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**MOBILE LEARNING ACCEPTANCE AMONG STUDENTS OF
RAMKHAMHAENG UNIVERSITY, THAILAND**

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ABSTRACT

The rapid growth of mobile technology will push educational institutions to adopt mobile learning (m-learning). It has the potential to allow students to more closely integrate with learning activities in their lives. However, its adoption and level of use is low in Thailand compared to other countries. This study aims to identify factors that affect the adoption of m-learning in Thailand. The Technology Acceptance Model (TAM) is used as theoretical framework towards understanding the adoption of m-learning. The quantitative method was applied to collect primary data from 200 Ramkhamhaeng University (RU) students who use m-learning. The findings reveal that only three factors contributed significantly towards adoption of m-learning among RU students. The factors were Thai Social Influence, Student Readiness, and Quality of Content. Thai Social Influence was found to be the most influential factor in the model. On the other hand, factors such as Perceived Usefulness, Perceived Ease of Use, and Network Accessibility were found to insignificantly contribute predictors on m-learning adoption. This research provides useful information in the understanding students' acceptance of m-learning in RU. Moreover, it also gives perspectives to RU and other institutions who want to integrate m-learning system into their curricula.

Keywords: Mobile Learning, Technology Acceptance, Thailand

INTRODUCTION

An immense amount of information and communication technology (ICT) in education is readily available through powerful computer, which are connected with high-speed data communication network, such as the Internet. Therefore, many educational institutions have set up electronic learning (e-learning) in their educational system to support learners with online access to search, receive, and study the learning material. Compared with the traditional education, e-learning has an advantage of allowing students to select when, where, and how they study. However, it has some limits in educational purpose. Namely, students are required to reach computer and Internet connection to practice learning. Besides that, students are now demanding more from the educational institutions for the flexible delivery of lectures, educational services, and administrative information. Consequently, the solution of this scenario is mobile learning (m-learning).

The concept of m-learning has been defined in several ways in different studies. The interest of the academicians has reflected each definition of m-learning (Peng, Su, Chou, & Tsai, 2009). The term m-learning refers to the use of digital mobile and handheld devices, such as Personal Digital Assistant (PDA), mobile phone, computer notebook, and other handheld devices, to aid teaching and learning (Boyinbode & Akinyede, 2008; Geddes, 2006). It also allows students to perform learning anywhere and anytime (Akour, 2009; Al-Fahad, 2009; Dulyalak & Settapong, 2005; Geddes, 2006) without permanent physical connection to cable network (Boyinbode & Akinyede, 2008). It can be concluded that m-learning is the intersection of e-learning and mobile technology (Georgiev, Georgieva, & Smrikarov, 2004; Quinn, 2000).

Several studies on m-learning revealed that m-learning has both of the advantages and disadvantages in education (Georgiev et al., 2004; Monchai, 2004; Phanthipa, 2010). Most advantageously, m-learning allows both teachers and students to perform learning anywhere and anytime because of the mobility and flexibility of mobile technology (Georgiev et al., 2004; Kinash, Brand, Mathew, & Kordyban, 2011; Leung & Chan, 2003; Monchai, 2004; Pansak & Kalayanee, 2006). Notwithstanding, the mobile device has some problems on visual property, which influence the potential of m-learning. The display is too small, causing difficulties in viewing information (Pansak & Kalayanee, 2006; Shudong & Higgins, 2005).

The m-learning is possible today because of the proliferation of ICT and the rapid advance of the mobile technology (Brown, 2005). The use of mobile devices is becoming a primary personal communication tool (Quinn, 2000). The mobile technologies – m-learning, mobile network, and mobile content – potentially promote, facilitate, and enhance students' collaboration and interaction by providing a means for accessing, discovering, discussing, and sharing via multimedia mobile contents (Uzunboylu, Cavus, & Ercag, 2009). Therefore, m-learning will be an important channel for obtaining learning material and a significant next trend in the educational environment (Huang, Lin, & Chuang, 2007; Monchai, 2004; Motiwalla, 2005; Tiong & Kinshuk, 2006).

