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Factors Influencing Students' Intention to Use M-learning

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Abstract — The use of mobile devices is increasingly popular worldwide. The emergence of mobile learning (M-learning) can be utilized to enrich education, putting content in the hands of students regardless of their location. It indicates a new opportunity for the education industry's development. Nonetheless, there is still a lack of comprehensive understanding regarding factors affecting university students' intention to use M-learning. This paper developed an integrated model to investigate the predictors of Behavior Intention to use mobile learning by university students. This model is based on the Unified Theory of Acceptance and Use Technology (UTAUT). It aims to provide a framework for future research and will serve as a base for our future surveys and collected data. This study will use the quantitative approach by questioning students in University Technology Malaysia. The data will be analyzed using SPSS (Statistical Package for the Social Sciences). To test and validate the proposed model, a structural equation modeling approach will be used and Confirmatory Factors Analysis to test the validity of each construct.

Keywords – student behavior intention ; factors affecting student's intention; M-learning ; predictors of intention

1. INTRODUCTION

Nowadays, the pervasiveness of mobile devices has increased, and subsequently there has been as many mobile applications developed to support teaching and learning programs [2]. Mobile learning (M-learning) is an educational provision used in environments supported by mobile technologies, such as smart phones, tablet computers and notebooks [23]. A learning environment is referred to M-learning if students can use mobile devices to obtain learning materials and aid their learning actions wherever and whenever they choose to. [25] illustrated M-learning environments enable users to learn at anytime and anyplace. [2] Demonstrated that weather using a Tablet PC or laptop; working indoors or outdoors; operating individually or in a team situation; M-learning has few limitations.

Currently M-learning and mobile technology acceptance research using information technology theories such as the Technology Acceptance Model (TAM) or the Unified Theory of Acceptance and Use Technology (UTAUT) is limited [16]. In particular, there is a lack of research using technology acceptance theories on whether higher educations' students plan to use or are currently using mobile devices to support their learning or to access the resources in online libraries and communities. Whilst there is growing interest from academic institution and business, the issue on how to promote students' intention seem to be largely unsolved and are considered to be challenging for M-learning application designers. Therefore, it appears to be an urgent requirement to understand the factors that influence students' Behavior intention to use M-learning in order to carefully develop M-learning context that match with students' interest and expectations. This study can serve the University in a number of ways because anticipating the factors that influence students' behavior intention will help to ensure the implementation of M-learning according to the students' perception. Furthermore, testing the intention of student is paramount in ensuring the budget is not wasted on an M-learning that nobody use.

This paper is organized as follows :-Section 2 briefly explains the literature and describes the theoretical model of behavior intention. Section 3 proposes the research model for testing students' intention to use M-learning and explains the relationship Between behavior intention and each construct. Finally the conclusion and potential contributions are listed in the summary.

2. LITERATURE REVIEW

Behavior intention is an individual subject probability of performing a behavior [28]. As part behavior intention is also defined as a user group willing to use information technologies for their tasks [5]. Several studies have investigated the Intention to use M-learning by adopting TAM as the base of research design [17].Research found TAM was helpful to understand factors affecting M-learning adoption with 3rd generation mobile telecommunication (3G) technology. the

author [8] also confirmed that the unified theory of acceptance and use of technology as developed by Venkatesh [24] was able to explain the students' intention to use M-learning

To investigate the behavior intention, TAM emerges as one of the most widely accepted and applied models. TAM was proposed by Davis [4], which focuses on two particular constructs of perceived usefulness and perceived ease of use as drivers of technology acceptance. In the past decade, a number of modifications and changes to the original TAM model have been made, in which UTAUT stands out as a most prominent one. The UTAUT model introduced by Venkatesh [24] explains the intention to use information system, and describes four variables Performance Expectancy, Effort Expectancy, Social Influence, and Facilitating Conditions as direct dominant indicators to the intention of use and usage Behavioral of information system As shown in Figure 1, the UTAUT model also considers four moderators influencing the four direct determinants: gender, age, experience and voluntariness of use. UTAUT was developed based on conceptual and empirical similarities across eight competing and prominent models in IS adoption research. After empirical examination, UTAUT has been found to exceed in performance of the eight individual models, and account for 70% of the variance in user intention [24]. In this sense, UTAUT is introduced as the basis of our research model.

