) developed by Davis (1989) is among most popular accepted and applied theory model to investigate behavioral intention to use information technology system. TAM focused on two particular constructs of perceived of usefulness and perceived of ease of use as drivers of information technology acceptance. A number of modification and proposed models have been made to this original theory of TAM and other theories models. One of these recent popular theories that seeks to identify information technology intention to use is the Unified Theory of Acceptance and Use of Technology (UTAUT) proposed by Venkatesh et al., (2003). UTAUT model combined empirically elements from different theories models for information technology behavioral intention to use. It has four key variable constructs. These are on Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions as direct determinants intention to use technology and behavioral intention to use. The Eight theory models that have been compared and reviewed by the researchers were in deriving at the UTAUT model are Theory of Planned Behavioral, the Theory of Reasoned Action (TRA) (Fishbein and Ajzen, 1975), TAM (Davis, 1989), the Motivational Model (MM) (Davis et al., 1992), the Theory of Planned Behaviour (TPB) (Ajzen, 1991), the Model of PC Utilization

(MPCU) (Triandis, 1977; Thompson et al., 1991), the Innovation Diffusion Theory (ITD) (Moore and Benbasat, 1991; Rogers, 2003), Social Cognitive Theory (SCT) (Bandura, 1986; Compeau et al., 1999) and a model that combined TAM and TPB (C-TAM-TPB) (Taylor and Todd, 1995, Chen, 2013).

Researchers have validated the constructs of UTAUT model. It comprises of Performance Expectancy, Effort Expectancy, Social Influence and Facilitating Conditions. Wang et al., (2009) argued that mobile technologies in the learning context differs from other information technologies and UTAUT does not fully address the adoption of mobile technologies for learning. They added perceived playfulness and self-management of learning to this original framework and eliminated the facilitating conditions element. Pedersen and Ling (2003) suggested that the traditional adoption models in information systems research maybe customized and extended when they applied to investigate mobile technologies for learning (m-learning).

Venkatesh et al., (2003) defined performance expectancy as the extent to which a person believes that using an information system would help him or her to benefit in terms of job performance. UTAUT researchers refer three previous existed constructed theory models to capture and form concept of performance expectancy “perceived usefulness (TAM/TAM2 and C-TAM-TPB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT), and outcome expectations (SCT)”. In the context of m-learning, Wang et al., (2009) suggested that students will find mobile technologies for learning useful because they can learn at their convenience and quickly as it will also enhances their learning performance. Ahmed and Steve (2013) reported that factors influence intention to use m-learning from a survey of 174 students are performance expectancy, effort expectancy, influence of lecturers, quality of service and personal innovativeness and that all these significantly affect behavioral intention to use m-learning.

Venkatesh et al., (2003) defined effort expectancy as the degree of ease to use associated with the use of the system. Researchers constructed this variable from three existing pervious theoretical models that are related to effort expectancy to capture the concept of perceived ease of use (TAM/TAM2), complexity (MPCU), and ease of use (IDT). Empirical research on e-learning behavioral intention indicated that individual-level variables, the performance expectations, effort expectancy, perceived behavioral control and group-level variables which are incentive and the social influence have a positive effect on behavioral intention (Liao et al., 2011). Venkatesh et al., (2003) reported that effort expectancy’s effect will be strong during the initial stages of using a system and decrease over time as the user gains experience.

Social influence has been defined as the extent to which a person perceives it is important that others believe he or she should use the new information system (Venkatesh et al., 2003). In the context of m-learning, examples of social influence are

influences for teachers, parents, peers, etc. Researches on adoption e-government services using by UTAUT model found that performance expectancy, effort expectancy and peer influence determine students' behavioral intention. Wang et al., (2009) also found a positive influence of social influence and intention to use M-learning among Taiwanese college students.

There are two possible approaches to perceived playfulness dimension. It is either through trait of playfulness or state of playfulness (Moon & Kim, 2001). Traits refer to comparatively stable characteristics of individuals. These are relatively invariant to situational stimuli. States, however, refer to affective or cognitive episodes that are experienced in the short run and fluctuate over time. (Moon & Kim, 2001). Based on these two dimensions of playfulness, Moon and Kim (2001) found that perceptions of playfulness appeared to influence user's attitude toward using the Web. Thus, perceived playfulness can be considered as important in the design of future information systems and their elements include providing better concentration, curiosity and enjoyment. Playfulness is an important factor which play major role to examine students acceptance mobile technologies for learning. Ahn et al., (2007) investigated the effects of playfulness web user's acceptance of online retailing. Their data were collected from 942 users and found that playfulness plays an important role in enhancing user attitude and behavioral intention to use a website. In addition to that research work by Iqbal and Qureshi, (2012) on mobile technologies and adoption for learning found that perceived usefulness, ease of use, and facilitating conditions significantly affect the students' intention to adopt m-learning, and weak influence from perceived playfulness. They also reported that social influence is negatively related to adoption of m-learning.

