

1 **The Technology Acceptance Model (TAM) and its implications to** 2 **the utilization of mobile learning technologies**

3 4 **Abstract**

5 *Researchers have argued that inclusion of technologies in the teaching-learning places must*
6 *be preceded by the user accepting the technology. Without this effort, the technologies remain*
7 *abandoned or heavily underutilized once supplied to school system. So researchers have*
8 *proposed frameworks that can inform policy makers, education managers and teachers on*
9 *how best technology can be incorporated in an educational scenario. The most popular of all*
10 *frameworks is the Technology Acceptance Model (TAM) as proposed by Davis, 1989. This*
11 *study describes how the TAM has been used in predicting the acceptance and utilization of*
12 *various technologies in teaching learning places. The study then arguments how TAM can be*
13 *adopted in the development and utilization of the most recent technological innovation for*
14 *teaching and learning: - mobile technologies. The study was a documentary analysis of*
15 *virtual documents stored electronically for access through the internet, text books, archival*
16 *repositories as well as encyclopedia and was able to reveal that despite attitudinal and*
17 *technical challenges, mobile technologies are receiving acceptance as useful resources for*
18 *all pedagogical practices.*

19 Key words

20 *Instruction, technology, Technology Acceptance Model, mobile technologies*

21 **Introduction**

22 In many countries of the world, governments are changing their national curriculum with a
23 view of adding more of information communication technology into it. The investment is
24 directed towards policy, teacher training, and technology adoption as well platforms that
25 promote the acceptance of the technology.

26 Attempts to include technologies in the education market place have been with
27 educationist for quite some time. Literature indicates that the electronic industry has always
28 exerted pressure on the education system to accept and utilize technologies not only in
29 teaching and learning, but in the support of other services within the school system.
30 However, a great challenge to the inclusion of technology in education is predicting its
31 acceptance and eventually its utilizations, especially for academic purpose. Bowen (1986) in
32 Davis (2008:11) observes that sufficient utilization of any educational technology in the
33 education place is often obstructed by the unwillingness of the user (teachers and students) to
34 accept and adopt that technology

35 Such unwillingness to accept and adopt technology is referred to as resistance to
36 technology. Resistance to technology has been persistent in the education place for quite
37 some time. The education systems resisted biro pens, slide rules, electronic
38 calculators(Makau, 1988), as well as computers. The e-learning concept experienced an equal
39 measure of resistance despite efforts to popularize it(Mugo, 2007:72). Siting this lassitude,
40 players in the electronic industry such as IBM and Xerox have often preferred to measure
41 user perceptions before introducing any technology anywhere, including the school place.
42 According to Davis (1989:3), such measures help the industry to design, build and implement
43 products that respond to user reactions, tastes and preferences. So for a long time now,
44 industry players have been relying on instruments, which have received acceptance and
45 validation by researchers in the training and electronic industry.

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47 **Technology Acceptance frameworks**

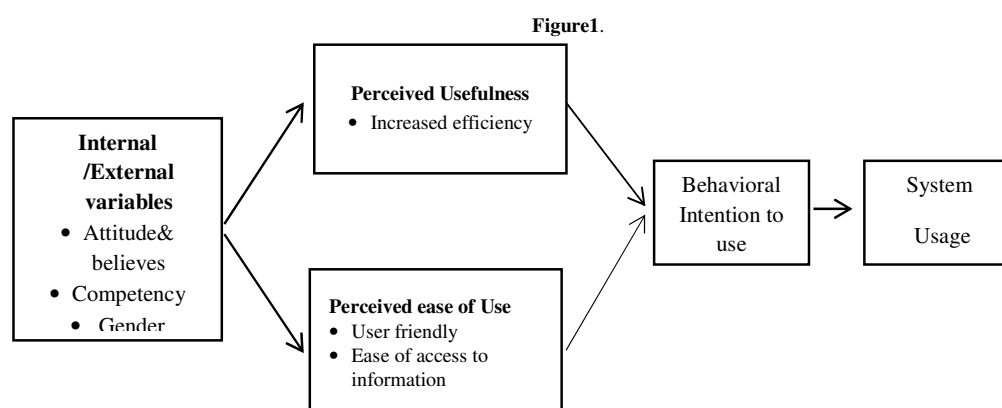
48 The determinants of technology acceptance and utilization have been widely
49 interrogated in literature. Shroff, Doneen and Eugenia (2011:601), Kurnia, Smith and Lee
50 (2005), discusses the various frameworks used to measure the determinants of technology
51 acceptance and utilization. Among the frameworks include the Diffusion of Innovation
52 Model by Rogers (1983), Technology Acceptance Model (TAM) by Davis (1989) and the
53 Theory of Reasoned Action (TRA) by Aizen and Eishbein (1975). Saga and Zmud (1994) in
54 Kurnia, Smith and Lee (2005) suggest that amongst other models, the Technology
55 Acceptance Model (TAM) has been the most influential and widely adopted to predict the
56 acceptance and use of various technologies for learning. This is because the model has a
57 strong theoretical basis and enjoys sufficient empirical support. When used effectively, the
58 model can save an educational institution from the risk of investing in a technology that may
59 remain abandoned or quite underutilized.

