

THE INFLUENCE ON MOBILE LEARNING BASED ON TECHNOLOGY ACCEPTANCE MODEL (TAM), MOBILE READINESS (MR) AND PERCEIVED INTERACTION (PI) FOR HIGHER EDUCATION STUDENTS

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Abstract—M-learning is not only e-learning with handheld devices. M-learning creates new learning channel in which students can access content just in time information required at the right time and right place. Despite the fact that m-learning provides mobility and instant access to students, there are some implementation challenges and issues in transition from e-learning to m-learning. Mobile learning is still in its infancy, identifying the factors influencing the adoption of this technology is an essential issue. Researchers and developers in education sphere should consider these mobile capabilities and challenges before developing m-learning content. Students play the most important role in determining the success or failure of the systems. The students adopt or reject a new technology is an importance and complexity case. Moreover, there are numerous models and theories have been conducted for a better understanding of students-adoption, especially in the educational context. Technology Acceptance Model (TAM) is one of the best and well-known adoption models which can be used to interpret the adoption of new technologies. In order to find the factors that influence on m-learning adoption, in this study will adopt TAM model as a theoretical framework and extending this model with two external variables to propose new model. A questionnaire survey will be adopted based to collect required data. The results of data analysis will guide this study to find which of the following independent variables (Mobile Readiness, Perceived Interaction, Easy To Use, Usefulness, Attitude to Use) has a more significant effect on dependent variable (the Influence On M-learning Adoption). Finally, the results will provide valuable implications for ways to increase college students' acceptance of mobile learning.

Keywords— TAM Model, Perceived Interaction (PI), Mobile Readiness (MR), adoption.

I. INTRODUCTION

The fast development of information and communication technologies (ICTs) has changed the student's way of learning [1-2]. Also using electronic media (television, personal computer, and other devices transporting information as medium); to perform electronic learning (e-learning). Therefore, E-learning has increased the opportunity to introduce a new learning environment. According to [3] E-Learning is using electronic media information and communication technologies (ICT) in education; Such as, Computer Based Instruction (CBI), Computer-Based Training (CBT), Internet-Based Training (IBT), Web-Based Training (WBT), online education, and M-learning. Many definitions of

E-Learning are related to the type of learning that is falling in and what is being learned from definitions that concentrate on the role of technology and infrastructure [4].

According to [5] the learner faces difficulty while accessing material through using a personal computer that related to the place or location. Mobile technologies have enabled a new way of communicating and learning [6] as well as have the power to make learning even more widely available and accessible anywhere and anytime; than we are used to in existing e-learning environments. Furthermore mobile phones will play the vital role to improving the educational processes; and changed the way of teaching and learning processes [7-9]. Also can be considered as one of the cheapest tool which can be used for learning [9-10].

According [11] mobile learning (m-learning) refer to use mobile devices in learning to deliver the electronic learning (e-learning) materials on mobile devices such as personal digital assistants (PDAs), mobile phones, Tablet PCs, Pocket PCs, palmtop computers, etc. The revolution of Mobile Technology and portable handheld devices has critical changes on mobile learning; i.e. it allows students to access learning materials [12-13], as well as interact with instructors and student colleagues wherever they are located [14]. Despite of availability of using mobile and wireless technologies in learning since few years, the researchers have not been reached yet to agreed definition for M-learning.

According to [15] defined Mobile technology as "Mobile technology in word open various ways for new educational technologies aimed to fulfill the country's educational needs" and also defined as "M-learning is the exciting art of using mobile technologies to enhance the learning experience" [16].

Even though M-learning comes with many advantages such as freedom to study with flexibility, low cost, and timely [17], there are limitations to use M-learning. The former studies [18-23] in mobile learning field were limited to the mobile phones features as well as faced a problem in the implementation of mobile learning; this problem concerns in sufficiency of mobile phone features among students and they are not likely to use mobile devices for learning.

