CASE REPORT

The Role of Mobile Learning in Supporting Community Health Workers' Continuous Learning: A Case of Village Health Teams in Patongo and Lokule Sub Counties-Uganda

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ABSTRACT
The study assesses the role of Mobile learning in supporting Community Health Workers' continuous learning using a Smartphone application. The Community Health Workers are members of the community commonly known as Village Health Teams in Uganda. This group is presumed not be a priority for training. The aim is to objectify using Mobile learning affordances to support Community Health Workers' training, an activity presently considered to be irregular and underfunded. This is achieved through the implementation of a Mobile App prototype used as a learning tool for digitized training content on the subject of diseases, reproductive health, sanitation, and family wellbeing. The study involved 41 participants categorized as Community Health Workers, community health students, and Community Health Leaders who selectively participated in piloting the mobile application, responded of a survey questionnaire, took an interview and attended a feedback session. The study examined the availability of Smartphone devices, ease of Mobile App use, challenges of the existing approach to training and information delivery, Mobile Application accessibility issues, and anticipated technical challenges. Despite the conspicuous challenges of mobile technology in a rural setting, 97% of the participants indicated that Mobile learning is a favorable alternative to support the training of Community Health Workers, though, only 48% had access to a Smartphone. Attrition of volunteer workers was identified as the primary challenge to the training of Community Health Workers. The identified advantages relate to geographic convenience, cost of training, numerous mobile services, ease of access, update, storage, and sharing of content. However, imminent bottlenecks identified include the availability of Smartphone devices among Community Health Workers, lack of electricity, unreliable networks, and lack of internet data. Notable interventions from stakeholders aiming to mitigate the challenges are highlighted.

Keywords: Mobile Learning, continuous learning, Community of Practice

1. Introduction

By the year 2012, the health sector in Uganda had encountered numerous mobile pilot interventions (Mobile Health- mHealth) aimed at improving access to health information through basic phone short messaging. The interventions from varying providers became excessive and did not scale[1]. The challenges were related to repetition, cost, and the iterative process involved before an innovation is fully operational[2]. Telecom company controlled the flow of health content via basic cellular phones. At that time, over 50 mHealth projects were piloting mobile messaging interventions before a moratorium was imposed by the government of Uganda to streamline mHealth services in Uganda[3]. According to the Uganda Bureau of Statistics, the population of Uganda stands at 43 million with a growth rate estimated at 3 percent, the doctor-to-patient ratio stands at 1:11,000, and the nurse and midwife ratio is 1:1000[4,5,6]. There is a cumulative deficit of human resource personnel in the health sector which brings us to the attention of the Community Health Workers (CHWs) known as Village Health Teams (VHTs) in Uganda. They are community members and volunteers supporting the health system, especially in the communities. The majority (75 percent) of Uganda's population lives in rural communities[7]. The role of CHWs in rural communities is vital. They are the main link to the health services system in Uganda. As a result, the attrition rate of VHTs is expected to be high which trend affects the skilling and reskilling of VHTs. These compound challenges informed the study to objectify the use of a Smartphone application to support the skilling and continuous learning of CHWs. The study used a mobile application prototype to pilot the study intervention. The term Mobile learning is interchangeably used to refer to the flexibility of learners and the movability of a device used to facilitate learning. In this article, Mobile learning is used to refer to both flexibility and movability facets.

2. Literature Review

MOBILE LEARNING IN HEALTH SERVICES

Mobile learning is a form of learning that affords liberty to learners to access learning objects from almost anywhere and anytime. This is possible because of the availability of mobile technologies and the Internet[8]. Whereas early mHealth applications focused on the use of short text message services, Smartphone applications are used extensively to include applications used to assist Health Care Professionals (HCPs) in health record maintenance and access, communications and consulting, reference and information gathering, and medical continuing education and training[9,10]. In a study, 'It's on My iPhone', results indicate that student- 55 percent, and residents-95 percent having access to a mobile computing device had a positive educational effect associated with having rapid access to resources required for learning or clinical care procedures[11]. However, the positive results of Mobile learning in the health sector do not explicitly show CHWs to be benefiting from Mobile learning in Uganda despite technology for development being a central pillar in National Development Plan-NDPIII[12]. Equally, the Uganda eHealth strategy highlights technology skills development and training as parts of the strategy implementation but does not practically indicate CHWs as direct beneficiaries[13].

Figure 1 below indicates that CHWs in Low and Middle-Income Countries (LMICs) are not utilizing mobile technologies to benefit from continuous learning. The study acknowledges that the presence of many mobile-driven platforms disregards the inclusion of the Community Health Worker (CHW) training component in software applications[14]. Apart from the activities visible in the 2x2 dimension, that is mental health and child health (x-axis) at the workplace and on-the-job aid (y-axis), there are sparse activities linked to Mobile learning and CHW's onboarding and in-service continuous training.