Based on these notions, m-learning has several effective benefits in educational purpose, but it is not widespread in educational institutions (Akour, 2009; Lu & Viehland, 2008). What reasons do affect users to accept and adopt m-learning? According to the relevant

researches, they pointed out that there are many reasons that influence students' acceptance and rejection of m-learning (Akour, 2009; Chen & Huang, 2010; Huang et al., 2007; Kallaya, Prasong, & Kittima, 2009; Liu, Li, & Carlsson, 2010; Lu & Viehland, 2008).

This research attempts to examine the relationship between the several factors and students' m-learning acceptance. By doing so, the use of Theory of Technology Acceptance Model (TAM) can help researchers to investigate and comprehend the causes that influence users to accept the m-learning (Akour, 2009; Davis, 1989; Davis, Bagozzi, & Warshaw, 1989; Venkatesh, 2000; Venkatesh, Morris, Davis, & Davis, 2003). Therefore, the TAM theory is employed to identify six factors, i.e. Perceived Usefulness, Perceived Ease of Use, Network Accessibility, Quality of Content, Student Readiness, and Thai Social Influence to enhance the explanatory power of the model.

This study endeavours to contribute the body of knowledge in the fields of m-learning and technology acceptance in higher institutions of Thailand by providing information needed to academicians of Thailand. It would help Thai academicians to understand the students' perception towards the utilization of m-learning as well as to understand the variety of factors that can influence their intention and acceptance.

THEORETICAL BACKGROUND AND RESEARCH MODEL

The theoretical framework for this research is the Technology Acceptance Model (TAM). It is proposed by Davis (1989). The TAM is a useful instrument to predict and explain the behavioural intention to use new systems and technology (Davis, 1989; Davis et al., 1989; Venkatesh et al., 2003). It states that attitude and perceived usefulness can affect to the behavioural intention to use, then behavioural intention to use effect the actual use. Meanwhile, the attitude is simultaneously affected by perceived usefulness and perceived ease of use while perceived ease of use affects perceived usefulness. Moreover, the external variables influence indirectly behavioural intention to use and actual use through perceived usefulness and perceived ease of use (Davis, 1989).

Figure 1: illustrates the original TAM model by Davis (1989).

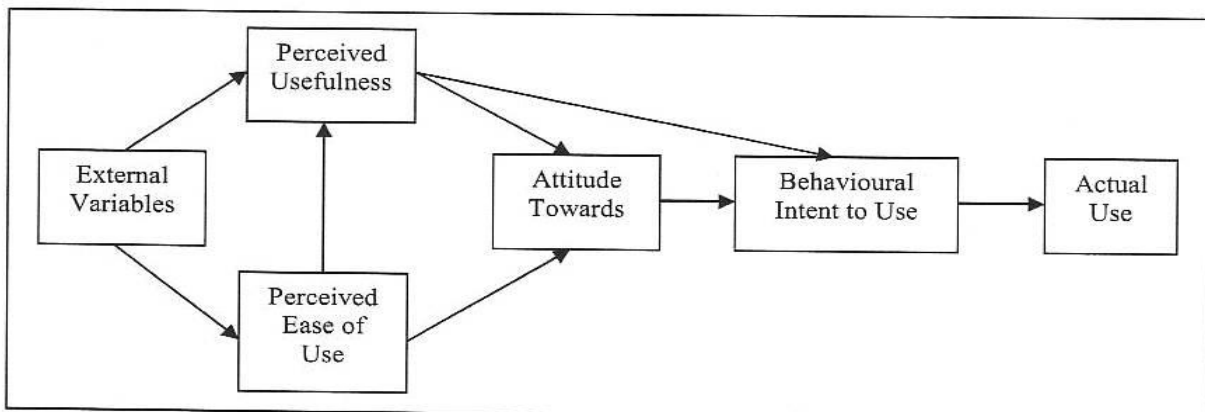


Figure 1: The Original Technology Acceptance Model (TAM)

The TAM theory has been cited and applied in several of empirical studies to examine technology adoption (Lin & Wu, 2002; Lopez & Manson, 1997), such as e-mail, word processing, academic portals, web applications, web site, Internet banking, e-commerce, Internet, online shops, online learning, wireless, and e-learning (Adams, Nelson, & Todd, 1992; Aditiawarman, 2007; Davis et al., 1989; Gefen, 2003; Lee, 2006; Macharia & Nyakwende, 2010; Park, 2009; Pathan, 2010; Presley & Presley, 2009; Wang, Wang, Lin, & Tang, 2003; Yu, Liu, & Yao, 2003). Moreover, this theory has been specifically applied on the study of m-learning acceptance (Akour, 2009; Callum & Jeffrey, 2012; Chen & Huang, 2010; Huang et al., 2007; Liu et al., 2010; Lu & Viehland, 2008).