Venkatesh, et al.[24] uses an empirical study to compare eight competing IS models. From their finding they proposed UTAUT model which contains four determinants of IT use Behavioral and four moderators of key relationships. The Eight models that have been reviewed by the researchers are: Theory of Planned Behavioral, Theory of Reasoned Action (TRA), Technology Acceptance Model (TAM), Combined Technology Acceptance Model and Theory of Planned Behavioral (C-TAM-TPB), Motivational Model (MM), Model of PC Utilization (MPCU), Social Cognitive Theory (SCT), Innovation Diffusion Theory (IDT). While they are comparing these models, they use data from four organizations to formulate and validate the Unified Theory of Acceptance and Use of Technology (UTAUT). Table 1 shows the constructs of UTAUT and the eight stream model they derived from.

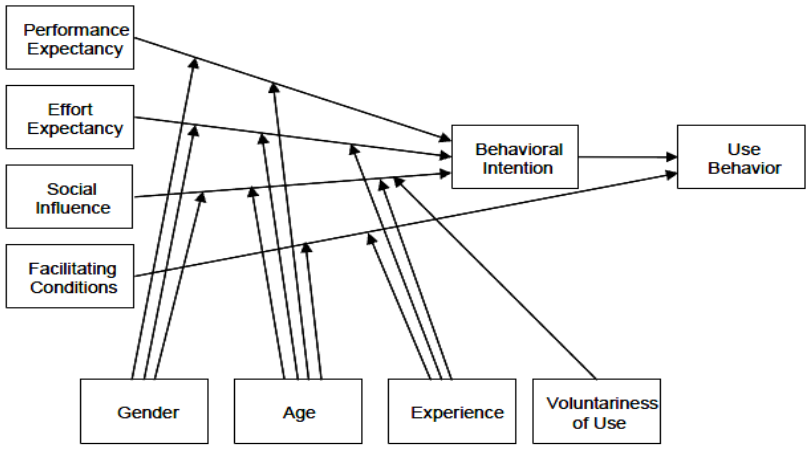

FIGURE 1: UTAUT model Venkatesh [23]

The advantages of UTAUT are its present superior factor strength. It can Explain up to 70% of the variance of intention Venkatesh, et al[24] In cooperation with previous technology acceptance models (e.g. TAM, TAM 2) which can only show the acceptance roughly 30% [11] .Unlike TAM, UTAUT addresses Voluntariness of use and facilitating factors. Moreover, UTAUT has the advantage of including a distinction between mediating and determining factors. Both model TAM and UTAUT are applicable to study intention due to the use of quantitative variables. However, we used UTAUT over TAM for the following reasons:-

1- TAM doesn't address the organization and system variables which Play role in affecting an individual intention of using new technology, these variables are financial cost, system characteristics, training, support, and management support, Whereas these variables has been marked in UTAUT under Social Influence, facilitating, and voluntaries construct

2- Facilitating Condition (FC) become an important factor in UTAUT , in our study too study Facilitating condition consider important variables because students have to compare the benefit of M-learning to the cost spending. Thus, they

need to consider all the resources necessary for the acceptance of using such technology like the cost of mobile device, smart phones and the cost of internet connection. Nassuora[12] have addressed Facilitating Conditions to be one the determinant that have direct influence to the Intention to use of M-learning.

3- TAM and TAM 2 may be applied in the workplace where the system is mandatory, so the variable of Voluntaries of use is absent in these two models. In contrast, accessing the database, eBook, IT training videos with mobile devices is voluntary not compulsory [6]. For this study Voluntaries of use have been chosen to be one of the predictor for the Intention to use M-learning and it is going to be tested in the model as one of the determinant of (BI).

