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A THEORETICAL END USER FACTOR MODEL THAT SUPPORTS MOBILE LEARNING

[1]RICHARD K. NYAKUNDI, [2]STEPHEN KIMANI, [3]CYRUS ABANTI

[1,2,3]School of Computing and Information Technology
Jomo Kenyatta University of Agriculture and Technology

Abstract: **Education systems around the world are transitioning from the conventional educational practices to digitized learning. However the adoption remains largely unrealized in economically transitioning countries due to low adoption of usage factors. This is as a result of learning institutions' focus on the technical supply-side factors with little emphasis on the end user factor perspective of mobile learning. There has been inadequate research and development in IT usage factors to inform education sector's uptake of Mobile Learning adoption in learning institutions. While a number of adoption models have been proposed and applied to the developed countries, they require domestication in order to address the specific consumer needs of developing nations. This study therefore develops a theoretical model which best support learner centered adoption in educational institutions.**

Keywords: **Mobile Learning adoption, e-learning.**

1.0 Introduction

Mobile learning is a natural extension of electronic learning that has the potential to further expand where, how and when we learn and perform in all the learning aspects (Sofia and Dobrica, 2013). One of its key benefits is its potential for increasing productivity by making learning available anywhere and anytime, allowing learners to participate in educational activities without the restrictions of time and place (Moon and Kim, 2010). According to Moon and Kim, mobile technologies have the power to make learning more widely available and accessible than we are used to in existing e-learning environments. M-learning could be the first step towards learning that is truly just-in-time where you could actually access education and training at the place and time that you need it. End user refers to people who are not professional software developers but can use tools to create or modify software artifacts and complex data objects without significant knowledge of a programming language (Nigel 2011). He further, defines factor model as a fundamental focus on economic factors that affect a particular industry or market. According to Wikipedia free encyclopedia, end user factor model is a set of methods, techniques and tools that allow users of a software system who are acting as non-professional software developers at some point to create, modify and extend a software artifact.

Mobile Learning adoption refers to the intention of mobile users to engage in mobile learning to achieve their educational needs. The resulting benefits of adoption of mobile learning are diverse and long lasting including an easy-to-use online classroom system, round-the-clock technical support, a faculty that is engaged in every aspect of learning, ability to join class discussions and group projects, access to academic support services and the freedom to study from any location around the world. (UNESCO, 2013).

The role of end user factors in bridging the mobile learning adoption gap has not been emphasized and developing countries are far behind in its implementation (Nikam et al., 2012). In order to realize efficiency, users require a model

whose input will lead to use of a system that do respond to their needs (InfoDev, 2012). Institutions agencies do not as a rule engage learners in the development of their mobile learning system (Al Sawafi, 2011). Rather, many applications are internally driven to meet cost savings and other institutional mandates regarding efficiency in learning.

2.0 Literature Review

This study is built on the backbone of Technology Acceptance Model (TAM) by Davis (1989) and other scholars. The Model was developed in light of concerns that educational institutions were not using ITs made available to them optimally. It is based on the theory of reasoned action, a social behavioral theory useful for understanding a variety of behaviors, (Fishbein, & Ajzen, 1975). The reasoning was that the key to increasing use was to first increase acceptance of IT, assessed by asking individuals about their future intentions to use IT. Knowing the factors that shaped one's intentions would allow institutions to manipulate those factors in order to promote acceptance, and thus increase IT use. TAMs main dependent constructs are the behavioral intention to use and system usage. Its major independent construct(s) are the perceived usefulness as and perceived ease of use as shown below:

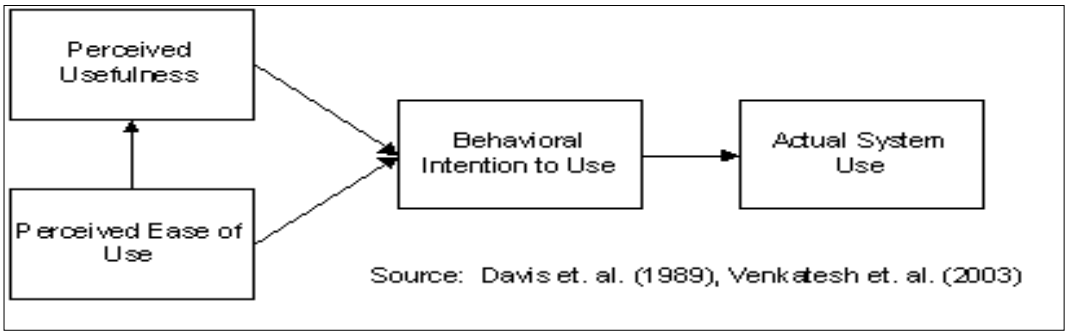

Figure 1. Technology Acceptance Model (From: Davis 1989)

