An Acceptance of Mobile Learning for Higher Education Students in Thailand

Kallaya Jairak [1]
Prasong Praneetpolgrang [2]
Kittima Mekhabunchakij [3]
Faculty of Informatics, Doctor of Philosophy Program in Information Technology
Sripatum University, Bangkok 10900
Email: [1]ajkallaya@gmail.com, [2]prasong.pr@spu.ac.th, [3]kittima.me@spu.ac.th

***Abstract*- The objectives of this research are to assess the likelihood of acceptance in mobile learning (m-Learning) and study main factors that effect to use m-Learning that focus on higher education students in Thailand. The researchers use a quantitative and qualitative approach to survey on 390 students. The samples are selected on the probability basis that using the stratified random sampling under the different area by divided into 2 groups: (1) the private universities and (2) the public universities in Thailand. We use questionnaires for collecting the data. In addition, the modified acceptance framework that based on the Unified Theory of Acceptance and Use of Technology (UTAUT) model is adopted to determine the factors that influence the students' intention to use m-Learning. The results from statistical analysis show that the acceptance level of students on m-Learning is in the high level.**

***Keywords*- Mobile Learning, User Acceptance, UTAUT**

I. INTRODUCTION

The growth of e-Learning implementation in education is still growing at a steady rate. In developing country such as Thailand, the major equipment of anytime anywhere learning concept is still focusing on personal computer or PC. Because of the physical limitations of the PC, learners can not access learning materials in some place or some location. In this case, mobile device that becomes popular among the teenagers can be fulfilled in the ubiquitous learning idea. Normally, we call e-Learning with mobile device as mobile learning or m-Learning in abbreviation.

In recently, many researchers have focused on m-Learning and its environment, such as users' acceptance in m-Learning ([1],[2]), environment setting for m-Learning ([3],[4],[5],[6]), and implementation of m-Learning in developed countries [7]. The adoption of mobile device is not the same in all countries. Therefore, the researchers should explore this case by case in a specific country.

In Thailand, m-Learning is not a new word for Thailand academic but it is during the initial stage of implementation. There are very few universities that embedded m-Learning in their learning environment. This may be due to the high cost of investment. University administrators be carefully considered for the high budget in m-Learning. The factors that affect to use m-Learning are also another major consideration when deciding to invest or not to invest in m-Learning.

The main purpose of this research is to study on student acceptance of m-Learning for higher education in Thailand. The rest of this paper is structured as follows. Firstly, we describe literature reviews about theory and model that can be explain and predict an acceptance in new technology. Secondly, we describe research methods, hypotheses and instrument measurement reliability. Third, we describe the results of this study and conclusion shown in the final section (section 4). In addition, we hope that this

study will lead to better understanding the acceptance on m-Learning in Thailand students' context.

II. THEORETICAL BACKGROUND

Over the past on two decades, many theories were developed to study and explain the user intention or acceptance to use new technology that has been recognized since the mid-1980s [8]. The theories that most popular and influential such as Theory of Reasoned Action (TRA) that proposed by Fishbein and Ajen (1991)[9], Technology Acceptance Model (TAM) proposed by Davis (1989) ([10],[11]), Theory of Planned Behavior (TPB) proposed by Icek Ajzen (1985) ([12],[13]), Innovation Diffusion Theory (IDT) propose by Rogers (1995) [14], extended TAM or TAM2 proposed by Venkatesh and Davis (2000) [15] and most recently, the Unified Theory of Acceptance and Use of Technology model (UTAUT) ([8],[16]). This part we explain and refer the theories that related with this research.

A. Technology Acceptance Model (TAM)

Davis(1989) and Davis et al. (1989,1992) developed Technology Acceptant Model (TAM) ([10],[11]) based upon Theory of Reasoned Auctioned (TRA) and later validated by many other researchers in a variety of academic disciplines. TAM aims to examine why users' beliefs and attitudes affect their acceptance or rejection of information technology. This model has been validated through examining various types of technologies including mobile technology both mobile commerce ([17],[18]) and mobile learning ([1],[2]). TAM consist of two beliefs, the first of these belief is perceived usefulness(PU) that is defined as "the degree to which a person believes using a particular system would enhance his or her job performance" and the second belief is "perceived ease of use" (PEOU), which is defined as "the degree of to which a person believes that using a particular system would be free of effort" [8] and TAM2 extended TAM by including subjective norm as an additional predictor of intention to use. The original TAM by Davis (1989) is shown in Fig. 1.