CONTINUOUS TRAINING AND HIGH PERFORMANCE IN HEALTH SERVICES

The Institute of Medicine (IOM) defines quality in healthcare as the degree to which health services for individuals and populations increase the likelihood of desired health outcomes and are consistent with current professional knowledge[15]. Continuous access to knowledge and skills is associated with a high performance of CHWs. In a study 'Performance of community health workers and associated factors in a rural community in Uganda', the researcher asserts that there is a statistically significant relationship between CHWs having attended additional refresher training and high performance[16]. An assessment of health worker performance in the management of children with acute respiratory infections in Nigeria found many of the underperforming health workers had not attended a continuing education program in the previous two years. The study underpins the importance of continuous learning to be as significant as original training[17]. In a controlled study in Uganda, high performance was registered from the majority of CHW participants (292, 98 percent) after going through a series of refresher training that included diagnosis, record keeping, and referral of sick children[18].

Figure 1: Evidence on the use of mobile technology to support the training of CHWs in LMICs[14]
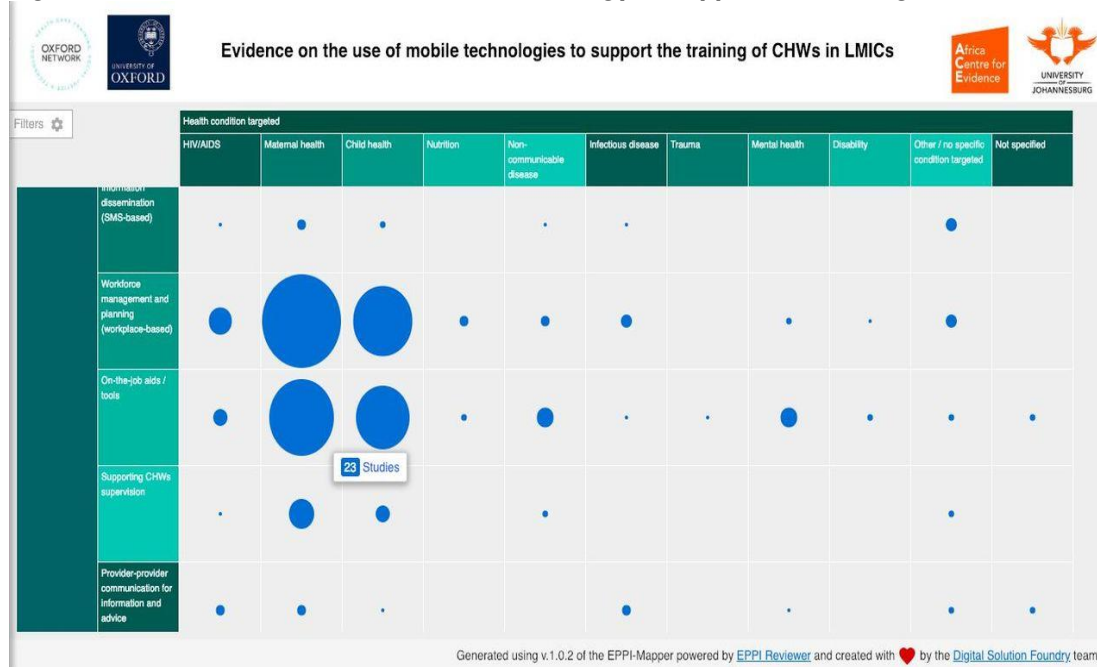
An extraction from a cited article

MOBILE TECHNOLOGY DEVICES AND THE INFRASTRUCTURE IN UGANDA

The Uganda mobile broadband network[1] predominantly third-generation (3G), covers 135 districts. The 4G network is mostly found within urban locations and the 5G network is undergoing tests in Kampala city. The majority of the Ugandan population is presumed to stay in rural areas and only 10 million out of 43 million people stay in urban locations[4]. According to the National Information Technology Authority, 15 percent of the surveyed population in the year 2018, owned a Smartphone[19]. In 2019, the Research ICT-Africa noted in a policy paper that Uganda had a huge urban-rural gap in Internet use of 70 percent, where only 9 percent of Ugandans living in rural areas had access to the Internet[20]. Since then, there has been some transformation in the internet penetration trends. The 3Q21 report[2] from the Uganda Communication Commission (UCC) shows that the penetration rate of fixed and cellular subscriptions is 69 percent, which means that 7 in 10 Ugandans, regardless of age, own a mobile phone of which 85 percent of the new telephone subscriptions were data-enabled[21]. The internet subscription leap is attributed to the demand for mobile devices and data consumption due to prominence in supporting education services during the COVID-19 pandemic lockdown[22]. The 3Q21 report from UCC estimates Smartphone devices to be contributing 9.4 million of the total telephone connection in Uganda. The commission (UCC) has also championed the distribution of 1,400 solar power and tablet devices to rural dwellers as proof of ICT for the development concept[23]. However, there is no reliable record to suggest the availability of data and Smartphones in the rural communities where CHWs are predominately located.

3. Research Methods

The study used a mixed-method approach to inform data collection and analysis. The study aimed at objectifying the concept of utilizing mobile learning to support the training of CHWs by responding to a general question; how can Mobile learning technology on a Smartphone device support the continuous training of CHWs? A mobile application prototype code-named DigiCHealth was deployed on the smartphone devices of the study participants. After 2 weeks of mobile App use, the participants responded to a Google Form questionnaire embedded in the mobile application and later gathered to give oral feedback.