There are two beliefs in TAM: Perceived Usefulness (PU) and Perceived Ease of Use (PEOU). Davies defined PU as "the degree to which a person believes that using a particular system would enhance his or her job performance and Perceived Ease of Use as the degree to which a person believes that using a particular system would be free of effort". TAM posits that users' adoption of any new information system is determined by the users' intention to use that system, which is in turn determined by the users' beliefs about the system. According to Moon and Kim, (2010), TAM has been tested empirically in different parts of the world, yielding statistically reliable results and it has proved to be one of the most reliable and easy models of explaining individual's intention of adoption of a technology.

Park, (2011) highlighted that Technology Acceptance Model (TAM) has been used by many researchers especially in information systems to achieve a better understanding of IT adoption and its success in institutions: Biasiotti and Nannucci (2012) had such related work including mobile learning, healthcare, and physicians: Park, (2011); Chismar and Sonja (2006). TAM has proven to be a strong and robust framework to clarify adoption pattern of users, (Horton et al (2009. Chuttur (2011) admitted that several studies found significant statistical results for the high influence of perceived usefulness on behavioral intention to use a specific system and these studies provided a strong evidence to support TAM as a model for predicting systems usage behavior.

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 posits four core determinants of intention and usage, namely performance expectancy, effort expectancy, social influence and facilitating conditions (Venkatesh et al. 2003). The model considers gender, age, experience and voluntariness of use as moderators influencing the four direct determinants. However, there is still lack of a comprehensive understanding regarding the factors affecting the adoption of mobile learning. In this light, an adoption model of mobile learning was built based on the Unified Theory of Acceptance and Use of Technology, (Yong Liu 2010). In his work self-efficacy, mobility, attainment value, perceived enjoyment and self-management of

learning are integrated in order to increase the predictive capability of model. This model provided a framework for future research, and hence served as a basis for the end user factor model for adoption of mobile learning.

3.0 Research Model Description

The end user factor model for adoption of mobile learning requirements were identified in a field study. The factors include: trust, benefits, attitudes, education, training, and user support. These factor requirements were used together with the Technology Acceptance Model (TAM) developed by Davis (1989) to develop the theoretical end user factor model for adoption of mobile learning by using a Unified Modeling Language where use cases and a scenario for the model was created.
The study showed that, the *B* coefficients (the plus or minus sign) interpreted the direction of the relationship between variables. When a *B* coefficient is positive, then the relationship of this variable with the dependent variable is positive and if the *B* coefficient is negative then the relationship is negative, if the *B* coefficient is equal to 0 then there is no relationship between the variables. From the study, the independent variables that had positive relationships with perceived ease of use were training, trust and user support the ones with negative relationship are attitude benefits and education. Independent variables that had positive relationship with perceived usefulness were training, attitudes, benefits and education; those with negative relationships are trust and user support.

Standard error, which is the distance between the line and all the points, indicates whether the regression analysis has captured a relationship that is strong or weak. The closer a line is to the data points, overall, the stronger the relationship.

The Beta value is a measure of how strongly each independent variable influences the dependent variable. The beta is measured in units of standard deviation. The Beta value is used to assess the strength of the relationship between each independent variable to the dependent variable and the higher the beta value the greater the impact of the independent variable on the dependent variable. The independent variable with higher beta values in this study is training (b= 0.547) and the independent variables with higher beta values are training (b= 0.453), attitudes (b= 0.365) and education (b= 0.180)

The significance value (*P* value) gives the impact of each independent variable on the dependent variable. A smaller P value suggests that the independent variable is having a significant impact on the dependent variable. In this study the results of the multiple regression showing the influence of the independent variables on Perceived usefulness (the dependent variables). For independent variables to have significant influence on the dependent variables, their significance value should be 0.05 and below. The summary of the multiple regression analysis shows the values of coefficients and the direction of relationship with the dependent variable including their respective p-values (significance values).

