# Mobile Learning Acceptance in Higher Education: Using a Simplified and Extended Technology Acceptance Model

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This empirical study investigates the factors affecting mobile learning acceptance among higher education students in Malaysia. It is based on an extended and simplified version of the Technology Acceptance Model (TAM) and data collected from 384 students. Besides, the study is supported by an extensive literature review. The research shows that Perceived Usefulness, Perceived Ease of Use, and Perceived Enjoyment significantly affect the Intention to Use mobile learning. The study also indicates that the Perceived Enjoyment has the highest effect on the Intention to Use mobile learning. This enhances our understanding of TAM by extending and simplifying it. The study concludes that higher education students in Malaysia are ready to accept and use mobile learning.

**Keywords:** *Mobile Learning, Higher Education, Technology Acceptance Model*

## Introduction

The number of mobile phone users globally is expected to pass the five billion mark by 2019. In 2016, mobile phone users represented around 62.9 percent of the global population. It is also likely that by 2018, more than 50 percent of the users will own smartphones (The Statistics Portal, 2016).

Mobile technology and smartphone devices have been a crucial part of our daily life. They make us connected with our communities and provide us with a vast number of services and applications. Affordability, user-friendliness, and effectiveness are features of mobile devices (Nassuora, 2012). It is observed that people are so attached to their smartphones that

researchers have introduced a new term called "Nomophobia," which is the fear of being without a mobile device or connectivity (Elmore, 2014). It is also estimated that college students may spend up to nine hours per day using their phones (Roberts, Yaya, & Manolis, 2014).

Information and communication technology (ICT) has an evident and effective integration in the education and learning processes. E-books, educational websites, educational software, search engines, wikis, and audio-video materials are famous examples. The new trend nowadays is mobile learning or what we called as M-learning. M-learning is a relatively new phase in the electronic and distance learning world. It is defined as any learning conducted with mobile devices such as smartphones and tablets. These devices can move with the learners to allow the main feature of learning anytime, anywhere (Naismith et al., 2006; Wang, Wu, & Wang, 2009).

M-Learning can provide higher education students access to course material and content to learn and engage in a collaborative environment (Nassuora, 2012). Students can receive evaluation and feedback from instructors (Crawford, 2007). In the future, one of the most effective ways of providing higher education learning content is expected to be through M-learning (El-Hussein & Cronje, 2010).

The M-learning industry is developing rapidly in several parts globally, obviously in the U.S. and China (Liu, Li, & Carlsson, 2010). Based on the Ambient Insight report (Adkins, 2008), in 2007, the US M-learning market reached $538 million, and it is expected to have a compound annual growth rate (CAGR) of 21.7% annually for a five-year compound period. In China, mobile producers use M-learning services as a new marketing tactic to increase sales and attract more customers. Besides, there is an increase in M-learning outside the traditional learning context, like in offices and museums. M-learning can also provide new educational opportunities for the unemployed and dropouts (Attewell, 2005).

Generally, there are several mobile learning initiatives in Asia. The Malaysian government has developed a "Smart School" national initiative to prepare Malaysian learners for a society based on knowledge and ICT integration. This strategic plan includes a roadmap with four implementation stages starting in the year 1999 to 2020. In the final Stage (2010–2020), there will be plans to make sure that the Smart School educational concepts are integrated into Malaysia's schools. In this large-scale plan, mobile technology will be an essential element. The 2005–2020 Smart School Roadmap precisely mentions mobile phones as a scheme to be inaugurated to help all children buy an access device for mobile learning for use during the child's school-going days. This is one solution schools and parents can consider part of school governance (MSC, 2005). As Mohamad and Woollard (2010) stated, mobile phones are widespread in Malaysia. Generally, there is a positive attitude toward mobile learning among students in Malaysia.

To investigate the acceptance of mobile learning among students, a modified version of the Technology Acceptance Model (TAM), which Davis introduced in 1986, will be a foundation for this study. User acceptance of technology can be explained through the TAM model. The model has been widely proved and tested theoretically and empirically (Devaraj et al., 2002).

