

Investigating students' behavioural intention to adopt and use mobile learning in higher education in East Africa

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ABSTRACT

Recent penetration of mobile technologies and its services in East Africa has provided a new platform for institutions to widen access to education through mobile learning. Mobile technologies provide learners with flexibility and ubiquity to learn anytime and anywhere via wireless Internet. However, far too little research has been conducted to investigate factors that contribute towards students' adoption and use of mobile learning in East Africa. We applied the Unified Theory of Acceptance and Use of Technology (UTAUT) model to investigate students' behavioural intention to adopt and use mobile learning in higher education in East Africa. A sample of 823 students selected from five higher learning institutions was collected and tested against the research model using regression analysis. The results showed that, four factors: performance expectancy, effort expectancy, social influence, and facilitating conditions had significant positive effects on students' mobile learning acceptance with performance expectancy being the strongest predictor. These findings will enable those who are involved in the implementation of mobile learning to develop mobile services that are relevant and acceptable to learners in higher education in East Africa.

Keywords: *Mobile learning; Mobile learning acceptance; technology adoption; technology acceptance model; UTAUT*

INTRODUCTION

Over the past few years, there has been a tremendous growth and penetration of mobile technologies and mobile services in East Africa. The number of mobile devices shipped to East Africa has been increasing every year. At the same time, the number of mobile subscribers and Internet users has been increasing too. By the end of 2012, Kenya had 30.7 million (78 per cent) mobile phone subscribers (CCK, 2013), Tanzania had 27.4 million (57 per cent) (TCRA, 2013), and Uganda had 16.4 million (45.9 per cent) (WB, 2013). Unsurprisingly, Kenya and Tanzania were ranked 3rd and 4th respectively by ITU for mobile phone penetration in Africa in 2010 after Nigeria and South Africa (Swarts & Wachira, 2010). Actually, people in East Africa have a better access to mobile devices than to clean water, to bank account or even to electricity (WB, 2012).

Despite the penetration of mobile devices in higher education in East Africa, their use to enhance education is not widespread. Most of eLearning technologies implemented in higher education are based on desktop computers. Desktop computers have limitations in terms of flexibility and mobility to learners (Jairak, Praneetpolgrang, & Mekhabunchakij, 2009). Furthermore, eLearning

implementation through desktop computers requires institutions to install extensive traditional communications infrastructure as well as building multiple computer rooms (Traxler & Kukulska-Julme, 2005).

The recent emergence of mobile learning can provide a new platform for institutions in East Africa to enhance education through mobile learning. Mobile learning provides learners with flexibility and ubiquity to learn anytime, anywhere via mobile devices connected to wireless Internet (Taleb & Sohrabi, 2012; Vosloo, 2012; Wang, Wu, & Wang, 2009). Moreover, it provides a new way to deliver education without installing complex communications infrastructure. According to Hellström (2010), mobile devices have become all-in-one devices that can be carried and used almost anywhere. Consequently, they give learners the opportunity to carry their institution in their own hands (Taleb & Sohrabi, 2012). Even those learners described as “hard-to-reach” learners such as work-based, traveller communities, can easily benefit from courses offered via mobile technologies (Duncan-Howell & Lee, 2007).

Despite numerous opportunities offered by mobile learning in education, mobile devices suffer from several challenges such as having small screens, limited processing power, and small keyboards (Wang et al., 2009). For example, memory size is said to be too small to hold the course resources such as PDF files and other multimedia enhanced resources (Kukulska-hulme, 2007). These devices also suffer from risk of loss due to their portability (Liu, Han, & Li, 2010; Vosloo, 2012). Due to these challenges and many others, some users have negative perceptions towards using these devices for education purposes (Vosloo, 2012) and make adopting mobile learning difficult (Wang et al., 2009).

Clearly, the presence and accessibility of mobile technologies do not guarantee their potential will be realized in educational contexts (Liu et al., 2010). It should be noted that, the success of mobile learning depends on human factors in the use of mobile devices (Kukulska-hulme, 2007). The need to understand factors that contribute towards learners' intention to adopt and use mobile learning is critical for successful implementation in a given context. This will help those who are involved in mobile learning implementation to make mobile services that are relevant and acceptable.

This study was aims to examine students' behavioral intention to adopt and use mobile learning in higher education in East Africa. A sample of 823 students selected from five higher learning institutions was collected and tested against the research model using regression analysis. The four institutions were from Tanzania and one institution from Kenya. The study adopted the Unified Theory of Acceptance and Use of Technology (UTAUT) model (Venkatesh et al., 2003) as a theoretical framework.

