

Perspectives

Perspectives of Students' Behavior Towards Mobile Learning (M-learning) in Egypt: an Extension of the UTAUT Model

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Abstract—The rapid development of third-generation (3G) mobile technologies has led to the emergence of a new kind of learning called mobile learning (m-learning). M-learning means the use of mobile devices to access learning materials at anytime and anywhere with the aid of mobile terminals and networks. This paper explores the possibility of applying m-learning for schools in Egypt through a proposed model of acceptance factors that may affect the students' intentions to adopt m-learning. We use the original model of Unified Theory of Acceptance and Use of Technology (UTAUT) and extended it with three new factors mobility, interactivity, and enjoyment.

Keywords-behavioral intention; enjoyment; interactivity; mobility; mobile learning; students; UTAUT

I. INTRODUCTION

With the continued development in the field of mobile technology and the introduction of the third generation of mobile telecommunications technology, the mobile device becomes a multi-functions device. A variety of services (financial, health tracking, news, information sharing, etc) are added. A new mechanism for training and learning known as mobile learning or m-learning has also appeared. According to, mobile learning can be used as a way to overcome many educational problems. Mobile learning definition can be varying. According to [2], m-learning is using mobile technologies to facilitate learning. In [3] m-learning is considered an e-learning by using of mobile devices. The perception of mobility is the most important aspect of m-learning, not the technology itself [4]. In this sense, it is considered that m-learning refers to learning processes supported by the use of mobile and wireless information and communication technologies which have as a fundamental characteristic the students' mobility, who may or may not be physically or geographically remote from formal educational

places, such as classrooms, workplace, instruction and training rooms [4].

M-learning has many advantages that increase the attraction of educators and learners. The most important advantage of mobile learning against traditional education approaches is mobility [5, 6] as it enables users to exchange information anytime and anywhere. Hence, the problem of locality and the requirement that students travel to access learning is removed. M-learning supports collaborative learning through interaction. Mobile devices help achieve interaction and access learning materials anytime and anywhere [7]. Interaction in m-learning can happen between students themselves or between student and educator or between student and content [8, 9]. Interaction encourages learners to exchange information, knowledge and ideas between them [10]. Through m-learning, students can combine between education and enjoyment through a collection of edutainment tools such as E-book, educational games, E-drawing. That makes education fun and helps alleviate the pressures of studying. M-learning supports situated learning; students can capture their own material using their mobile phones with cameras or video and transfer to other students and lecturers. The learners like to take an active role in their education, rather than a passive role, through scheduling, monitoring, and assessment their own learning [11, 12]. M-learning encourages a sense of responsibility and self-managing of learning. Hence, the students become the center of the learning process and have more control on their own learning. According to [4], there are different types of m-learning applications. Some of them are simple applications and others more complicated:

- Interacting with colleagues and teachers using SMS. It is also possible to contribute in conversation forums or video classes via cell phones.

- Students can answer questions through a mobile phone; after watching a video, listening to an audio track or accessing previously defined content in a mobile [13].
- Learning through access a mobile learning management system that include interaction with colleagues, search for materials anywhere and sharing knowledge [14-16].
- Learn by using mobile games.
- Applications that allow students to capture and organize information that occur in specific places.
- Applications that allow learners to access different Third Dimension Virtual Worlds (TDVW) via mobile devices.
- Exchange information for informal learning activities such as access social networks
- Listen to podcasts presenting comments or lecture syntheses recorded by a teacher or classmate, after a class [14, 17].
- Learn in context. For example, one can visit a historical place and receive important information about events that happened in that place [18].
- Support in attendance teaching. For instance, some schools already demand that newly enrolled students own a tablet to attend the classes.

Egypt is an African developing country with a population of 86 million people [19]. According to [20], the Egyptian telecommunications sector is one of the most developed in the middle east/north Africa region and it is expected to continue growth in the next few years. Additionally, Egypt is one of the most rapidly growing mobile markets in Africa [20]. A Study by GSMA and DOCOMO [21] indicates that Egyptians children between the ages of eight and 18 are familiar with mobile devices. They have believed that the ownership of the mobile device increases their confidence. M-learning in Egypt is still in its infancy. According to [22], the current trends that could last for two-five years in Egypt is e-learning practices such as open source learning applications, social media, e-textbooks, and so on. For mobile learning, it is not expected to be adopted in Egypt before five years [22]. Additionally, the studies that analyze the acceptance of mobile technology in learning in Egypt are limited. For these reasons, and in order to support m-learning in Egypt, it is important to investigate the factors that may affect students' intentions to adopt mobile technology. In this paper, the authors will extend the UTAUT acceptance model to examine students' intentions to adopt mobile learning in Egypt.