MOBILE LEARNING ACCEPTANCE MODEL AND HYPOTHESES

As shown in Figure 2, the extended TAM includes four external variables, namely Network Accessibility, Quality of Content, Student Readiness, and Thai Social Influence. These external variables may significantly affect existing TAM variables. The next section describes in the justification with explanation of why these variables were integrated into the proposed model and all hypotheses concerning the relationships among the variables in the model.

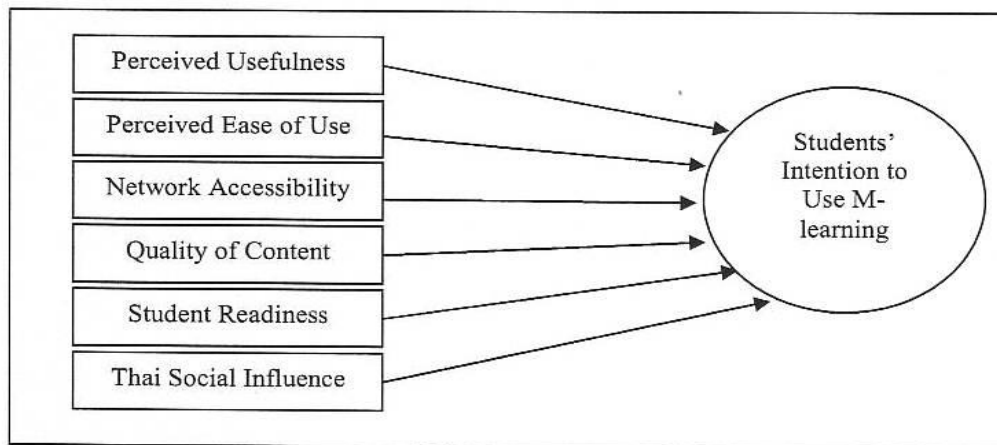


Figure 2: M-learning Acceptance Model

Perceived Usefulness (PU)

Davis (1989) and Davis et al. (1989) defined PU that the prospective user's subjective probability that the use of new technology would enhance their performance. M-learning system has demonstrated the usefulness of context awareness support, providing appropriate information to support a students' life (M. S. Norazah & Norbayah, 2011; Parsons, Brown, & Ryu, 2006). In addition, the use of m-learning

as an interactive tool in education could increase the communication between students and lecturers (Al-Fahad, 2009; Yousuf, 2007). This study examines the relationship between PU and IN, as expressed in the following hypothesis:

H1: PU has no a positive effect on students' intention to use m-learning.

Perceived Ease of Use (PEU)

According to Davis (1989) and Davis et al. (1989), they mentioned that people's belief that uses a new technology would be free from effort. Strong evidences from previous researches supported that PEU is a direct variable that determine user to uptake the new technology, such as e-mail, word processing, academic portals, web applications, web site, Internet banking, e-commerce, Internet, online shops, online learning, wireless, e-learning, and m-learning (Adams et al., 1992; Aditiawarman, 2007; Akour, 2009; Chen & Huang, 2010; Davis et al., 1989; Gefen, 2003; Huang et al., 2007; Lee, 2006; Liu et al., 2010; Lu & Viehland, 2008; Macharia & Nyakwende, 2010; Park, 2009; Pathan, 2010; Presley & Presley, 2009; Wang et al., 2003; Yu et al., 2003). An individual might have a higher intention to adopt m-learning if they think m-learning is easy to operate, leading to this hypothesis:

H2: PEU has no a positive effect on students' intention to use m-learning.