The participants were selected using purposive sampling that considered all available but limited CHWs in the category of VHTs to be relevant to the study. A semi-structured questionnaire was used to collect both structured and unstructured responses from participants. Data was collected using a Google form integrated with the study Mobile App and hard copy forms were provided to participants without Smartphones. Data entries were processed using Excel and the Statistical Package for the

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[1] MTN telecom Uganda: Coverage Map

[2] 3Q21-3rd Quarter of the year 2021 Report

Social Sciences (SPSS). Secondary data was used to justify the study and to describe the primary data.

The study examined five (5) variables including the availability of Smartphone devices, ease of Mobile App use, challenges of the existing approach to information delivery and training, App accessibility issues, and anticipated technical challenges. The study focused on a smaller scope with 22 VHTs from the district of Agago (Patongo, and Lukole sub-counties). The other category of participants was 17 community health students from the Kampala School of Paramedicals in Kayunga district. Key informants were 2 Community Health Leaders (CHLs) from the Agago district and Health Implementing Partner (HIP) Marie Stopes-Uganda. The total number of study participants was 41.

4. The Mobile App Concept

The Mobile App runs on the Android operating system which is predominantly used in Uganda. The Mobile App concept in Figure 2 looks at the elements intended to enhance the Mobile learning user experience while the prototype image in Figure 3 explores the user interface.

a) **Community of Practice:** The cohesion of groups of people intentionally participating in collective and collaborated learning in a shared domain of human endeavor[24].

b) **Skills and Scenario-based simulations:** As tools intended to influence the learning process to nurture procedural skills, team-based context, or responding to a crisis[25].

c) **Sharable Content:** The intention is to engage users by creating content that generates user-initiated sharing on social networks[26].

d) **Diverse languages:** In a learner-centered approach to formal or informal learning, literacy and learning in the local language become a strategic component of the development plan[27].

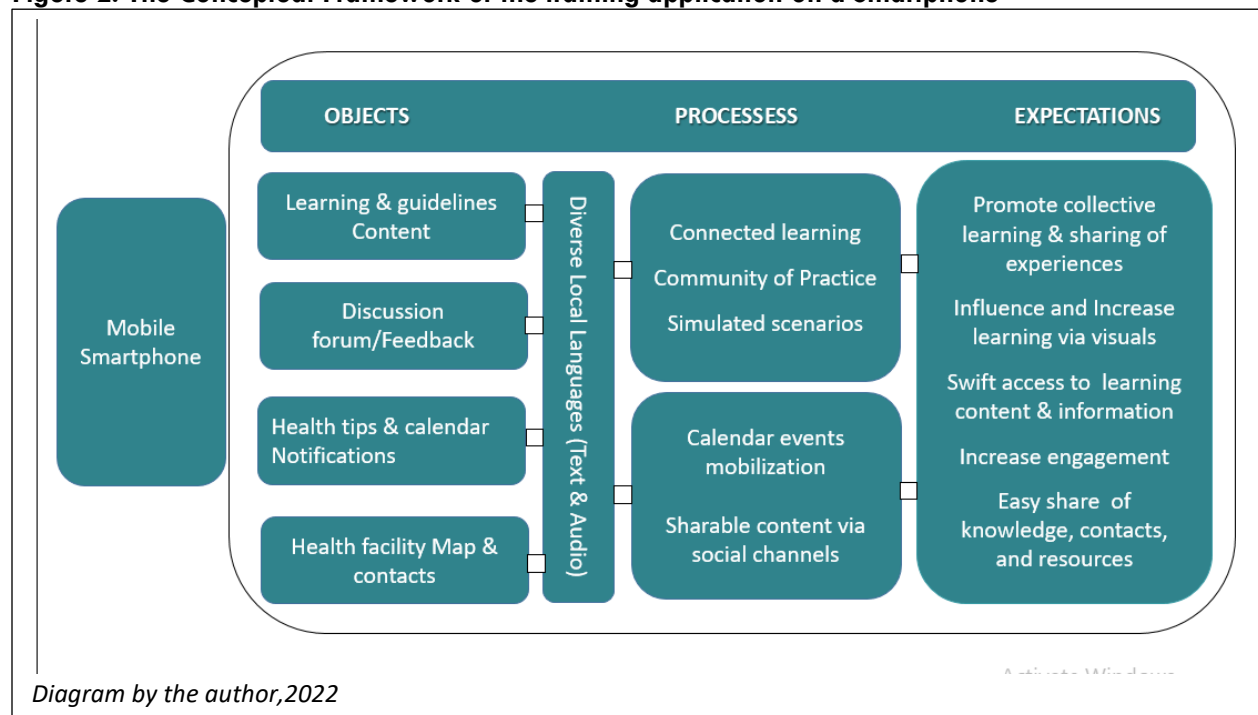**Figure 2: The Conceptual Framework of the training application on a Smartphone**

Diagram by the author,2022

Figure 3: The mobile App Prototype Graphical User Interface (GUI)

Screenshots by the author,2022

5. Results

5.1 FINDINGS FROM COMMUNITY HEALTH WORKERS AND COMMUNITY HEALTH STUDENTS

The study engaged 39 CHWs (VHTs) and community health students as indicated in Figure 4.

