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Factors influence the acceptance of m-Learning in Malaysia: Perceived Usefulness, Perceived Ease of Use and Attitude

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Abstract: This paper explores the relationship between the three factors that influence the acceptance of m-Learning. A sample of 210 respondents was selected whereby the respondents have to be m-Learning users to be included in the survey. A structured, self-administered questionnaire was used to elicit responses from these respondents. The findings indicate that perceived ease of use ($\beta = 0.490$, $p < 0.001$) and perceived usefulness ($\beta = 0.474$, $p < 0.001$) were positively related to positive attitude to use m-Learning. Furthermore, perceived ease of use ($\beta = 0.936$, $p < 0.001$) was found to be a significant predictor of perceived usefulness. This goes to show that perceived ease of use, perceived usefulness and attitude are the three main drivers of m-Learning acceptance. Implications of the findings for developers are discussed further.

Keywords: Perceived usefulness, perceived ease of use, attitude, m-Learning

1. Introduction

Mobile and communication technologies hold a huge potential to reshape cultures and societies with the capabilities to connect peoples in this digital era with a vast of information at any time and any place. Mobile technologies played its part in enhanced learning methodologies. m-Learning has become a phenomenal in the field of education throughout the world. m-Learning as a kind of learning model allowing learners to retrieve learning materials without time and place constraints using mobile technologies and the Internet (Ozdamli & Cavus, 2011). m-Learning refers to the use of mobile devices such as personal digital assistant (PDA), mobile phones, laptops and computer tablets to support teaching and learning (Alsaadat, 2009). m-Learning as a point where the mobile computing and e-Learning are overlapped to create learning experiences at anytime and anywhere (Kambourakis, Kontoni & Sapounas, 2004)

Technology Acceptance Model (TAM) were used as a basis of this study as it has empirical evidence in explaining technology acceptance (Hu , Chau, Sheng & Tam, 1999). Additionally, TAM is one of the most widely used models in ICT acceptance (Gefen & Straub, 2000; Stoel & Lee, 2003). TAM is also a basic theory that has been used in many empirical studies related to technology (Venkatesh & Davis, 2000). TAM proposes two concrete concepts that are perceived ease of use (PEOU) and perceived usefulness (PU) (Davis, 1989). Both of these dimensions have been extensively studied in various field of technology adoption. In this study, PU refers to the extent to which student believes teaching and learning activities through m-Learning can be useful and increase their learning performance. While, PEOU refers to which one believes that m-Learning is easy to operate without any effort. Meanwhile, ATT is generally defined as either positive or negative feelings towards the performance of a specific behavior (Ajzen & Fishbein, 1980). ATT in this study refers to the extent either where student received positively or negatively the use of mobile technology as a form of teaching and learning.

A study carried out by Nasri and Charfeddine (2012) who examined the factors that influence the acceptance of internet banking using TAM as the basic model. The findings showed that PEOU has a positive relationship towards PU. Meanwhile, a study conducted by Seif, Sarmadi, Ebrahimzadeh and Zare (2012) also found that PEOU have a direct positive effect on PU. Direct effect between PEOU and ATT has been tested in various aspects in acceptance technology. Positive relationship between PEOU and ATT proved in the context of mobile banking (Raleting & Nel, 2011). At the same time, PEOU and ATT showed a significant direct effect in determination of user's acceptance of e-government services (Suki & Ramayah, 2010). Aside from that, both dimensions

showed a significant relationship in e-Learning acceptance. In general, literature has been highlighted the presence of relationship between PEOU and ATT. The past literature also had shown significant relationship between PU and ATT. For instance, a study conducted by Raleting and Nel (2011) found that PU has positive influence on ATT towards the use of mobile banking. Additionally, Seif et al. (2012) and Teo (2011) also found direct effect between PU and ATT in the context of e-learning acceptance and factors that influence teachers to use technology. In line with the past literature reviews, it can be hypothesized in this study that the students' perceived ease of use of m-Learning will be significantly influenced by their attitude (Refers figure 1).