Moreover, this study will focus on the factors that affect on using of mobile device in learning in higher education students by explore the system factors, interaction between learners and instructors as well as between students and content, and the

role of mobile capabilities in m-learning based on Technology
II. PROBLEM STATEMENT

Mobile learning (M-learning) is a new type of learning mode which based on the use of mobile devices such as Personal Digital Assistants (PDAs), mobile/smart phones, notebooks or Tablet PCs [24]; to access educational information, resources and services such as course material, engage with the course activities, communication and feedback, useful papers or articles [25], newsletters, m-Learning events, and interact with the instructor and classmates [26].

M-learning is considered as an extension of E-learning but M-learning [27] is not just e-learning with mobile devices; the information can be accessed anywhere, anytime, by anyone [28] with a proper authentication.

Central to the e-learning and m-learning is the Learning Management System (LMS) [29] which make it possible to manage the course contents and organisation of teaching. According to [30] there are challenges in the transition from E-Learning to M-Learning; one of the big challenges is the main difference between eLearning and m-Learning in the technologies used for educational content provided. E-Learning is mostly uses Personal Computers (PCs) whereas M-learning uses Mobile devices; the features of mobile devices are limited compared to the personal computers. However, LMS are not suitable for the mobile devices due to the limited viewing screen unit [31].

Many studies in M-learning [18-23] faced problem on the implementation perspective ; mobile learning also limited in terms of the low resolutions of the displays, insufficient memory, navigational difficulties, small keyboard, lack of interaction, and the content itself . These hinder the student's acceptance to use mobile devices as a tool to access the learning materials.

Mobile content has become the main issue on the adoption of mobile learning [32]. Mobile devices with limited capabilities are a major problem to successful development and delivery of this course with high quality. Moreover, should have a way for mobile devices with a minimum set of requirements to function right in accessing and interacting with mobile learning content [25].

The lack of a full understanding of students' needs and attitudes towards M-learning especially the content of mobile device was the main reason to fail the previous studies ; Personal attitudes are a major factor to affect individual usage of information technology [33]. In other words, understanding students' attitude toward m-learning facilitates the creation of appropriate m-learning environments for teaching and learning [34].

Interactive model for M-learning systems has three components are student, educator, and content [35]. The interactions between components in an efficient way; so that the mobile learning is successful and the implementation is efficient. Interactions are important elements in the design courses [36-37] .moreover quality and quantity of interactions play the crucial role to improve student attitude towards learning, and course effectiveness [38].Consequently, in this study will use Perceived Interaction as a main factor to

Acceptance Model (TAM) was proposed by Davis.
determine students attitude to use mobile in learning; and find the relationship with system factors and mobile readiness.

According to [39] to make M-learning accepted by wide audiences must be robust and be of high quality ; therefore, this study will focus on mobile readiness as a factor because the quality of the m-learning is related to the limitations of mobile devices [18-23] .

III. LITERATURE REVIEW

1. TECHNOLOGY ACCEPTANCE MODEL (TAM)

In 1985, Davis proposed the first Technology acceptance model (TAM), Users' motivation can be affected by three main factors: Perceived Usefulness, Perceived Ease of Use, and Attitude toward using. Perceived Usefulness was defined as the extent to which a person believes that using a system would enhance his or her job performance and effectiveness. Perceived Ease of Use was defined as the extent to which a person believes that using a system would be free of mental effort.

According to Davis (1985) attitude toward using plays a critical effect on accepting or rejecting the system. Attitude toward using is affected by two main key- beliefs: Perceived Usefulness and Perceived Ease of Use; Perceived Ease of Use has a direct effect on the Perceived Usefulness. Finally, Perceived Usefulness and Perceived Ease of Use are affected directly by system design, which is represented as X1, X2, and X3 as shown in Fig.1. below.