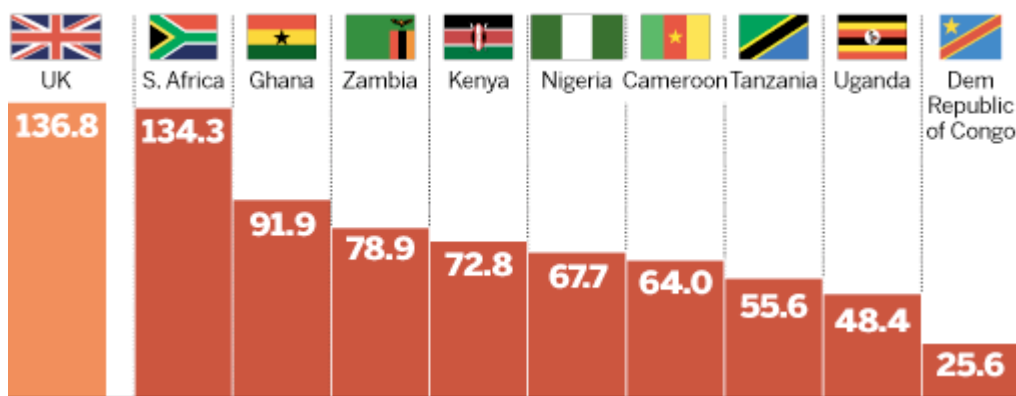
CONTEXTUAL BACKGROUND

Developing countries, particularly African countries, have the fastest growing telecommunication sectors in the world (Vosloo, 2012; WB, 2012). The number of mobile phone subscribers and Internet users in Africa has been increasing exponentially. According to eTransform Africa Report produced by the World Bank (WB) and the African Development Bank in 2012, there were almost 650 million mobile subscriptions in Africa, more than in the United States or the European Union,

making Africa the second fastest growing region in the world in mobile phone penetration (WB, 2012).

In East Africa, Kenya was reported to have 30.7 million mobile phone subscribers which is equivalent to 78 per cent (CCK, 2013), while Tanzania had 27.4 million mobile phone subscribers which is equivalent to 57 per cent (TCRA, 2013). Similarly, Uganda was predicted to have higher than 90 per cent penetration of mobile phone by end of 2013 (Ngarambe, 2013). Figure 1 shows mobile penetration rate in some selected countries.

These developments have impacted almost every sector of the economy. This is demonstrated by recent report by Deloitte and GSMA of 2012 which showed that, the telecommunication industry contributed around US\$32 billion, including paying US\$12 billion taxes in Sub-Saharan Africa alone. The industry has also created more than 3.5 million full-time jobs both formal and informal sectors.



Source: Strategy analyst

Figure 1: Mobile subscribers' penetration rate, by the end of 2012

On the other hand, the price of mobile devices is plummeting and becoming affordable to the majority of users in East Africa. For example, the price of handsets has decreased to as low as US\$ 30 in Sub-Saharan Africa (Deloitte & GSMA, 2012). At the same time, the cost of airtime and data has decreased significantly in the last few years. For example, price per minute fell on average by 10% between 2009 and 2010 in countries such as Kenya, Nigeria, Namibia, Ghana, Niger, Senegal, and South Africa (Deloitte & GSMA, 2012). The reduction of the price of mobile devices, airtime, and data, has in turn increased affordability and accessibility to the majority of users in Africa. These devices are now an integral part of many users' everyday lives. Figure 2 shows the reduction of mobile device prices in three selected countries.

According to Sife, Kiondo, and Lyimo-Macha (2010), mobile industry has contributed significantly to reduce poverty and to improve rural livelihoods by expanding and strengthening social networks in Africa. It has also increased people's ability to deal with emergencies and to cut down travel costs.

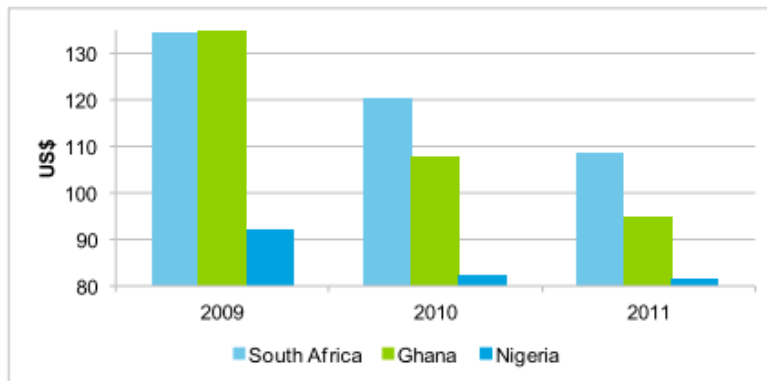


Figure 2: Reductions in mobile device prices (2009–2011): Source: (Deloitte & GSMA, 2012)

It is evident that several sectors of the economy have benefited significantly by utilising various mobile services. Nonetheless, the application of mobile technologies to enhance education is still not widespread (Vosloo, 2012) specifically in higher education in East Africa. Most of existing mobile learning initiatives are either pilot projects or SMS based applications that focus on primary and secondary education (Hellström, 2010). However, far too little is known as to why mobile learning is not adopted and implemented in higher education in East Africa. The empirical findings of this study will contribute towards understanding learners' intentions to adopt and use mobile learning in East Africa.

THEORETICAL FRAMEWORK

The UTAUT model was adopted and extended to examine students' behavioral intention to adopt and use mobile learning. The model was developed by Venkatesh et al. (2003) by combining eight similar technology acceptance models to develop a unified model. The models that were combined are: Technology Acceptance Model (TAM), Innovation Diffusion Theory (IDT), Theory of Reasoned Action (TRA), Motivation Model (MM), Theory of Planned Behavior (TPB), Combined TAM and TPB, Model of PC Utilization (MPCU), and Social Cognitive Theory (SCT).