Self-management of learning refers to the degree to which an individual perceives self-discipline and is an enabler for teenage in autonomous learning (Smith et al., 2003). Wang et al., (2009) defined self-management of learning as the extent to which an individual feels he or she is self-disciplined and can engage in autonomous learning. Since mobile learning can be considered as a kind of e-learning via mobile devices, it is expected that an individual's level of self-management of learning will have a positive influence on his or her behavioral intention to use mobile learning. In the context of mobile learning, Huang (2014) reviewed the effectiveness of a meaningful learning-based evaluation model for context-aware mobile learning. They stated that students may manage their own learning as they are sometimes separated from faculty, peers and the institutional support.

3.0 Research Methodology

This is a quantitative study. The target populations of this study was the 4 technical universities in Malaysia, also known as Malaysian Technical University Network (MTUN). The name of universities are Universiti Malaysia Perlis (UniMAP), Technical University of Malaysia Malacca (UTeM), Universiti Tun Hussein Onn Malaysia (UTHM) and Universiti Malaysia Pahang (UMP). The sample size determined from

population was based on Krejcie and Morgan Table (Krejcie & Morgan, 1970). Data was collected from 400 respondents through self-administered survey questionnaire. In this research, questionnaire was designed to collect the primary data from respondents. The questionnaire was constructed and adopted from original UTAUT model authors (Venkatesh et al., 2003), Wang et al., 2009). A five-point Likert scale 1=strongly disagree to 5=strongly agree has been used to measure each of the elements of the respected items of UTAUT. Reliability tests using Cronbach Alpha has been used to test the reliability of the measures. The results on reliability of the measures are tabulated in Table 1. Cronbach's Alpha value of greater or equal 0.70 indicates that the measure is reliable (Nunnally, 1978). Thus, all the measures are valid and reliable.

Table 1: Reliability of Measurements

S/N	Variables	No of Items	Cronbach Alpha
1.	Performance expectancy	4	0.824
2.	Effort expectancy	6	0.853
3.	Social influence	4	0.803
4.	Perceived playfulness	6	0.735
5.	Self-management of learning	4	0.853
6.	Intention to use	5	0.894

3.1 Research model and hypothesis

Figure 1 shows the research framework of this study. The independent variables are performance expectancy, effort expectancy, social influence, perceived playfulness and self-management of learning. The dependent variable is intention to use mobile technologies for learning.

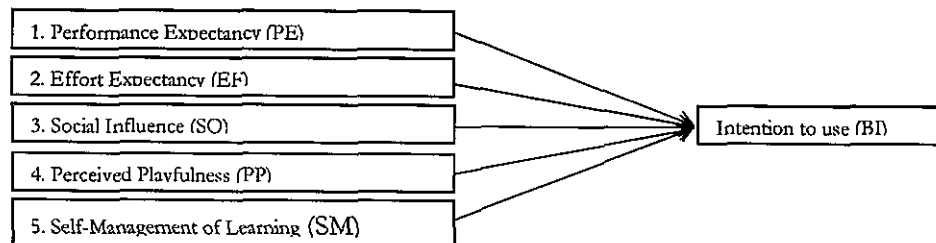


Figure1: Research framework

The hypotheses that have been formulated basing on this research framework are as follow:

1. Performance expectancy has a significant influence on behavioral intention to use mobile technologies for learning;
2. Effort expectancy has a significant influence on behavioral intention on mobile technologies for learning;

3. Social influence has a significant influence on behavioral intention to use mobile technologies for learning;
4. Perceived playfulness has a significant influence on behavioral intention to use mobile technologies for learning;
5. Self-management of learning has a significant influence on behavioral intention to use mobile technologies for learning.

4.0 Data Analysis and Findings

The profile of the respondents of this study is tabulated in Table 2. These profile include gender, age, the University where they are from, the level of degree course they are taking, their race, type of mobile device they are using, the m-learning experience and frequency of use of the mobile device.

