

Using Mobile Phones for Teaching and Learning Purposes in Higher Learning Institutions: the Case of Sokoine University of Agriculture in Tanzania

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Abstract

The study investigated how mobile phones have been used for teaching and learning purposes in higher learning institutions in Tanzania. Specifically the study assessed how mobile phones facilitated the teaching and learning process, identified the mobile phone applications used for teaching and learning, determined the types of learning activities facilitated through mobile phones and assessed the common limitations of m-learning in at Sokoine University of Agriculture (SUA). The study employed a survey where teaching staff and students from faculties and institutes hosting academic programmes were involved. A total of 30 teaching staff and 40 students were randomly selected and included in the study. In-depth interviews, observations and questionnaire were used for data collection. It was found that majority of the respondents used their mobile phones for teaching and learning process. It was found that most respondents reported to use traditional mobile learning applications including text messages and calls. Few respondents had smart phones with a number of m-learning applications most of them being teaching staff. These were able to create upload, download and share academic resources through their smart phones while others recorded and stored files in their phones. It was also found that among teaching staff many were not aware of the capacity of their mobile phones such that they underutilized them. Costs associated with downloading multimedia content was another constraint which limited some respondents especially students from using phones for learning purposes. More than that, users were forced to use SMART/VISA cards for buying online mobile applications of which most respondents were not aware of.

Keywords

e-learning; mobile phones; m-learning; Information and Communication Technologies; Tanzania

1. Introduction

The emergence and advancements of Information and Communication Technologies (ICTs) have changed the way teaching and learning processes are being conducted. ICTs facilitate immediate access to information resources needed for teaching and learning. According to Sife et al. (2007), ICTs have capabilities of improving information accessibility; facilitating communication via electronic facilities; enhancing synchronous learning and; increasing cooperation and

collaboration. In the teaching and learning process, ICTs are known to be more cost-effectiveness as they facilitate collaborations among learners and tutors and enhance pedagogical improvement through simulations, virtual experiences, and graphic representations.

Information and Communication Technology (ICT) applications enhance an exchange of information between learner-tutor or learner-learner. This takes place through the use of different ICT tools including computers, radio, television, mobile phones and some other devices. These tools provide suitable platform for the teaching-learning process. Current developments in ICTs have increased the level of interactivity and collaborations among learners and tutors. Advancements in web technology have brought about another opportunity for teaching and learning. Web based learning platforms are known to limit problems caused by distance between learners and tutors. Web-based learning is a form of e-learning supported by an internet browser (Tinio, 2003). It occurs through electronic mails, chats, web-based conferencing, message boards and web pages for sharing information resources. It provides a suitable instructional media, facilitates interactive and collaborative learning, and enhances assessment during the teaching-learning process (Wijekumar, 2005).

Among the ICT tools mostly owned and used among people are the mobile phones. These tools can provide suitable learning platforms as they have a lot of applications tutors and learners may use in their academic activities. Learning through mobile phones is termed as mobile learning (m-learning). Guy (2009) defines mobile learning as electronic learning (e-learning) through mobile computational devices. Mobile phones have a potential of improving the teaching and learning processes as the tools are cheap compared to other ICTs which can be used for teaching and learning. The current study therefore, assesses how mobile phones facilitate the teaching-learning process; identifies the commonly used mobile phone applications and the types of learning activities facilitated by mobile phones; and determines the factors limiting the usage of mobile phones in teaching and learning.

2. Literature Review

2.1 The role of Mobile phones in supporting teaching and learning

Mobile phones are becoming popular as many people can afford them, currently the use of mobile communication devices has gone beyond the traditional communication role that it is now used in supporting teaching and learning. In education, mobile phones have led to the evolution of new paradigm known as mobile learning (Muyinda *et al*, 2007). The rapid growth of access to mobile phones around the world and in Africa and Middle East regions in particular have a potential of improving teaching, learning and institutional efficiencies to enable national education system transformation (UNESCO, 2012). According to (Huang *et al*, 2010), mobile learning applications can facilitate students not only learning contents conveniently but also interacting with others collaboratively anytime and anywhere. Hence, the development of m-learning as a new strategy for education has implications for the way students and tutors in educational institutions interact.