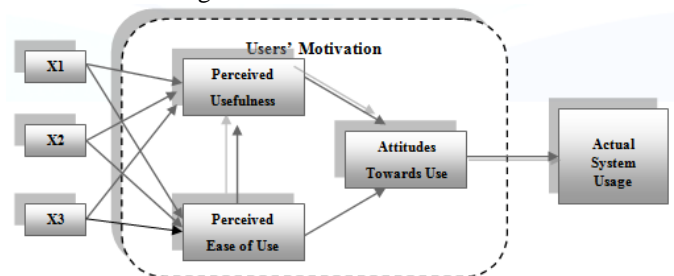


Fig.1. the first and original TAM was proposed by Davis in 1986, p.24

The first Technology Acceptance Model (TAM) was Updated by Fred D Davis based on the "Theory of Reasoned Action" and "Theory of Planned Behavior" [40] in a pioneering article, titled "User Acceptance of Computer Technology: Comparison of Two Theoretical Models". This model has guided many student projects and has been cited by researchers, authors, and PhD students. Theory of Reasoned Action (TRA) is a theory of human behavior in the ground of Social Psychology. Moreover, TAM model was specifically considered as a model in information systems to explore the impact of technology on users' behavior [41].

As shown in Fig.2. The actual use is determined by a users' behavioural intention of use. The users' behavioural intention of use is determined by attitude to use, and perceived usefulness. The users' attitude is determined by perceived usefulness and perceived ease of use. Finally, perceived ease of use affects perceived usefulness, which also mediates the effect of perceived ease of use on attitude to use [41]. Furthermore, TAM assumed that some external variables affect perceived

usefulness and perceived ease of use, which also mediate the effect of external variables on attitude to use.

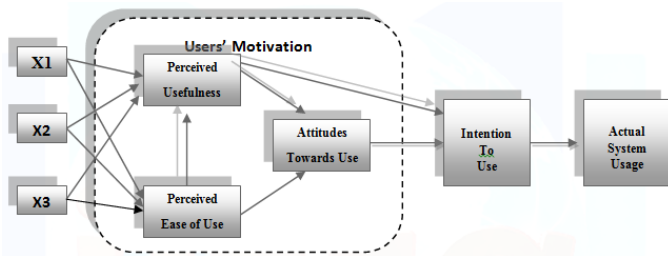


Fig.2. Technology acceptance model by Davis based on the original model [41]

The Technology Acceptance Model focuses on the process of using technology [42]. The model has been employed in many information technology and information system areas such as e-learning [43], World-Wide-Web [44-45], online auctions [46], Radio Frequency Identification (RFID) [47], e-portfolio systems [48-49], wireless LAN [50], E-government [51], E-commerce [51], internet banking [46], and mobile learning [52-54]. All previous research papers show that TAM model can efficiently expect the adoption about information technology and systems. Moreover, the proposed research model will adopt Technology Acceptance Model of Davis (1989) as a theoretical model.

2. RELATED STUDIES (TAM MODEL AND M-LEARNING)

While the TAM had been employed in many information technology and information system areas; the TAM was applicable to various technologies. The structure in the TAM must be extended by adding external factors depending on the target technology, users, and the context [55]. According to many studies developed information system success on m-learning to explore the factors that affect students' intention or adoption to use m-learning in developing country [49, 56] some studies have extended the TAM with external factors to explain and predict users' acceptance of M-learning [57-62] in developing country. Moreover TAM aims to examine why users' beliefs and attitudes affect their acceptance or rejection of information technology [5].

According to [58] the factors that influence the students' adoption to use m-Learning learning via Short Message Service (SMS-learning) in the distance learning in the Universiti Sains Malaysia (USM) are examined by adding usability as external factor. The survey was constructed using a questionnaire for (105) students from management and sciences disciplines. Results indicated that the usability of the system contributed to be effectiveness in assisting the students with their study. Respondents agree that SMS-learning is easy, effective and useful to help them study. However, the results show that there has been a problem in mobile learning that decreases interaction with lecturers.

In Malaysia [57] Were integrated into the Technology Acceptance Model (TAM) three factors Perceived Mobility Value, Prior Use of Electronic Learning, and Self-efficacy as external variables to examine that influence the adoption of M-learning by students in Universiti Teknologi Malaysia (UTM). The proposed model was empirically tested using data collected from a survey for (350) students. The results of the study indicated that Perceived Usefulness, Perceived Ease of

use, Perceived Mobility Value, Prior Use of Electronic Learning, Self-efficacy, and Attitude toward using, can positively affect the adoption of M-learning.