Table2: Demographic profile

Description	Categories	Total students	
		No. of respondents	Percentage
1. Gender	Male	168	42.0
	Female	232	58.0
2. Age	Below 18	5	1.3
	18-23	133	33.3
	23-28	191	47.8
	28-33	27	6.8
	33 and above	44	11.0
3. University	UTHM	100	25.0
	UniMAP	100	25.0
	UTeM	100	25.0
	UMP	100	25.0
4. Level of education	Diploma	32	8.0
	Degree	200	50.0
	Master	131	32.8
	PhD	37	9.3
5. Race	Malay	58.3	58.3
	Chinese	16.3	16.3
	Indian	10.0	10.0
	Others	62	15.5
6.Type of mobile device	Smartphone	244	61.0
	Tablet	50	12.5
	Laptop	103	25.8
	PDA's	3	0.8
7. M-learning experience	Less than three years	93	23.3
	Between 3 to 5 years	102	25.5
	Above 5 years	205	51.3

8. Frequency of use of mobile technologies	Very infrequently	72	18.0
	Somewhat infrequently	28	7.0
	occasionally	61	15.3
	Somewhat frequently	87	21.8
	Very frequently	152	38.0

SPSS AMOS statistical software was used to test the goodness of fit of model. Four common model-fit measurements were used to assess the model's overall goodness of fit. These are comparative fit index (CFI), goodness-of-fit index (GFI), Tucker Lewis index (TLI) and root mean square residual (RMSEA). According to Browne and Cudeck (1993), RMSEA range of between 0.05 to 0.08 is acceptable, GFI range ≥ 0.90 is good fit, CFI range ≥ 0.90 is good fit, TLI range ≥ 0.90 is good fit. After examining and analyzing basing on the deletion of elements of items using the modification indices, factor score weights and covariance between the variables, the final model of the research framework met the goodness of fit measurements with RMSEA value of 0.068. Tests comparing the target model with the null model gives GFI value of 0.892, CFI value of 0.933 and TLI value of 0.90. These indicated that the value of GFI, TLI, CFI approach to value of 1, the better is the degree of fit of the model and achieved fitness and is acceptable.

The hypothesized relationships between latent variables and observed variables that help to predict intention to use m-learning is shown in Table 3. The regression weights indicate the strength of the relationship between the variables and the asterisk indicate whether there is a significant relationship between the variables tested.

Table 3: Regression weights between the variables and intention to use

	Variables	Intention to use
1.	Performance expectancy	.513***
2.	Effort expectancy	-.083
3.	Social influence	.041
4.	Perceived playfulness	.145
5.	Self-management of learning	.350 ***

Note: Standardized estimate; *** $p < 0.001$

Table 4 summarizes the results of hypothesis tested. The observed variables are performance expectancy (PE), effort expectancy (EF), social influence (SI), perceived playfulness (PP) and self-management of learning (SM), while latent variable is behavioral intention to use (BI). The path analyses showed that Hypotheses H1 and H5 were supported while H2, H3 and H4 were not supported.

Table 4: Summary of results of results of hypotheses tested

Hypothesis	Path	Result
H1: There is significant relationship between performance expectancy and behavioral intention.	PE→BI	Supported
H2: There is significant relationship between effort expectancy and behavioral intention.	EF→BI	Not Supported
H3: There is significant relationship between social influence and behavioral intention.	SO→BI	Not Supported
H4: There is significant relationship between perceived playfulness and behavioral intention.	PP→BI	Not Supported
H5: There is significant relationship between self-management of learning and behavioral intention.	SM→BI	Supported

5.0 Discussions

This study employed UTAUT model to find out the factors influencing intention to use m-learning among students at Malaysian technical universities (MTUN). To achieve the objectives 400 survey questionnaires were distributed to students of these technical universities using convenient structured random sampling. AMOS was performed to analyze the data to check the model fit and regression for hypothesis testing. The result showed that proposed UTAUT model has the ability to predict student's intention to use m-learning and it met the goodness of fit measurements. AMOS linear regression was used to test the hypothesized relationship associates latent variables towards observed variables to find out what factors is significantly related to the use m-learning among student at Malaysia technical universities. Performance expectancy, effort expectancy, social influence, perceived playfulness and self-management of learning were the observed variables or factors influencing intention to use m-learning base on proposed UTUAU model constructs, while behavioral intention to use is the latent or dependent variable. The finding reveals that performance expectancy and self-management of learning was found to be significant related to behavioral intention to use m-learning at p-value 0.001. This finding is similar study done by Wang et al., (2009) and Liu (2008). Performance expectancy and self-management of learning has significant relationship to predict factors influencing behavioral intention to use m-learning. It seems that students believe that the use of mobile technologies for learning will have positive impact, have a tendency to accept m-learning comparing to students with lower performance expectancies in terms of their educational performance. They will also have self-disciplined to engage learning anytime at anywhere. Huang (2014) argued that students may manage their own learning as they are sometimes separated from faculty, peers, and the institutional support.