Evidence derived from the study shows that out of the six independent variables, only one was found to exert a significant influence on perceived ease of use. This is because its respective p-values was less than the level of significance ($p<0.05$) and according to the results, this variable is Training (p= 0.000). This suggests that holding other factors constant perceived ease of use in the context of this study is dependent on training, other variables playing a negligible role. It was also revealed that out of the six independent variables, three are found to exert a significant influence on perceived usefulness as their respective p-values are less than that the level of significance ($p<0.05$). These variables are training (p= 0.000), attitudes (p= 0.000) and education (p= 0.006). These results suggest that holding other factors constant, perceived usefulness is dependent on the three independent variables, others playing a negligible role.

The following factors were not significant at the 0.05 level in in perceived usefulness; trust (beta = 0.169 and significance level 0.150), attitude (beta = 0.097 and significance level 0.346), user support (beta -0.178, significance level 0.109), benefits (beta = -0.045 and significance level 0.435), education (beta 0.172 and significance level 0.109). In perceived ease of use; trust (beta -0.031, significance level 0.542), user support (beta -.044 and significance level 0.435), benefits (beta 0.089, significance level 0.217). This is because their significant levels are above the 0.05 significance level in this study.

The factors determining perceived usefulness were training (B=.453, p<.000), attitudes (B=.365, p<.000), education (B=.180, p<.006) and the factor determining perceived ease of use is training (B=.547, p<.000). Trust, user support, benefits were not significant at the 0.05 level in this model.

The understanding of the theoretical model that supports mobile learning is important if users are to use the mobile learning. This study examined the need of the end user factors that significantly influenced perceived usefulness so as to adopt mobile learning. The results show that the factors that have significant and strong influence on perceived usefulness are training, attitudes, and education. This means that the extended model is adequate and can be used for mobile learning adoption in Kenya.

With respect to training, the results showed that training had significant influence on perceived usefulness implying that in practice, training of the end users of mobile learning would make them perceive mobile learning as useful leading to adoption of mobile learning and must be taken into account while implementing the end user factor model for mobile learning.

Regarding attitudes, the results showed that it had a significant effect on perceived usefulness. This means that if the negative attitudes of the end users of mobile learning are addressed, they will perceive mobile learning to be useful.

Education equally has a significant effect on perceived usefulness. This means that if the mobile learning end users are educated in information technology skills and internet use, they will perceive mobile learning as useful.

The results showed that training has a direct significant effect on perceived ease of use. This means that training the end users of mobile learning would make them perceive the system as easy to use.
Results from the multiple regression analysis shows that user support, trust and benefits have no significant effect on perceived usefulness nor perceived ease of use.

Component diagram adoption of a Theoretical End User Factor Model that Supports Mobile Learning

Amber (2010) defines component diagrams as physical analogs of class diagram. The study has outlined a Theoretical End User Factor Model that Supports Mobile Learning and all the requirements for modeling the system and adoption as used to enhance the Technology Acceptance Model by Davis (1989). Three factors enhance perceived usefulness and perceived ease of use which are: attitudes, training and education as illustrated below.