In Pakistan a survey was conducted by [59] to find out students' perceptions about m-learning adoption by using facilitating conditions, perceived playfulness, and Social influence as external variables on TAM model. A survey was conducted among the students of 10 chartered universities operating in the twin cities of Rawalpindi and Islamabad in Pakistan. The results indicated that perceived usefulness, ease of use, and facilitating conditions significantly affect the students' intention to adopt m-learning, whereas perceived playfulness is found to have a less influence. Social influence is found to have a negative impact on adoption of m-learning.

In Taiwan by [60] TAM model was extended with perceived convenience as an external variable to examine the effect of perceived usefulness On students' attitude to use mobile in English learning. A survey was conducted among 158 college students from the middle part of Taiwan. The results revealed that: (a) Perceived convenience, perceived ease of use and perceived usefulness were antecedent factors that affected acceptance of English mobile learning; b) perceived convenience, perceived ease of use and perceived usefulness had a significantly positive effect on attitude toward using; and c) perceived usefulness and attitude toward using had a significantly positive effect on continuance of intention to use.

In Saudi Arabia, an extended Technology Acceptance Model (TAM) was proposed by [62] to investigate the factors that affect on use of mobile devices and smart phones by students in learning by adding perceived innovativeness and Perceived ICT anxiety as extended to TAM in parallel with perceived usefulness and ease of use. The sample of the study consisted of (60) male students who studied at a college computer science and information technology. The results indicated that perceived innovativeness does not show high positive correlation with perceived usefulness of m-learning but the rest of variables have showed high positive correlation.

In Jordan [61] Conducted a study on an extended technology acceptance model to explore the factors that affect intention to mobile learning (M-learning). This study aims to explore the utilization of mobile phones in the educational environment and investigate students' expectations and intentions towards M-learning in Jordan. The proposed model was empirically tested using data collected from a survey containing 21 questions. The researcher used (380) questionnaires that were distributed randomly. The researcher found that all variables significantly affected users' behavioural intention except trust. Among them, the perceived ease of use had the most significant influence.

The adoption of mobile learning is not the same in all countries due to the level of awareness of the technology, availability of infrastructure, the expertise in the new technology and the willingness of the users to implement and use the technology [63]. According to prior studies the researchers are agreed with (1) User's attitude is perceived to be an important factor which influences the use of new technology [41]. (2) Perceived ease of use and perceived usefulness are the important determinants for an individual's acceptance and usage on mobile learning system [41].

Moreover, based on TAM model I will explore Mobile Readiness as external variables to find the effect of external variables on students' attitude to use M-learning for higher education students by using Perceived Ease of Use, Perceived Usefulness, and Perceived Interaction as internal beliefs in TAM model.

3. THEORETICAL FRAMEWORK

Despite the importance of the adoption of m-learning, very little research has been conducted concerning the factors affecting the acceptance of m-learning by students in higher education [64]. [59] "Identifying motivating factors for m-learning in developing countries is needed"; the successful adoption of one technology in one country does not necessarily apply to other countries. This is due to the different environment for the implementation [63]. Moreover, the model in fig.3. Explains the causal relationships between Mobile Readiness(MR), Perceived Interaction(PI), perceived usefulness(PU), perceived ease of use(PEOU), attitude to use (ATU) , and The influence on M-learning. The proposed model based on TAM model will be described depending on three particular principles: Perceived Usefulness, Perceived Ease of Use, and Perceived Interaction will be determined by external variable Mobile Readiness. Users' attitude toward M-learning will be determined by three particular aspects: Perceived Usefulness, Perceived Ease of Use, and Perceived Interaction. Attitude leads the influence on M-learning. Based on the above theoretical variables; this study presents research model and will discuss the relationships between all the factors that influence on M- learning for higher education students. The proposed model is illustrated in Fig. 3.