5.1.1 The availability of Smartphone devices

As indicated in Figure 4, out of 39 participants, VHTs (36 percent) had access to or owned a smartphone. Students (58 percent) had access to or owned a smartphone. Also, data from the survey indicates that female participants (57.1 percent) did not own a smartphone while male participants (42.9 percent) had no access to or owned a smartphone.

Figure 4: The availability of smartphones among VHTs and students
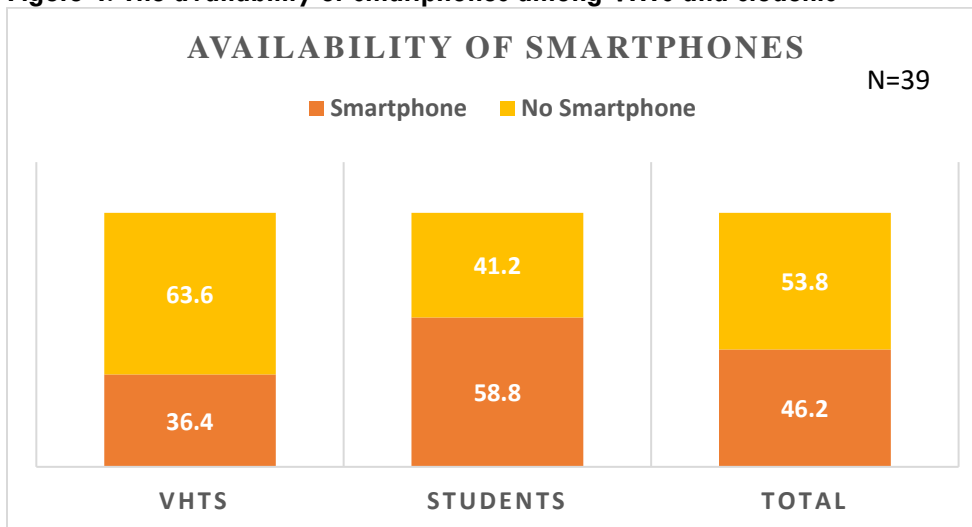
5.1.2 The need for the Mobile App, ease of use, and navigation

The majority of participants 100 percent (VHTs) and 93.8 percent (Students) indicated that a mobile application is needed and useful to support the training of CHWs. However, 6.2 percent of students disagree that the App would not be useful because some VHTs and students do not own smartphone devices.

VHT participants indicated that the Mobile App is favorable because software content is preserved better, access to information is easy and available anytime since we move with our phones, the information in the App is easier to follow during training, taking notes is safer, and easy to access, information can be easily updated and published, the App can be used as a tool for collecting data from the community, saves time transporting people for training, the easiest way to sensitize community members and technical terms can be searched and meaning acquired right away.

5.1.3 Challenges of the existing approach to training delivery

In Figure 5, a portion of the VHT participants (30 percent) agree that the paper used in training is vulnerable to wear and tear in the village environment. Participants (29.2 percent) admit that it is not easy for all to return to training with previous training scripts without defects. They attribute paper damage to improper storage, children, termites, and the need for lighting fires. Also, participants (25 percent) assert that sharing limited scripts during training is a challenge. Some participants (16 percent) indicate that the content on paper is not easily updateable, therefore, it is unlikely that they can receive updates in real-time about new procedures required to manage a situation such as the COVID-19 pandemic. VHTs indicated that they receive training but not regularly and the times they get to train, they are expected to learn too much information in a short period.

Figure 5: Challenges to be addressed with a mobile application
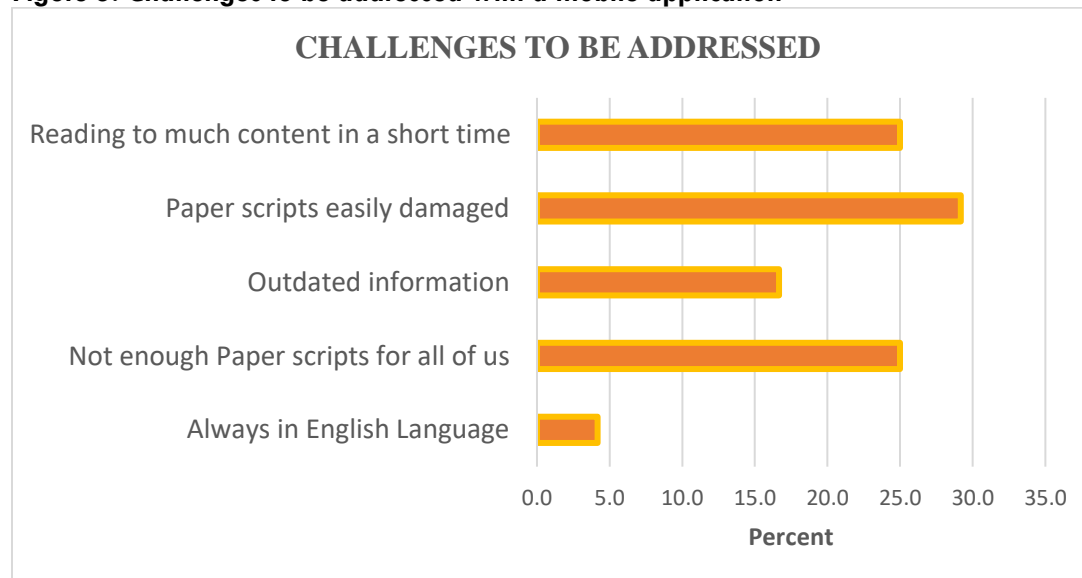
The attrition rate of VHTs is high. According to the study data, the attrition rate of VHTs shows a mean of 3.33, with a standard deviation of 1.404 years. Also, the data indicate that VHT volunteers are active at the age range of 25-34 (66.7 percent, n=16). In addition, VHT participants (45.9 percent) were serving in the 4th or 5th year. The results point to attrition of over 50 percent between 1 and 3 years. Other challenges pointed out include, the training funding gap, and the mobility of VHTs.