The UTAUT consist of four key constructs:

- **Performance expectancy** is defined as "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (p.447).
- **Effort expectancy** is defined as "the degree of ease associated with the use of the system" (p.450).
- **Social influence** is defined as "the degree to which an individual perceives that important others believe he or she should use the new system" (p.451).
- **Facilitating conditions** is defined as "the degree to which an individual believes that an organizational and technical infrastructure exists to support the use of the system" (p.453).

These four constructs are direct determinants of usage intention and behavior. Moreover, the variables: gender, age, experience, and voluntariness of use moderate the key relationships in the model. The UTAUT model is shown in Figure 3.

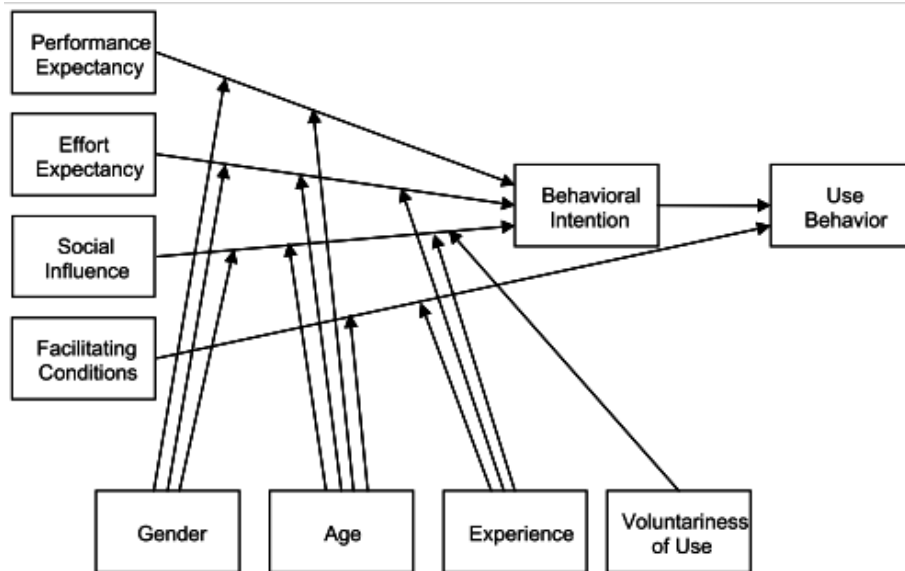


Figure 3: The UTAUT model Source: (Venkatesh et al. 2003, p.447)

The model was tested in a longitudinal study and found to outperform the eight individual models by explaining 70 percent of the variance in behavioral intention and about 50 percent of actual use (Venkatesh et al., 2003). The model has also been cited in more than 700 articles to date. This is an impressive number of articles given numerous acceptance theories in the literature.

The model has been widely used to investigate mobile learning acceptance in both developed and developing countries worldwide. It has also successfully assessed students' acceptance of mobile learning in higher education in many developing countries such as Thailand (Jairak et al., 2009), Saudi Arabia (Nassuora, 2012), Pakistan (Iqbal & Qureshi, 2013), and Guyana (Thomas, Singh, & Gaffar, 2013). Studies to investigate students' mobile acceptance in higher education in East Africa by using UTAUT model are limited. In the next sub-section, the modified research model for this study is explained in detail.

RESEARCH MODEL AND HYPOTHESES

The majority of studies that adopted the UTAUT model have extended the model by including new variables or reducing existing variables to suit a particular context of the study. This is because the rate of mobile devices penetration and mobile learning adoption is not the same in all countries (Nassuora, 2012). Likewise, this study extended the model to suit the context of mobile learning acceptance in East Africa.

This study did not measure actual use of the system since there is no tangible mobile learning initiative implemented in higher education in East Africa. All four constructs are hypothesized to have a positive effect on behavioral intention to use mobile learning. Furthermore, the use of mobile learning will be voluntary to learners. Learners will have other options to access learning resources and activities besides using mobile devices. Mobile learning is expected to widen access, increase flexibility and mobility to access learning resources. In this case, *voluntariness of use* in the UTAUT model was removed.

In addition, this study did not investigate the effect of *Gender*, *Age* or *Experience* in behavioral intention to use mobile learning. The majority of students in higher education are of almost of the same age and with small variations in technological experiences. Similar to findings obtained in other studies conducted elsewhere (Jairak et al., 2009; Nassuora, 2012; Thomas et al., 2013), *Gender*, *Experience* and *Age* were also dropped in the proposed research models. The research model is shown Figure 4.

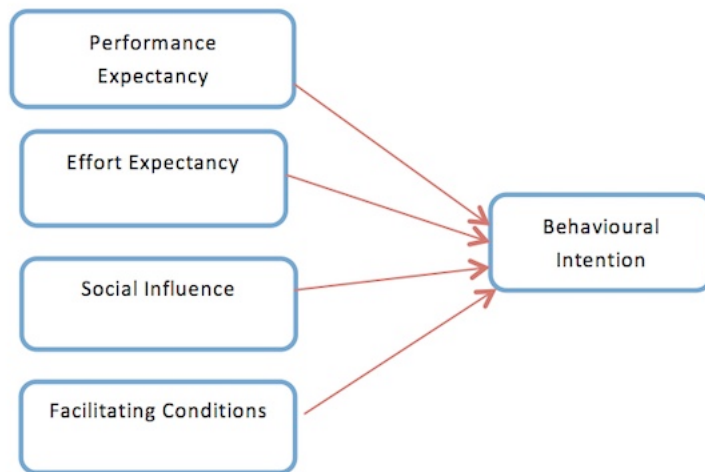


Figure 4: Research Model

The hypotheses of this study are:

