



GLOBAL JOURNAL OF HUMAN-SOCIAL SCIENCE: H
INTERDISCIPLINARY

Volume 18 Issue 1 Version 1.0 Year 2018

Type: Double Blind Peer Reviewed International Research Journal

Publisher: Global Journals

Online ISSN: 2249-460X & Print ISSN: 0975-587X

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GJHSS-H Classification: FOR Code: 920506



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Addressing Knowledge Gaps among Nurses in Health Care in Tanzania: Use of Mlearning Platforms in Tanzania

David Urassa ^α, Pius Chaya ^σ & Joseph Pilot ^ρ

Abstract- Penetration of ICT in the health system has received due attention. Globally, penetration of smart phones has fueled health systems to use it in bridging information gaps among Health Care workers. This paper presents the end-line evaluation findings conducted in 2015 to measure the “reaction” and “learning” among the Nurse-Midwives who benefited from the Jibu mLearning project under Amref Health Africa Tanzania. The study used Kirkpatrick model for levels 1 and 2 that aimed at assessing the perception and degree of learning among Nurses at work and nurses in school who were using mLearning platform. The study used case and cross-sectional design with a mix of data collection methods such as self-administered interview, telephone interviews, and documentary review. The study sites included six regions namely Dar es Salaam, Kilimanjaro, Tanga, Mtwara, Mbeya and Dodoma. The regions and sites were selected based on geographical disparity and diversity of users. The units of inquiry comprised of 45 active users, 67 dormant users, nine training of Trainees (ToT), nine coordinators, 190 mentors, 45 tutors, 345 district nursing officers, nine school principals and, 9 IT officers. At the regional level, multi-stage random sampling was used to select districts, health facilities, and schools. The study contacted 428 trained users and who had registered in 21 sites in six regions of Mtwara, Dar es Salaam, Mbeya, Dodoma, Tanga, and Kilimanjaro. Out of the 428 users, there were 108 active users and 320 dormant users. There was a clear agreement that the program was relevant, useful, and it has made significant achievements. Most of the respondents figure out mlearning as a well-designed platform to facilitate easy access to learning materials, make learning and teaching more interesting, encourage more interaction in learning and enhance self-direct learning. mLearning platform for nurses in school and those out of school proved to be successful regarding increasing access to Sexual and reproductive health, and right information. However, limited ownership of mobile phones and capacity to use the existing platforms call for revamping the mhealth governance system in Tanzania.

Keywords: *mlearning, innovation, amref, kirkpatrick model, nurse midwives, sexual and reproductive health and rights.*

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I. INTRODUCTION

The growth of mobile health (mHealth) has triggered the utilization of mobile learning (mLearning) as a cost-effective tool to increase healthcare providers' access to medical information and resources, especially in resource-limited settings (Chang et al. 2011; Zolfo et al. 2010). There are serious challenges related to transfer of health-related information and training among African medical teams, and this has been associated with a suboptimal delivery of healthcare to a substantial portion of the world's population (Pakenham-Walsh et al. 2009). There is no doubt now that mobile devices and wireless networks allow resource-limited countries like Tanzania to implement capacity building programs by circumventing low bandwidth and substandard computer resources.

Human Resources for Health (HRH) is one of the most key components of any health system. Most countries like Tanzania suffer acute shortages, and the available health workers are not adequately utilized to provide quality health services. Though there have been significant efforts by the ministry of health and development partners as well as NGOs, yet utilization of health workers remain a critical challenge in serving special population groups.

Nurses and midwives provide the majority of primary care, maternal care, and emergency obstetric care in Tanzania. Nurses and midwives are considered an essential part of the healthcare workforce in sub-Saharan Africa; particularly for delivering health outcomes in rural settings. Enhancing the ability of nurses and midwives to deliver quality services to their clients remains a critical priority issue for governments and many stakeholders in the health sector. Nurses and midwives are required to be adequately prepared to deal with specific health care needs of their clients and adolescent in particular.