Any educational organisation must be aware if students are willing to use the M-learning technology and services. It is not wise to invest in a service that will not be used. Therefore, this paper will investigate the factors affecting students' acceptance towards mobile learning and the relationship between these factors based on an extended and simplified version of the Technology Acceptance Model (TAM). This investigation will be derived from previous related literature reviews and studies and confirmed by a questionnaire answered by a selected sample of higher education students in Malaysia.

**Research Problem**

M-learning remains relatively in its beginning phase, with several components that need to be explored and investigated (Taylor, 2003). The technical side of M-learning has been widely and deeply addressed by previous studies (Chang et al., 2003; Chen et al., 2003; Liu et al., 2003), but we still need extra empirical works on M-learning from the point of view of users and students (Huang et al., 2007). Additionally, prior studies have noticed less focus on the factors that affect learners' acceptance of mobile learning (Cheng, 2015). In this paper, we will try to know the factors influencing the acceptance level of mobile learning among higher education students in Malaysia. An extended yet simplified version of TAM will be used as a supporting model. It is crucial to address this issue, which will also help higher education institutions and M-learning service providers consider these factors while implementing and introducing M-learning for their students.

**Research Question**

This paper will try to answer the following two questions:

1. What are the factors influencing the acceptance of mobile learning among higher education students in Malaysia?

2. What is the relationship between Perceived Usefulness, Perceived Ease of Use, Perceived Enjoyment towards intention to use?

**Research Objective**

Based on an extended version of TAM, this paper aims to provide a comprehensive and simple vision towards understanding and evaluating the factors that affect the acceptance of M-learning and understanding, measuring, and confirming the relationship between these factors. This study's indirect objective is to act as a supporting document for higher education institutions and mobile learning service providers who are willing to introduce and implement a mobile learning solution for their students or customers.

**Literature Review**

**Mobile learning**

Mobile learning (M-learning) is expected to be the next big trend among millennial students. It has useful features which provide collaborative learning among students, especially those in different geographical locations. Another feature is student and content engagement. It also acts as a substitute for books and P.C.s. As a substitute to the physical classes, attendance and M-learning can provide 'just-in-time' information delivery (Zoraini et al.,2009). Higher education students use their mobile devices to make text and voice communication and take photos and videos more frequently. Students are also using mobiles for computing wirelessly and interacting with wiki-based blogs on the concept of "anytime, anywhere" (Norris & et al., 2010).

Mobile learning is possible by developing interactive applications that combine several hardware and software technologies to facilitate learning material delivery in a different design for higher education learners (Lavin, Moreno & Fernandez; 2008). Most higher education students worldwide use these relatively small communications and high-end processing gadgets almost all the time, utilising these devices mainly for personal use (Evans, 2008). Mobile devices and smartphones are like pocket-size computers, which are available to be used and connected almost all the time. They are not seen as the traditional communication and interaction devices among students anymore. (Prenski, 2005). Mobile phones enabled learners to bring the whole university into their hands. They can combine personal life activities and the learning process (Taleb & Sohrabi, 2012). According to Goh & Kinshuk (2006), it can be said that M-learning, with the help of mobile and smart devices, provides learners with an extra access channel when compared to e-learning. M-learning is a learning method influenced by the movability and the relatively low cost of mobile devices (Yamaguchi, 2005). Digitalised education is allowed by M-learning with the anytime\anywhere feature. M-learning overcomes major technical issues like internet accessibility, power issues, and other P.C.-related obstacles, especially remote and rural locations. Mobile phone network efficiency is excellent support for M-learning (Traxler, 2007).

**M-Learning in Malaysia**

The analysis shall first begin within the Malaysian context. According to the Malaysian Communications and Multimedia Commission 1st quarter of 2017 report named *Communications and Multimedia: Facts and Figures, 1Q 2017*, there are 134 mobile-cellulars per 100 inhabitants. Also, there are some exciting points extracted from the *Hand Phone Users Survey 2014* also conducted by the Malaysian Communications and Multimedia Commission in 2014:

- In 2014, 53.4% were using smartphones compared to 14% in 2010.
- 63.3% access the internet through mobiles.
- Obsession: 71.4% of Malaysian mobile users constantly check their handphones even when it does not ring; out of which 60.9% are young adults aged 20 to 39.