Ferry, (2009) describes that modern mobile phones can be used to help students to access web based contents, remix it, share it, collaborate with others and create media rich deliverable for the classroom teachers as well as global audience. According to Cui and Wang (2008), universities in United Kingdom (UK) have made the use of mobile phones to store and retrieve information such as e-books, instructional materials, reviewing students' marks thus making teaching and learning practices more effective. Moreover, Liaw (2009) reported that in higher

education mobile phones can provide course materials to students including due dates for assignments, and information about time table and room changes. Furthermore, Cui and Wang (2008) noted that in China students can view their teachers' web page or access some other online English learning resources via mobile phones and they can also take online tests.

The study done by UNESCO, (2012) has shown that mobile learning projects in South Africa have been used to improve teaching system especially teaching biology subjects. Furthermore the study conducted by Utulu (2012) in Nigeria revealed that mobiles phones were used by students for communicating with lecturer in charge of the course, collect data (recordings), sending emails to lecturers, access Online Public Access Catalogue and share knowledge. Also a study by Kajumbula (2006) in Makerere University found that mobiles phones were used by students for learning and teaching; for example students can know whether their marks are missing, dates for tutorials, venues and meeting times with research supervisors. However, mobile phone uses for teaching and learning purposes in primary, secondary and tertiary education in Tanzania is highly limited (Nihukia, 2011). Kafyulilo, (2012) adds that, although mobiles phones are the most accessible technological tools in schools and colleges their use in teaching and learning is among the lowest both in Tanzania. It is unknown why the usage mobile phones is low.

2.2 Mobile learning applications

Mobile devices integrate a series of features used in various learning environments. In some mobile learning applications currently available, mobile features are being utilized for various educational practices include the use of Short Message Services (SMS), GPS, camera, browsing, downloading, bluetooth, Wi-Fi, voice calls and gaming (Kizito, 2012; Hoppe, 2009; Cui and Wang, 2008). According to Cui and Wang (2008), SMSSystem can be used to help students learn foreign languages and teachers can use SMS to communicate with one student or even one group of students. For instance teachers in higher education in UK have made use of SMS as prompt for course requirements, polling classes, pop quizzes to students and sending information about time table and reminding students about dates for examination (Ferry, 2009).

Browsing with cell phones is one convenient way for students to surf online. Most of the modern mobile phones are incorporated with browsing applications such as Opera Mini, Internet explorer, Mozilla fire fox, Opera and Google chrome. Hoppe (2009), Ferry (2009) and Cui and Wang (2008) state that students can use browsers to check emails, read materials such as e-books, and watch lecture from anywhere and at any time. Mobile phones have downloading feature which can be used by students and tutors to download various kinds of materials through their mobile phones easily. Teachers can download video through their mobile phones and present them to students through a TV set available in the classrooms (Kafyulilo, 2012).

Mobile phones can be used for sharing information resources through Infrared, Bluetooth and Wi-Fi. Other applications including emails, Google drive and social media can equally be used for sharing academic information resources. According to Common Wealth of learning (2008), teachers can share with students' movies, audio files and other learning materials through their mobile phones.

Most of the mobile phones have features which can be used for recording and playing multimedia contents. Students can greatly benefit from having a camera on the cell phones for documenting visual materials and collecting scientific data (Common Wealth of learning, 2008), Cui and Wang, (2008).

Despite the massive advantages that mobile phones do have in the teaching and learning process, there are some challenges of m-learning among tutors and students. Some of the mobile phones do not have programs that have direct compatibility with the academic programs such as pdf, words, excel and PowerPoint. Screen size is another limiting factor for m-learning.

3. Conceptual Framework

The modified Technology Acceptance Model (TAM) was adopted and guided the study. The model describes how a technology may be adopted to facilitate performance of a particular activity. Yang and Lin (2010) describe TMA to be the most influential model for testing information system. According to Alrafi (2005), TAM helps to assess how potential users of a particular technology come to accept and use it. The model explains the causal relationships between system design features, perceived usefulness, perceived ease of use, attitude toward using, and actual usage behaviour.