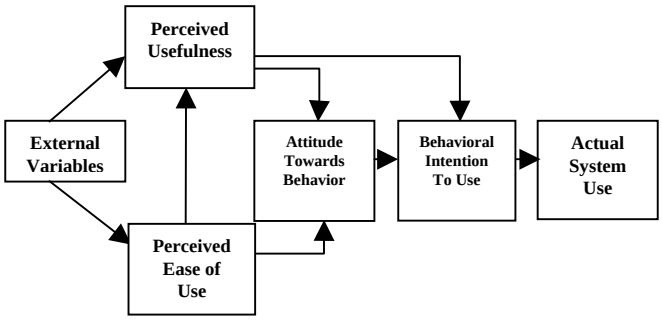


Fig. 1 Original Technology Acceptance Model [10]

B. Unified Theory of Acceptance and Use of Technology (UTAUT)

The UTAUT model is one of most widely used in the field of information and communication technology acceptance modeling was developed by Venkatesh, Morris, Davis, and Davis (2003) based upon Technology Acceptance Model that it attempts to explain user intentions to use a new information system and subsequent usage behavior. In addition, UTAUT was able to explain 70% of technology acceptance behavior [19] consists of four key constructs that are, Performance Expectancy (PE), Effort Expectancy (EE), Social Factors (SFs) and Facilitating Conditions (FCs) which influence directly the use intention. This model is shown in Fig. 2.

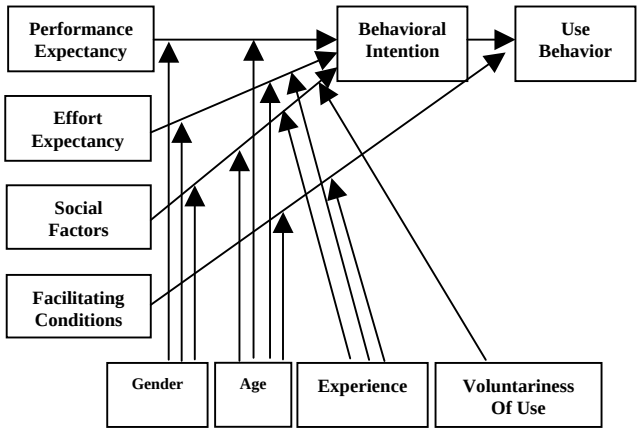


Fig. 2 UTAUT model

UTAUT has been investigated by Tao Zhou (2008) [20] that it is drawing on eight theories these four factors are not the totally new factors and they are adapted from extant factors and PE is similar to perceived usefulness and EE is similar to perceived ease of use of Technology Acceptance Model (TAM). SFs is similar to subjective norm of Theory of Reasoned Action (TRA) and Theory of Planned Behavior (TPB).

C. Mobile Learning

The definition of mobile learning (m-Learning) is defined as the delivery of electronic learning materials to mobile devices [21] that in currently exploits both handheld computer such as laptop PCs in small size, tablet PCs but not desktop and mobile phone such as mobile phone, smart phones, Personal Digital Assistants (PDAs), Pocket PCs ([21],[22]) including the learning that can happen anywhere and at anytime. Therefore, in summary that m-Learning is a type of e-Learning, a method for distance learning through wireless mobile devices. In previous research, many researchers in-depth studied on the m-Learning in each issue such as framework, features, platform, usefulness, application, evaluating and etc. supported that m-learning is continuously developing.

III. RESEARCH FRAMEWORK AND HYPOTHESES

After considered in the TAM and UTAUT model, we selected and adopted UTAUT in our study. The research framework is shown in Fig. 3.

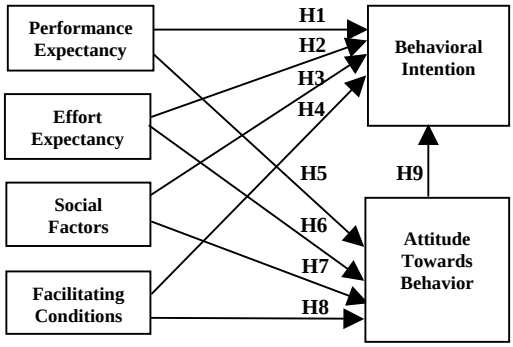


Fig. 3 Research Framework

This preliminary research based on UTAUT model use five major factors that give a direct effect to intention to use in m-Learning and cutting off the mediator variables such as gender, age, experience, voluntariness of use. The condensed model can cover the explanation of m-Learning user in this context.