Network Accessibility (NA)

The NA refers to the extent to which people believe that they can easily access the network for gaining the information through mobile devices (Mohammed, 2006). This concept is built upon the concepts of mobility and convenience and the anywhere and anytime paradigm upon which m-learning is based (Aditiawarman, 2007; Huang et al., 2007; Tang & Chiang, 2009; Yoon & Kim, 2007). The NA has great influence on the user to use m-learning because of it is fully mediate the behaviour intentions to use m-learning (Huang et al., 2007). It is hypothesized as:

H3: NA has no a positive effect on students' intention to use m-learning.

Quality of Content (QC)

The QC is defined as the extent to which people believe that they can receive information or digital mobile content through mobile devices with serviceable and appropriable quality (Datta & Agogino, 2007; Kalinic & Arsovski, 2009; Pocatilu & Boja, 2009). According to Liu et al. (2010), they agreed that higher quality of mobile content could completely determine student to adopt m-learning for their learning experience. The higher quality of content is important to promote the students' level of satisfaction with the mobile technology, which in turn leads to m-learning utilization (Al-Karadsheh, 2009; Ansari & Sanayei, 2012; Vogt, Schaffner, Ribar, & Chavez, 2009). Therefore, the QC will be integrated into the research model and leading to this hypothesis:

H4: QC has no a positive effect on students' intention to use m-learning.

Student Readiness (SR)

The SR is defined as student's self-perception and self-management of being capable to succeed in learning tasks (Akour, 2009). In this case, it refers to students' perception and management of using m-learning to perform learning. Another concept of SR in this study, it refers to students' affordance is the extent to which students believe that they have enough the financial resources to buy mobile devices and pay mobile services for performing m-learning (Lu & Viehland, 2008). Previous studies evidenced that the use of m-learning successfully enhanced the teaching and learning process when students had fully the readiness (N. Norazah, Mohamed, Ruhizan, Saemah, & Mclor, 2010). The current study extends this research in the following hypothesis:

H5: SR has no a positive effect on students' intention to use m-learning.

Thai Social Influence (TH)

Venkatesh et al. (2003: 451) have defined the notion of social influence as "the degree to which an individual perceives that other important persons believe he or she should use the system". Lu & Vichland (2008) verified that social influence is the great impact on behavioural intention to use m-learning. Meanwhile, Akour (2009) examined that social influence was found to be the most influential factors in the m-learning acceptance. These results indicated the importance of society roles in shaping impressions of the value of using the new system and the potential underutilization of other people influence to shape behaviour in new system (Shen, Laffey, Lin, & Huang, 2006). In this study, social influence refers to the pressure from Thai society – by positive attitude from family, friends, culture, foundation of education, language, and other m-learning adopters – that can cause students to accept and adopt m-learning. It is hypothesized as:

H6: TH has no a positive effect on students' intention to use m-learning.

Students' Intention to Use M-learning (IN)

According to TAM theory, behavioural intention is a proper proxy to examine and predict a user's behaviour toward a particular technology or system (Davis, 1989; Davis et al., 1989). Meanwhile, Ajzen & Fishbein (1980: 288) asserted behavioural intention as "the extent to which an individual intention to perform a specific behaviour". Results from much research has indicated consistent results showing a significant correlation between several of factors and behavioural intention (Napaporn, 2007). In this case, it refers to the students' behavioural intention to use m-learning. Consequently, it is expected that behavioural intention can predict that students will use m learning in the future

RESEARCH METHODOLOGY

This research examines six factors that influence the adoption of m-learning, thus a survey research methodology is appropriate for this research because it uses direct questioning to gather descriptive data to answer the questions posed in the six hypotheses (Creswell, 2008).

A survey instrument with 36 questions that addressed various aspects of the six hypotheses was developed. The questions used to construct variable were mainly adopted from previous studies and newly created in this study. Participants were asked to evaluate statements using a 5-point Likert-type (i.e., "strongly agree" to "strongly disagree"). A pilot study was conducted to insure the questionnaires were easily and correctly understood.