Social influence, effort expectancy and perceived playfulness do not indicate significant influence on behavioral intention to use m-learning. Venkatesh et al., (2003) stated that social influence has strong influence during initial stage of m-learning adoption and decreases over time. In this study 76% of the population have 3 years and above

experience with m-learning (refer to Table 1). Thus, they are not in the initial stage to adopt m-learning, providing the reason why social influence has no significant to intention to use. This finding is similar to research work by Iqbal and Qureshi, (2012). Their research on mobile technologies and adoption for learning found that perceived usefulness, ease of use, and facilitating conditions significantly affect the students' intention to adopt m-learning with perceived playfulness having less influence. However, the difference is that they found social influence negatively impact on adoption of m-learning.

6.0 Conclusion

Mobile technologies extend learning beyond traditional face to face learning whereby students are able to conduct their learning anytime at any place using their mobile technologies devices. The objective of this research was to investigate factors such as performance expectancy, effort expectancy, social influence, perceived playfulness, self-management of learning to influence on behavioral intention to use m-learning among students at four Malaysia technical universities (MTUN). The results this empirical study revealed that among the five constructs, performance expectancy and self-management of learning positively impact on behavioral intention to use m-learning. It implies that these factors have predict power on the behavioral intention to use m-learning. The findings of this study add substantially understanding factors that influence students' intention to use m-learning to both educators and developers to focus on the most factors that could influence students to use their mobile technologies for learning in order to innovate and improve better applications that will give support to students' learning tool or related features that is beneficial to their study. Besides, students will understand that using mobile technologies have the ability to have seemingly everything they could need as a tool for communication and learning. On-line services are continuously changing and evolving. On the final note, it is crucial for universities to ensure sustainable and competitive e-services are provided to student which include the availability of internet and intranet for accessibility to m-learning. Regular evaluations and appraisals of e-service provided by universities are necessary to monitor e-learning performance (Kim-Soon et al., 2014). In this case, m-learning among students should be an items included in the regular monitoring of e-learning performance at universities.

7.0 Acknowledgments

This research project is supported by Universiti Tun Hussein Onn Malaysia through its Multi-Discipline Research Grant Number 1322. The authors wish to thank the respondents who have spent their precious time and patience for participating in this project.

8.0 References

- Ahn, T., Ryu, S. and Han, I. (2007). The impact of Web quality and playfulness on user acceptance of online retailing. *Information & Management*, 44(3), 263–275. doi:10.1016/j.im.2006.12.008.
- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Alharbi, S. and Drew, S. (2014). Using the Technology Acceptance Model in Understanding Academics' Behavioural Intention to Use Learning Management Systems. *International Journal of Advanced Computer Science and Applications*, Vol. 5(1).
- Ally, M. (2009). Mobile learning: Transforming the delivery of education and training. Edmonton, AB: Athabasca University Press.
- Alzaza, N.S. and Yaakub, A.R. (2011). Students' Awareness and Requirements of Mobile Learning Services in the Higher Education Environment, *American Journal of Economics and Business Administration*, 3(1), 95–100, DOI: 10.3844/ajebasp.2011.95.100
- Attewell, J. and Savill-Smith, C. (2004). Learning with mobile devices. *Research and development. London: Learning and Skills Development Agency*.
- Ayoade, O.B. (2015). Factors Influencing Students' Behavioural Intention to Adopt and use Mobile Learning in Higher Educational Institutions in Nigeria: An Example of Ekiti State University, Ado-Ekiti. *International Journal of Emerging Technology and Advanced Engineering*, Vol. 5(4), 307-313.
- Bandura, A. (1986). *Social foundations of thought and action: a social cognitive theory*. Englewood Cliffs, NJ: Prentice Hall.
- Browne, M.W. and Cudeck, R. (1993). Alternative ways of assessing model fit. In K. A. Bollen & J. S. Long (Eds.), *Testing structural equation models* (pp. 136- 162). Newbury Park, CA: Sage
- Chen, Chih-Chung. (2013). The exploration on network behaviors by using the models of Theory of planned behaviors (TPB), Technology acceptance model (TAM) and C-TAM-TPB. *African Journal of Business Management*, 7(30), 2976-2984, DOI: 10.5897/AJBM11.1966
- Cheon, J., Lee, S., Crooks, S.M. and Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education*, 59(3), 1054–1064. doi:10.1016/j.compedu.2012.04.015
- Compeau, D., Higgins, C.A. and Huff, S. (1999). Social cognitive theory and individual reactions to computing technology: A longitudinal study. *MIS Quarterly*, 23(2), 145-158.
- Davis, F.D. (1989). Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly*, 13(3), 319-340.
- Davis, F.D., Bagozzi, R. P. and Warshaw, P. R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. *Journal of Applied Social Psychology*, 22, 14, 1111–1132.