Performance Expectancy

Performance expectancy is the strongest predictor of behavioural intention to use several technologies in both voluntary and involuntary settings (Venkatesh et al., 2003). In mobile learning context, it represents the degree to which students believe that using mobile learning will help to enhance their learning performance and gain better grades (Wang et al., 2009). Strengthening this belief will increase students' behavioral intention to adopt and use mobile learning. This construct has been driven from perceived usefulness described in TAM and TRA. A similar study conducted to elicit acceptance of mobile phones to deliver tutorial in Ghana using TAM found performance expectance being a strong predictor (Adedaja, Adelere, Egbokhare, & Oluleye, 2013). The hypothesis can be explained as follows:

Hypothesis 1: Performance Expectancy has a positive effect on Behavioural Intention to use mobile learning.

Effort Expectancy

Effort expectancy represents students' perception that using the mobile learning will be easy and free of efforts. Since many learners in developing countries are not exposed to many information systems (Ssekakubo, Suleman, & Marsden, 2011), this construct is an important determinant of mobile learning acceptance. It is expected that acceptance to adopt and use of mobile learning will depend on whether students believe using mobile learning will be ease of use (Wang et al., 2009). Therefore, the proposition is derived as follows:

Hypothesis 2: Effort Expectancy has a positive effect on Behavioural Intention to use mobile learning.

Social Influence

Social influence represents the degree to which students perceive other students or important people believe they should adopt and use mobile learning (Venkatesh et al., 2003). Prior studies have demonstrated that a student's decision is normally influenced by peer students or by other people such as instructors and parents (Abu-al-aish & Love, 2013; Miller, Rainer, & Corley, 2003). Therefore, it is important to include social influence as one of the constructs in the modified research model. The proposition is derived as follows:

Hypothesis 3: Social Influence has a positive effect on Behavioural Intention to use mobile learning.

Facilitating Conditions

Facilitating conditions refers to availability of resources to support adoption and usage of mobile learning at a given institutions (Venkatesh et al., 2003). In the context of mobile learning, the resources include availability of mobile devices, reliable broadband connection, and other related resources. Therefore, student's decision to adopt and use mobile learning will be influenced by his or her perception on availability of support services and resources to deliver mobile learning. The proposition is derived as follows:

Hypothesis 4: Facilitating Conditions has a positive effect on Behavioural Intention to use mobile learning.

Behavioral Intention

Venkatesh et al. (2003) suggested that behavioral intention to use a given technology has significant influence on usage behavior. At the moment, there is no tangible mobile learning initiative in higher education in East Africa. Therefore, it is not possible to measure actual use of the technology. The study measures behavioral intention instead of actual usage. This is consistent to previous studies that have elicited students' behavioral intention to use mobile

learning in places where actual mobile learning implementation is still at early stage (Iqbal & Qureshi, 2013; Jairak et al., 2009; Nassuora, 2012; Thomas et al., 2013).

RESEARCH METHODOLOGY

Data collection

The target population was students in higher education institutions in East Africa. Five institutions were selected using convenient sampling technique. These institutions are: University of Dar Es Salaam (UDSM), College of Business Education (CBE), Kenyatta University (KU), Dar es Salaam Institute of Technology (DIT), and Institute of Finance Management (IFM).

Two versions of questionnaire were prepared. The first version was hardcopy that was distributed to 1,000 students. The study utilized librarians in the surveyed institutions during data collection process. Students were given the questionnaire on entrance to the library and asked to fill in and return to the reception when leaving the library. Other copies of questionnaire were made available to the Dean of Students Office and Students' Unions Offices. A sample of 697 usable responses was obtained.

The second version was created using an online tool "Google Docs" and a link to the questionnaire was emailed to 518 students. Students email addresses were obtained from IT Units from participating institutions. The questionnaire was self-administered. A total of 126 students managed to fill in the online questionnaire. All respondents were guaranteed confidentiality and the name field was treated as optional.

A total of 823 completed questionnaires out of 1,518 questionnaires were obtained. This is 54% of all respondents. The data collection was undertaken between April to June 2013. The data analyzed using Statistical Packages for Social Science (SPSS) version 20.

Demographic information

The demographic information indicates that 76.8% of respondents were males, and 22.2% were females. In terms of institution distribution, 22.2% respondents were from CBE, 15.2% from DIT, 17.9% from IFM, 11.8% from KU, and 32.9% from UDSM. Moreover, 73.9% of respondents were studying science courses while 26.1% were studying arts courses.

The most interesting finding was that 93.4% of respondents had access to Internet via mobile devices while only 6.6% did not have. Majority of respondents (80.3%) were undergraduate students, 15.7% diploma students, and 3.5% postgraduate students. Figure 5 shows respondents' demographic information.