TABLE 1: List of Hypotheses

UTAUT Constructs	Model	Constructs
Performance Expectancy (PE)	TAM, TAM2, C-TAM, TPB, MM MPCU IDT SCT	Perceived Usefulness Extrinsic Motivation Job-fit Relative Advantage Outcome Expectations
Effort Expectancy(EE)	TAM, TAM2 MPCU, IDT	Perceived Ease of Use Complexity Ease of Use
Social Influence (SI)	TRA, TAM2, C-TAM,TPB/DTPB MPCU,IDT	Subjective Norm Social Factors Image
Facilitating Condition (FC)	TPB/DTPB,C-TAM-TPB, MPCU, IDT	Perceived Behavioral Control Facilitating Conditions Compatibility
Behavior Intention	TRA, C-TAM,TPB/DTPB MM	Attitude Toward Behavioral Intrinsic Motivation

3. RESEARCH MODEL

Venkatesh [24] has proposed the Unified Theory of Acceptance and Use Technology (UTAUT) by integrating eight competing acceptance models. According to the UTAUT Intention to use the information technology (IT) can be determined by three antecedents: Performance Expectancy, Effort Expectancy and Social Influence. For M-learning some studies showed that Facilitating Condition (FC) is a determinant of Behavioral Intention (BI) [8, 15]

UTAUT has been used in many IS studies involving Mobile context. However, the model may not fully address the unique context of mobile information systems; the model was extended with the additional constructs of Perceived Playfulness, and Self-management of Learning [26]. [26] Found that self-management of learning and Perceived Playfulness is significant determinants of Behavioral Intention to use M-learning. [6] Adds voluntaries of use as another determinant and found that it has negatively significant effect on Behavioral Intention. However the researcher stated that the study is geographically limited to the USA and needs to be investigated in another background. In addition to the four main constructs of UTAUT, three additional constructs associated with M-learning context are integrated in our model, namely Self-management of Learning, Perceived Playfulness and Voluntaries of Use as shown in figure 2.

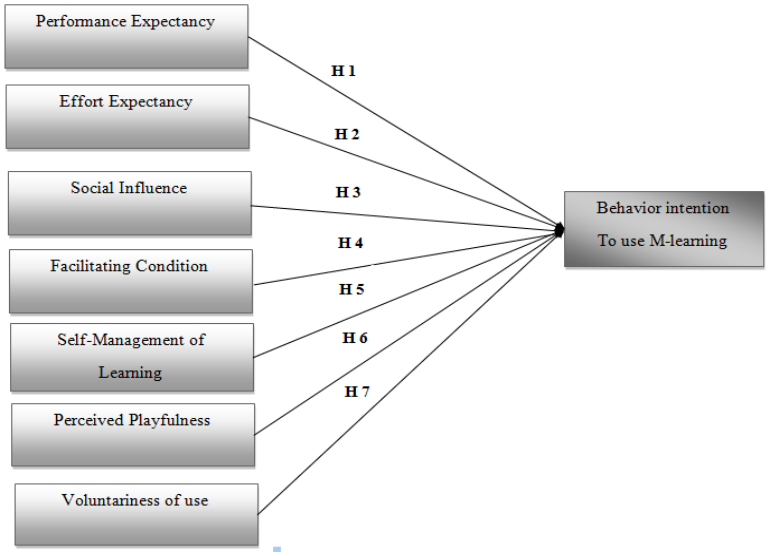

FIGURE 2: Model for Factors influencing Students' Intention to Use M-learning

The model of the study has been established based on the relationships between Behavior Intentions as independent variable and Performance Expectancy, Effort Expectancy, Facilitating Condition, Self-management of Learning, perceived Playfulness and Voluntariness of use as dependent variables.Subsequently, there are seven relationships to be tested. These relationships have been formulated into hypotheses listed in Table 2.

TABLE 2: List of Hypotheses

No	Hypotheses
H1	Performance Expectancy has a significant positive relationship with Behavioral Intention to use M-learning
H2	Effort Expectancy has a significant positive relationship with Behavioral Intention to use M-learning.
H3	Social Influence has a significant positive relationship with Behavioral Intention to use M-learning.
H4	Facilitating Condition has a significant positive relationship with Behavioral Intention to use M-learning.
H5	Self-management of Learning has a significant positive relationship with Behavioral Intention to use M-learning.
H6	Perceived Playfulness has a significant positive relationship with Behavioral Intention to use M-learning.
H7	Voluntariness of use has a significant positive relationship with Behavioral Intention to use M-learning.

The hypotheses proposed in the model are justified by previous studies, as listed in Table 3.