Health management systems have shown to improve the quality and efficiency of healthcare provision. Additionally, well designed Health Information System (HIS) allow nurses and midwives to work as knowledgeable workers. The knowledgeable worker role has been found to increase nurses' feelings of autonomy and accountability, which has a positive effect on job satisfaction. Selection of the appropriate

technology and thoughtful design is critical to the success of any implementation.

An emerging area of HIS is mobile health, or mHealth, which means the use of mobile technology, such as cellular phones, wireless devices, or radio frequency identification tags, for healthcare or health services. Precisely, m-Learning is learning through mobile devices such as smart phones etc, while eLearning is learning through electronic devices such as laptops etc.

In Tanzania, the adoption of m-health for nurses and midwives has been rare despite the fact that there are national guidelines and strategies to enforce it. The government has recently introduced m-health among the clinical officer cadre, and this is still under the pilot phase. The mLearning project, dubbed Jibu, implemented by Amref Health Africa Tanzania (May 2014-April 2015) aimed to provide nurses and midwives with access to sexual and reproductive health and rights information, through using their mobile phones. This paper aims to provide some perception of the users of the mhealth platform in Tanzania.

II. METHODOLOGY

a) Study Sites

This study took place in six project sites of Amref in the following regions: Dar es Salaam, Kilimanjaro, Tanga, Mtwara, Mbeya and Dodoma. The selection of these regions and study sites based on geographical disparity and diversity of users. The unit of inquiry comprised of active users, dormant users, Trainers of Trainees (ToTs), coordinators, mentors, tutors, district nursing officers, school principal, and IT officers. Also, the active and dormant users involved nursing students and nurses at work.

b) Study design and sampling procedure

The study used a case design. It also used Multi stage random sampling to select districts, health facilities and schools. We used Simple random sampling to select respondents from the list of active and dormant users of m-Learning. Researchers used Purposive sampling to obtain respondents (beneficiaries) from health facilities and nursing schools. The selection of two districts from each region based on geographical disparity i.e. one urban and one rural. We decided to include all health facilities from the selected districts. The study collected quantitative data from from project beneficiaries [both active and dormant users] of m-learning. The researchers administered Self-administered questionnaires to a total of 108 active users and 320 dormant users. The study interviewed a total of 21 key informants comprising m-learning coordinators, mentors, Information Technologist (IT), tutors, Training of Trainees, District Nursing Officer, and school Principals. Out of 21 informants 12 were female

and 8 were males. The study reached a total of 885 respondents.

c) Data Collection Process and Analysis

Data collection took place using open and closed ended questionnaires and interviews guide. The researcher designed a questionnaire to capture information regarding *reaction* and *learning* from m-Learning active and dormant users. Questions meant to capture respondent's general views and opinions about specific and general aspects of the project. Questionnaire/ Score-chats captured information regarding program impact/ outcome, achievements and effectiveness. Interview guide was developed to capture information regarding program impact, achievement, effectiveness, lessons learned, cost effectiveness and efficiency as well as recommendations. The researcher used interview guide to collect data from Trainers of Trainees (TOTs), Coordinators, Mentors, District Nursing Officers, school principals and IT officers. We also used Telephone interviews to respondents whom during data collection were not found in the study sites. The transcribing of Qualitative data took place in the field using framework analysis using Atlas.Ti version 7 computer software. We used SPSS software to analyze data from individual questionnaires.

III. FINDINGS AND DISCUSSION

a) Awareness creation and Ability to Own a Mobile Phone for learning

Awareness creation in learning has been instrumental to stimulate uptake of the platform among different users. Stakeholders including the District health managers as well as the users of the platform were well informed about the platform. The project team conducted introduction sessions as well as sensitization meetings with nurses on m-learning before embarking on the training program and use of the platform. The study involved stakeholders from Ministry of Health and regional as well as district level from the inception and during the implementation of the program. For example one of the District Nursing officers pointed out that *"I am very aware; I was involved since the baseline, introduction, content development, training, and making follow up. Moreover, I am using the platform to remind myself of important topics and during my work as a supervisor"*.