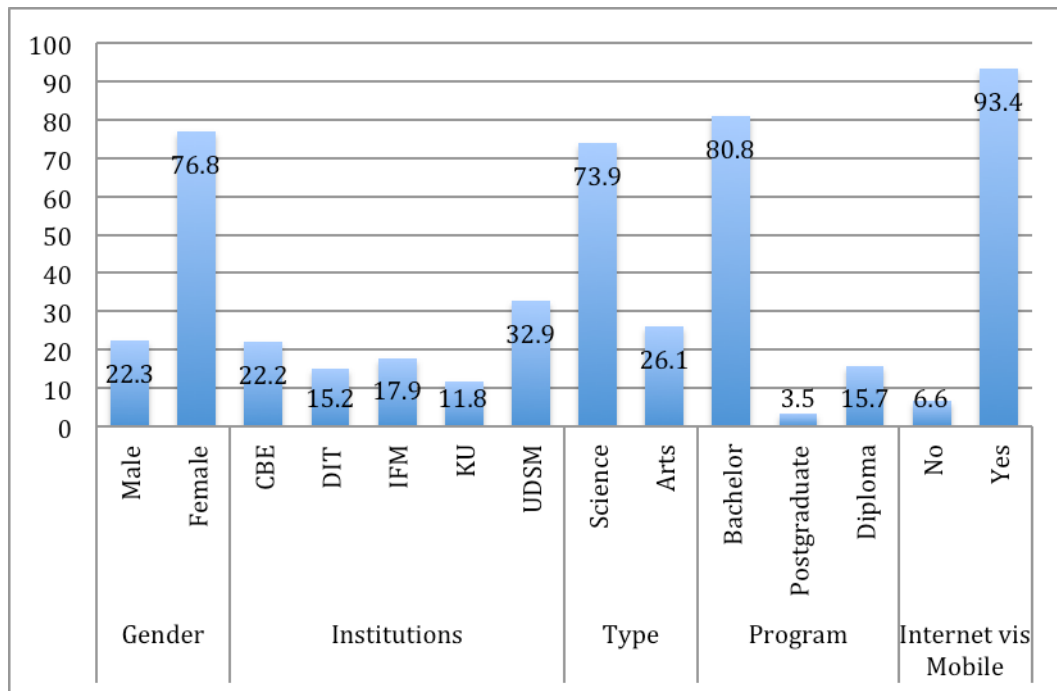


Figure 5: Respondents' Demographic Profile

Data collection instrument

The study adopted research instrument developed by Venkatesh et al. (2003) that uses 5-point Likert scale ranging from 1(Strongly Disagree) to 5(Strongly Agree). The data collection instrument was re worded and modified to suit the context of this study. Table 1 shows part of data instrument used to collect data (excluding demographic part).

Table 1: The UTAUT Items Construct

Construct	Code	Item
Performance expectancy	PE1	I would find mobile learning useful in my learning
	PE2	Using mobile learning will enable me to accomplish learning activities more quickly.
	PE3	Using mobile learning will increase my learning outcome
	PE4	The use of mobile learning will allow me to have access to more information about my courses.
Effort expectancy	EE1	My interaction with mobile learning applications would be clear and understandable
	EE2	It would be easy for me to become skillful at using mobile learning
	EE3	I would find mobile learning easy to use
	EE4	Learning to operate mobile learning applications is going to be easy for me
Social influence	SI1	People who influence my behavior will think that I should use mobile learning

Construct	Code	Item
	SI2	People who are important to me will think that I should use mobile learning
	SI3	The lecturers and other staff at my institution will be helpful in the use of mobile learning
	SI4	In general, my institution will support the use of mobile learning
Facilitating conditions	FC1	I have the resources necessary to use mobile learning
	FC2	I have the knowledge necessary to use mobile learning
	FC3	Mobile learning applications are going to be similar to other systems I use in mobile devices
	FC4	A help is available when I get problem in using mobile learning applications
Behavioural intention	BI1	I intend to use mobile learning applications in the future
	BI2	I predict I would use mobile learning applications in the future
	BI3	I plan to use mobile learning applications in the future

Scale labels: 1 – Strongly Disagree, 2 – Disagree, 3 – Neither Agree nor Disagree, 4 – Agree, 5 – Strongly Agree

RESEARCH RESULTS

Reliability and Validity

Reliability is used to ensure the consistency of the results for the various items being tested within each component (Foster, 2001). It is normally evaluated by assessing the internal consistency of the items representing each construct using Cronbach alpha (Cronbach, 1951). Based on SPSS results, the Cronbach alpha coefficient for the 19-item instrument was 0.913. The value of Cronbach's Alpha should be positive and even greater than 0.700 (Nunnally, 1978). As shown in Table 2, Cronbach alpha value for five constructs ranges from 0.763 to 0.884. All these values are above 0.700.

Table 2: Cronbach's alpha coefficients for construct reliability measurement

No.	Construct	Cronbach's alpha (α)
1.	Performance expectancy	0.884
2.	Effort expectancy	0.822
3.	Social influence	0.752
4.	Facilitating Conditions	0.763
5.	Behavioural Intention	0.851

The overall questionnaire was considered valid as it used the same items from previous surveys without adding new or deleting existing items.

Sampling adequacy

The Kaiser-Meyer-Olkin Measure of Sampling (KMO) to measure the sampling adequacy of the data. According to Kaiser (1973), the KMO below 0.50 is unacceptable and factor analysis should not be performed. In this study, the KMO was found to be 0.832 confirmed the sampling adequacy of the data. Moreover, Bartlett's test of sphericity $p < .001$, indicated that correlations between items were sufficiently large for performing the Principal Component Analysis.