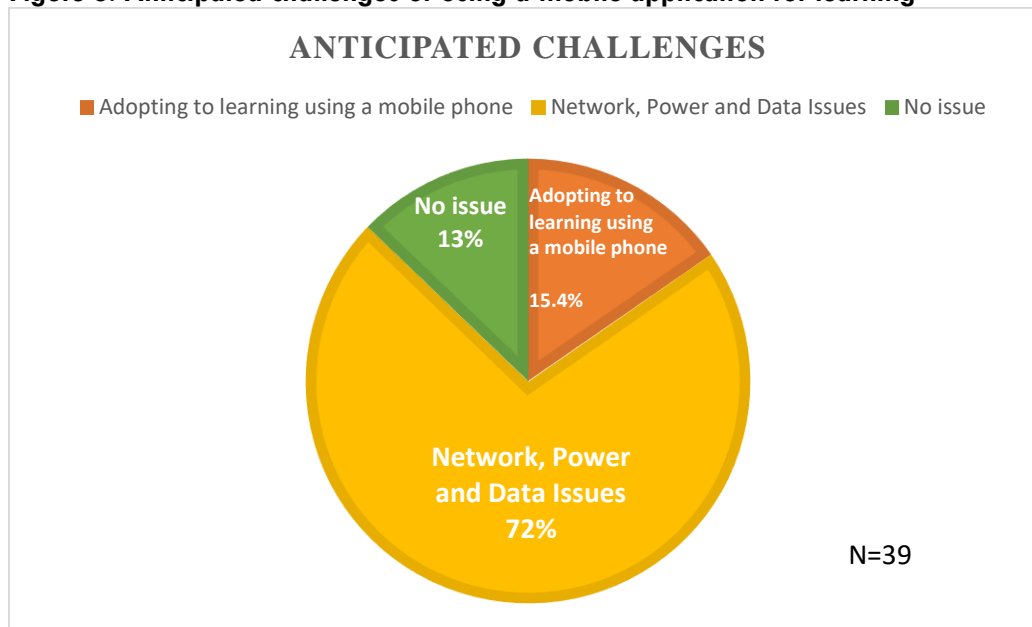### 5.1.4 Accessibility and Features of the Mobile App

The participants, VHTs, and Students (60 percent) point to the use of one language as a hindrance. VHTs contend that scientific health-related terms and phrases need to be in the language they understand to easily explain to the community members. Other accessibility features suggested by the participants include a dictionary of terms to ease interpretation of strong words, descriptive images that paint and relate scenarios to ease understanding of situations, community members' communication links, and product illustrations on family planning commodities.

5.1.5 The anticipated technical challenges

As shown in Figure 6, participants VHTs and Students (71.8 percent) indicate that the expected challenges are related to the mobile network, irregular electricity to charge devices and internet data. Internet data is mentioned to be costly for both VHTs and students. Some participants (15.4 percent) expect to have adoption to mobile devices challenge as a tool for learning. A portion of participants (12.8 percent) do not expect to have issues resulting from using a Mobile App for learning.

Figure 6: Anticipated challenges of using a mobile application for learning

ANTICIPATED CHALLENGES

■ Adopting to learning using a mobile phone ■ Network, Power and Data Issues ■ No issue

No issue 13%

Adopting to learning using a mobile phone 15.4%

Network, Power and Data Issues 72%

N=39

5.2 FINDINGS FROM THE COMMUNITY HEALTH LEADERS (CHLS)

The discussion with the community health leaders was guided by the 5 variables used in the study.

5.2.1 Availability of Smartphone devices among participants

CHLs agree that Smartphone devices are scarce among rural dwellers. However, CHL-1 indicated the need for services delivered on Smartphones such as data collection and reporting, Health Implementing partners (HIPs) have started providing Smartphones to CHWs.

"Recently HIP provided 90 Smartphone devices to CHWs in the Northern region of Uganda. This is intended to facilitate them with tools that can enable them to give us timely reports but also to easily collect data which we do regularly. The same devices can be used as training tools." CHL-1.