Participation to m-learning platform was determined by the ability to own a mobile phone. One of the determinants for owning mobile phone was income. In this evaluation- income was crossed with the type of a mobile phone owned by target group members for m-learning. As indicated in Table 1, most of the users with smart phone were those with less income and most of them were students. Most of the dormant users seemed to be willing and ready to use the platform but some were affected by several factors such as lack of mobile

phone, lack of appropriate mobile phones for program, not received the password, failures of some passwords and inadequate technical support. The readiness of the target group members to use the platform was supported by their experience in using other platforms for learning. Some of the platforms used by some of the target group members were: google, MEDSCAPE, youtube, Whatsapp, adobe reader and students' psychiatric dictionary, just to mention a few. In addition, regarding affordability, in this evaluation- income was crossed with the type of mobile phones owned by target group members for m-learning.

Evidence suggests that for the nurses who were using the platform, most of them had smart phones and some had normal phones that can access internet, and therefore appropriate to be used for m-learning. As one of the key factors, mobile phones owned by target

group members were crossed with ability of the phones to access internets. Also both active and dormant users had mobile phone that can access internets. In addition, dormant users were able to participate in the m-learning platform using their mobile phones. All active users had suitable phones and used them for m-learning platform. It was only few target group members who did not have mobile phones.

In the same analysis, the use of mobile phones for m-learning is determined by the ability to afford airtime that enables the internet facility to function. M-learning requires that the mobile phone is connected to the internet to facilitate installation of the software that supports the program. Internet subscription was afforded through different means. In addition, there was a strong ownership of the platform since majority of the users used to pay for internet airtime on their own.

Table 1: Relationship between income and type of the phone owned by target group for M-Learning

Dormant users						
Mobile Device Type	Monthly Income in TZS					Total
	Below 450,000/=	450,000 - 900,000	900,000 - 1,350,000	Above 1,350,000	No monthly income	
A Cell/Mobile Phone	30	24	11	1	88	154
Smart Phone	24	29	14	2	91	160
Total	54	53	25	3	181	314
Active Users						
A Cell/Mobile Phone	3	1	1	6	0	11
Smart Phone	16	15	4	62	0	97
Total	19	16	5	68	0	108

b) Suitability of the mobile phone on M-learning Platform

A suitable mobile phone for m-learning refers to the phones' ability to access internet. Such mobile phones can be a smart phone or other normal mobile phone. Most of the target group members had smart phone and some had basic phones that can access internet, and therefore appropriate to be used for m-learning. As one of the factors- mobile phones owned by target group members were crossed with the ability of the phone to access internets. Findings indicated that most of both active and dormant users had mobile phones that can access internets. This finding implies that most of the dormant users were able to participate in the m-learning platform using their mobile phones if motivated. All active users had suitable phones and they used them for m-learning platform. Six (6) target group members did not have mobile phones. Table 2 shows the number of both active and dormant users who owned mobile phones and their ability to access internet.

Table 2: Owned mobile phones and ability to access internet

Aspect	Mobile device with ability to access internet			
	Dormant Users		Active Users	
	Yes	No	Yes	No
Owned Mobile Phones	213	98	108	0
Total	213	98	108	0

c) Affordability of Airtime for M-learning

The use of mobile phone for m-learning is determined by the respondents' ability to afford airtime that enables the internet facility to function. M-learning requires that the mobile phone is connected to the internet to facilitate installation of the software that supports the program. For instance for active users 76% of respondents said that in average they spend less than Tanzanian Shillings (Tshs) 25,000/= for internet subscription per month. This was lower than the 24% spent between Tshs 25,000/= to 50,000/=. None of the respondents was able to spend above Tshs 50,000/=. For dormant users, 83% of respondents were able to spend below Tshs 25,000 for internet subscription per

month, and 13 percent were able to spend between Tshs 25,000/= and 50,000/=. Only 4% of dormant users were able to spend above Tsh. 50,000 for internet subscriptions. Respondents were asked who pays for their internet subscription. Results show that 94.4% of active users and 88.5% of dormant users consulted during this evaluation- purchase airtime on their own. About 3.7% active users and 7.7% dormant users get airtime through friends and relative support while 1.9% active users and 3.8% dormant users got through other means.

d) *Reaction of Active Users of M-learning*

Active users of m-learning platform were trained and registered for the program. Findings show that in health facilities where active users were found- training was conducted at different times. It also appeared that training was conducted in different batches. In the first batch, respondents were trained in all sampled health facilities with active users except for Machame nursing school. Participants at Machame nursing school were only trained in the second batch. This reflected the statement from the coordinator who pointed out that the training was only conducted in the last one month of semester and that most of the students were yet to receive their log-in and password.