- Fishbein, M.A. and Ajzen, I. (1975). *Belief, attitude, intention and behavior: An introduction to theory and research*. Reading, MA: Addison-Wesley.
- Georgiev, E., Smrikarov, A. and Georgiev, T. (2005). A general classification of mobile learning systems. *Proceeding of the International Conference on Computer Systems and Technologies* pp.11-16
- Huang, Y. (2014). *Empirical Analysis on Factors Impacting Mobile Learning Acceptance in Higher Engineering Education*.
- Iqbal, S. and Qureshi, I.A. (2012). M-learning adoption: A perspective from a developing country. *The International Review of Research in Open and Distance Learning*, 3(3), 147-164.
- Joosten, T. (2010). *Mobile learning and social media: Increasing engagement and interactivity*. Paper presented at the *New Media Consortium Conference*, June 9-12, 2010, Anaheim, CA.
- Kambourakis, G., Kontoni, D.P.N. and Sapounas, I. (2004). *Introducing Attribute Certificates to Secure Distributed E-Learning or M-Learning Services*. *Proceedings of the IASTED International Conference. Innsbruck, Australia*. pp 436-440. Retrieved April 24, 2007
- Kim-Soon, N., Rahman, A. and Ahmed, M. (2014). E-Service Quality in Higher Education and Frequency of Use of the Service, *International Education Studies*, 7(3), 1-10
- Korucu, A.T. and Alkan, A. (2011). Differences between m-learning (mobile learning) and e-learning, basic terminology and usage of m-learning in education. *Procedia - Social and Behavioral Sciences*, 15, 1925–1930. doi:10.1016/j.sbspro.2011.04.029.
- Krejcie, R.V. and Morgan, D.W. (1970). *Determining Sample Size for Research Activities*. *Education and Psychological measurement*
- Liao, P.W., Yu, C. and Yi, C.C. (2011). Exploring effect factors of e-learning behavioral intention on cross-level analysis. *Advanced Materials Research*, 204-210, 174-177.
- Liu, Y. (2008). *An adoption model for mobile learning*. In *Proceeding for the IADIS International Conference e-Commerce*. Amsterdam, Netherlands.
- Moon, J. and Kim, Y. (2001). Extending the TAM for a world-wide-web context. *Information & Management*, 38, 4, 217–230.
- Moore, G. C., and Benbasat, I. (1991). Development of an instrument to measure the perceptions of adopting an information technology innovation. *Information systems research*, 2(3), 192-222.
- Nunnally, J.C. (1978). *Psychometric theory* (2nd edition). New York: McGraw-Hill.
- Pedersen, P.E. and Ling, R. (2003). *Modifying adoption research for mobile internet service adoption: Cross disciplinary interactions*. *Proceedings of the 36th Hawaii International Conference on System Sciences*, (pp. 6-9). Los Alamitos: IEEE Computer Society Press.
- Pinkwart, N., Hoppe, H.U., Milrad, M. and Perez, J. (2003) Educational scenarios for the cooperative use of Personal Digital Assistants. *Journal of Computer Assisted Learning*, 19, 3, 383-391. doi: 10.1046/j.0266-4909.2003.00039.x

- Rogers, E. (2003). *Diffusion of Innovations*. 5th Edition. *New York: Free Press*. ISBN: 0-7432-2209-1.
- Rosman, P. (2008). M-Learning-As a paradigm of new forms in education. *E+M Economies and Management*, 1, 119-125.
- Smith, P. J., Murphy, K.L. and Mahoney, S.E. (2003). Towards identifying factors underlying readiness for online learning: an exploratory study. *Distance Education*, 24, 1, 57-67.
- Taylor, S. and Todd, P.A. (1995). Understanding Information Technology Usage: a Test of Competing Models. *Information Systems Research*, 6 (2):144 – 176.
- Thompson, R. L., Higgins, C. A. and Howell, J. M. (1991). Personal computing: toward a conceptual model of utilization. *MIS Quarterly*, 15, 1, 124-143.
- Triandis, H. (1979) Values, Attitudes, and Interpersonal Behaviour, Nebraska Symposium on Motivation, 27, 195-259.
- Venkatesh, V., Morris M. G., Davis, G. B. and Davis, F. D. (2003). User acceptance of information technology: Toward a unified view. *MIS Quarterly*, 27(3), 425-478.
- Wang, Y., Wu, M. and Wang, H. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40(1), 92-118. doi:10.1111/j.1467-8535.2007.00809.x