Some studies in Malaysia cover topics like perceptions, awareness, readiness, and satisfaction level towards mobile learning. The studies indicated positive results (Hussin et al., 2012). The Malaysian government is also putting M-Learning in its plans and agenda. According to the Malaysia Education Blueprint 2013-2025, Shift 7: to leverage ICT to scale up quality learning across Malaysia, there is support for mobile learning-related technologies and infrastructures (MOE, 2013).

Overall, research into mobile learning is becoming more important in the electronic learning aspect in Malaysia. There are several mobile learning initiatives (Issham, Idrus, et al., 2010). However, there is a shortage in mobile learning adoption in higher education in this region (Song, Murphy, & Farley, 2013).

**Technology acceptance model (TAM)**

TAM was introduced in 1986, and it is still one of the most widely utilised theoretical models in the information system technology field. It is considered the leading employed and influential theory mostly standard for explaining users' acceptance of information systems and technologies (Lee, Kozar, & Larsen, 2003).

TAM is derived and adapted from the Theory of Reasoned Action by Ajzen and Fishbein (1980). Davis, who initially introduced it in 1986, proposes that user's acceptance of information systems is determined and influenced by two main factors: Perceived Ease of Use (PEOU) and Perceived Usefulness (P.U.)(Lee, Kozar, & Larsen, 2003). P.U. is defined as "the degree to which a person believes that using a particular system would enhance his/her job performance." PEOU is defined as "the degree to which a person believes that using a particular system would be free of physical and mental effort" (Davis, 1989). TAM's external variables can affect P.U. and PEOU, which affect the attitude toward using the system. This attitude will

determine the behavioral intention, eventually leading to the system's actual use (Davis, 1989; Davis et al., 1989) and (Cheng, 2015). The original TAM model can be illustrated in Fig 1.
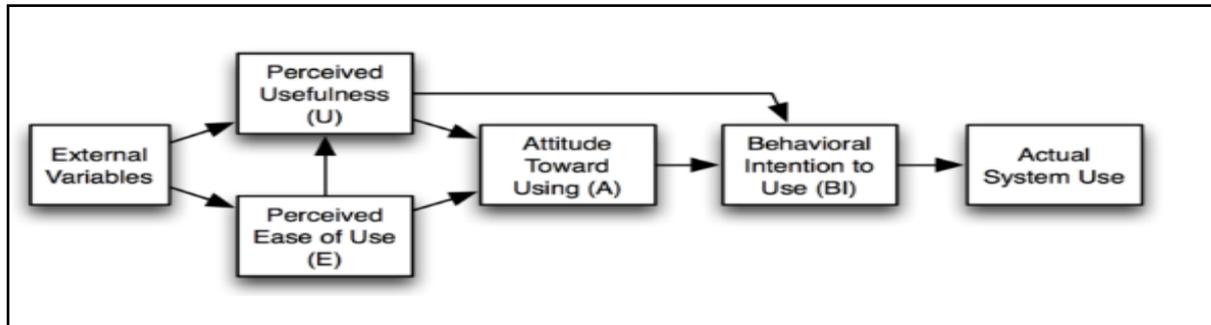


**Fig. 1**: The original Technology Acceptance Model (TAM) Davis-1989

The TAM model has been adjusted, extended, and improved by several studies over the past years. TAM did not maintain its original model. Like a living organ, TAM has continuously developed (Lee, Kozar, & Larsen, 2003). To enhance and extend TAM, an intrinsic motivator, the Perceived Enjoyment (P.E.), was added to identify and measure a hedonic-oriented IS/IT (Cheng, 2015). According to Lee, Kozar, & Larsen (2003), the extended TAM with the Perceived Enjoyment (P.E.) was first introduced by Davis and others in 1992.The study called "Extrinsic and Intrinsic Motivation to Use Computers in the Workplace." They defined Perceived Enjoyment (P.E.) as "the extent to which the activity of using a specific system is perceived to be enjoyable in its own right, aside from any performance consequences resulting from system usage." According to the study, the extrinsic motivational side of specific system usage is frequently represented by P.U. and PEOU. In contrast, P.E. (Davis et al., 1992) can represent the intrinsic motivational side of system usage. M-learning acceptance can be significantly influenced by Perceived Enjoyment (Huang et al., 2007; Phuangthong & Malisawan, 2005).