CHLs asserts that if a CHW is provided with a Smartphone device it is possible to push content from a centralized point to affect all parties. CHL-1 and CHL-2 acknowledge the task cannot be accomplished by one or two implementing partners but rather by all stakeholders including the government of Uganda.

5.2.2 The need, ease of use, and navigation of the Mobile App

CHL stated that service delivery improvements such as Mobile learning using a Smartphone are very welcome because they work with limited funding and personnel.

"I asked some VHTs in a training workshop to use the App to access the content on family planning training and they did not find any difficulty accessing the text. For those without Smartphones, we gave them hard copies. It will be good if all hard these devices." CHL-2.

5.2.3 Challenges of the existing approach to training delivery

CHLs agree that VHTs are volunteer workers whose role is to support the health system in their communities. The attrition rate of VHTs is expected to be high.

"They choose to go whenever they have to do so and they do not need to make an official explanation. We hold no leverage to keep them working for community health apart from their conviction to serve the community." CHL-2.

5.2.4 Accessibility Issues of the Mobile Application

CHLs agree that language should not be limited to English. The argument advanced is that the required education level of a VHT is Ordinary Level education but in rural, VHTs still struggle to comprehend English terms and have limited exposure to knowledge. The local language is seen as a remedy aimed at improving accessibility.

5.2.5 Technical challenges anticipated from using a Mobile Application.

CHLs emphasize what VHTs and students anticipate as challenges. Electricity and network coverage are

deemed a major hindrance to using electronics in rural areas.

6. Discussion

Mobile technologies are steadily gaining ground in Uganda with the acceptance that they are part of daily life. This fact is held by all stakeholders including CHWs and students in rural and urban settings. They serve as financial transfer units, communication, collaboration, entertainment, and learning. Despite their versatility, the study's findings clearly show that mobile devices are only dominant in data collection among CHWs and no activity is related to education and training support. In this discussion, the term Mobile learning is used to refer to the mobility of learners and learning and the portability of a device used to facilitate learning[28]. The factors this study identifies as hindrances to utilizing Mobile learning to support CHW-VHTs training include the absence of active policies to guide the implementation and facilitation of Mobile learning, low availability of Smartphone devices among CHWs and community health students especially female participants, lack of awareness about Mobile learning affordances, the lack of mobile-driven content for training, and the absence of emphasis on reskilling CHWs using alternative avenues. Even then, CHWs and community health students exhibit a clear understanding of the existing challenges of accessing training and the role Mobile learning plays in mitigating the challenges. Notably, the CHW-VHTs group of health support is non-waged, non-salaried, and seldom facilitated financially to carry out their duties to the communities[29].

The outstanding issues coming out of this study are related to the attrition rate of VHTs in Uganda. They are non-salaried workers whose participation in community service is voluntary, making their retention difficult[30]. The study findings indicate an attrition rate of 50 percent between the 1-3 years which presents a training challenge. Our findings indicate that half of the VHT team would be replaced and trained every 3 years. This presents not only a services gap but also a funding challenge to periodically facilitate the recruitment, training, and retention of CHWs-VHTs[31]. Equally, in-service training is inconsistently provided and not program-based but rather specific campaigns from health implementing partners[32]. VHTs are not only poorly facilitated to take on community service tasks but also insufficiently trained to execute their duties. With the funding gaps between the government of Uganda and the health implementing partners, community health personnel replacement and training do not happen quickly hence community

health service is affected. The use of low-cost mobile technologies[33] such as DigiCHealth is intended to mitigate the existing training challenges by fostering continuity of learning and effortlessly onboarding new VHTs.

Unexpectedly, the lack of digital competencies in using a Smartphone did not feature among the pressing issues for CHWs and students. Smartphone training is associated with rapid access to medical support resources and tools[34]. However, the low availability of Smartphone devices among CHWs and Community Health students is attributed to the cost of acquiring and maintaining a Smartphone in a rural environment. Notably, female participants (57%) were the majority of participants without access to a Smartphone. The World Health Organization indicates 67% involvement of women in health social care including CHW[35]. Whereas this study did not clear gender stratification statistics on CHWs, a recent case study in Wakiso district indicated 75% participation of female CHWs[36.] which justifies the need to support female CHWs to easily access Smartphone devices for community health support and learning.

Globally, training is omitted in the digitization of community health services as indicated in the literature. The dominant drive for community health service digitization includes diagnosis, data collection, and reporting. The same trend is seen in Uganda citing a recent case study that looked at digitizing a Village Health Team[37] where training does not feature among the aims of the pilot. It is worth noting that training is central to CHW's performance[38] and Mobile learning makes the process less challenging. Training should not be excluded in the process of digitization of community health services. The caution is to consolidate efforts of stakeholders to drive the community health digital interventions as a consortium as opposed to disintegrated efforts aiming for similar outputs. This is to avert the early days of the Mobile Health Services (mHealth) pitfall which resulted in a moratorium imposed by the government of Uganda.