The study also revealed that some health facilities with active users received training more than once while some received training only once. The facilities that received training only once were Ligula, Machame, Mawenzi, Mbalizi, Mkomaindo, and Pasua. All other facilities with active users received training more than once. It is important to note that as indicated in Figure 1, active users were only found in 17 out of 22 visited health facilities. In some facilities, respondents were not able to recall when the m-Learning training was provided to them.

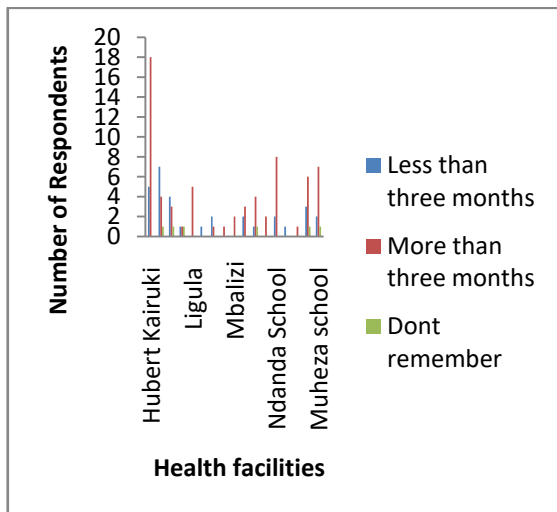


Figure 1: The Period and the Number of Times for the Training

e) *Registration to mLearning platform*

As indicated in the previous section, registration to m-learning was a process. It began during the training where a list of participants' names including their mobile numbers were written down and taken over by AMREF project manager. Thereafter usernames and passwords were sent back to participants through their mobile phone. Regarding active users, findings indicate that the registration process was well done as respondents were successfully registered immediately after the training. As indicated in Figure 2, the number of active users covered in a period more than three months is very much closer to the number of users who began to use m-learning platform in more than three months period. The number of active users who have been using m-learning platform in more than three months was about 40 respondents out of 108. The number seemed to grow up to more than 50 after training in a period less than three months. This is an indication of a successful registration process to some of the trained target group and program as a whole.

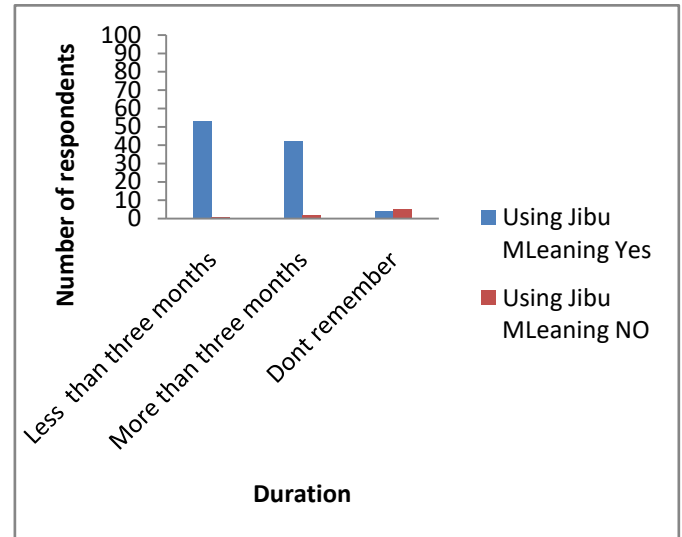


Figure 2: Period in which Participants have been using the M-learning Platform

f) *The use of other Applications for Learning*

It was also interesting to know the type of mobile applications used by active users. Findings indicated that different active users have used different mobile applications for learning. However, the mostly used applications were Google (40%) follow by MEDSCAPE. Figure 3 shows a variety of other applications that were used by active users. This shows that some of the active users were already interested in using mobile application for learning.