Research Hypotheses

H1: Performance expectancy (PE) has a significant positive relationship with attitude towards behavior (AT).

H2: Effort expectancy (EE) has a significant positive relationship with attitude towards behavior (AT).

H3: Social factors (SFs) have a significant positive relationship with attitude towards behavior(AT).

H4: Facilitating conditions(FCs) have a significant positive relationship with attitude towards behavior (AT).

H5: Performance cxpectancy (PE) has a significant positive relationship with behavior intention to use (BI).

H6: Effort cxpectancy (EE) has a significant positive relationship with behavior intention to use (BI).

H7: Social factors (SFs) have a significant positive relationship with behavior intention to use (BI).

H8: Facilitating conditions (FCs) have a significant positive relationship with behavior intention to use (BI).

H9: Attitude towards behavior (AT) has a significant positive relationship with behavior intention to use (BI).

H10: The students in public university and private university have different level of acceptance in m-Learning.

IV. RESEARCH METHODOLOGY

A. A Collection and Analysis of Research Data

The numbers of sample in this research is 400 students but we can collect the questionnaires 390 set that is (97.5%). We collected data in five universities of Thailand that divided into two groups, the first is private university consist of Sripatum University, Payap University and North-Chiangmai University. The second is public universities consist of Rajabhat Chiangmai and Rajamangala University of Technology Lanna. The questionnaire is divided into three parts: Part I: The students' demographics information. In this part questions, we analyzed by statistic frequency and percentage. Part II: Question in this part, we use many items in each constructs for examine the relationship between four main factors with behavior intention to use m-Learning and assess the likelihood of level of acceptance. The questions using a 5-point scale was employed to collect the data and then we analyzed by statistic mean and standard deviation, regression analysis, including hypothesis testing by t-test. Part III: Opinion about m-learning analyzed by grouping and descriptive statistic.

B. The Factors and Items in Part II

All of the constructs and questionnaires in part II to assess the likelihood of level acceptance was developed based on the instrument by Venkatesh et al. (2003) with some additional constructs included. The question domains include: PE 4 items, EE 3 items, SFs 3 items, FCs 4 items, Attitude toward using technology (AT) 3 items and Behavioral intention (BI) 3 items. In summary, we use 20 items in 6 constructs. that the questions are shown in Table I.

TABLE I
THE QUESTIONS IN PART I

Item	Measures	N. of Item
PE1	m-Learning has useful for education in overall.	4
PE2	Using m-Learning enables student to accomplish tasks more quickly	
PE3	m-Learning would improve of students' performance in online transactions.	
PE4	m-Learning would increase students' productivity in online.	
EE1	m-Learning easy to use.	3
EE2	Finding or using menu in m-Learning is easy.	
EE3	Learning to operate the m-Learning is easy.	
SF1	People who influence my behavior think that you should use m-Learning.	3
SF2	People who are important my behavior thinks that you should use m-Learning.	
SF3	The teacher of this university has been supportive in the use m-Learning.	
FC1	In general, the organization has support the using m-Learning.	4
FC2	I have the resources necessary to use m-Learning.	
FC3	I have the knowledge necessary to use m-Learning.	
FC4	I have the person is available for assistance when m-Learning are difficulties.	
AT1	Using m-Learning is good idea.	3
AT2	I like to use m-Learning.	
AT3	Working with m-Learning is fun.	
BI1	I intend to use m-Learning indeed.	3
BI2	I predict I will use m-Learning.	
BI3	I have the plan to use m-Learning.	

V. DATA ANALYSIS AND RESEARCH RESULTS

Four hundred questionnaires were received after the follow-up activities. The 390 (97.5%) complete questionnaires can use to analyze in this study.

A. Analysis Validity and Reliability

The internal consistency reliability and construct validity using SPSS was assessed by computing the principal component analysis with varimax rotations and Cronbach's alpha coefficients range from 0.79 to 0.91 that is shown in Table II.

Several of the scales that represent UTAUT constructs appear to have a good degree of reliability with statistic value is above 0.70.