II. THEORETICAL BACKGROUND

A. Technology Acceptance Model (TAM)

Technology acceptance model (TAM) is one of the robust models used in explaining the acceptance of information technology [23]. In [24], TAM was developed by proposing two factors, the perceived usefulness (PU) and perceived ease of use (PEU), are basic factors for explaining the adoption of new technology. PU is defined as the extent to which a person believes that using the system will enhance his or her job performance and PEU is defined as the extent to which a person believes that using the system will be free of effort.

According to TAM, external variables can affect on PU and PEOU. Hence these two key factors (PU and PEOU) are mediated the effect of external variables on intention [17, 25]. TAM states that actual use of a system is determined by behavioral intention to use a system, where the intention to use the system is determined by the attitude of a person toward using the system. Person's attitude towards using the system is affected by perceived usefulness (PU) and perceived ease of use (PEU).

B. Unified Theory of Acceptance and Use of Technology (UTAUT)

In [26], a model known as the unified theory of acceptance and use of technology (UTAUT) was proposed. The researchers designed UTAUT by consolidating eight significant theories in behavior prediction. UTAUT has four independent variables (performance expectancy, effort expectancy, social influences, and facilitating conditions) are determinants of behavioral intention or use behavior. According to [26], performance expectancy and effort expectancy in UTAUT are similar to perceived usefulness and perceived ease of use in TAM, social influences is similar to the factor "subjective norm" in TAM2, an extension of TAM and facilitating conditions is having the same meaning of compatibility construct from diffusion of innovation theory (DOI). UTAUT also considers the moderating variables (gender, age, experience, and Voluntariness of use) are essential in understanding the effect of users' characteristics on the technology adoption.

Many studies in different domains have adopted the UTAUT model, including 3G mobile communication [27, 28], mobile banking implementations [29, 30] and organizational learning systems [31, 32]. Also UTAUT applied as a framework in training in health care systems [33]. With regard to the UTAUT, The selection of this model for this study is justified by its global and comprehensiveness approach. The constructs of UTAUT have been adopted from eight other user acceptance models [26]. This model covers almost the main factors that influence user acceptance of technology such as technology factors that describes the characteristics of a technology and environment factors that includes organization characteristics [26, 34]. Additionally, UTAUT defined an experience, age, and gender as individual differences which may influence the attitudes of a person about a given technology. UTAUT could successfully predict the adoption of information technology in approximately 70 percent of the cases, but other user adoption models could do so in about 40 percent of the cases [17, 26]. Moreover, UTAUT is considered a new theoretical framework and needs more investigation to validate its robustness [35].

III. RESEARCH MODEL AND HYPOTHESES

A. Performance expectancy (perceived usefulness)

Performance Expectancy (PE) is defined as the degree to which an individual believes that using the new technology will aid him/her to achieve benefits in job performance [26]. According to [26], age and gender moderated the relationship between performance expectancy and behavioral intention to

use an information technology. In the context of mobile learning, there are many studies that suggest performance expectancy (PE) has a positive influence on behavioral intention to use m-learning [36-39]. Adapting this scheme (performance expectancy) to examine the acceptance of mobile learning by students suggests that they will accept mobile learning if they believe that the technology improves their performance. Regarding the gender and age moderating, this study presents whether the gender of the students will moderate the relationship between performance expectancy and students intention to use mobile learning. We will investigate the behavioral intention of mobile learning for students from the same age group, so we have omitted the age moderator.

Therefore, the following hypotheses are stated:

- H1: Performance expectancy has a positive effect on student intention to use m-learning.
- H2: The impact of performance expectancy on intention to use m-learning will be moderated by gender.

B. Effort expectancy (perceived ease of use)

Effort expectancy (EE) is defined as the degree to which an individual believes the new technology will be easy to use [26]. In [26] age, gender and user experience were identified as a moderating variables for the relationship between effort expectancy and behavioral intention. There are many studies that suggest that effort expectancy has a significant influence on user intention to use m-learning technology [36, 39-43]. Adapting this construct (effort expectancy) to examine the acceptance of mobile learning by students suggests that they will accept mobile learning if they believe that the technology is easy to use. It is the interest of the study to find out whether the relationship between effort expectancy and students intention to mobile learning is moderated by gender and students' experience. We will investigate the behavioral intention of mobile learning for students from the same age group, so we have omitted the age moderator.