7. Conclusion

This study was conducted to highlight the role of Mobile learning in supporting CHW's continuity of in-service learning. Mobile learning serves as a suitable, cost-effective intervention for skilling and reskilling CHW volunteers without altering their work schedules. The approach allows the CHWs to access regular training with updated content, provides mechanisms for CHWs to collaborate and share experiences, reduces the long movement of CHWs to attend physical training, and averts the

challenge of paper damage in a rural setting of Uganda. What is reechoing is the omission of Mobile learning in the digitation processes of community health services as an alternative avenue to supporting CHWs training. This requires attention from all stakeholders.

Whereas the benefits of Mobile learning are tangible they are not without challenges. The major issues are related to the availability of smartphone devices, mobile networks, power supply, and internet data. It is worth noting the strides made in improving Uganda's digital infrastructure including the restoration of the Mpoma Earth-Ground station. All CHWs should have a Smartphone device and be supported to maintain it while executing CHW duties.

8. References

1. McCann D. A ugandan mhealth moratorium is a good thing. ICTworks. November 3, 2023. Accessed December 19, 2023. https://www.ictworks.org/ugandan-mhealth-moratorium-good-thing/.

2. Manglani Y. MHealth for maternal health: Mhealth pilotitis – time for recovery or relapse? Maternal Health Task Force. August 10, 2016. Accessed December 19, 2022. https://www.mhtf.org/2014/03/31/mhealth-for-maternal-health-mhealth-pilotitis-time-for-recovery-or-relapse/.

3. Huang F, Blaschke S, Lucas H. Beyond pilotitis: Taking Digital Health Interventions to the national level in China and Uganda. Globalization and Health. 2017;13(1). doi:10.1186/s12992-017-0275-z

4. Uganda Bureau of Statistics. Uganda Bureau of Statistics. December 18, 2023. Accessed December 19, 2023. https://www.ubos.org/.

5. Achest. Hospitals in crisis in Uganda as Middle Eastern countries poach medical staff. Africa Health. September 26, 2017. Accessed December 19, 2023. https://africa-health.com/news/hospitals-crisis-uganda-middle-eastern-countries-poach-medical-staff/.

6. The World Bank. Nurses and midwives (per 1,000 people) - Uganda. World Bank Open Data. Accessed December 19, 2023. https://data.worldbank.org/indicator/SH.MED.NUMW.P3?locations=UG.

7. Ministry of Finance and Economic Development. Rural Development | Development policy and performance portal. Ministry of Finance and Economic Development. Accessed July 8, 2022. https://development.finance.go.ug/rural-development.

8. Ozdamli F, Cavus N. Basic elements and characteristics of Mobile Learning. Procedia - Social and Behavioral Sciences. 2011;28:937-942. doi:10.1016/j.sbspro.2011.11.173

9. Wilson K. Mobile cell phone technology puts the future of health care in our hands. Canadian Medical Association Journal. 2018;190(13):1-2. doi:10.1503/cmaj.180269

10. Ventola CL. Mobile devices and apps for health care professionals: uses and benefits. *P T*. 2014;39(5):356-364. May 2014. Accessed December 20, 2023. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4029126/.

11. Wallace S, Clark M, White J. "it's on my iphone": Attitudes to the use of mobile computing devices in medical education, a mixed-methods study. BMJ Open. January 1, 2012. Accessed December 20, 2023.

https://doi.org/10.1136/bmjopen-2012-001099.

12. National Planning Authority. Third national development plan (NDPIII) 2020/21 – 2024/25. Ministry of Health. January 2020. Accessed December 19, 2023. http://library.health.go.ug/sites/default/files/resources/Third%20National%20Development%20Plan%20III%2C%202020-21-2024-25.pdf.

13. Ministry of Health Uganda. (2017). Uganda National eHealth Strategy [Review of *Uganda National eHealth Strategy*]. In *Ministry of Health*. Government of Uganda. https://health.go.ug/sites/default/files/National%20e_Health%20Strategy_0.pdf.

14. Winters N, Langer L, Nduku P, et al. Using mobile technologies to support the training of community health workers in low-income and middle-income countries: Mapping the evidence. *BMJ Global Health*. 2019;4(4):1-10. doi:10.1136/bmjgh-2019-001421

15. Allen-Duck A, Robinson JC, Stewart MW. Healthcare Quality: A concept analysis. *Nursing Forum*. 2017;52(4):377-386. doi:10.1111/nuf.12207

16. Musoke D, Ndejjo R, Atusingwize E, Mukama T, Ssemugabo C, Gibson L. Performance of community health workers and associated factors in a rural community in Wakiso District, Uganda. *African Health Sciences*. 2019;19(3):2784-2797. doi:10.4314/ahs.v19i3.55

17. Umunyana J, Mwali AK, Radeny S. Piloting An eLearning Course for Community Health Worker Training. IntraHealth International. May 2022. Accessed December 19, 2023. https://www.intrahealth.org/sites/ihweb/files/attachment-files/tb2pilotingelearningcourserev-5-22hr-d.pdf.