In this paper, the model is extended by adding the Perceived Enjoyment (P.E.) variable. The student perspective on intention to use M-learning is related to how enjoyable the experience will be. If M-learning is enjoyable, students are likely to spend more time on it, leading to an increase in their learning and knowledge acquisition level.

The TAM is also simplified in this paper by removing the Attitude Toward Using variable. It is assumed that there is a minimal role of attitude in explaining the behavioral intention to use a system or its actual adoption. Attitude is considered a partial mediator between salient beliefs and the purpose or adoption behavior (Venkatesh and Davis, 1996; Venkatesh and Davis, 2000; Venkatesh et al., 2003). The Actual Use variable is removed for more simplification because it is a natural result of the Intention to Use a variable. The Actual Use variable is controlled by the Intention to Use variable, and therefore the Intention to Use variable determines the technology acceptance (Alharbi & Drew, 2014). In addition, we are not considering the

Perceived Ease of Use (PEOU) relationship and effect on Perceived Usefulness (P.U.) because it is out of the focus of this paper.

**Conceptual Framework**

Based on the literature reviews mentioned above, the TAM can be extended by adding the Perceived Enjoyment (P.E.) variable Cheng (2015) and simplified by removing the Actual Use variable because it is controlled by the Intention to Use a variable. Therefore the Intention to Use variable determines the technology acceptance (Alharbi & Drew, 2014). As a result, the extended and simplified TAM for this paper is proposed in Figure 2.
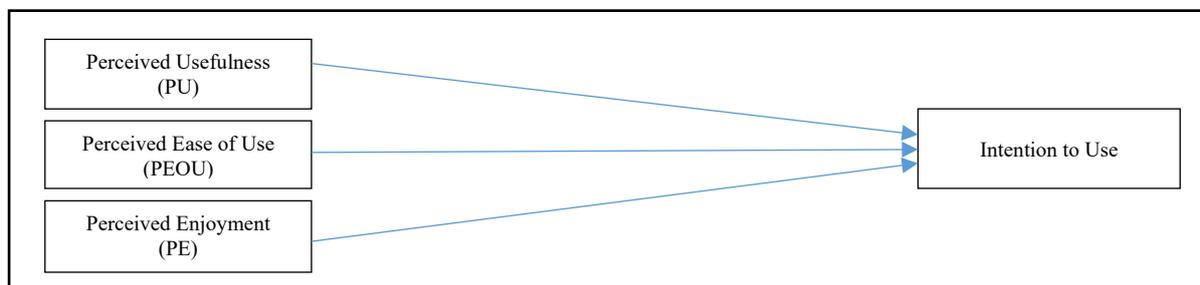


**Figure 2:** An Extended and Simplified TAM

**Hypotheses**

The proposed framework suggests a positive causal relationship between the independent variables and the dependent variable. Therefore, the hypotheses are:

**H1:** P.U. will positively affect Intention to Use Mobile learning.
**H2:** PEOU will positively affect Intention to Use Mobile learning.
**H3:** P.E. will positively affect Intention to Use Mobile learning.

**Methodology**

**Measures**

In this research paper, a survey was designed to measure students' responses. The survey had five parts; the first part is for demographic data, and the remaining four parts were to measure the P.U., PEOU, PE, and the Intention to Use variables using a 5-point Likert scale with 1 (strongly disagree) to 5 (strongly agree) and 3 being neutral.

The constructs measurement items were derived and adapted from previously published studies to ensure the validity of the survey contents.

## Sample size and data collection

According to the latest published statistics related to higher education in Malaysia for 2016, the total number of students enrolled is **1,479,568** (local students: 1,346,858 and international students: 132,710). Taking the total number of enrolled students as the research population size and using the Krejcie and Morgan Table method with 95% confidence level and 5% error margin, the sample size for this research will be **384**. 384 surveys were collected through the paper-based survey: 112 and online survey: 272.