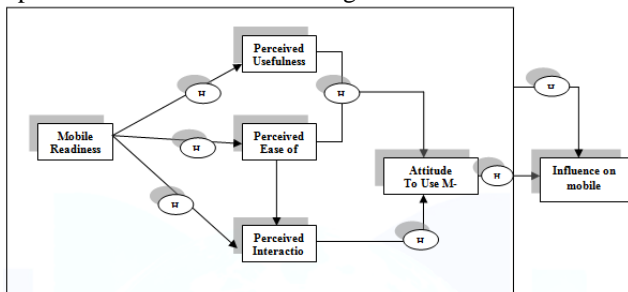


Fig.3. A proposed research model based on TAM model for higher education students

4. MAIN RESEARCH HYPOTHESES:

H1: To what extent does the independent variables (Mobile Readiness, Perceived Usefulness, Perceived Ease of Use, Perceived Interaction, and Attitude to Use) affect the dependent variable (influence on mobile learning)?

Sub Research Questions:

H2: Is there a significant affect between Attitude to Use m-learning and influence on m-learning?

H3: Is there a significant affect between Perceived Ease of Use and Perceived Usefulness and Attitude to Use?

H4: Is there a significant affect between Perceived Interaction and Attitude to Use?

H5: Is there a significant affect between Mobile Readiness and Perceived Usefulness?

H6: Is there a significant affect between Mobile Readiness and Perceived Ease of Use?

H7: Is there a significant affect between Mobile Readiness and Perceived Interaction?

A. Perceived usefulness (PU)

PU is the first source of motivation in the TAM model was originally defined as the extent to which a person believes that using a system would enhance his or her job performance and effectiveness [41]. Moreover, in this study Perceived usefulness will be defined as "the degree to which students believe that M-learning would enhance their learning performance". This study will investigate perceived usefulness to determine the students' attitude to use mobile device in learning.

B. Perceived ease of use (PEOU)

PEOU is a second source of motivation in the TAM model was originally defined as the extent to which a person believes that using a system would be free of mental effort [41]. Moreover, in this study Perceived ease of use the degree to which a student believes that using M-learning would be free from effort. This study will investigate perceived ease of use to determine the students' attitude to use mobile device in learning.

C. Attitude to Use (AU)

According to TAM paradigm attitude is defined as "an individual's positive or negative feelings about performing the target behavior". Personal attitudes are a major factor to affect individual usage of information technology [41]. TAM model is defined as a mediating affective response between usefulness and ease of use beliefs [41]. consequently, the greater perceived ease of use and perceived usefulness of a particular system, the more likely an end-users will have a positive attitude toward using it [41]. Moreover, users' beliefs and attitudes play a crucial role in accepting or rejecting information technology. In this study I will explore Attitude toward use to determine "the influence on m-learning".

D. Mobile Readiness (MR)

According to [63] One critical issue that will determine the success of the mobile learning implementation and usage of the technology for teaching and learning is the students acceptance and readiness to use the new technology. The Users' acceptance of new information technology such as m-learning can be affected by the features of the technology, targeted users , and the environment [44]. Moreover, the use of technology alone for learning is insufficient to ensure success in knowledge acquisition [65]; We also need to consider other important factors such as mobile's readiness. Technology readiness definition as the propensity to embrace and use new technologies for accomplishing goals in home life and at work [66]. Depending on Technology readiness definition, mobile readiness in learning process can be defined as propensity to embrace and use mobile device for accomplishing goals in learning. Earlier research on the use of mobile phones in

delivery of educational content was restricted to the features available on mobile phones [67]. This study will examine whether the influence of m-learning will increase or not based on mobile readiness among students in higher education students. Moreover, in this research will investigate the effect of mobile's readiness on m-learning.

E. Perceived Interaction (PI)

According to [68] Interaction plays an important role in students' Satisfaction and Learning levels. Moreover, Interactivity and active learners has a great impact upon successful learning; but lack of interaction has no the learning motivation of the students [69].