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The Technology Acceptance Model (TAM)

In this section, we will explore the technology acceptance model as proposed by Davis 1989. Originally proposed Fred Davis in 1985 as a doctoral thesis at the Massachusetts Institute of Technology, current literature indicates that TAM is a highly cited model. This is because the model has a sound theoretical assumption and practical effectiveness (Chuttur, 2009). The model was further refined so as to incorporate variables and relationships obtained from the 1975 theory of reasoned action (TRA) as proposed by Fishbein and Ajzen. The output from the adjustments was a more refined model essential for anyone willing to interrogate the theory around technology acceptance and technology utilization in learning.

The technology acceptance model (TAM) shows how users come to accept and use a technology. The theoretical basis is built on the premise that when users are presented with a new technology, three major factors influence their decision about how and when they will use it. The first determinant is its perceived usefulness (PU), the second is the perceived ease of use (PEOU), while the third determinant is user attitude towards usage (ATU). According to Davis (1989), Shroff, Deneed& Eugenia (2011:601), Davis, Bagozzi&Warshaw (1989) perceived usefulness (PU) is the degree to which a person believes that using a particular system would enhance his or her job performance. On the other hand, perceived ease-of-use (PEOU) is the degree to which a user believes that using a particular technology would be free from effort. In other words it is the degree to which consumers perceive a technology as better than its substitutes (Rogers, 1983), (Nadim and Noorjahan, 2008). Commenting on the model, Chen, Shan and Han Li (2011:125) extends the argument that perceived usefulness and perceived ease of use positively affects the attitudes toward usage (ATU) of a technology. These determinants have been illustrated using a diagrammatic model as indicated below



Adopted from Venkateshet.al (2003)

In addition, both perceived ease of use and perceived usefulness are influenced by some critical variables. While investigating the implementation of Learning Management Systems at the university of Saudi Arabia, Asiri, Mohamud, Abu-Bakar and Ayub (2012) and Alharbi and Drew (2014:114) identified two categories of variables that determine technology acceptance:- internal variables and external variables. Internal variables consist of factors such as the attitude of the user, their pedagogical beliefs towards, and level of competency. The authors confirmed that a positive attitude towards technology will likely motivate a user to utilize the technology. Further, along similar lines with other studies, beliefs about e-learning were found to be important in determining the use of a technology. The study noted that the use of technology could be predicted by competency level, meaning that having the skills and knowledge to use a system will affect its utilization. On the other hand, external variables include those external barriers faced by users as during utilization. Such barriers include factors such as organizational barriers, technological barriers, and social barriers. Similarly, demographical factors such as gender, computer self-efficacy, and levels of training (competency) are also used to predict technological usage.

Industrial application of TAM

The Technology Acceptance Model has been applied in various information technology and information system areas (Chen, Shan and Han-Li, 2011:126). The researchers, while interrogating literature, identified specific areas where scholars have adopted the model. Moon and Kin (2001) used the model to explain the users' acceptance of World-Wide-Web context; Lin et al. (2007) in clarifying e-stock users' behavioral intention, Chen and Chen (2009) in understanding the automotive telematics users' intention; Stern et al. (2008) on consumers' acceptance of online auctions; and Serenko et al. (2007) used the model to assess user acceptance of interface agents in daily work applications; and Muller-Seitz et al. (2009) used the same model to determine customer acceptance of Radio Frequency Identification (RFID). In view of the stated cases and many others, Chen, Shan and Han Li (2011:124,126) therefore collaborates that TAM "...is one of the most influential research models..." that "...have been tested in many empirical researches" and its tools have provided statistically reliable results.

Application of TAM in learning Places

The technology acceptance model (TAM) could be extended in determining the acceptance of mobile devices in learning places. The use of mobile devices for educational purposes is becoming a common expectation amongst learners. According to Daesang, Rueckert, Kim and Seo (2013:52, 60), learners(particularly those in rural and remote areas)are demonstrating eagerness to use mobile technologies as tools that extend beyond communication and entertainment. The argument is that the devices are portable, therefore are perceived as convenient, affordingfreedom that allows learners to study when they want. Besides, mobile devices afford student ownership of the learning process which produces positive learning experiences. Based on these affordances, scholars have assumed that the technologies cannot be wished away. So literature is awash with studies that endeavor to fit mobile technologies into the Technology Acceptance Model. In doing so, they have discussed the technologies under the following considerations: perceived usefulness, perceived ease of use, and attitude towards utilization.