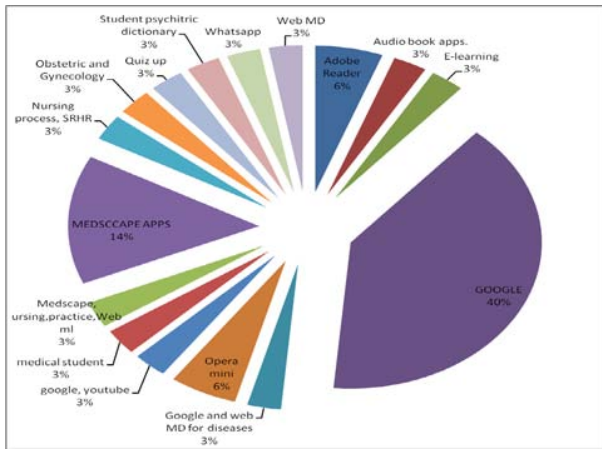


Figure 3: Other Mobile Application used by some of the Active Users

g) Effectiveness of the M-learning Platform to the users

The methodology used in m-learning, reliability and the quality of the materials were considered as factors that were likely to influence the use of m-learning platform. A number of aspects were evaluated to determine effectiveness of m-learning platform. Respondents were asked to rate the aspects on the basis of: strongly disagree, disagree, no opinion, agree and strongly agree. The m-learning platform was evaluated in terms of: the extent to which target group members considered platform adds value to their learning; reliability, provide effective learning aid, considered as effective method for personalized learning, perceived as convenient, supplementary to what they used to get in their courses, provided access to practical medical skills, and provided access to medical guidelines. Findings in Figure 5 indicate that a large percent of respondents “agreed” that the platform managed to create effective learning for the few users. However, many people were trained to use the application but only few were using. The major factor limiting the use of m-learning was unsuitable phones and limited internet connectivity. “The benefits might not match because there are few users. For example, there was a class of many students we taught m-learning, but only three students had Smartphone, while the others liked the program but did not have the Smartphone” said one tutor.

The program was utilized by active members to access the modules provided through mLearning platform. Some of the modules accessed were mentioned to have been accessed by target group members were: Health Services Management, Pharmacology, Nursing Process, Research, SRHR and Peer learning. The modules were accessed on daily, weekly and monthly basis. The stakeholders had conflicting views about the achievement of the m-learning. Some had views that it is too soon to notice program achievements and others had opinions that the

program had already yielded some results. Some of the achievements mentioned by the stakeholders included improvement of skills and knowledge among users, simplification of accessibility to learning and teaching materials and timely support obtained through charting platform. One tutor pointed out that “it has improved knowledge and skills of nurses, especially students have been happy with the program. Also those who are studying through e-learning have made efforts to get Smartphone, and can access the contents of m-learning”.