According to [70] Mobile devices could facilitate human interaction and access learning materials anytime and anywhere. It also plays a vital role in changing human-computer interaction and learning activities. Interaction in m-learning can take place between groups such as student and student, student and educator, student and content [35, 71]. Interaction between groups allows learners to exchange information, knowledge, thoughts or ideas regarding course content, and received feedback or comments [72].

According to [25] traditional learning has gradually changed with the rapid emergence of technologies; that has led a new form of interaction between mobile users and their devices, or a Human-Mobile Interaction (HMI). Moreover, Perceived Interaction is defined as follows. When the higher education students join an M-learning community, they perceive two types of interaction: human-system interaction (student to content) and interpersonal interaction (student to student, student to instructor).

IV. RESEARCH OBJECTIVES

M-learning is spreading rapidly in many regions of the world. Despite the importance of the adoption of m-learning, very little research has been conducted concerning the factors affecting the acceptance of m-learning by students in higher education. There are many factors that influence to adopt mobile devices in learning. These factors vary from a focus on technology itself to the attitudes and characteristics of users. The users adopt or reject a new technology in learning is an importance and complexity case. Moreover, there are numerous models and theories have been conducted for a better understanding of user-adoption, especially in the educational context. Technology Acceptance Model (TAM) is one of the best and well-known adoption models which can be used to interpret the adoption of new technologies.

This study aims to propose a new model for m-learning in a university environment; to identify and investigate the factors that affecting on students' attitude to use M-learning within the context of higher education to find the influence on M-learning adoption. Also investigate how these factors can shape students' attitude to use mobile learning. The proposed research model will be adjusted based on The Technology Acceptance Model (TAM). TAM model was proposed by Davis in (1989) to address the issue of how users accept and use a technology.

Finally, A better understanding of the process of m-learning adoption will help researchers and decision makers work together to implement proper strategies for m-learning

[64]. Moreover, this study will propose a new model to identify the factors that will affect on mobile learning adoption in higher education students. This model will be a useful way in providing guidance to developers and educators for designing m-learning courses specifically in the context of developing countries before implemented m-learning system on mobile devices with low capabilities.

V. RESEARCH QUESTIONS

Students are the centre of the educational process. So it is necessary to identify their attitudes towards using mobile phones in education. Hence the problem of the study is to identify the attitudes of the higher education students at the USIM University toward mobile phone usage in education and to identify the effect of the variables on their attitudes to adopt mobile device in learning based on TAM model.

Although the TAM is applicable to various technologies, constructs in the TAM must be extended by incorporating additional factors. These additional factors depend on the target technology, users, and the context. Therefore, this study will extend TAM model with external variables (Mobile Readiness, and Perceived Interaction). Moreover, this research will examine the following seven factors: perceived usefulness, perceived ease of use, Attitude to Use, Mobile Readiness, Perceived Interaction, and Influence on M-learning adoption.

VI. METHODS

The study is considered to be an analytical descriptive study in order to examine the relationship between variables. The independent variable are perceived usefulness, perceived ease of use, perceived interaction, attitude to use, mobile readiness; the dependent variable is the influence on m-learning adoption.

A questionnaire will be designed in order to explore the influence on m-learning adoption. Multiple regressions analysis will be conducted to extract betas coefficients and to use them as raw data for path analysis to extract causal coefficients in order to test the relationship. The population and sampling will be the students in higher education.

VII. CONCLUSION

As a PhD student, this study will aim to propose a new model for m-learning in a university environment; to identify and investigate the factors that affecting on students' attitude to use M-learning within the context of higher education to find the influence on M-learning adoption. Also investigate how these factors can shape students' attitude to use mobile learning. In order to find the factors that influence on m-learning adoption, in this study will adopt TAM model as a theoretical framework and extending this model with two external variables to propose new model. A questionnaire survey will be adopted based to collect required data. The results of data analysis will guide this study to find which of the following independent variables (Mobile Readiness, Perceived Interaction, Easy To Use, Usefulness, Attitude to Use) has a more significant effect on dependent variable (the Influence On M-learning Adoption). Finally, the results will provide valuable implications for ways to increase college students' acceptance

of mobile learning especially with higher education students based on TAM model.

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