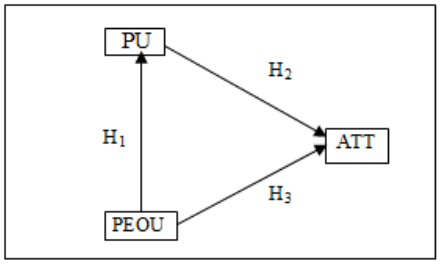

Figure 1. Research framework

1.1 Objectives

The objectives of this study are to develop a structural model of students' acceptance towards m-Learning among university students. This study will analyze the relationship of the selected factors, which are perceived ease of use (PEOU), perceived usefulness (PU) and attitude towards m-learning (ATT).

1.2 Research hypotheses

In this research, these following hypotheses were proposed:

H_1 : There is a significant relationship between students' PEOU and ATT to use m-Learning.

H_2 : There is a significant relationship between students' PU and ATT to use m-Learning.

H_3 : There is a significant relationship between students' PEOU and PU to use m-Learning

2. Methodology

A total of 210 respondents participated in this study was selected by using random stratified sampling. The respondents are students from the Faculty Educational Studies in one of the local university in Malaysia. m-Learning in this study refers to the use of Short Messaging Service (SMS) as a medium of communication between the respondents and instructors to support the learning process throughout one semester (14 weeks). For the purpose of the study, we used a portal for sending bulk SMS to the respondents. The contents of the SMS categorized into five types; learning contents, quizzes, special greeting, motivation and course management. For quizzes SMS, the respondents were required to give their answers as part of their course evaluation. After 14 weeks, a set of questionnaires distributed to the respondents to gather the necessary data for this study.

2.1 Statistical procedure

Each response from the questionnaires coded first in a SPSS program as soon as the questionnaires collected. Descriptive statistical analyses such as mean were analyzed using SPSS while structural equation modeling analysis was conducted using AMOS software.

2.2 Analysis of measurement model

Before proceed analyzing the measurement model, the reliability of the construct need to be checked first. Each of the constructs shows a good reliability with value exceed .70 (DeVellis, 2003). The next step is to conduct an evaluation of convergent validity from the measurement model. Convergent validity is the extent to which different assessment methods will be equivalent to the measurement of the same trait (Bryne, 2010). Convergent validity implies the extent to which the indicators of latent variable that are theoretically related should be highly correlated. All factor loadings exceeded 0.70, which accounts for 50% of the variance. Factor loading, Average Variance Extracted (AVE) and

Construct Reliability (CR) were used to confirm the convergent validity. Loading values proposed by Hair, Black, Babin, Anderson & Tatham (2010) were .50 and .70 or higher. AVE values of .50 or greater indicates good convergent validity (Hair et al., 2010). CR should be .70 to show good internal consistency. Based on the table 2, it shows that the factor loading exceeded .70, AVE measure exceeded .50 and CR exceeded .70, suggesting adequate reliability.

Meanwhile, Goodness-of-fit is used to access the models overall compatibility hypothesis (Ho, 2006). There are three categories of fitness index namely incremental fit, absolute fit and parsimonious fit (Hair et al., 2010). Hair et al. (2010) recommended the use of three or four fitness index with at least one index form incremental fit and absolute fit. Hair et al. (2010) also suggested that the reported value of Chi Square, degrees of freedom (df), CFI (Comparative Fit Index) or TLI (Tucker-Lewis Index) and RMSEA (Root Mean Square Error of Approximation) has provided unique information that sufficient to evaluate a model. Based on this term, researchers have used four fitness indexes. TLI and CFI which represent incremental fit categories, RMSEA fit which represent absolute fit categories, and Chisq / df (Chi Square / Degrees of Freedom) which represents the category parsimonious fit, in oder to test the measurement model and structural model. Appendix 1 shows the information related to the fitness index used in this study.