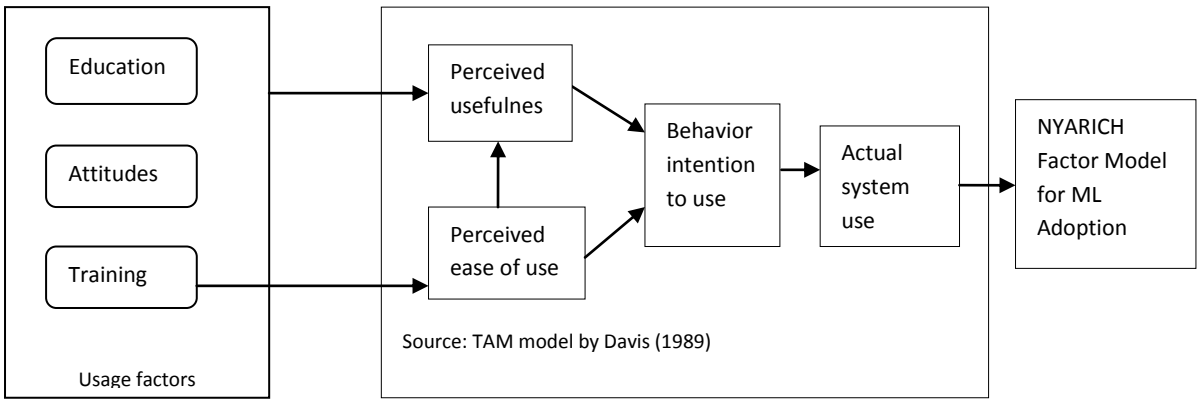

Figure 2. A Theoretical End User Factor Model that Supports Mobile Learning

The model developed is an extension of the Technology Acceptance Model (TAM) by Davis (1989) using requirements obtained from the field study. Apart from the two factors established in TAM: perceived usefulness and perceived ease of use; the new model adds three additional theoretical constructs: training, attitudes and education.

4.0 Directions of Future Research

This study has revealed that most learning institutions have focused on the supply-side of mobile learning adoption. The results of this study shows that, the directions for future research to better understand and enhance mobile learning adoption and use are as follows:

i) The extended version of TAM needs to be modified and in developing this new model, new constructs need to be tested as independent variables to TAM and independent variables need to be identified and tested especially for perceived ease of use.

ii) This research also proposes that further research be carried out on the level of adoption of mobile learning both in rural and urban settings. The results can be used to devise specific strategies for increasing adoption both in rural and urban areas.

iii) The Extended TAM needs to be evaluated including the variables in the original TAM to find out the impact of the external variables on TAM's perceived usefulness, the impact of perceived usefulness on behavioral intention to use, actual system use and mobile learning adoption.

iv) This research proposes the adoption process to be studied in future to understand the difference stages, activities and responsible persons

5.0 Recommendations

The study established the end user factors for successful mobile learning adoption in Kenya and the study was summed up by developing an end user factor model for adoption of mobile learning. The researcher therefore recommends the following:

Training of mobile learning end users should be highly effected throughout the implementation of mobile learning if these services are to be adopted and this should be done before, during and after the implementation of any mobile learning endeavor to subdue the possibility of its failure and increase benefits from adoption and usage of the services. The research found that training had a significant effect on perceived usefulness; therefore, the MoEST when intending to offer mobile learning -services should address the training needs of the end users (especially training in the specific mobile learning service/software) and provide continuous user support if they want those services to be adopted successfully.

Implementation of mobile learning should focus on changing the negative attitudes of consumers towards mobile learning. Results revealed that respondents' negative attitude towards mobile learning deterred them from using the services; also, validation results showed that training had a significant effect on perceived usefulness. This research therefore recommends that training be undertaken to reduce on such negative attitudes before implementing mobile learning and other mobile learning services because this is one of the main barriers for mobile learning adoption.

Finally, a policy for mobile learning and mobile learning adoption needs to be formulated and implemented that will address end user issues. This can guide mobile learning service providers in implementation of the mobile learning-services and ensure successful adoption.

6.0 Conclusion

This study found out that there is low usage rate of mobile learning and the reasons for this are lack of benefits, lack of trust, negative attitudes of end users, little user support, lack of training in mobile learning and lack of education in internet use.

Differently said, the end user factor model approach of adoption of mobile learning can be costly and will require a shift in learning institutions from chalk to board system in a four corner classroom to a Theoretical End User Factor Model that Supports Mobile Learning. However, the model approach can bridge the identified gaps between learning provided and

used, thus increase the use of mobile learning; increasing the impact of those services; and increasing user interaction with learning institutions.

From the results in this study, the Theoretical End User Factor Model that Supports Mobile Learning requires great investment from learning institutions and the ministries concerned with education to change attitudes of end users if these services are to be adopted in the short and long run. Not making these investments will however minimize the benefits of including end users in the design, development, implementation and hence adoption of the system.

For the mobile learning system developers, it is worth noting that training, attitudes and education are key factors influencing user perceived usefulness and perceived ease of use of the mobile learning. Therefore, to support mobile learning adoption, service providers should focus on these end user factors at the forefront of mobile learning implementation and adoption.

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