

## **Extension of Technology Adoption Models (TAM, TAM3, UTAUT2) with Trust; Mobile Learning in Jordanian Universities**

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**Abstract:** In the present times, mobile devices have slowly permeated the day-to-day lives of people. This may be exemplified by the use of mobile learning as a new learning technology in developing nations including Jordan. The education sector in Jordan has been attempting to explore and predict future avenues on the way such technology can be understood and effectively utilized. This research contributes to literature by conducting an extensive review of the concepts, applications and development of technology adoption models namely TAM, TAM3 and UTAUT2 with trust on the basis of the literature view dedicated to the application of the mobile learning as a new technology. The study primary focus is on examination of students, attempting to achieve mobile learning systems adoption among Jordanian universities. The study indicated that student's acceptance of mobile learning and identified the pertinent factors driving usage success. The reviewed literature provided insight into the technology application potential conceptualization in future studies, its distinctive aspects and the technology models that underpin such technology's adoption in the past, present and future.

**Key words:** TAM, TAM3, UTAUT2, trust, mobile learning, Jordanian Universities

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### **INTRODUCTION**

The current monumental developments in Information and Communication Technologies (ICTs) have led to the transformation of working practices among companies and individual users in a way that new paradigms have cropped up as a consequence and these include e-Government, e-Commerce, online banking, e-Learning with the top extensive advancement in technologies being notable in the education sector.

With the increasing power of technology, its proliferation and dominance in many life aspects cannot be denied and this holds true for the education sector (Al-Adwan and Smedley, 2013). In fact, technology has come up with different tools to support the educational processes in light of learning and teaching in the education sector (Seliaman and Al-Turki, 2012). Specifically, the unrelenting advancement in mobile technology in the past 10 years have led to the proliferating use of such devices and this coupled with the internet availability and easy accessibility have introduced mobile learning (m-learning) as the top current trend in higher education institutions all over the globe (Shorfuzzaman and Alhussein, 2016). Added to this, for higher education students, the reasonable cost, sophistication and widespread use of mobile devices have boosted education provider's use of such devices as new learning medium. In fact, mobile devices capabilities are increasingly being enhanced to perform the entire

required functions in the learning process. Also, mobile technology comprises of different applications and tools, enabling a more dynamic and accessible learning so much, so, student's learning processes are not limited to classrooms anymore (Callum and Jeffrey, 2014).

According to Tomei (2008), mobile learning refers to a technology that is mobile-related for learners to study from. Electronic learning is different from mobile learning in that the former can be carried out via various equipment models while the latter is solely related to mobile technology (Alshraideh and Al-Shrida, 2018). Mobile learning can be referred to as electronic learning as it possesses various features that are similar with the former like multimedia and communication (Al-Adwan *et al.*, 2018). Evidently, mobile learning can be utilized at any time and due to its mobility, it really satisfies student's learning requirements (Al-Adwan *et al.*, 2018).

A mobile device is characterized by three features and they are portability (it can be moved and used during different times and in different locations), quick connectivity (it can be used to at any time and place) and context sensitivity (it can be used to obtain data and its simulation) (Almaiah, 2018). These characteristics of mobile learning make it suitable for use in the learning processes (Traxler, 2010).

Moreover, there are different components to mobile learning including hardware and software which allow users to experience its effectiveness and communicate with their instructors (MacCallum, 2011). There are four

techniques to mobile learning that assists the user to learn and they are: personalized learning, learning in an informal way, collaboration learning and situated learning. More specifically, personalized learning is related to the access of information and learning via. student's involvement whereas situated learning has its basis on the student's experiencing actual learning and can be clarified by student's learning about social responsibility and environment programs that society can benefit from. On the other hand, collaboration learning is related to the student's interaction with others like him via. mobile technology and informal learning has its basis on the learning of students in their free time or in a time that is convenience for them (Mahajaroenkul, 2017). M-learning is thus, a significant phenomenon to understand, particularly in view of the factors that contribute to the intention of users to its usage.