Table 1. Goodness of fit measure for structural equation modelling

Category	Index	Measure	Level of Acceptance	Literature	Comments
Incremental Fit	TLI	0.966	TLI > 0.90	Bentler & Bonett (1989)	TLI > 0.95 is a good fit
Incremental Fit	CFI	0.97	CFI > 0.90	Bentler (1990)	CFI > 0.95 is a good fit
Absolute fit	RMSEA	0.074	RMSEA < 0.08	Browne & Cudeck (1993)	Range 0.05 to 1.00 acceptable
Parsimonious fit	Chisq/df	2.157	Chi Square / df < 5.0	Marsh & Hocevar (1985)	The value should be less than 5.0

The measurement model at the beginning of data analysis showed poor fit indices. Hence, researchers need to perform model modification by deleted items from latent variables. Several items were deleted according to the suggestion modification indices by AMOS. The finalized structural model as shown in figure 2. The chi-square goodness-of-fit value obtained was 284.73. TLI and CFI were also tested and these indexes exceeded .90 (refers table 1). Meanwhile, the value of RMSEA used to represent the proposed model was 0.074 and this value is acceptable. Consequently, the revised model is considered as having passed all the criterion values (TLI, CFI > .90, RMSEA < .08, Chisq/df < 5) and showing a better fit with data.

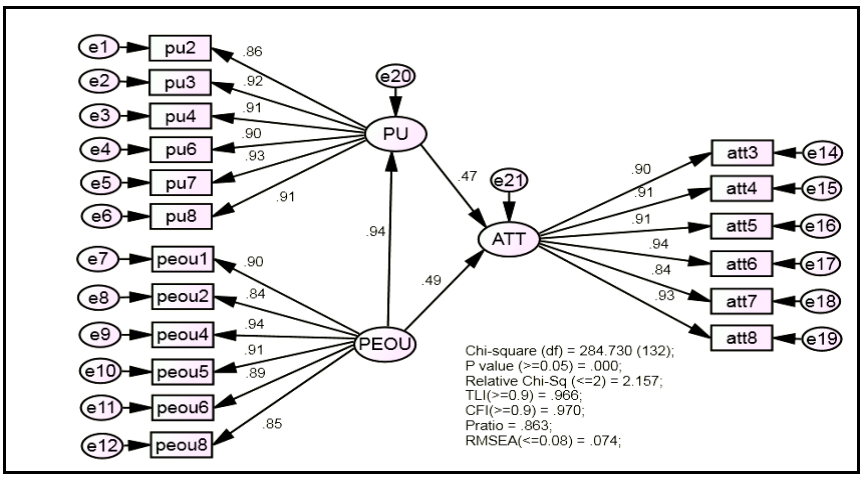

Figure 2. Finalized Structural Model

2.3 Hypotheses Testing

The first hypothesis postulates that the students' perceived ease of use has a significant influence on their attitude towards m-Learning. Based on the results, significant influence of perceived ease of use was indicated on attitude (β= 0.490, $p < 0.001$), and thus supporting hypothesis 1. Meanwhile, second hypothesis investigates the students' perceived usefulness has a significant influence on their attitude towards m-Learning. Based on the hypothesis testing, perceived of usefulness was shown to have significant influence on attitude (β= 0.474, $p < 0.001$), supporting hypothesis 2. The third hypothesis postulates that the students' perceived ease of use has a significant influence on their perceived usefulness. Based on the results, there is a significant coefficient linking perceived ease of use and perceived usefulness (β= 0.936, $p < 0.001$). Thus, hypothesis 3 was supported. The summaries of hypotheses testing summarized into table 2.