The model assisted in assessing the mobile applications used by teaching staff and the perceived usefulness of mobile phones in teaching and learning. The model will be used to assess perceived ease of use, behavioral and cultural intention to use. It was also be used to assess the actual use of mobile phones for teaching and learning.

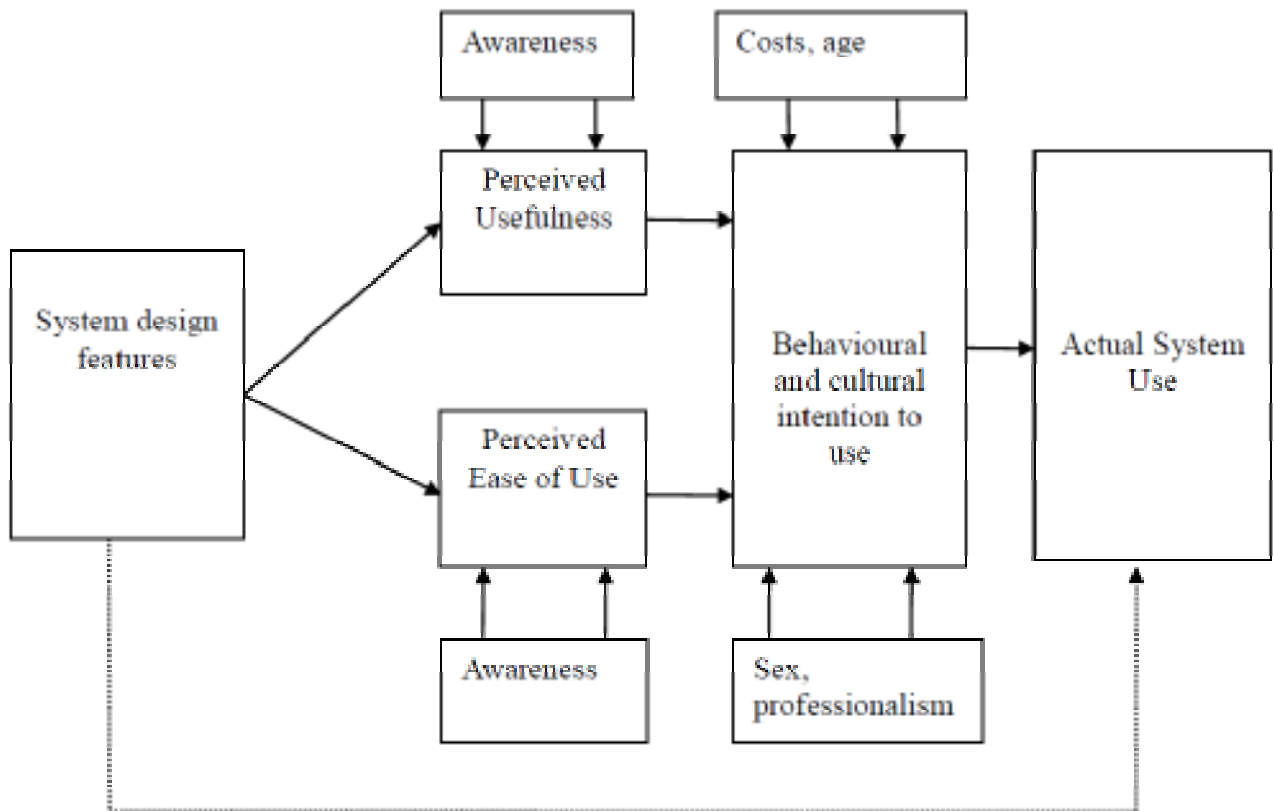


Figure 1: The modified Technology Acceptance Model (adopted from Liu et al., 2003; Davis 1989, 1993)

4. Research Methodology

The study was conducted at Sokoine University of Agriculture (SUA) in Tanzania. The study involved teaching staff (lecturers and technicians) and students. The study involved staff from the Faculty of Agriculture; Forestry and Nature Conservation; Science; and Veterinary Medicine. It also involved the two institutes (Development Studies Institute and Sokoine National Agricultural Library) hosting academic programmes at SUA.