TABLE II
RESULTS OF ROTATED FACTOR LOADING AND CRONBACH'S α

	Component					
	1	**2**	**3**	**4**	**5**	**6**
PE1	0.759					
PE2	0.714					
PE3	0.714					
PE4	0.671					
EE1		0.794				
EE2		0.807				
EE3		0.757				
SF1			0.862			
SF2			0.855			
SF3			0.390			
FC1				0.562		
FC2				0.817		
FC3				0.834		
FC4				0.696		
A1					0.639	
A2					0.708	
A3					0.466	
BI1						0.807
BI2						0.823
BI3						0.819
Alpha Value	**0.811**	**0.913**	**0.821**	**0.842**	**0.791**	**0.796**

B. Research Results Part I

According to Table III, total 390 usable complete responses are obtained. The relevant to the respondents' characteristics as shown and analyze by statistic frequency and percentage. The information that receives from data indicates that the majorities of the respondents are female 70.3%. 66.4% are students in public university and 33.6% are in private university in Thailand. Most of students are studying in bachelor degree on two and three level totals is a 67.4%, with the largest group of 56.9% in the 21-23 year of age category.

Overall students use mobile devices at 95.1% and over 70% of students indicated that they use smart phone and over half has previous experience with using internet via mobile. However, more than half of students have no familiar with m-Learning. Interestingly, the people who influence most with intention to use m-Learning are teacher and friend with similarity percentage at 40.8% and 40.3%.

TABLE III
DEMOGRAPHIC INFORMATION OF STUDENTS

Items	**N = 390**		
	Frequency	**(%)**	**Cumulative**
1. Gender			
Male	116	29.7	29.7
Female	274	70.3	100.0
2. Type of university			
Public	259	66.4	66.4
Private	131	33.6	100.0
3. Education Level			
1	8	2.1	2.1
2	132	33.8	35.9
3	131	33.6	69.5
4	119	30.5	100.0
4. Age			
18-20 years	158	40.5	40.5
21-23 years	222	56.9	56.9
>23 years	10	2.6	100.0
5. Use Mobile device (yes/no)			
Yes	371	95.1	95.1
No	19	4.9	100.0
6. Type of Portable			
PDA phone	30	7.7	7.7
Blackberry	22	5.6	5.6
I-Phone	41	10.5	10.5
Net book	41	10.5	10.5
Smart Phone	276	70.8	70.8
7. I have been using internet connection via mobile (yes/no)			
Yes	294	75.4	75.4
No	96	24.6	100.0
8. I know m-Learning (yes/no)			
Yes	165	42.3	42.3
No	225	57.7	100.0
9. The person who influence most with intention to use m-Learning of student			
Teacher	157	40.3	40.3
Friend	159	40.8	40.8
Senior	9	16.7	16.7
Nobody	65	2.3	100.0

Note : Questions 6 respondents are allowed to choose more than one items in the category.

C. Analysis Result Part II

We conducted in order to provide a understanding the level of perception and acceptance in m-Learning which using statistic mean value and standard deviation and shown in Table IV.

TABLE IV
THE LEVEL OF ACCEPTANCE M-LEARNING

N	**Constructs**	$\overline{X}$	**S.D.**	**Level**
1	Performance Expectancy (PE)	3.68	0.59	**High**
2	Effort Expectancy (EE)	3.51	0.67	**High**
3	Social Factors (SFs)	3.41	0.82	**Moderate**
4	Facilitating conditions(FCs)	3.18	0.76	**Moderate**
5	Attitude towards behavior(AT)	3.58	0.70	**High**
6	Behavioral Intention to use(BI)	3.50	0.82	**High**

Notes: S.D. = Standard Deviation

From Table IV, A summary of the higher education students have high level on acceptance m-Learning ($\overline{X}$= 3.50).