Identifying the factor structure

The Factor Analysis (FA) was performed using Principal Component Analysis Extraction Method on 19 items using Oblimin with Kaiser Normalization rotation method. The aim of the FA was to show whether the related items were clustered under the same construct or not. The minimum factor loadings should be 0.300 (Hair, Black, Babin, & Anderson, 2009). The loadings per each item are shown in Table 3. All items in the research instrument loaded successfully.

Table 3: Items Loadings on the UTAUT Constructs Item

	Performance Expectancy	Effort Expectancy	Social Factors	Facilitating Conditions	Behavioural Intention
PE1	0.920				
PE2	0.680				
PE3	0.920				
PE4	0.692				
EE1		0.581			
EE2		0.559			
EE3		0.560			
EE4		0.485			
SI1			0.724		
SI2			0.719		
SI3			0.493		
SI4			0.399		
FC1				0.802	
FC2				0.796	
FC3				0.741	
FC4				0.584	
BI1					0.836
BI2					0.925
BI3					0.859
Variances	9.087	8.410	8.690	10.041	5.721

Research model summary

Five factors were subjected linear regression analysis to measure the success of the model and predict causal relationship between Behavioral Intention and four factors: Performance Expectancy, Facilitating Conditions, Effort Expectancy, and Social Influence. Using enter method, a significant model emerged: $F(4,818)=79.597$, $p<.0005$. The model explains 27.7% of the variance (Adjusted R Square = 0.277) in students' behavioral intention to adopt and use mobile learning in higher education in East Africa. Clearly, there are factors other than these four constructs included in this model that can be used to predict students' behavioral intention to adopt and use mobile learning. Although the percentage looks small, it is acceptable in social science research. According to Gaur and Gaur (2009, p.109), as much as lower value R square (0.10-0.20) is acceptable in social science research. Table 4 shows a summary of the research model.

Table 4: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1.	0.529	0.280	0.277	0.85049589

The regression analysis was also able to determine the causal relationship between Behavioral Intention and four constructs in the research model. Table 5 shows a summary of predictive factors in terms of beta values for each hypothesis obtained from regression analysis. The results show that all four factors have significant positive effect on students' behavioural intention to adopt and use mobile learning at $p < 0.0005$ and $p = 0.001$. Therefore, all hypotheses are accepted. The beta values are shown in Table 5.

Table 5: Unstandardized and standardized regression coefficients for the constructs entered in the model

Construct	B	Std. Error	Beta
PE	0.331	0.033	0.331**
FC	0.152	0.033	0.152**
EE	0.152	0.032	0.152**
SI	0.102	0.031	0.102*

** $p < 0.0005$, * $p < 0.001$

Therefore, the prediction model is:

Behavioral Intention = $0.331 \times (\text{Performance Expectancy}) + 0.152 \times (\text{Facilitating Conditions}) + 0.152 \times (\text{Effort Expectancy}) + 0.102 \times (\text{Social Influence}) + 1.77$

DISCUSSION

This study was set up with the aim of assessing students' behavioural intention to adopt and use mobile learning in higher education in East Africa. The main finding was that all four constructs had significant positive influence towards students' behavioral intention to use mobile learning. Similar to findings by Wang et al. (2009), performance expectancy was found to be the strongest predictor in mobile learning acceptance. This implies that students in higher education in developing countries believe mobile learning is useful, and will enable them to accomplish their learning activities faster and more efficiently. Students also think that mobile learning will help them to improve their learning performance and to obtain better grades. In order to strengthen this belief, educators should pay attention to the quality of learning resources deployed in mobile devices as well as developing tools that will facilitate student learning.

Consistent with findings from other studies (Iqbal & Qureshi, 2013; Jairak et al., 2009; Nassuora, 2012; Wang et al., 2009), this study also revealed that effort expectancy had a significant positive effect towards students' behavioral intention to use mobile learning. These findings suggest that students believe that they will not need a lot of instruction to be able to use mobile learning as they think it will be clear, understandable, and easy to use (Abu-al-aish & Love, 2013). Moreover,

they believe they will have the required skills to use mobile learning once it is introduced. To strengthen these beliefs, developers should develop usable mobile learning services (Wang et al., 2009). If the devices and mobile application are made easy to use, students are likely going to adopt and use. Usability is a key for students to use mobile learning services as many mobile devices have small screen sizes, limited processing power, and small sized keyboards (Wang et al., 2009).

Another important finding was that students believe they have resources and knowledge necessary to use mobile learning. This was demonstrated by the fact that facilitating conditions construct had significant positive effect towards students' behavioral intention to use mobile learning. This was a bit strange as it is believed that resources are very limited in developing countries and therefore facilitating conditions will affect adoption (Thomas et al., 2013). However, we found that 93% of students indicated that they had access to Internet via mobile devices. This result was consistent with the findings of studies conducted elsewhere in Africa (Kihoro, Oyier, Kiula, Wafula, & Ibukah, 2013; Mtega, Bernard, Msungu, & Sanare, 2012). It seems that many students have access to Internet via mobile devices. Institutions can take advantage of it by widening access to education via mobile devices.

Finally, social influence had the lowest significant level amongst four constructs in the research model but still acceptable. These results provide further support for the hypothesis that, students believe their colleagues and friends can influence them to adopt and use mobile learning. Mobile learning providers should conduct training and awareness to early adopters who are already using various mobile services. These early adopters have the potential to persuade their colleagues and friends to adopt to use mobile learning (Wang et al., 2009).