TABLE 3: hypotheses Justification

Factors	References
Performance expectancy	[8, 26, 6, 15]
Effort Expectancy	[8, 26, 6, 15]
Social Influence	[8, 26, 6, 15]
Facilitating Condition	[8, 6, 15]
Self-management of Learning	[26, 6]
Perceived Playfulness	[26, 6]
Voluntaries of use	[6]

A. Performance Expectancy

Performance Expectancy (PE) is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" [24]. UTAUT uses three constructs from existing models to capture the concept of Performance Expectancy: perceived usefulness (TAM/TAM2 and C-TAM-TAB), extrinsic motivation (MM), job-fit (MPCU), relative advantage (IDT), and outcome expectations (SCT). UTAUT suggests that Performance Expectancy is the strongest predictor of an individual's Behavioral Intention to use an information system/technology and is significant at all points of measurement for mandatory and voluntary settings .

In the context of M-learning Performance Expectancy suggest that individuals will find M-learning useful due to the opportunity that mobile presents for gaining access to information quickly from anywhere at any time further studies are needed to substantiate the effect of this variable on M-learning. Some research finds that Performance Expectancy strongly influences students' Intention to use electronic government resources [1]. On the other hand, [9] discovered that Performance Expectancy be a key determinant of Behavioral Intentions of students' intention to use instant messaging on mobile device.

B. Effort Expectancy

Effort Expectancy (EE) is the degree of ease an individual associates with the use of an information system/technology. UTAUT uses three constructs from existing models to catch the concept of Effort Expectancy. These constructs are perceived ease of use (TAM/TAM2), complexity (MPCU) and ease of use (IDT) Venkatesh [24]. In the context of M-learning, it seems that Effort Expectancy will strongly affect Behavioral Intention. [8] In their study validated that Effort Expectancy has a significant positive relationship with Behavioral Intention (BI). [26] found Effort Expectancy to have a significant effect on an individual's Intention to use information kiosks.

C. Social Influence

Social Influence (SF) is the extent to which users perceive that others important to them believe that they should use a new information system. UTAUT uses three constructs from existing models to capture the concept of Social Influence: subjective norm (TRA, TAM2, TPB and C-TAM-TPB), social factors (MPCU) and image (IDT) [24]. In the context of M-learning, there are many effects of Social Influence (e.g. Lecturers, instructors, parents, peers, etc.). All of these social factors will strongly affect students' Intention to use M-learning in the pedagogical environment.

[8] Shows that Effort Expectancy has a significant positive relationship with Behavioral Intention (BI).Furthermore, [1] use UTAUT to examine acceptance of e-government services. Findings show that peer influence for students is more significant in situations where they have limited experience with an information system (e.g. Mobile devices). The researchers highlight the importance of ensuring positive experiences with an information system since users may be influenced by their peers or those considered important to them.

D. Facilitating Condition

Facilitating Conditions (FC) is defined as the "degree in which an individual believes that an organizational and technical infrastructure exists to support the use of the system" [24]. UTAUT uses three constructs from existing models to capture the concept of Facilitating Conditions. These constructs are perceived Behavioral control (TPB/C-TAM/), Facilitating Condition (MPCU) and compatibility (IDT) [23]

Researches indicate that Facilitating Conditions as predictors of Behavioral Intention (BI) is minimal when the variable of Performance Expectancy and Effort Expectancy are present. However Facilitating Condition has been found to be the main predictor of actual use of technology [24]. Furthermore [8] have proved that Facilitating Conditions has a significant positive relationship with Behavioral Intention (BI), and not significant with the attitude toward Behavioral (AT).

Dealing with the new technology needs training unless the users have a great deal of experience in dealing with such technology. After a review of the literature, [14] identifies the student and staff training for M-learning as an important component for effective mobile device use. [26] Found that Facilitating Conditions have a significant positive effect on an individual's use of an information kiosk. [3] Also emphasize the importance of providing students with guidance and technical support to facilitate engagement with learning technologies.

E. Self-management of Learning

Self-management of Learning is questionable as a determinant in this study. The more the learner controls their own activities, the more successful learning will occur [18, 19]. Classroom learning will guide the students learning but when the student moves out of this context the literature evokes that Self-management of Learning is important to a student's success.