Table 2. Hypotheses Testing

Hypothesis	Path		Estimate	S.E	C.R	P	Standard Estimate	Results of Hypotheses
H1	PEOU	→	ATT	.502	.100	5.006	***	Supported
H2	PU	→	ATT	.476	.099	4.823	***	Supported
H3	PEOU	→	PU	.954	.057	16.711	***	Supported

3. Discussion

The advanced of technologies especially mobile technologies have brought many positive changes in education settings especially in higher education. With the new technological innovations, learning can take place through mobile devices. One of the ways of learning via mobile learning is using SMS. According to Moore (1997), this type of learning would reduce the transactional distance of psychological and communication space especially among distance learners (Moore, 1997). It also enables the lecturers to reach out their students outside of conventional communication spaces. As a result, m-learning would help to keep students connected to their lecturers and their peers. It is important to study the factors related with the acceptance towards this type of learning.

This study investigates the relationships between three factors which are perceived usefulness (PU), perceived ease of use (PEOU) and attitudes towards m-learning. Finding of this study shows that there is a significant relationship between PEOU and ATT in the context of m-Learning. Result of this study has confirmed that students who felt that mobile learning is easy to use will have a positive attitude towards m-Learning. This finding is in line with the study that being carried out by Raleting and Nel (2011), Suki and Ramayah (2010), Park (2009) dan Kuo and Yen (2009). Besides, based on the direct effect of PU on ATT, students were expect to use m-Learning when it was perceived as useful and when they felt the worthiness of using m-Learning will enhance their learning. This is consistent with the studies by Relating and Nel (2011), Ju et al. (2007), Suki and Ramayah (2010), Park (2009), Seif et al. (2012) and Teo (2011). Similarly, finding of this study found a significant direct relationship between PEOU and PU. In other words, students were likely to use m-Learning when they felt that m-Learning is easy to use and useful.

4. Conclusion

In brief, each selected factors investigated in this study directly influenced the acceptance of m-Learning. m-Learning would be one of the possible method in teaching and learning. Students in this study have shown that the acceptance of m-Learning relies on these three selected factors: perceived ease of use, perceived usefulness and attitude towards m-Learning. In short, finding of this study found that students felt that m-Learning is useful, easy to use and they have a positive attitude towards it.

References

Ajzen, I., & Fishbein. M. (1980). *Understanding attitudes and predicting social behaviour*. Englewood Cliffs, NJ: Prentice-Hall.

Alsaadat, K. (2009). Mobile learning and university teaching. *Proceeding of the International Conference on Education and New Learning Technologies (EDULEARN09).*

Bentler, P. M., & Bonnett, D. G. (1980). Significance tests and goodness of fit in the analysis of covariance structures. *Psychological Bulletin*, 88(3), 588.

Bentler, P.M. (1990). Comparative fit indexes in structural models. *Psychological Bulletin*, 107, 238 – 246.

Browne, M. W., & Cudeck, R. (1993). Alternative ways of assessing model fit. *Sage Focus Editions*, 154, 136-136.

Byrne, B. M. (2010). *Structural equation modeling with AMOS: basic concepts, applications, and programming* (2nd ed.). New York, London: Taylor and Francis Group.

Davis, F. D. (1989). Perceived usefulness, perceived ease of use, and user acceptance of information technology. *MIS Quarterly*, 3(3): 319–340.

DeVellis, R. F. (2003). *Scale development: Theory and applications* (2nd Edition). Thousand Oaks, CA: Sage Publications.

Gefen, D., & Straub, D. W. (2000). The relative importance of perceived ease of use in IS adoption: a study of e-commerce adoption. *Journal of the Association for Information Systems*, 1(1), 8.

Hair, J. F., Black, B., Babin, B., Anderson, R. E., & Tatham, R. L. (2010) *Multivariate Data Analysis: A Global Perspective*. New Jersey, USA: Pearson Education Inc.

Ho, R. (2006). *Handbook of univariate and multivariate data analysis and interpretation with SPSS*. Chapman & Hall/CRC.