## Data Analysis

All the survey data related to the 384 respondents were entered into SPSS software for analysis. No missing or invalid data were found.

## Descriptive Analysis:

Table 1 shows the demographic data frequencies of all the respondents.

**Table 1:** Demographic Data Frequencies

| Gender | Freq. | % | Institution Type | Freq. | % |
|---|---|---|---|---|---|
| Male | 155 | 40.4 | Public University | 126 | 32.8 |
| Female | 229 | 59.6 | Private University | 218 | 56.8 |
| **Age** | **Freq.** | **%** | University College | 30 | 7.8 |
| < 20 | 56 | 14.6 | College | 10 | 2.6 |
| 20 - 30 | 258 | 67.2 | **Level of Study** | **Freq.** | **%** |
| 31 - 40 | 49 | 12.8 | Diploma | 13 | 3.4 |
| 41 - 50 | 20 | 5.2 | Bachelor's degree | 246 | 64.1 |
| > 50 | 1 | .3 | Master's degree | 86 | 22.4 |
| **Student Type** | **Freq.** | **%** | PHD | 23 | 6.0 |
| Local Student | 277 | 27.9 | Foundation | 16 | 4.2 |
| International Student | 107 | 72.1 | **Field of Study** | **Freq.** | **%** |
| | | | Social Science | 41 | 10.7 |
| | | | Business\ Management | 266 | 69.3 |
| | | | Engineering, Science, Computer Science | 64 | 16.7 |
| | | | Medicine | 13 | 3.4 |

## Scale Measurement (Reliability)

The reliability analysis with Cronbach's Alpha was used to ensure that the collected data is reliable to provide us with accurate and stable results. Table 2 shows the analysis results.

**Table 2:** Reliability Analysis

| Reliability Statistics | | |
|---|---|---|
| **Variable** | **Cronbach's Alpha** | **No. of Items** |
| Perceived Usefulness | .894 | 6 |
| Perceived Ease of Use | .816 | 6 |
| Perceived Enjoyment | .916 | 6 |
| Intention to Use | .911 | 4 |

As we can see from Table 2, Cronbach's Alpha values are more significant than 0.7, indicating that the data collected is highly reliable.

## Inferential Analysis

## The Pearson Correlation Coefficient

This test will help us to prove the research proposed hypotheses. The Pearson Correlation Coefficient will determine the significance, strength, and direction of the relationship between the variables. Table 3 summarises the Pearson Correlation Coefficient results for all variables.

**Table 3:** Correlation

| | | Perceived Usefulness | Perceived Ease of Use | Perceived Enjoyment |
|---|---|---|---|---|
| Intention to Use | Pearson Correlation | **.755** | **.716** | **.787** |
| | Sig. (2-tailed) | **.000** | **.000** | **.000** |
| | N | 384 | 384 | 384 |

We can see that the Pearson Correlation value between the independent and dependent variables is more significant than 0.7, indicating a strong and positive relationship. The p-value is less than 0.01which means there is a significant relationship between the independent and dependent variables. Therefore, all the three proposed hypotheses in this research are accepted and proved.

**Multiple Linear Regression**

The previous analysis shows that there is a significant and positive relationship among the variables. Here, we will examine how fit the proposed model is, how much it can explain, and how much each independent variable affects the dependent variable.

Table 4 shows the model summary. We can see that the variables are highly and positively correlated. This is obvious because the R-value is 0.855. We can also see that the dependent variables can explain 73% of the dependent variable. Other factors that can explain the remaining are 27%.

**Table 4:** Model Summary

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate |
|---|---|---|---|---|
| 1 | .855 a | .731 | .729 | .43626 |

Table 5 is the ANOVA table. The p-value is less than 0.05, and the F value is high. This indicates that the model is significant and that the independent variables are excellent predictors of the dependent variable.

**Table 5:** ANOVA

| Model | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Regression | 196.535 | 3 | 65.512 | 344.207 | .000ᵃ |
| Residual | 72.324 | 380 | .190 | | |
| Total | 268.859 | 383 | | | |

Table 6 is the Coefficients table. The B value for all the independent variables is positive, and the p-value is less than 0.05. This reconfirms the hypotheses in this paper and indicates a significant and positive relationship between the independent and dependent variables. The standardized coefficients Beta values show how much contribution each of the independent variables has on the dependent variable. We can see that the Perceived Enjoyment has the highest contribution with the Beta value of 0.442, followed by the Perceived Usefulness with the Beta value of 0.340, and Perceived Ease of Use with the lowest Beta value of 0.177.