The purposive sampling is employed as the sampling strategy in this research. 200 students, who use mobile devices for their learning, were purposively sampled to be participants in this research. By doing so, the results could be generalized to other mobile learners of Ramkhamhaeng University.

The multiple regression analysis was employed to address all six proposed hypotheses. It provides a mean of objectively assessing the degree and character of the relationship between dependent and independent variable by forming the variate of independent variables (Hair, Anderson, Tatham, & Black, 1998).

FINDINGS

Demographical Profile

200 students of Ramkhamhaeng University, who use m-learning, were purposively asked to evaluate their perception and acceptance of m-learning. 51.5 % (N = 103) were from male respondents, and 48.5 % (N = 97) from female respondents. The majority of the respondents used Thumb Drive (100%), Computer Laptop (52%), Tablet (28.5%), Smart Phone (24%), Digital Media Player (19%), and Cellular Phone (7%) for learning. The experience of using m-learning ranged from 6 months – 2 years.

Reliability Analysis

Internal consistency is measured in this research using Cronbach's coefficient alpha, (α). The statistic provides an indication of the average correlation among all of the items that make up the scale. Values range from 0 to 1 with higher values indication greater reliability. Table 1 indicates the result of analysis of the Cronbach's alpha scale for PU, PEU, NA, QC, SR, TH, and IN where their value was more than 0.7. This indicates that the survey instrument can be a reliable tool to measure all dimensions consistently.

Table 1: Reliability Analysis

Variables	Cronbach's Alpha
Perceived Usefulness (PU)	.857
Perceived Ease of Use (PEU)	.857
Network Accessibility (NA)	.918
Quality of Content (QC)	.862
Student Readiness (SR)	.908
Thai Social Influence (TH)	.828
Students' Intention to Use M-learning (IN)	.935

M-learning Acceptance

Initially, the researcher conducted descriptive statistics to provide an understanding the level of perception on m-learning which using statistic mean value and standard deviation and shown in Table 2.

Table 2: Descriptive Statistics of M-learning Acceptance Questionnaire

Constructs	Mean	Standard Deviation	Level
PU	4.17	0.40	High
PEU	3.84	0.53	Moderate
NA	4.11	0.43	High
QC	4.18	0.40	High
SR	4.20	0.75	High
TH	4.13	0.42	High
IN	4.46	0.39	High

The report indicates that students believed that m-learning is an useful tool for education in high level with mean value of PU is 4.17, and student tend to agree that m-learning is easy to use and easy to learn in moderate level with mean value of PEU is 3.84. The results also report that the students believed that they can connect with mobile network anytime with mean value of NA is in high level (mean = 4.11), and the descriptive statistics also support that students satisfied with the quality of learning material in high level with mean value of QC is 4.18. Additionally, the students evaluated themselves that they have ability to use m-learning with mean value of SR is 4.20. Moreover, the results suggest that the students may be influenced by others who think they should use m-learning with mean value of TH is in high level (mean = 4.13). The results suggest a high level of use in terms of students' intention to use m-learning with mean value of IN is 4.46. Eventually, the degree of m-learning acceptance among mobile learners of Ramkhamhaeng University was quite high, except PEU.

Multiple regression analysis was secondarily performed to test the relationship between independent variables and dependent variable. Six hypotheses were proposed and results were enumerated in Table 3. The F statistics produced ($F = 10.440$) was significant at 1 percent level (Sig. $F < 0.01$), thus confirming the fitness for the model. Consequently, there is a statistically significant relationship between the six factors (PU, PEU, NA, QC, SR, and TH) and IN. The coefficient of determination R^2 was 22.2 percent. Thus, the six factors can significantly account for 22.2 percent in the students' intention to use m-learning.

Table 3: Multiple Regression Analysis

Multiple R	.492
R^2	.245
Adjusted R^2	.222
Standard Error	.34851
F	10.440
Sig. F	.000

Variables	Variables in the Equation				
	B	SEB	Beta (\square)	T	p value
PU	.050	.071	.051	.707	.480
PEU	.047	.051	.063	.909	.364
NA	.091	.064	.101	1.419	.157
QC	.152	.068	.156	2.236	.026
SR	.107	.036	.203	2.937	.004
TH	.207	.064	.224	3.239	.001

a) Dependent Variable: Students' Intention to Use M-learning (IN)

b) Significant at the .05 level (\square = .05)

H1 posited that PU has no a positive effect on students' intention to use m-learning. Results suggest that there was no significant relationship exists; therefore, H1 is failed to reject ($\beta = 0.051$; $t = 0.707$; $p = 0.480$). Thus, H1 is supported where students' find that m-learning is not totally useful tool for education.