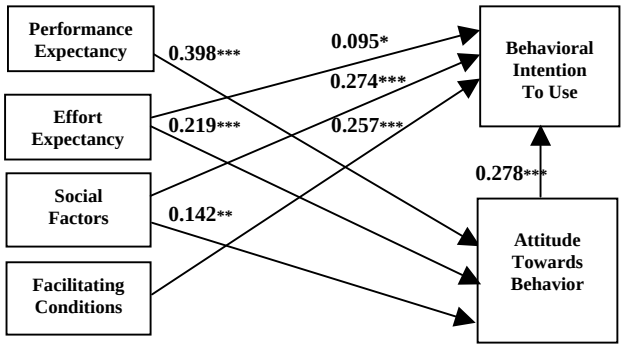
The reports indicated that students believe that m-Learning is a useful in high level with mean value of PE is 3.68, student tend to agree that m-Learning is understandable and easy to use and easy to learn in high level with mean value of EE is 3.51, the result suggest that the students may not be influenced by others who think they should use m-Learning that mean value of SFs is in moderate level ($\overline{X}$=3.41), the descriptive statistics support the students' believe that they have necessary resources, knowledge and support to use m-Learning in moderate level with mean value of FCs is 3.18, the students surveyed tend to belief that m-Learning is good idea, they likes to use and m-Learning is fun in high level with mean value of AT is 3.58 and the result suggest a high level of use in terms of behavioral intention to use m-Learning with mean value of BI is 3.50.

D. Analysis Result of Part III.

Mostly the opinion of students, the m-Learning style that they want is emphasis in easy to use, can use anytime and anywhere and interest interface. Moreover, they want to training before to use m-Learning.

E. Results of Regression Analysis

Regression analysis is conducted to assess the relationship between five main factors and behavioral intention to use m-Learning. Fig. 4 illustrated the graphical presentation of the β-value for each of the factors.



* Significant at p < 0.05, ** Significant at p < 0.01, *** Significant at p < 0.001

Fig. 4 Graphical representation of β-value

VI. HYPOTHESIS TESTING RESULTS

A. Hypotheses Conclusions

The results of hypothesis testing are depicted in Table V. Overall, most of correlation is significant with a *p*-value less than 0.001. The finding reveals that there are positive association between the attitude towards behavior (AT) and three factors: a) PE, b) EE and c) SFs. Hence, H1, H2 and H3 that are supported and then appeared that three factors: a) EE, b) SFs and FCs have relationship with behavioral intention to use (BI). Moreover, the results indicated that FCs is not positive relationship with AT but it has direct effect with BI and PE is not direct effect with BI. However, since FCs is not direct effect with BI but it has relationship with AT that can be mediator into BI significantly.

TABLE V
THE RESULTS OF HYPOTHESIS TESTING

Hypotheses	Result	Conclusion
H1: PE has a significant positive relationship with AT.	Yes: Significant (Beta = 0.398, p < 0.001)	Supported
H2: EE has a significant positive relationship with AT.	Yes: Significant (Beta = 0.219, p < 0.001)	Supported
H3:SFs has a significant positive relationship with AT.	Yes: Significant (Beta =0.142, p < 0.01)	Supported
H4:FCs has a significant positive relationship with AT.	No: Not Significant	Not Supported
H5: PE has a significant positive relationship with BI.	No: Not Significant	Not Supported
H6: EE has a significant positive relationship with BI.	Yes: Significant (Beta = 0.095, p < 0.05)	Supported
H7: SFs have a significant positive relationship with BI.	Yes: Significant (Beta = 0.274, p < 0.001)	Supported

TABLE V
THE RESULTS OF HYPOTHESIS TESTING (CONTS.)

Hypotheses	Result	Conclusion
H8: FCs have a significant positive relationship with BI.	Yes: Significant (Beta = 0.257, p < 0.001)	Supported
H9: AT has a significant positive relationship with BI.	Yes: Significant (Beta = 0.278, p < 0.001)	Supported

B. Hypothesis Testing (T-test)

H10: The students in public university and private university have different level of acceptance in m-Learning.

TABLE VI
TESTING HYPOTHESIS OF H10

Analysis Factors	df	t	Sig. (2-tailed)	Result
Type of University	390	3.25	0.001	Yes

From Table VI, the result indicated that the Sig. (2-tailed) value = 0.001 less than the significant 0.01 level. Therefore, the students in public university and private university have acceptance m-Learning difference in mean value with confidence level and the significant level is 0.01.

VII. CONCLUSION

The study in-depth in each aspect about m-Learning is still necessary because the m-Learning in Thailand is on initial stage. We can use the results from this preliminary study for supported the research or develop technology m-Learning for student in the future. The objective of this research was to study the acceptance of mobile learning (m-Learning) in which focus on higher education students in Thailand and also examining factors that have a positive relationship with behavioral intention to use m-Learning based on UTAUT model.