RECOMMENDATIONS FOR FUTURE RESEARCH

Respondents who participated in this study came from Tanzania and Kenya alone with the majority coming from Tanzania. Amongst five institutions involved in this study, four were from Tanzania, and one from Kenya. Therefore, the sample population used in this study may not be representative of the entire student population of East Africa. Future research should consider including institutions from other East African countries in order to make generalisations from the data. Moreover, the convenience sampling method used to select institutions to participate in the study has a potential bias.

Another limitation of this study was that, all four constructs in the research model accounted for 27.7% variance in the students' behavioural intention to use mobile learning in East Africa. Although this is acceptable percentage in social science research, obviously, there are factors other these four which should also be used to predict students' behavioural intention to adopt and use mobile learning. Future research should consider adding new factors in the UTAUT model in order to predict behavioural intention to adopt and use mobile learning in a given context. Some of the factors which can be considered are perceived enjoyment, and perceived mobility value (Huang, Lin, & Chuang, 2007), self-management of learning, perceived playfulness (Wang et al., 2009), and attitude (Thomas et al., 2013).

Finally, individual perceptions change over time as users gain experience (Abu-al-aish & Love, 2013; Venkatesh et al., 2003). The findings of this study should be considered as students' perceptions and intention to adopt and use mobile learning at a single point in time. Future research should validate this model in order to apply the findings at a given time. Despite these limitations, this study provides insights on factors that contribute towards successfully adoption of mobile learning in higher education in East Africa. The findings provide important implications to managers, educators, and mobile learning system developers.

CONCLUSIONS

It is becoming increasingly difficult to ignore the importance of mobile learning to enhance education in higher education in East Africa. There is a need to determine factors that contribute towards learners' acceptance of mobile learning in education in order to facilitate adoption and usage of mobile learning. The empirical findings of this study add substantially to our understanding on some factors that affect students' intention to adopt and use mobile learning in higher education. These findings will help those who are involved in planning and developing mobile learning for higher education in East Africa to make mobile services that are relevant and acceptable to learners.

ACKNOWLEDGEMENT

The authors appreciatively acknowledge the financial support provided by a grant from University of Dar es Salaam, World Bank project and the support from University of Tampere for preparing this article. Moreover, the authors would like to thank students from five institutions, namely: IFM, UDSM, KU, DIT, and CBE who willingly accepted to participate in the study.

REFERENCES

- Abu-al-aish, A., & Love, S. (2013). Factors Influencing Students' Acceptance of M-Learning : An Investigation in Higher Education. *The International Review of Research in Open and Distance Learning*, 14(5), 83–108.
- Adedola, G., Adedola, O., Egbokhare, F., & Oluleye, A. (2013). Learners' Acceptance of the Use of Mobile Phones to Deliver Tutorials in a Distance Learning Context : A Case Study at the University of Ibadan. *The African Journal of Information Systems*, 5(3), 80–93.
- CCK. (2013). *Quarterly Sector Statistics Report Third Quarter of the Financial Year 2012-13* (Vol. 13, pp. 1–31). Nairobi, Kenya. Retrieved from http://www.cck.go.ke/resc/downloads/Sector_Statistics_Report_for_3rd_Quarter_2012-2013.pdf
- Cronbach, L. J. (1951). Coefficient alpha and the internal structure of tests. *Psychometrika*, 16(3), 297–333.
- Deloitte, & GSMA. (2012). *Sub-Saharan Africa Mobile Observatory 2012*.

- Duncan-Howell, J., & Lee, K.-T. (2007). M-learning : Finding a place for mobile technologies within tertiary educational settings. In *ascilite Singapore* (pp. 223–232). Retrieved from <http://www.ascilite.org.au/conferences/singapore07/procs/duncan-howell.pdf>
- Foster, J. J. (2001). *Data Analysis Using SPSS for Windows Versions 8 - 10: A Beginner's Guide* (p. 272). SAGE Publications Ltd.
- Gaur, A. S., & Gaur, S. S. (2009). *Statistical Methods for Practice and Research: A Guide to Data Analysis Using SPSS* (2nd ed., p. 208). SAGE Publications India Pvt Ltd.
doi:10.4135/9788132108306
- Hair, J. F., Black, W. C., Babin, B. J., & Anderson, R. E. (2009). *Multivariate Data Analysis* (p. 816). Prentice Hall; 7 edition.
- Hellström, J. (2010). *The Innovative Use of Mobile Applications in East Africa*.
- Huang, J.-H., Lin, Y.-R., & Chuang, S.-T. (2007). Elucidating user behavior of mobile learning: A perspective of the extended technology acceptance model. *The Electronic Library*, 25(5), 585–598. doi:10.1108/02640470710829569
- Iqbal, S., & Qureshi, I. A. (2013). M-Learning Adoption : A Perspective from a Developing Country. *The International Review of Research in Open and Distance Learning*, 13(3), 148–164.
- Jairak, K., Praneetpolgrang, P., & Mekhabunchakij, K. (2009). An acceptance of mobile learning for higher education students in Thailand. In *The Sixth International Conference on eLearning for Knowledge-Based Society* (pp. 17–18). Thailand.
- Kaiser, H. F. (1973). An Index of Factorial Simplicity. *Psychometrika*, 39(1), 31–34. Retrieved from <http://eric.ed.gov/?id=EJ105008>
- Kihoro, J. M., Oyier, P. A., Kiula, B. M., Wafula, J. M., & Ibukah, R. W. (2013). E-Learning Eco-system for Mobility and Effective Learning : A Case of JKUAT IT Students. In *IST-Africa 2013 Conference* (pp. 1–9).
- Kukulska-hulme, A. (2007). Mobile Usability in Educational Contexts : What have we learnt ? *International Review of Research in Open and Distance Learning*, 8(2), 1–16.
- Liu, Y., Han, S., & Li, H. (2010). Understanding the factors driving m-learning adoption: a literature review. *Campus-Wide Information Systems*, 27(4), 210–226.
doi:10.1108/10650741011073761
- Miller, M. D., Rainer, R. K., & Corley, J. K. (2003). Predictors of Engagement and Participation in an On-Line Course. *Online Journal of Distance Learning Administration*, 6(1).
- Mtega, W. P., Bernard, R., Msungu, A. C., & Sanare, R. (2012). Using Mobile Phones for Teaching and Learning Purposes in Higher Learning Institutions : the Case of Sokoine University of Agriculture in Tanzania. In *5th UbuntuNet Alliance annual conference* (pp. 118–129). Retrieved from <http://www.ubuntunet.net/sites/ubuntunet.net/files/mtegow.pdf>