In literature, it is expected that researchers extend and assess theoretical acceptance models, using different variables and this holds true in mobile learning. In this regard, learning acceptance studies have been correlated with TAM as the supporting and underpinning model as the model is effective in examining the adoption and acceptance of mobile learning technologies (Sumak *et al.*, 2011). Therefore, in the present study, prior studies that used and cited TAM as the underpinning model in the assessment of m-learning acceptance are reviewed to investigate the relationship between additional external variables and to contribute knowledge that supports the belief structures.

In the case of Jordan, educational institutions have not formally adopted mobile learning but e-Learning has been utilized in different e-Learning technologies by instructors and students. In relation to this, the reality of e-Learning adoption in Jordan's higher education institutions still lags behind the international level adoption (Almarabeh and Mohammad, 2013). This study is a few of its kind to examine mobile information system adoption in the higher education institutions of Jordan. The primary aim of this study is to shed light on the drivers of acceptance and usage of m-Learning in Jordanian higher learning institutions. Accordingly, the research integrates TAM, TAM3 and UTAUT2 with trust to examine the level of m-learning acceptance in the mentioned context.

## MATERIALS AND METHODS

**Technology Acceptance Model (TAM):** The Technology Acceptance Model (TAM) is a model adapted from the Theory of Reasoned Action (TRA), especially developed to model user acceptance of IS. TAM is among the

popular models that examine technology acceptance and use and has been validated in its potential to explain and predict user behavior of information technology (Park and Kim, 2014). Hence, in the present work, TAM is the most appropriate model to be used in exploring adoption of m-learning in Jordan via specific variables. In this regard, TAM is created based on two basic elements namely, Perceived Ease of Use (PEOU) and Perceived Usefulness (PU). The former element underlies system design and features whereas the latter underlies the decrease of effort (Moore, 2012).

**Perceived Ease of Use (PEOU):** Perceived ease of use is the level to which an individual is convinced that using a specific system will be effort-free (Blank and Dutton, 2012). The factor was also defined by Teo (2001) as the level to which the user is convinced that the system is user-friendly. It has been included as a significant factor in IS adoption field (Oliveira *et al.*, 2014; Park and Kim, 2014). Ease of use has been evidenced to be effective in system adoption and acceptance and on the basis of several studies in literature including (Almaiah *et al.*, 2016; Almaiah and Man, 2016) perceived ease of use is a top factor that explains both perceived usefulness and use of the system.

**Perceived Usefulness (PU):** This factor is mainly linked to work performance, quality and effectiveness as explained by Davis *et al.* (1989). It has led to the development of e-Services concepts like e-Commerce (Shah, 2014), mobile payment services (Lee and Song, 2013), health information system (Codish and Ravid, 2015) and system issues that are linked to its dynamic functioning (Dobre, 2015). The inclusion of usefulness in TAM expects its direct influence on the behavioral intention to adopt the system (Gao *et al.*, 2008).

## RESULTS AND DISCUSSION

**Technology Acceptance Model 3 (TAM3):** The most current development and advancement of TAM took its form in TAM3. The model considered prior TAM versions and TAM studies to understand individual's acceptance of IS. With TAM3, Venkatesh and Bala (2008) moved their focus to assisting management to reach informed decisions concerning interventions that would enhance IS acceptance and use in the firms.

More specifically, TAM3 was built on a theoretical framework comprising of four categories synthesized from prior TAM versions. The four categories and their constructs are individual differences consisting of computer self-efficacy, computer anxiety and computer

playfulness, system characteristics consisting of job relevance, output quality, result demonstrability, perceived enjoyment and objective usability, social influence consisting of subjective norm and image and facilitating conditions consisting of perceptions of external control all these stem from two primary determinants of PU and PEOU (Venkatesh and Bala, 2008). From the above mentioned TAM3 constructs, the present study adopts perceived enjoyment and social influence as recommended by prior studies (Kalinic and Marinkovic, 2016; Sanchez-Prieto *et al.*, 2017; Sibiya *et al.*, 2014).