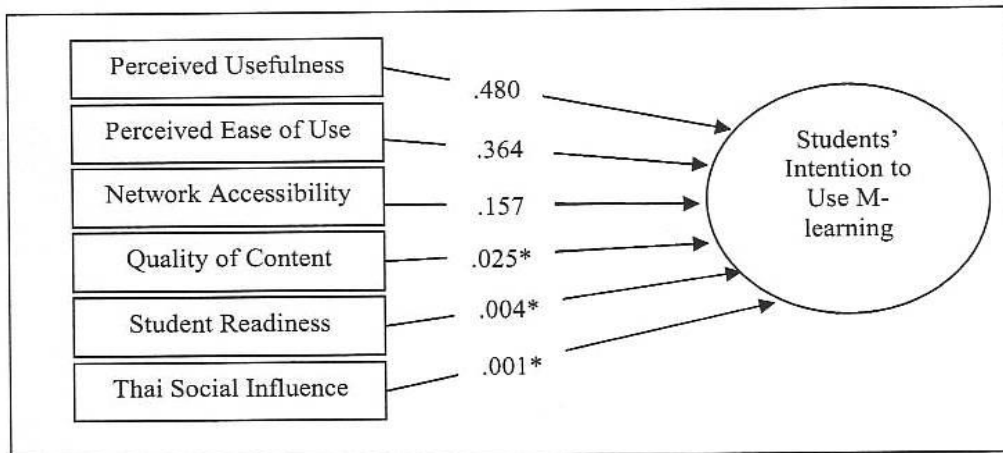
Further investigation of study was performed on second proposed hypothesis on whether there was significant relationship between PEU and IN. Findings in Table 3 confirm that PEU ($\beta = 0.063$; $t = 0.909$; $p = 0.364$) was not significantly to IN. Hence, H2 is verified that PEU factor would not contribute to IN, and the researchers are unsuccessful to reject H2 as well.

In addition, H3 exhibited a significant relationship between NA and IN ($\beta = 0.101$; $t = 1.419$). Its p-value is > 0.05 , posited that H3 is supported by the data. Great diversity of mobile network could excite students with more flexibility that leads them to experience enjoyable towards using m-learning. However, the findings imply that mobile network provided by university would not be motivated students to adopt m-learning, and H3 would be accepted.

Next, H4 proposed that QC has no a positive effect on students' intention to use m-learning. QC exhibited a significant relationship with IN ($\beta = 0.156$; $t = 2.236$). Its p-value is < 0.05 , posited that H4 is not supported. Consequently, students evaluated that the accuracy, reliability, and quality of information and course materials completely contribute them to use mobile device for learning.

Moreover, H5 hypothesized that SR has no a positive effect on students' intention to use m-learning. Findings in Table 3 confirm that SR ($\beta = 0.203$; $t = 0.2937$; $p = 0.004$) was significantly to IN. Henceforth, H5 would be rejected and it could be concluded that the readiness could cause students to accept and adopt m-learning. They also believed that they have ability to organize and accomplish learning tasks by using m-learning as well as can afford to buy mobile devices and pay for service charge of m-learning.

The final hypothesis proposed that TH has no a positive effect on students' intention to use m-learning. TH indicated a significant relationship with IN ($\beta = 0.224$; $t = 3.239$). Its p-value is < 0.05 , posited that H6 is not strongly supported. The test also confirms that H6 would be denied. The results suggest that students may be influenced by others who think they should use m-learning. Thus, the significant role of Thai society in shaping behavioural intention to use m-learning has been visible when students adopted m-learning due to Thai society – family, friends, culture, foundation of education, language, and other m-learning adopters – has pressured them to use it. Figure 3 illustrated the multiple regression model of m-learning acceptance for each of the factors.