- Nassuora, A. B. (2012). Students Acceptance of Mobile Learning for Higher Education in Saudi Arabia. *American Academic & Scholarly Research Journal*, 4(2). Retrieved from <http://naturalspublishing.com/files/published/5z8b9f97ju9k98.pdf>
- Ngarambe, A. (2013). Mobile phone penetration records significant growth. *The East African*. Retrieved from <http://www.theeastafrican.co.ke/Rwanda/Business/Mobile-phone-penetration-records-significant-growth/-/1433224/1669528/-/item/1/-/121dra/-/index.html>
- Nunnally, J. (1978). *Psychometric theory*. New York, NY: McGraw-Hill.
- Sife, A., Kiondo, E., & Lyimo-Macha, J. (2010). Contribution of mobile phones to rural livelihoods and poverty reduction in Morogoro Region, Tanzania. *International Journal of Education and Development Using Information and Communication Technology*, 42(3), 1–15.
- Ssekakubo, G., Suleman, H., & Marsden, G. (2011). Issues of Adoption : Have E-Learning Management Systems Fulfilled their Potential in Developing Countries ? In *Proceedings of the South African Institute of Computer Scientists and Information Technologists Conference on Knowledge, Innovation and Leadership in a Diverse, Multidisciplinary Environment* (pp. 231–238). Cape Town, South Africa.: ACM New York, NY, USA ©2011. doi:0.1145/2072221.2072248
- Swarts, P., & Wachira, E. (2010). *Tanzania: ICT in Education Situational Analysis. Global e-Schools and Communities Initiative*. Retrieved from http://www.gesci.org/assets/files/Knowledge Centre/Situational Analysis_Tanzania.pdf
- Taleb, Z., & Sohrabi, A. (2012). Learning on the Move: The use of Mobile Technology to Support Learning for University Students. *Procedia - Social and Behavioral Sciences*, 69(Icepsy), 1102–1109. doi:10.1016/j.sbspro.2012.12.038
- TCRA. (2013). *Quarterly Telecom Statistics Quarter 3 (March 2013) Report 1* (Vol. 3, pp. 1–7). Dar es Salaam. Retrieved from <http://tcra.go.tz/images/documents/telecommunication/telecomStatsMarch13.pdf>
- Thomas, T. D., Singh, L., & Gaffar, K. (2013). The utility of the UTAUT model in explaining mobile learning adoption in higher education in Guyana. *International Journal of Education and Development Using Information and Communication Technology (IJEDICT)*, 9(3), 71–85.
- Traxler, J., & Kukulska-Julme, A. (2005). *Mobile Learning in Developing Countries "A report commissioned by the Commonwealth of Learning."* Knowledge Series. Vancouver, BC. Retrieved from www.col.org/SiteCollectionDocuments/KS2005_mlearn.pdf
- Venkatesh, V., Morris, M. G., Hall, M., Davis, G. B., Davis, F. D., & Walton, S. M. (2003). User Acceptance Of Information Technology : Toward A Unified View 1. *MIS Quarterly*, 27(3), 425–478.
- Vosloo, S. (2012). *Mobile Learning and Policies: Key issues to consider mobile learning* (pp. 1–55). Paris, France. Retrieved from <http://unesdoc.unesco.org/images/0021/002176/217638E.pdf>

- Wang, Y., Wu, M., & Wang, H. (2009). Investigating the determinants and age and gender differences in the acceptance of mobile learning. *British Journal of Educational Technology*, 40(1), 92–119. doi:10.1111/j.1467-8535.2007.00809.x
- WB. (2012). *The Transformational Use of Information and Communication Technologies in Africa*. WB. Retrieved from <http://siteresources.worldbank.org/EXTINFORMATIONANDCOMMUNICATIONANDTECHNOLOGIES/Resources/282822-1346223280837/Summary.pdf>
- WB. (2013). Data on Sub-Saharan Africa. Retrieved October 04, 2013, from <http://data.worldbank.org/region/SSA>

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