The study involved a total of 70 respondents including students and teaching staff. Simple random sampling procedure was employed in selecting five teaching staff from each of the four faculties and two institutes while a total of 40 students were randomly selected and involved in the study. This sampling technique was adopted because it provides an equal opportunity for each element of the population to be selected.

Structured questionnaire were used to collect data from the 40 students while in-depth interviews and observations were employed in assessing the usefulness of mobile phones among teaching staff. Data collected was analysed through content analysis and the Statistical Packages for Social Sciences. Frequency distribution tables were used to present results of quantifiable data.

5. Findings and Discussion

5.1 Mobile phones system design features used by teaching staff at SUA

Teaching staff were asked to mention the types of mobile phones they owned; it was found that 70% of them mentioned to own and use smart phones. It was identified that majority of those who owned smart phones knew the operating systems installed in their phones. Some of the operating systems installed in their smart phones included the Android, Research in Motion (RIM) Blackberry, Apple's iOS, Nokia Symbian, Samsung's Bada and Microsoft windows (see Table 1 below for details). It was also found that 43% of those owning smart phones did not know the operating systems installed in their phones.

Mobile operating systems	% of users
RIM's Blackberry	7%
Android	22%
Apple's iOS	7%
Nokia Symbian	7%
Samsung's Bada	7%
Microsoft Windows	7%
Do not know	43%

5.1.1 Usage of mobile phones among teaching staff at SUA

Teaching staff were further asked on their commonly used mobile applications. It was found that all staff used their phones for Short Message Services (SMS), 84% mentioned to access internet

services through their phones, 68% used Multimedia Services while 64% mentioned to use some Web 2.0 applications (see Table 2 below for details).

Table 2: Services provided by mobile phones

Type of service	% of users
Internet services	84%
Multimedia services	68%
SMS	100%
Calls	100%
Web 2.0 services	64%
Recording event (photographing)	85%
Storing files	60%

These findings are supported by Boyera (2007) who describes that people use SMS applications for sending requests by text-messages to a specific phone number, and get the result with a new text-message they receive. Moreover, some others use voice applications for calling while others used their mobile phones for recording events and storing files. Others accessed internet services as mobile phones had Web browsers installed in them for viewing web contents.

5.1.2 Mobile web browsers used by staff at SUA

For effective usage of internet services, mobile phones should be incorporated with a web browser. Good mobile browsers should accommodate contents optimized for mobile devices and for personal computer screens. According to Roto and Kaikkonen (2003), for effective usage of web mobile services, both content and browser developers should understand the nature of mobile situation. The teaching staff involved in the study mentioned to use Internet Explorer, Mozilla Firefox, Opera, Opera min and Google chrome browsers (see Table 3 below for details). Teaching staff mentioned to be satisfied with the mobile web browsers they used as they had good display and reproduction of web sites and multimedia contents and supported different input and output modes in a user-friendly form.

Table 3: Browser software installed in the mobile phone

Browser software	% of users
Internet explorer	58%
Mozilla firefox	37%
Opera	26%
Opera Mini	47%
Google chrome	21%

Since most staff involved in the study owned mobile phones which could support internet services, it was possible for most of them to use internet services. Those with smart phones were privileged to have access to more mobile web based services. Moreover, most staff mentioned the ease of use of web services through their mobile phones. They also mentioned that it was easy to afford the mobile internet bundle subscriptions from the mobile phone operators.

5.1.3 Categories of internet services used by teaching staff at SUA

Teaching staff mentioned to access various internet services through their mobile phones. Among the 25 staff who mentioned to have been using internet services, 76% of them have been surfing for accessing various web based contents while 81% mentioned to have been using social network software through their mobile phones. It was found that all of the 25 staff who mentioned to use internet services accessed electronic mailing services through their phones (see Table 4 below for details).