* Significant at $p < 0.05$

Figure 3: Multiple Regression Model of M-learning Acceptance

DISCUSSION

The purpose of this study is to examine the relationship between the several factors and students' m-learning acceptance. Each of those factors is briefly discussed in this section, with some additional analysis from some of the survey questionnaire results and insight from the literature.

Even though all direct paths in m-learning acceptance model in this study were significant, only TH, SR, QC factors were significant predictor of m-learning acceptance. The findings also reveal that TH was greatest impact on behavioural intention to use m-learning. This result is analogous to Akour (2009) and Lu & Viehland (2008) that the role of society is very important to drive people to notice and utilize m-learning. It could be due to the possibility that students are more influence by society than other reasons. Some studies also supported this finding that social influence can motivate people to use the new technology (Chao, Wu, & Kao, 2009; Kallaya et al., 2009; Sajjad, Saif, & Humayoun, 2009; Venkatesh et al., 2003).

Another finding indicates that SR was significant influence on students' intention to use m-learning. This result is similar to Akour (2009), Lu & Viehland (2008), Napaporn (2007), and N. Norazah et al. (2010) who asserted that student readiness factor could cause students to adopt m-learning and other systems in education. For this research, mobile learners' judgment of their ability to organize and accomplish learning tasks by using mobile technology as well as their affordance to buy mobile devices and pay for service charge of m-learning.

In addition, QC had a significant influence on behavioural intention to adopt mobile device for education. Many researches in 2010s showed that the higher quality of mobile content could completely influence students to adopt m-learning for their learning experience in both

regular and distance education system (Issham, Rozhan, Azidah, & Mumirah, 2010; Issham, Thenmolli, Koh, & Rozhan, 2010; Liu et al., 2010). Due to the quality of content, it could usefully aid students to understand the information through mobile devices (Akour, 2009).

In contrary to previous literatures, PU and PEU were surprisingly found to be insignificant determinant in using m-learning. These findings totally disagreed with the findings from many previous studies, which suggested that these variables have a significant effect on usage behaviour (Davis, 1989; Davis et al., 1989; Venkatesh & Davis, 2000; Venkatesh et al., 2003). However, some researchers agree with the findings of this research that PU and PEU was not a significant factor in determining the intention to use information system (Mao & Palvia, 2008; Mohammad & Razli, 2011; Ramayah & Ignatius, 2005; Yuena & Ma, 2008). Therefore, PU and PEU discourage an individual to regard m-learning as a useful technology in education.

Similarly, H3 was supported, showing that NA was not likely to have a direct effect on IN of the construct, which again is consistent with previous researches (Akour, 2009; Park, 2009). Accordingly, Williams (2009) stated that mobile network is not important to process education because face-to-face teaching method and m-learning method is not different in term of delivery of content. In conclusion, these three variables are not the major determinants that can encourage students' attitude in using m-learning like TH, SR, and QC.

CONCLUSION

This research has proposed and verified that TAM with four added constructs can be employed to explain and predict the acceptance of m-learning. The model shows that the new variables are imperative. It thus has examined relationship between Perceived Usefulness (PU), Perceived Ease of Use (PEU), Network Accessibility (NA), Quality of Content (QC), Student Readiness (SR), Thai Social Influence (TH), and Students' Intention to Use M-learning (IN). The most important result of this study is to identify factors that influence the behavioural intention of users to adopt m-learning. They are Thai Social Influence (TH), Student Readiness (SR), and Quality of Content (QC). Nonetheless, among the six factors, Perceived Usefulness (PU), Perceived Ease of Use (PEU), and Network Accessibility (NA) are proven to be insignificantly influencing the Behavioral Intention towards using m-learning. These variables may be a necessary condition, but not the sufficient criterion to lift students' intention to adopt m-learning.

Finally, this study has shown the importance of TH, SR, and QC to an individual's acceptance of m-learning. It implies that the role of society, readiness of learners, and quality of learning material are very important to succeed the use of m-learning in Thailand. Thus, the university administration should emphasize on well fit design m-learning system that appropriate with students' perception.

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