Hu, P. J., Chau, P. Y., Sheng, O. R. L., & Tam, K. Y. (1999). Examining the technology acceptance model using physician acceptance of telemedicine technology. *Journal of management information systems*, 91-112.

Kuo, Y.F., & Yen, S.N. (2009). Towards an understanding of the behavioral intention to use 3G mobile value-added services. *Computers in Human Behavior*, 25(1), 103-110.

Marsh, H. W, & Hocevar, D. (1985). Application of Confirmatory Factor Analysis to the Study of Self-Concept: First and Higher-Order Factor Models and Their Invariance Across Groups. *Psychological Bulletin*, 97(3), 562-582.

Moore, M. G. (2007). The theory of transactional distance. In M. G. Moore (Ed.), *Handbook of distance education* (pp. 89-105). Mahwah, NJ: Lawrence Erlbaum Associates.

Nasri, W., & Charfeddine, L. (2012). Factors affecting the adoption of Internet banking in Tunisia: An integration theory of acceptance model and theory of planned behavior. *The Journal of High Technology Management Research*, 23(1), 1-14.

Ozdamli, F., & Cavus, N. (2011). Basic elements and characteristics of mobile learning. *Procedia-Social and Behavioral Sciences*, 28, 937-942.

Raleting, T., & Nel, J. (2011). Determinants of low-income non-users' attitude towards WIG mobile phone banking: Evidence from South Africa. *African Journal of Business Management*, 5(1), 212-223.

Seif, M. H., Sarmadi, M. R., Ebrahimzadeh, I., & Zare, H. (2012). A Model for Predicting Intention to Use E-learning based on Epistemological Beliefs. *Life Science Journal*, 9(2), 926-929.

Stoel, L., & Lee, K. H. (2003). Modeling the effect of experience on student acceptance of Web-based courseware. *Internet Research*, 13(5), 364-374.

Suki, N. M., & Ramayah, T. (2010). User acceptance of the e-government services in Malaysia: structural equation modelling approach. *Interdisciplinary Journal of Information, Knowledge & Management*, 5(1), 395-413.

Teo, T. (2011). Factors influencing teachers' intention to use technology: Model development and test. *Computers & Education*, 57(4), 2432-2440.

Venkatesh, V. & Davis, F.D. (2000). Extrinsic and intrinsic motivation to use computers in the work place. *Journal of Applied Psychology*, 22(14), 1111-1132.

Appendix 1
The summary of mean, loading, CR and AVE.

Construct	Indicator	Item	Mean	Loading
Perceived Usefulness	pu2	Using m-learning would likely enable me to accomplish learning tasks more quickly.	3.79	.863
	pu3	Using m-learning in this course would likely increase my productivity.	3.84	.916
	pu4	Using m-learning in this course could improve my performance.	3.84	.910
	pu6	I think that m-learning helps me in better understanding of what I have learnt.	3.86	.897
	pu7	I think that using m-learning for this course is a good choice.	3.84	.928
	pu8	I think that m-learning is good for learning	3.95	.910
Perceived Ease of Use	peou1	M-learning is easy for me.	3.92	.902
	peou2	My learning interaction in m-learning is clear.	3.81	.845
	peou4	I think that m-learning is convenient to use.	3.92	.936
	peou5	I would likely find m-learning flexible for interaction.	3.90	.905
	peou6	I would likely find it easy to do academic activities via m-learning.	3.86	.894
	peou8	It would be easy for me to become skillful at using m-learning.	3.83	.854
Attitude	att3	I would do well in a mobile-supported course.	3.89	.904
	att4	M-learning is a worthwhile tool	3.95	.911
	att5	M-learning is likely to be adopted in the future in some form.	4.06	.908
	att6	M-learning has assisted my overall learning processes this semester.	3.93	.939
	att7	I can plan better for my learning with m-learning than without it.	3.70	.840
	att8	Overall, I believe using m-learning is very effective.	3.90	.929