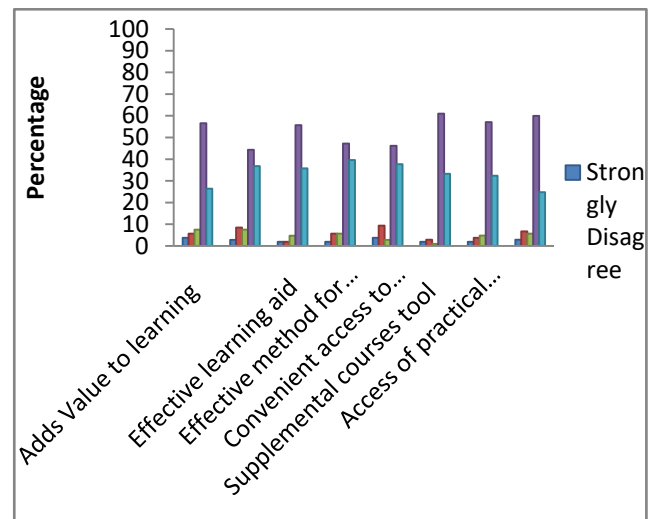


Figure 4: Effectiveness of the M-Learning Platform to the Target Group

h) Efficiency of the M-learning Platform to the Target Group

The efficiency of the platform was evaluated by asking respondents a number of aspects regarding the platform. The aspects included: logic organization of the models and modules contents, easy to work with, provide quick access to information, easy to remember, easy to read on the phone, and if the screen have right amount of the information. Respondents were required to provide their responses in terms of: “strongly agree”, “agree”, “no opinion”, “disagree”, and “strongly disagree”. All aspects received all these responses at different levels. The larger percent of active users “agreed” and “strongly agreed” that the m-learning platform was an efficient tool for learning. They appeared to be satisfied that the platform was efficiently designed to enable the users to easily use it. Only small percent of active users had “no opinion” about the efficiency of the platform. Also another small percent disagree and strongly disagree that the platform was efficiently designed. Figure 6 indicates the percent of active users’ views in all the aspects used to evaluate efficient.

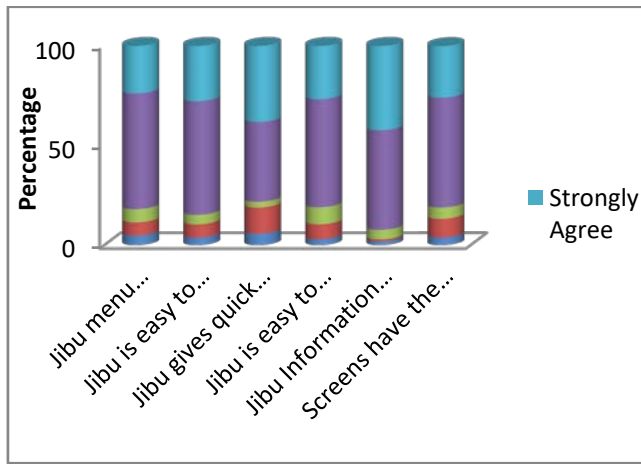


Figure 5: Active Users View on Efficient of the M-learning Platform

i) *Effect of M-learning on Knowledge and Skills on Active users of platform*

A set of five practical questions were designed to test knowledge and skills of active users on materials (aspects) covered through m-learning platform. These questions were placed in the last part of the questionnaire and were administered in the form of a quiz. The quiz was later marked and the score placed in each of the respondents' paper. It is important to notice that the quiz was provided in the form of surprising test and that respondents did not have time for preparation. Findings show that 76% of active users scored between 3 and 4 marks- which in this evaluation was labeled as "good" and 17% of active users scored all 5 marks- which was labeled as very good. Only 7% scored between 1 and 2 marks which was labeled 'fair'. The asked questions required that respondents had updated knowledge and skills on how to perform some nursing practices. This evaluation indicates that active users [nurses and students] have update knowledge and skills on nursing practices which is an indication of having access to updated learning materials provided through mLearning platform. There is some evidence and perspective that the program has had effect to learning among nursing professionals. The knowledge and skills test conducted to active users showed that most nurses at work and students have good knowledge and skills in nursing. About 76% of the active users were able to score 3-4 marks out 5 questions designed to test knowledge and skills. Another 17% were able to score 5 out of 5 questions which were very good.

Knowledge and skills test results support some of the perspectives given by stakeholders on the effect of the program to nurses and students. Some of the achievement with the program included: increasing knowledge and skills to both nurses and students; Because of expertise in mortality- have been reduced; has increased the number of nurses graduating from their program- as the number of failures has been

reduced; and students performance has improved. In general most of stakeholders think m-learning program has made significant achievements to nurses at work and students. They also think that the program can have more positive effective to nurses and students if some of the challenges will be addressed and suggestions for improvement will be put into practice.

j) *Reaction and Experience of mlearning Dormant Users*

Questionnaire was administered to a total of 320 dormant users from health facilities in the six sampled regions to evaluate their reaction and experiences on m-learning platform. The respondents were both nurses at work and nursing students. The aggregate was that: 43 % were not in services [mostly students]; 19% had 1-2 years' experience at work; 13% had 3-4 years at work; and 25% had above 4 years at work. All dormant users were trained and registered to M-learning platform. There have been variations on their experiences with m-learning. Some of the dormant users seemed to have used m-learning for a short time and others did not use at all. For instance 91% said they have never used m-learning while 9% said they used for a while. Those who have used for a while- seemed to have used at varied timeframe. Of the 9% - 19 respondents said they used in a period of less than three months; 5 in the period more than three months and 5 could not remember when they stopped using the platform(see Figure 8).