Self-management of Learning refers to "the degree to which an individual perceives self-discipline and can engage in autonomous learning" [20]. Successful Self-management of Learning comes as a result of developing competence and skill in learning how to learn [19]. Thus, [20] concludes that the skill of self-directed learning is essential for effective engagement with flexible delivery and resource-based learning.

In the context of M-learning students must be the managers of their own learning because they are away from faculty, peers, and the institutional support. Self-management of Learning has been found to play a critical role in predicting M-learning [26]. In the same study, it was also unexpectedly found that Self-management of Learning is a stronger determinant for women than for men. Therefore Self-management of Learning in this study has been assumed to have significant impact on students' Intention to use M-learning in higher education.

F. Perceived Playfulness

Perceived Playfulness is considered one of the critical factors that could potentially affect learning engagement with the utilisation of new teaching innovations and technology [22] .A recent study by [10] interpreted cognitive playfulness as "intellectual curiosity and intellectual creativity". [12] Added Perceived Playfulness to TAM as an intrinsic motivation factor. An intrinsic motivator refers to an individual's performance or engaging in an activity due to his or her interest in the activity. Furthermore [12] States that playfulness is subject to the main effect of conditional factors and the interaction effect between a person and condition. In relating Perceived Playfulness to M-learning contexts,[12, 26] suggested that Perceived Playfulness is defined as a state of mind, which includes users' concentration, curiosity, enjoyment and interaction with mobile devices.

Perceived Playfulness has been found to be a significant positive predictor in mobile research. [25] Found Perceived Playfulness to be a significant determinant of the Behavioral Intention to use M-learning. [7] Also found perceived enjoyment to have a significant positive effect on attitude toward the Intention to use M-learning. Therefore this study assumed that intrinsic motivation in the form of Perceived Playfulness would have a significant impact on the Intention to use M-learning by higher education students.

G. Voluntaries of Use

Voluntaries of use refer to "the degree to which use of the innovation is perceived as being voluntary, or of free will" [13] .This construct has been used to mediate the impact of the four key determinants of Intention [21]. However in some M-learning acceptance studies, it has been used as a predictor for Behavioral Intention [6].

Therefore voluntaries of use it has been used as moderated variables where the systems are operating both mandatory and voluntaries. However, the use of mobile devices is mostly voluntary, Thus for this study, voluntaries of use chosen as a predictor for the Intention to use M-learning.

4. RESEARCH CONTRIBUTION

This research has three contributions. First, a research model based on the Unified Theory of Acceptance and Use Technology has been extended with repositioning of three additional variables; Self-management of Learning, Perceived Playfulness and Voluntaries of use from [26, 6] this allows us to explore to explore new finding. Second, from a theoretical standpoint, the result presented contributes to the existing literature of M-learning by providing insights into the factors that affect students' intention to use M-learning. Third, for the University it is important to anticipate factors that influence students' intention to use M-learning before investing in the development of mobile services and content. If students fail to accept a new mobile technology then we are all missing out on the opportunity to easily seek and exchange information. Further, the outcome will certainly result wasted budgetary expenses.

The model proposed in the present study is based on quantitative research-in-progress and focuses on investigating the factors that influence students' behavior intention to use M-leaning. The respondents in this research will be students at

University of Technology Malaysia. This study will apply the quantitative approach and survey to collect data. The data collected is then analyzed by using SPSS (Statistical Package for the Social Sciences). To test and validate the proposed model, a structural equation modeling approach will be used and Confirmatory Factors Analysis to test the validity of each construct.

The research has some limitations. Only a single university will be used; therefore, the findings may not be statistically relevant for other universities. In addition, the variables that appear to be predictors of intention in this study may not be predictors in other studies of M-learning.

6. CONCLUSION

Study in depth about the potential aspect of M-learning is necessary because M-learning still in its initial stage. In this research-in-progress study, we propose a theoretical model to examine the factors that affect students' intention to use M-learning. In doing so we hope advise M-learning practitioners and designers in creating learning activities which match students' preference and perceptions. The model proposes to provide insight on students' intention in the context of M-learning.As you can see,it is evidently clear that this theoretical model could be a practical framework for future research design , as well as serving as a base for our future pilot surveys and actual data collected.

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