**Perceived Enjoyment (PE):** One of the frequently considered aspects of educational environments is making the learning process enjoyable and easy for students (Huang, 2014). According to Davis *et al.* (1992), perceived enjoyment is the degree to which the innovation is enjoyable in addition to the expected performance outcomes. Moreover, perceived enjoyment is deemed to be an intrinsic driver where users that are conducting the activity do so because of their interest in it (Iqbal and Qureshi, 2012). In prior literature, new system acceptance has been evidenced to be affected by the perceptions of intrinsic-related constructs namely, perceived playfulness and enjoyment (Masrek, 2015). This is related to the fact that users that experience gratification and pleasure during innovation/system use have a higher tendency to use it in the future. Wang *et al.* (2009) related that intrinsic motivators like perceived enjoyment are extensively utilized to investigate the perceptions of educational innovation among individuals. Studies also evidenced that perceived enjoyment is a significant driver of student's intentions towards m-learning usage and adoption (Cheng, 2014; Jung, 2014).

More specifically, Liu *et al.* (2010) revealed that the learning process may produce a stressful situation for students and as such it is pertinent to create m-learning applications that can be used with pleasure and with interest to assist in the adoption intention and decision. Added to this, student's engagement with learning activities are intrinsically boosted when confronted with enjoyable, new and exciting learning style. In this regard, m-Technologies are assumed to lead to a learning environment, enabling the easy learning access of students through an enjoyable experience (Martin and Ertzberger, 2013).

**Social Influence (SI):** According to Venkatesh *et al.* (2003), social influence is the level to which an individual perceives that his important others is convinced of his use or disuse of new technology. This construct is considered

as a social advantage among users that stems from new technology use and in the m-learning context, prior researchers indicated that the decisions towards m-learning use among students is significantly affected by their peers or important individuals to them (e.g., their instructors) (Abu-Al-Aish and Love, 2013; Mtebe and Raisamo, 2014). Literature also shows that the influence of social influence is often stronger and more significant in the initial m-learning process and decreases as time passes and with the wide use of m-learning (Ugur *et al.*, 2016). Finally, Taiwo and Downe (2013) explained that individuals are encouraged to adopt new technology through their behavior of change resistance and thus, there is a need to boost performance expectancy and ease of use of the system.

**Unified Theory of Acceptance and use of Technology 2 (UTAUT2):** The UTAUT2 was developed by Venkatesh *et al.* (2012) as an extension of the original UTAUT version, focused on the context of the consumer. In this version, there are three novel constructs included and they are hedonic motivation, price value and habit. Hedonic motivation is described as the pleasure degree brought about by a specific technology use, price value is the individual cost of using/purchasing new technology whereas habit is the automatic performance of the individual of the required behavior (use of specific technology).

Added to the above three constructs, voluntariness of use moderating role in UTAUT, was excluded from UTAUT2, owing to the voluntary rather than mandatory use in the context of consumer. Also, the construct of trust has been utilized widely in IS investigations, particularly its impact on behavioral intention towards new IS usage. Furthermore, trust was found as the top element in user's adoption of technology in several prior studies of this caliber (Gefen *et al.*, 2003; Yousafzai *et al.*, 2005) and thus, it cannot be ignored in the examination of m-systems acceptance as suggested by Blank and Dutton (2012), Lee and Song (2013) and Mou and Cohen (2014). Lastly, UTAUT2 was suggested to be used in learning technologies by prior studies (Ali *et al.*, 2016; Morosan and DeFranco, 2016).