Although more than half of the students in this study have not familiar with m-Learning, they have a good perception with m-learning and the results found that the performance expectancy (PE) or perceive usefulness and effort expectancy (EE) or perceive ease of use have high level of acceptance

Our survey results confirm the seven hypotheses. The results showed that a positive attitude leads to the behavioral intention to use m-Learning. Thus, the administration of university should emphasis on well fit design m-Learning system that appropriate with student's perception. The good perception and university policy supporting are two major factors that lead to success m-Learning system.

REFERENCES

[1] D. Phuangthong and S. Malisawan, "A study of behavioral intention for 3G mobile Internet technology: Preliminary research on mobile learning," *Proceedings of the Second International Conference on eLearning for Knowledge-Based Society*, 2005.

[2] Y. Liu, F. Hu, and H. Li, "Understanding learners' perspectives on m-learning: results from a survey," Proceedings of the 2009 Euro American Conference on Telematics and Information Systems: New Opportunities to increase Digital Citizenship, 2009.

[3] M. Virvou and E. Alepis, "Mobile educational features in authoring tools for personalised tutoring," *Computers & Education*, vol. 44, pp. 53–68, 2005.

[4] P.Y. Chao and G.D. Chen, "Augmenting paper-based learning with mobile phones," *Interacting with Computers*, vol. 21, pp. 173–185, 2009.

[5] R. Brown, H. Ryu, and D. Parsons, "Mobile helper for university students: a design for a mobile learning environment," *Proceedings of the 18th Australia conference on Computer-Human Interaction: Design: Activities, Artefacts and Environments*, 2006, p. 300.

[6] Z. Liu, G. Zhao, W. Zheng, and J. Jin, "The Research and Exploration of Mobile-Learning Based on Web2. 0," *Knowledge Acquisition and Modeling, 2008. KAM'08. International Symposium on*, 2008, pp. 520–524.

[7] Paul TJ James, "The 5th Challenges and Opportunities for Mobile-learning in Thailand," Fifth International Conference on eLearning for Knowledge-Based Society, 2008.

[8] Q.Min, S. JI, and G. QU, "Mobile Commerce User Acceptance Study in China: A Revised UTAUT Model," *Tsinghua Science And Technology*, pp. 257-264, 2008.

[9] I. Ajen and M. Fishbein, Understanding Attitudes and Predicing Social Behavior, Prentice

Hall, nglewood Cliffs, NJ, 1980.

[10] F.D. Davis, "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," MIS Quarterly, 13, pp.
319-340, 1989.

[11] F. D. Davis, R. P. Bagozzi, and P. r. Warshaw, "User Acceptance of Computer Technology: A comparison of Two Theoretical Models," Management Science, 35 (8), pp. 982-1003, 1989.

[12] Ajzen I, Madden T J, "Prediction of goal directed behaviors: Attitudes, intentions, and perceived behavioral control," *Journal of Experimental Social Psychology*, vol. 22(5), pp. 453-474, 1986.

[13] I. Ajzen, "The theory of planned behavior," Organizational behavior and human decision processes, vol. 50, pp. 179–211, 1991.

[14] E.M. Rogers, Diffusion of innovations, Free press, 1995.

[15] V. Venkatesh and F.D. Davis, "A theoretical extension of the technology acceptance model: Four longitudinal field studies," Management science, vol. 46, 2000, pp. 186–204.

[16] V. Venkatesh, M. G. Morris, G. B. Davis, and F. D. Davis, "User acceptance of information technology: toward a unified view," *MIS Quarterly*, vol. 27, pp. 425-478. 2003.

[17] Quan Sun, Chunlei Wang and Hao Cao, "*An extended TAM for Analyzing Adoption Behavior of mobile commerce*," Proc. 8th Int'l Conf. Mobile Business. (ICMB2009), IEEE CS Press, pp. 52-56, 2009.

[18] K.C. Yang, "Exploring factors affecting the adoption of mobile commerce in Singapore," *Telematics and Informatics*, vol. 22, pp. 257–277, 2005.

[19] M. Masrom and R. Hussein, *User Acceptance of Information Technology : Understanding Theories and Model*, Venton Publishing(M) Sdn. Bhd, Selangor Darul Ehsan, Malaysia, 2008.

[20] T. Zhou, "Exploring Mobile User Acceptance Based on UTAUT and Contextual Offering," *Electronic Commerce and Security*, 2008 International Symposium on, pp. 241–245. 2008.

[21] J. Traxler, "Defining mobile learning," *Proceedings, IADIS international conference on mobile learning, Malta*, 2005.