Table 4: Internet services used by teaching staff at SUA

Type of internet services	Number and % of users
Surfing	19 (76%)
Electronic mail	25 (100%)
Socializing through Web 2.0 tools	20 (81%)

Among the 20 staff who mentioned to socialise through mobile Web 2.0 tools, 82% of them used Facebook, 38% mentioned to use Facebook messenger while 38% used Skype. Others, 71% used Twitter, Wikis and Youtube (see Table 5 for details).

Table 5: Usage of social networks

Social network tool	Number and % of users
Facebook	16 (82%)
Facebook messenger	8 (38%)
Youtube	14 (71%)
Skype	8 (38%)
Wikis	14 (71%)
Twitter	14 (71%)

It can be observed that most of the mobile Web 2.0 applications used by teaching staff at SUA can in one way or the other be adopted in the teaching learning process. Evidences from Bosch (2009) have shown that students and teachers spend a lot of time on Facebook that it is possible to post some academic issues and access some immediate response. Moreover, Facebook have several features which allow collaborations including uploading and downloading files. Other applications including Wikis and Youtube are known to be useful in teaching and learning processes too.

Generally, teaching staff at SUA used their mobile phones for informing purposes. The mobile phones helped staff in storing files, recording events, and communication purposes. Ordinary mobile phones were used for calls, receiving and sending texts and recording events using multimedia applications. Those who owned smart phones could do more with their phone as they had more applications.

5.2 Using mobile phones for teaching and learning among teaching staff at SUA

Teaching staff were asked whether they used their mobile phones for facilitating teaching and learning. It was found that 100% of the teaching staff made some calls and sent text messages for alerting students and communicating with colleagues on academic issues. Among the 25 staff who mentioned to access internet services through their phones, 76% mentioned to download scholarly materials through their mobile phones. Others, 54% mentioned to use smart phone learning applications to support the teaching learning process (see Table 6 below for details).

Table 6: Usage of mobile phones in teaching and learning

Type of usage	% of users
SMS for alerting students	100%
Calls for alerting students	100%
Surfing (downloading scholarly materials)	76%
Smart phone learning applications	54%

Among those who accessed internet services, 63% mentioned to read scholarly articles through their mobile phones, 37% used some mobile web based applications for data collection while 58% reported to use their mobile phones for accessing and reading online text books. Majority (84%) of those who used internet services accessed online dictionaries while 11% and 42% searched library catalogues and shared information resources to others through their mobile phones respectively (see Table 7 for details).

Table 7: Mobile Web based learning services accessed by staff

Type of usage	Number and % of users
Reading scholarly articles	16 (63%)
Collecting data	9 (37%)
Reading text books	15 (58%)
Using online dictionaries	21 (84%)
Searching library catalogues	3 (11%)
Sharing information resources	11 (42%)

Among those who used mobile web based services to share information resources, 73% mentioned to access e-mails, others (30%) mentioned to use social network software while some (36%) used Google drive for the same purpose.

Table 8: Sharing information resources through mobile web based services

Type of application	Number and % of users
E-mails	8 (73%)
Social networks	3 (30%)
Google drive	4 (36%)

Among those owning smart phones, 35% of them mentioned to have downloaded some learning applications from some online stores to facilitate the teaching learning process. Moreover, 43% of those owning smart phones mentioned to use their phones for storing lecture notes and other academic documents. It was also found that 23% of those owning smart phones uploaded lecture notes and other reading materials for their students through their phones. Those with smart phones were also at a position to access dictionaries, encyclopedia and use word processor applications for viewing and editing lecture notes before uploading them to students.

5.3 Use of mobile phones by students

5.3.1 Common Mobile phone uses by students at SUA

Students were asked on their common usage of their mobile phones. It was found that all students used their phones for making calls and chatting. It was also found that 7.5% of the respondents claimed to use phones for downloading materials while very few 2.5% used phones for selling airtime apart from making calls and chatting.

Table 9 Common uses of Mobile phone

Common uses of mobile phone	Percentage (N=40)
Selling airtime	2.5
Download study materials	7.5
Making phone calls and Chatting with colleagues	100

4.3.2 Major academic uses of Mobile phones among students at SUA

The academic uses preferred by interviewed students included sending SMS (51.3%) and downloading materials (33.3%). While some mentioned to use their phones for taking photo during study activities (10.3%) and only a few others (5.1%) used their mobile phones for recording academic activities. Basing on these findings, most students used their mobile phones for various academic purposes. (See table 10 for details).