**Habit:** Venkatesh *et al.* (2012), referred to habit as the level to which individuals tend to perform behaviors in a natural manner because of learning and it affects behavior intention towards customer's technology use. This has been, time and again, evidenced in the case of e-Learning by Lewis *et al.* (2013) and Raman and Don (2013), e-Commerce as demonstrated by Escobar and Trujillo (2013) and trip advisor websites by Chong and Ngai

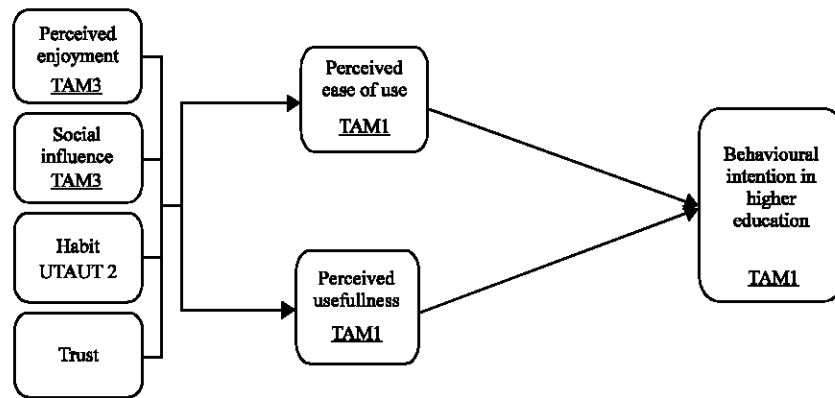


Fig. 1: Theoretical framework

(2013). The construct has been validated to be a top predictor of various technologies adoption owing to prior experiences (Venkatesh *et al.* 2012). Hence, in this study, habit is examined in e-Learning. The construct’s integration with intention was recommended by Hubert *et al.* (2017).

**Trust:** The trust construct has been examined in different research fields including, psychology, business and medicine, based on different term usage, explanation and definition. Generally speaking, trust refers to the individual’s competence to perform a certain task/expectancy that the promise of another individual can be relied on (Morgan and Hunt, 1994). By Kim *et al.* (2008) simply referred to it as the demand to citation or dependence and it has been extensively utilized in IS studies to investigate its effect on behavioral intention towards using new IS. Several authors reported trust to be the primary feature in technology adoption among users (Gefen *et al.*, 2003; Yousafzai *et al.*, 2005) while some other authors highlighted trust significant in accepting mobile systems (Blank and Dutton, 2012; Lee and Song, 2013; Mou and Cohen, 2014) and in technology adoption models (Kalinic and Marinkovic, 2016; Su *et al.*, 2016).

In the Jordanian institutions of higher learning, m-Learning has not been formally implemented and as such Behavioral Intention (BI) is considered as the dependent variable in the framework of this research as opposed to usage behavior. The independent variables considered are perceived enjoyment, social influence, habit and trust and the mediating variables considered are perceived ease of use and perceived usefulness. The study proposed study model is the mobile learning acceptance model and it represented the study’s theoretical framework. The model is particularly focused on mobile learning development and use which has only

been dealt with in few studies. The study examines the significant roles that the factors play in new system acceptance and usage (Fig. 1).

### CONCLUSION

This study reviewed literature on the study variables that covered different views, interpretations and findings and provide the discussion, concepts, applications and prior theories that ultimately served as the basis of the development of technology adoption model proposed. The reviewed literature indicated the differences in the technology adoption models and theories on the basis of theoretical insights, research problems, variables and measures. New theoretical research framework development hinged on several factors including research problems and objectives, the gap analysis, target market, the goals of the organization, understanding of relevant models and theories, among others. An understanding of this caliber would allow students, academics, researchers, governments, organizations and other stakeholders to relate theory to practice when it comes to models and theories. The review also indicated the potential applications of technology for future studies conceptualization, distinction and comprehension of the underlying and underpinning technology models and theories affecting the technology application in prior, current and future times. This study showed that TAM, TAM3 and UTAUT2 along with trust are all useful as the underpinning model base for the prediction and understanding of user’s intentions towards m-learning usage. The study also confirmed that in order to boost intentions among students to use m-learning, a positive perception of the usefulness of the technology has to be established as the attitude of students may normally ignore the importance of this element.

## RECOMMENDATIONS

Future studies of this caliber are suggested to examine TAM, through the addition of technology actual usage as this could maximize the IT acceptance predictable level. The model can also be extended through addition beliefs (risk perception, control and intrinsic interest) that could influence m-learning acceptance and use.

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