Therefore, the following hypotheses are stated:

- H3: Effort expectancy has a positive effect on student intention to use m-learning.
- H4a: The effect of effort expectancy on student intention will be moderated by gender.
- H4b: The effect of effort expectancy on student intention will be moderated by experience.

C. Social Influence

Social influence is defined as the degree to which an individual feel others' belief on the importance of the use of the new technology [26]. Age, gender, and experience have moderated the effect of social influence on behavioral intention to use m-learning [26]. Many kinds of literature indicate that the social influence has a significant influence on behavioral intention to use m-learning [36, 40, 42, 43]. For young students, the intention to use mobile learning is affected by beliefs of the parents and teachers about the important of the use mobile technology in education [6]. Social influence was

adapted in this study to suggest that the acceptance of mobile learning is determined by the opinions of teachers and parents on the use of the technology. It is worth to find that whether the relationship between social influence and the students' intention to use mobile learning will be moderated by gender and experience.

Therefore, the following hypotheses are stated:

- H5: Social influence has a positive effect on student intention to use mobile learning.
- H6a: The relationship between social influence and student intention will be moderated by gender.
- H6b: The relationship between social influence and student intention will be moderated by experience.

D. Facilitating Conditions

According to [26], the facilitating condition is defined as the degree to which an individual believes that an organizational and technical infrastructure will support the use of new technology. Many works of literature indicate that the facilitating condition has a positive effect on behavior intention to use mobile technology [20, 42, 44]. The essential requirement for implementing mobile learning for young students is students' ownership of a mobile device that support the activities of learning [6]. Schools in Egypt don't have enough budgets to buy a mobile device for each student. Therefore, the parents' support is important to implement mobile learning in schools. Additionally, parents' agreement for their children to interact with mobile devices at home [6]. Adapting this construct to mobile learning suggests that students perceive that availability of devices, learning materials, parents' support and suitable infrastructure will enable them to use mobile learning without any problem, and to interact with other students and teachers.

Therefore, the following hypothesis is stated:

- H7: Facilitating conditions has a positive effect on student intention to use mobile learning.

E. Mobility

Mobility (also known as ubiquity) means access mobile services, such as mobile banking, anytime and anywhere with the aid of mobile terminals and networks [30]. Mobility is additional construct added to the UTAUT and has not been tested previously by this model. Students in Egypt suffer from the issue of drop out, especially females, to avoid the cost of transportation [45]. Additionally, the students face the problem of increasing classroom density and limited availability of classrooms. With mobility, learning process take place virtually anywhere and anytime [28]. As well, mobility provides teachers and students with much more flexibility than a lab model because small laptops can be used anywhere, so students don't need to consume time in the movement to and from classrooms and labs [46] and this also will decrease in the number of rooms. Therefore, mobility is necessary for the acceptance of m-learning system in Egypt because it can overcome the problem of schools drop out and the limited number of classrooms.

Many studies have indicated that mobility of learners has a strong effect on the adoption decision for the acceptance of m-learning. In [47], it was found that individual mobility has a positive effect on user intention. In [48], the TAM model was extended to include perceived enjoyment (PE) and perceived mobility value (PMV) to explore users' behavior towards ubiquitous m-learning in private and government higher learning institutions in Malaysia. The study revealed that perceived mobility value has an effect on behavioral intention. Other studies suggested that mobility has an indirect impact on user intention to use m-learning through perceived usefulness (performance expectancy) [49-51].

Therefore, the following hypotheses are stated:

- H8: Mobility has a positive effect on performance expectancy.
- H9: Mobility has a positive effect on student intention to use mobile learning.

F. Enjoyment

Motivational model (MM) proposes that extrinsic motivation and intrinsic motivation as strong predictors of user intention to use particular information technology [52]. Extrinsic motivation refers to the extent to which the user believes that using a system will enhance his/her job performance (similar to performance expectancy in the UTAUT). Almost all information and communication technology studies indicated intrinsic motivation as enjoyment [53]. Intrinsic motivation has been defined as the degree to which a user believes that using the particular system will be enjoyable [54]. The process of traditional learning may cause a sense of stress and pressure, especially in Egypt. The parents put pressure on their children and require them to obtain the highest scores. Some parents send their children to private tutoring when they're still in a kindergarten school. With m-learning technology, the process of learning becomes more interesting and enjoyable. Therefore, we extend the UTAUT model to include the enjoyment construct.