Table 10: Major common and academic uses of mobile phones by students

Major academic use	% representative (N=40)
SMS	51.3
Downloading	33.3
Taking photos	10.3
Recording	5.1

5.4 Factors limitations the of usage of mobile phones in teaching and learning at SUA

Several factors were identified to limit the usefulness of mobile phones in teaching and learning. It was found that some teaching staff and students were unaware of the capacity of their mobile phones. Some of those who owned smart phones just used them for calls and text messages as they did not know other applications supported by their smart phones. Others did not know the type of phones they owned thus underutilising them.

Smart phones were sold with some applications already installed in them; however a number of important applications needed to be downloaded from the mobile application stores both freely and commercially. Among the 21 teaching staff who owned smart phones, only 30% of them mentioned to have downloaded some applications. Others just used the applications incorporated when the phones were manufactured; this limited them from using some of the applications suitable for teaching and learning purposes.

It was found that some of the important applications were sold; none of teaching staff who mentioned to have downloaded some mobile web based applications purchased any. It was identified that the mobile phone service providers in Tanzania had not included their pre-paid service systems that the mobile user's account can be easily debited thus paying for the cost of acquiring commercial applications. Instead the systems available wanted one to use SMART or VISA for accessing commercial applications.

It was identified that some of the teaching staff used their mobile phones for storing files, however; mobile phones owned had limited storage space. This limited many from installing e-learning software which could occupy more space as it decreased the storage space for lecture notes and text books. Others mentioned that they were not able to share stored files. This limited them from using their mobile phones for sharing lecture notes.

Some of the teaching staff particularly the females included in the study hesitated exposing their contact details including phone numbers to students because some of them misused them when given. It was explained that some students called them during late hours while others sent some text messages not relating to academics.

Web 2.0 tools are known to facilitate teaching and learning processes. It was found that very few (20%) teaching staff involved in the study were aware on how Web 2.0 tools facilitate teaching and learning. Moreover, most mobile phones with internet applications can support Web 2.0 services; despite this fact very few teaching staff used the services. However, it was identified that majority (80%) of the teaching staff did not have any Web 2.0 training thus limiting them from using social media in teaching and learning.

Students complained that when searching for materials only a few could be able to read HTML documents while other documents with tables were not legible; this might have been caused by empty meta-tags that made the downloads to fail. Sometimes documents containing internal style-sheets and script language might have been a problem.

There were a number of complaints made by respondents about the size of the text being uncomfortably small and difficult to read for prolonged periods. It was also identified that some were unable use some mobile applications useful for teaching and learning.

Apart from that, many respondents mentioned that the use of multimedia applications such as sound, more graphics or movie clips, to enhance learning were very expensive and that only few

could afford to pay for them. The limitations of the m-learning device such as screen size and functionality meant that the expectations of users were not always met.

6.0 Conclusions and recommendations

The study found that mobile phones were used for teaching and learning purposes among both teaching staff and students. Despite this generalization, the usage of mobile phone applications for teaching and learning differed among respondents. All teaching staff and students mentioned to use text messages and calls while few mentioned to have used some advanced learning applications. Few did not use such applications as they were not supported by their phones, others did not know how to go about using them. Income hindered some from accessing useful m-learning applications as they were sold. Moreover, limited mobile storage spaces limited some from storing large multimedia contents suitable for teaching and learning. Furthermore, limited Web 2.0 skills excluded the majority from using social media which are believed to enhance interactions and collaborations thus being suitable for teaching and learning.

It is recommended that before buying mobile phones people should try to study their specifications. Moreover, web content generators should consider mobile phones versions of their web contents as many people use their phones for accessing such contents. Mobile phone operators should reduce internet service tariffs so that more can afford and use mobile internet services. Furthermore, Web 2.0 awareness among students and teaching staff should be raised as these tools are believed to be efficient in teaching and learning.

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Biography

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