a) Perceived usefulness

Perceived usefulness of a mobile device is sometimes associated with its ability to provide a teacher with ease of access to online study groups, and to the learner instant access to numerous academic websites, graphics, video simulations and academic films. Graphics, video simulations and academic films are used by instructors to demonstrate processes and events within the curriculum. The devices are avenues that provide opportunity for accessing learning content any time anywhere, often times providing chances for individualized learning. Valk, Rashid, and Elder, L (2010:2)suggest that the benefits of mobile devices are not merely limited to increased access to educational services, but can also facilitate changes in the character of learning modalities that in turn impact educational outcomes. Mobile devices are useful to lecturers and students as they allow them to utilize “dead time” effectively. So when travelling, waiting for a meeting to start, when waiting for a bus or when waiting for a lecture, mobile devices can provide opportunity for meaningful engagement with learning content. Geddes (2004) inValk, Rashid, and Elder, L (2010:3) observes that m-Learning can maintain the appeal of learning and provides a motivating factor that can at times be lacking in traditional modes of education. It is also true that most mobile devices are relatively cheaper to buy than their computing counterparts, and run on smaller amounts of power than desktop and laptop computers. They are therefore accessible to lower end market segment, and particularly useful to people with limited access to mains electricity. Mobile

devices, particularly those running on Android Operating System have useful apps such as cameras, video player, email, calculator, notebook, sound recorder, organizers and dictionaries which students and teachers can find useful in performing tasks specific curricular engagements. Besides, they can find them even more useful for downloading appropriate apps generated by education industry players and by independent but licensed software developers

b) Perceived ease of use

The second aspect is perceived ease of use (PEOU). Regarding this argument, mobile devices have an easy to use operating system which manages its hardware and software. Examples of popular operating systems on mobile devices are Android, Symbian iOS and Windows phone. The operating systems are designed as user friendly systems whose operation is experiential. The user does not require formal training for them to operate the interface. Within thirty (30) or so minutes of operation, a user can navigate through the graphical user interphase with ease. On the same vein, mobile devices are designed to have at least one home screen. The home screen displays the main menu, apps and widgets. The user can customize the home screen, or add an extra home screen, providing the user with freedom of arranging the apps on an appropriate page. Besides the user can select and downloads apps that are unique to their needs, tastes and preferences. Thirdly todays' mobile devices have a large internal memory (up to 16 GB) and slots for a large capacity microSD cards. This makes it convenient and easy for users to save and retrieve files downloaded from the net or obtained from any other computing devices. Lastly many mobile devices are portable, have inbuilt net interface that allow Internet connectivity, either through Wi-Fi, blue tooth, hotspot, GPRS/EDGE/3G or 4G facilities. This gives the user support, ease and freedom to carry and connect to the net as well as share or receive academic data and files without the need of plugging extra hardware.

c) Attitude towards use

The third aspect is related to attitude towards use (ATU). As earlier indicated, the attitude of a user towards usage of a technology is an important element in determining the acceptance of the technology. A mistake made by donor agencies is to take a technology to schools then expect teachers and learners to utilize. Such users get excessive exposure and are subjected to anxiety towards it especially when the technology is not easy to use. In this regard, Daesang, Rueckert and Seo (2013:62) observe that users walk away in frustration, and

a negative attitude is projected towards the technology. So a good mobile learning environment must be created (preferably by training users). By so doing, users are able to change their perception towards the technology, making them embrace its utilization.

Ahmad and Steve (2013) were able to investigate attitudinal issues that influence the adoption of mobile technologies in teaching and learning. In their study titled “*Factors Influencing Students’ Acceptance of M-Learning: An Investigation in Higher Education*”, the authors refer to the works of Corbeil & Valdes (2007) as well as Park, (2011) to argue that the general attitude amongst educators is that mobile technologies have the potential to disturb the learning process. Based on this attitude, many school systems across the globe do not accept the use of mobile devices within the school system owing to their potential to “disturb” learning. In many countries (Kenya included) of the world, the technologies are associated with abetting dishonesty and exam irregularities. The second attitudinal issues revolve around the logistics of implementing the technology. Abu-Al-Aish, Love, & Hunaiti, (2012) in Ahmad & Steve (2013) focus on the lecturer’s unwillingness to accept and utilize the technology because “...they might face difficulties in trying to use it effectively as the technology may require a lot of effort to implement”. Thirdly, the technological limitations of the technology itself raises attitudinal issues further. Stockwells (2010) in Daesang, Kim and Seo (2013) in their study on the perception and experiences of mobile learning, indicated that the usability and willingness of teaching staff and students to use mobile for learning activities was more attitudinal, and was not necessarily by to their willingness or unwillingness to use the devices, but more so its dependent on the inherent technical limitations that the devices portends - a small screen and a limiting keyboard. In their recommendations, the authors stated that if innovators resolved these limitation(s) (e.g. let’s say by designing a larger but wireless keyboard) mobile technologies would be a viable and exciting option that would create meaningful learning experiences.

Conclusion

From this discussion we have obtained an appropriate opinion that Mobile technologies are gradually getting a place in pedagogy and in the educational system. However before they can be adopted in any learning environment there is need to conduct scientific investigation, guided by an appropriate technology acceptance model (preferably TAM) with a view of identifying the factors that may hinder sustained acceptance of the technologies into the education system(s). This argument is in line with the investigations

by Cheon et al (2012) who collaborates that determinants of student perceptions of m-learning need to be investigated as an initial step of implementing m-learning at whatever level of education. In the Kenyan education system, specifically at university level, these determinants are currently under investigation

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