In the context of mobile learning, perceived enjoyment is defined as the degree to which a student believes that using m-learning will be enjoyable. According to the information and communication technology literature, system enjoyment has a significant impact on user intention to use m-learning. For example, a study was conducted to understand the factors affecting m-learning acceptance [55]. It was found that perceived enjoyment has a significant effect on user behavioral intention to use m-learning. In [43], another study was conducted to investigate the determinants and age and gender differences in the acceptance of mobile learning. It was found that a significant relationship between perceived playfulness and intention to use m-learning exists. Additionally, a study to explain and predict the acceptance of mobile learning (M-learning) revealed that perceived enjoyment can predict user intentions of using m-learning as antecedents of the behavioral intention [49]. In relation to this study, students will adopt mobile learning if they perceive that using the technology and the courses will be enjoyable.

Therefore, the following hypothesis is stated:

- H10: Enjoyment has a positive effect on student intention to use mobile learning.

G. Interactivity

According to [56], interaction plays an important role in students' contentment and learning levels. Moreover, interactivity and active learners have a great impact upon successful learning; but the lack of interaction has no the learning motivation of the students. Interactivity is an additional element added to the UTAUT. The process of learning in most schools in Egypt depends on memorization and rote learning, and thus considered boring [45]. A student in most of the time is passive and the teacher transfers knowledge to learners without any participation from the students. M-learning can change the role of students from inactive learners to active learners through the interaction between students such as share knowledge with peers. Also, the teacher can use mobile devices for interactive activities with the students by having a quick survey or quiz in subjects. Hence, the interactivity is necessary for the acceptance of m-learning in Egypt.

In [57], a study was conducted to understand users' attitudes toward mobile learning environment. The study revealed that interactive learning environment variable has an effective indirect impact on user intention to use mobile services through the perceived usefulness (performance expectancy). in [58] it was suggested that system interactivity factor was an effective antecedent variable of the perceived usefulness and perceived ease of use that influences the intention to use e-learning system. In [17] it was found that perceived usefulness and perceived ease of use are completely mediated the effect of system characteristics on user intention to use e-mail technology.

Therefore, the following hypothesis is stated:

- H11: Interactivity has a positive effect on performance expectancy.

H. Proposed model

With the above literature review, a research model is proposed with seven independent variables and two moderators. Altogether, we generated 11 hypotheses as discussed above. The model proposed is presented in Figure 1. As shown in Figure 1, Unified Theory of Acceptance and Use Technology (UTAUT) were adopted as the basis of this study. Some modifications were applied to the traditional UTAUT model to include the properties of mobile technologies. Mobile learning is considered a new technology especially in Egypt and there is no system that actually use.

This study investigates the factors that may affect the future acceptance of mobile learning. Therefore, the behavioral intention was used as a dependant variable of mobile learning acceptance and use behavior construct was removed. Additionally, this study will investigate the acceptance of mobile learning for students from the same age and in totally Voluntary usage context, so we have removed age and the Voluntariness of use moderators.

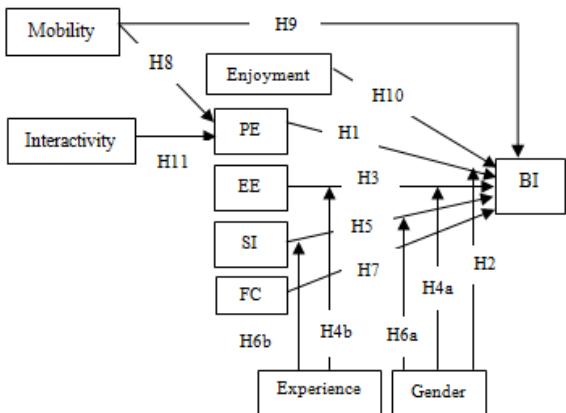


Fig. 1. Proposed research model, Key: PE= Performance Expectancy, EE= Effort expectancy, SI= Social Influence, FC= Facilitating Conditions, BI= Behavioral Intention

IV. CONCLUSION AND FUTURE WORK

The education in most schools in Egypt is facing some challenges and we need an innovative technology to overcome these issues. From the literature, mobile learning can be used as an innovative technology to support traditional education. The successful implementation of mobile learning in schools is dependent on many factors including the acceptance of mobile learning by students. In Egypt, the research in m-learning is still very new and there are limited studies have analyzed the acceptance of mobile technology in learning. This paper provides a roadmap the factors that may affect acceptance of mobile learning in schools by students in Egypt through a proposed model and certain hypotheses. The future work is to test the proposed model by using mobile learning application among students from several schools in Egypt to measure if this model can better explain the students' intention to use mobile technology in learning.

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