18. Musoke D, Ssemugabo C, Ndejjo R, Atusingwize E, Mukama T, Gibson L. Strengthening the community health worker programme for health improvement through enhancing training, supervision and motivation in Wakiso District, Uganda. *BMC Research Notes*. 2019;12(1):1-5. doi:10.1186/s13104-019-4851-6

19. National Information Technology Authority. (2018). National Information Technology Survey 2017/18 Report [Review of *National Information Technology Survey 2017/18 Report*]. In *NITA Uganda* (pp. 1–274). NITA-U. https://www.nita.go.ug/sites/default/files/2022-01/National%20IT%20Survey%20April%2010th.pdf

20. Gillwald A, Mothobi O, Tusubira FF, Ndiwalana A. The state of ICT in Uganda. Research ICT Africa. September 11, 2021. Accessed December 19, 2023. https://researchictafrica.net/publication/the-state-of-ict-in-uganda/.

21. Uganda Communication Commission. (2022). Market Performance Report 3Q21 [Review of *Market Performance Report 3Q21*]. In *Uganda Communication Commission* (pp. 1–56). https://www.ucc.co.ug/wp-content/uploads/2023/10/UCC-September-2021-Market-Intelligence-Report.pdf

22. Zhou X, Snoswell CL, Harding LE, et al. The role of telehealth in reducing the mental health burden from covid-19. *Telemedicine and e-Health*. 2020;26(4):377-379. doi:10.1089/tmj.2020.0068

23. Ahimbisibwe P, Otage S. 1,500 poor families to get free solar iPads, internet. *Monitor*. March 15, 2021.

24. Trayner W. Introduction to Communities of Practice. Wenger. June 4, 2023. Accessed December 19, 2023. https://www.wenger-trayner.com/introduction-to-communities-of-practice/.

25. Battista A. An activity theory perspective of how scenario-based Simulations Support Learning: A Descriptive Analysis. *Advances in Simulation*. 2017;2(1). doi:10.1186/s41077-017-0055-0

26. Young SWH. Chapter 1. principle 1: Create shareable content. Library Technology Reports. Accessed December 19, 2023. https://www.journals.ala.org/index.php/ltr/article/view/6144/7941.

27. Trudell, B. (2009). Local-language literacy and sustainable development in Africa. *International Journal of Educational Development*, 29(1), 73–79. https://doi.org/10.1016/j.ijedudev.2008.07.002

28. Imtinan U, Chang V, Issa T. Common Mobile Learning Characteristics-An Analysis of Mobile Learning Models and Frameworks. Eric - Institute of Education Sciences. Accessed December 17, 2023. https://files.eric.ed.gov/fulltext/ED556901.pdf

29. Agarwal S, Abuya T, Kintu R, et al. Understanding Community Health Worker Incentive Preferences in Uganda using a discrete choice experiment. Journal of Global Health. 2021;11. doi:10.7189/jogh.11.07005

30. Ludwick T, Brenner JL, Kyomuhangi T, Wotton KA, Kabakyenga JK. Poor retention does not have to be the rule: Retention of Volunteer

Community Health Workers in Uganda. *Health Policy and Planning*. 2013;29(3):388-395. doi:10.1093/heapol/czt025

31. Musoke D, Atusingwize E, Ndejjo R, Ssemugabo C, Siebert P, Gibson L. Enhancing Performance and Sustainability of Community Health Worker Programs in Uganda: Lessons and Experiences From Stakeholders. *Global Health: Science and Practice*. 2021;9(4):855-868.

32. Pandya S, Hamal M, Abuya T, et al. Understanding factors that support community health worker motivation, job satisfaction, and performance in three Ugandan districts: Opportunities for strengthening Uganda's Community Health Worker Program. *International Journal of Health Policy and Management*. Published online 2022. doi:10.34172/ijhpm.2022.6219

33. O'Donovan J, Kabali K, Taylor C, et al. The use of low-cost Android tablets to train community health workers in Mukono, Uganda, in the recognition, treatment, and prevention of pneumonia in children under five: A pilot randomised controlled trial. *Human Resources for Health*. 2018;16(1). doi:10.1186/s12960-018-0315-7

34. Short SS, Lin AC, Merianos DJ, Burke RV, Upperman JS. Smartphones, trainees, and Mobile Education: Implications for graduate medical education. *Journal of Graduate Medical Education*. 2014;6(2):199-202. doi:10.4300/jgme-d-13-00238.1

35. World Health Organization. Value gender and equity in the Global Health Workforce. World Health Organization. Accessed December 19, 2023. https://www.who.int/activities/value-gender-and-equity-in-the-global-health-workforce.

36. Musoke D, Ndejjo R, Atusingwize E, Mukama T, Ssemugabo C, Gibson L. Performance of community health workers and associated factors in a rural community in Wakiso District, Uganda. *African Health Sciences*. 2019;19(3):2784-2797. doi:10.4314/ahs.v19i3.55

37. Malikane J. Case study: Digitalizing a village health team in Uganda. UN Capital Development Fund (UNCDF). Accessed December 19, 2023. https://www.uncdf.org/article/7409/case-study-digitalizing-a-village-health-team-in-uganda.

38. Geldsetzer P, De Neve J-W, Boudreaux C, Bärnighausen T, Bossert TJ. Improving the performance of community health workers in Swaziland: Findings from a qualitative study. *Human Resources for Health*. 2017;15(1). doi:10.1186/s12960-017-0236-x