**Table 6:** Coefficients

| Model | Unstandardised Coefficients | | Standardised Coefficients | t | Sig. |
|---|---|---|---|---|---|
| | B | Std. Error | Beta | | |
| (Constant) | -.457 | .140 | | -3.257 | .001 |
| PU | .385 | .045 | .340 | 8.576 | .000 |
| PEOU | .229 | .053 | .177 | 4.347 | .000 |
| PE | .520 | .046 | .442 | 11.349 | .000 |

**Results and Discussions**

Several findings can be observed as a result of the data analysis of this research paper. First, the respondents' demographic profile was diverse to ensure that the sample is an accurate representation of the higher education population in Malaysia. Second, the data analysis results were in line with this research paper's proposed model and hypotheses. The questions used to measure the variables were also reliable. This is clear because of the high value of Cronbach's Alpha values.

All the proposed hypotheses were supported and accepted. The correlation table shows a strong, positive, and significant relationship between the independent and dependent variables. The variables are linear and highly positively correlated, and the independent variables can explain 73% of the dependent variable using the proposed model in this research paper. This indicates that the model is fit and trustworthy to present the research questions.

The results show that Perceived Usefulness, Perceived Ease of Use, and Perceived Enjoyment are excellent predictors of the Intention to Use Mobile Learning. Perceived Enjoyment has the highest contribution towards the Intention to Use mobile learning. This indicates that higher education students in Malaysia are finding and expecting the M-learning experience to be enjoyable. This has to be taken into consideration while designing content and applications for mobile learning. It seems that students are more willing to use M-learning if they find it fun and enjoyable.

It also seems that smart devices and smart mobiles among higher education students in Malaysia are ubiquitous and accessible. This can be derived from the low contribution of the Perceived Ease of Use variable towards the Intention to Use M-learning compared to the Perceived Usefulness and Perceived Enjoyment.

**Research Significance**

Regardless of the availability of different studies related to M-learning, its theoretical foundations are not on a mature level (Muyinda, 2007). Some researchers argue that understanding the acceptance and adoption of mobile technologies within the educational context is still in its initiating phase. Advocating and promoting mobile learning acceptance among users is still not mainly tackled (De Carvalho et al., 2012; Pozzi, F., 2007).

Considering that, we believe that this research paper will significantly contribute to our understanding of the factors influencing mobile learning technology acceptance among Malaysian students. It will also provide the reader with a simplified and comprehensive look at the TAM. This research will also contribute to the M-learning technology acceptance from the Malaysian students' point of view. According to Cheng (2015), there is considerably less emphasis on the determinants of learners' acceptance of mobile learning.

Practically, this paper can be used as a supporting document or a reference for any higher education institution or M-learning service provider thinking of introducing a mobile learning service to students in Malaysia.

**Conclusion**

This research paper enhances our understanding of the factors affecting mobile learning acceptance among higher education students in Malaysia. It concludes that students are ready to accept and adopt mobile learning as a new method or a new learning channel. Based on an extended and simplified version of the Technology Acceptance Model (TAM), and with the support of data collected and analysed from 384 higher education students in Malaysia, this empirical study concludes that the Perceived Usefulness, Perceived Ease of Use, and the Perceived Enjoyments are essential predictors and positively related to the Intention to Use Mobile Learning. The study also reveals that Perceived Enjoyment is the main affecting factor.

This study covers the behavioral aspect of M-learning and does not cover the technical aspect. Further research needs to be done to explore the effect that M-learning has on students' academic performance.

In conclusion, this empirical study introduces a simplified and extended version of TAM to investigate students' acceptance of mobile learning in Malaysia. The proposed model is supported by previous literature reviews and is confirmed with the data collected and analysed from 384 students. This study will significantly contribute to our understanding of mobile learning acceptance.

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