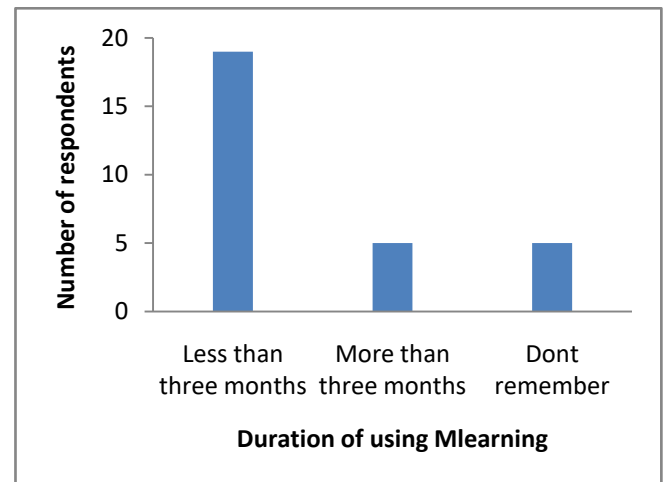


Figure 6: dormant users who have used m-learning in Different times

k) *Reasons for Not Using the platform or Stop Using m-learning Platform*

Respondents were asked as to why they were not using the platform or stopped using the m-learning platform. Figure 7 indicates percentage of such factors in undermining utilization of the m-learning platform. In order to identify some of the factors that negatively influenced the use of m-learning platform. The responses were categorized into: lost my mobile phone,

my phone has no ability to install the program software, do not have a mobile phone, inability of password to log in, did not receive password and lack of technical support. Findings indicated that most of respondents did not have mobile phones with the ability to install m-learning software. Only very few failed to use due to lack of technical support.

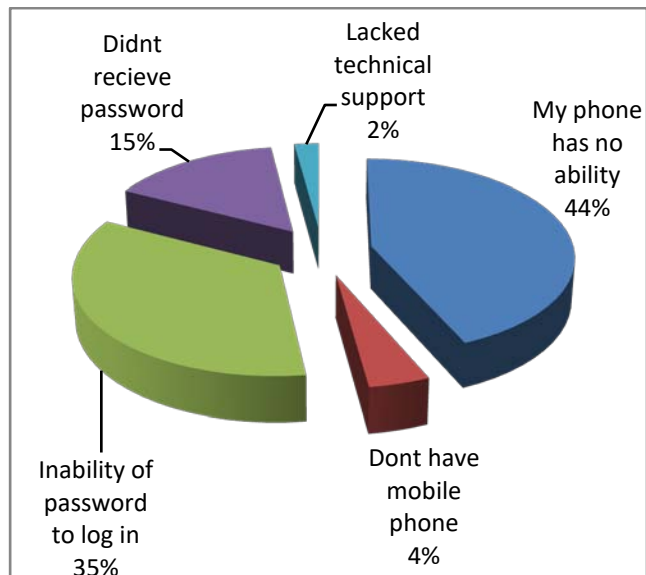


Figure 7: Factors influencing Dormant Users not to use m-learning Platform

IV. CONCLUSION

The uptake and scale up of mlearning tools has been taking place slowly in Tanzania. In the mLearning project funded by Amref Tanzania, there were notable achievements on the areas of awareness creations, motivation to users to buy and use the application as well as Increasing knowledge and skills of users. However, the use of the platform has been limited by less income of target group to own a mobile phone with high capacity, lack of support when needed and ability to buy internet bundles. This calls for the government and development patners to support the sustainability of projects of similar nature.

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