2023-06

A mobile application for research knowledge sharing and dissemination: the case of Monduli and mto wa mbu Arusha

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NM-AIST

https://doi.org/10.58694/20.500.12479/2188

A MOBILE APPLICATION FOR RESEARCH KNOWLEDGE SHARING AND DISSEMINATION: THE CASE OF MONDULI AND MTO WA MBU ARUSHA

Justine Mokiri Kemhe

A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of Master's in Information and Communication Science and Engineering of the Nelson Mandela African Institution of Science and Technology

Arusha, Tanzania

June, 2023

ABSTRACT

Scientific publications continue to be the primary mode of disseminating research findings from universities. Although appropriate for other scholars, the method is not accessible to the general public and policymakers, as the language used is often technical and assumes knowledge of the theories and techniques in the field, while recommendations focus on further scientific investigations rather than how to implement findings in real-world settings. Additionally, the vast majority of publications are not open access and thus require either paying an average of $300 to view a single file or paying an institutional access fee of $16 000 for institutional access to various publications. Evidence-based decision-making is a pillar for sustainable development, and therefore, this accessibility gap can have major implications for achieving development goals. Recently, researchers have utilized platforms such as personal websites, social media, blogs, and other ICTs to disseminate the key findings of their research in a succinct and non-technical format. Field dissemination methods such as workshops are also increasingly utilized, especially in low-resource communities. However, field methods can be costly and do not provide community members with long-term, repeated access to the presented information and to newer findings on the same topic. In this study, we aimed to determine how mobile technologies can be effectively utilized for continuous knowledge dissemination from researchers to low-resource communities. As a case study, we used the Monduli and Mto wa Mbu areas in Arusha, Tanzania, and the communities participating in 5 VLIR-UOS projects from NM-AIST, spanning from soil fertility to land use mapping. A user-centered design approach was used to determine the requirements from the researchers, community members, and government extension officers (n = 106). The results indicate that the application has the potential to enhance research collaboration and dissemination at Monduli and Mto wa Mbu, and provide insights into the challenges and opportunities associated with the use of mobile technologies for research knowledge sharing and dissemination in academic contexts.

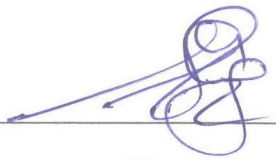
DECLARATION

I, Justine Mokiri Kemhe, declare to the Senate of the Nelson Mandela African Institution of Science and Technology that this dissertation is my original work and that it has neither been submitted nor concurrently submitted for a degree award in any other institution.

Justine Mokiri Kemhe		23/06/2023
Name of Candidate	**Signature**	**Date**

The above declaration is confirmed by:

Prof. Michael Kisangiri		01/09/2023
Name of Supervisor 1	**Signature**	**Date**

Dr. Edith Luhanga		04/09/2023
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DECLARATION

I, Tusekile Juma Mwasambili, declare to the Senate of the Nelson Mandela African Institution of Science and Technology that this project report is my original work and that it has neither been submitted nor concurrently submitted for a degree award in any other institution.

Tusekile Juma Mwasambili		25.08.2023
Name of Candidate	**Signature**	**Date**

The above declaration is confirmed by:

Dr. Elizabeth Mkoba	Mkoba	25.08.2023
Name of Supervisor 1	**Signature**	**Date**

Dr-Ing. Andreas Solsbach	Andreas Solsbach	08.07.2023
Name of Supervisor 2	**Signature**	**Date**

ACKNOWLEDGEMENTS

First and foremost, I would like to express my heartfelt gratitude to God Almighty for granting me the invaluable opportunity to complete this research journey. I am immensely grateful for the divine guidance and blessings that have led me to this moment. It is through God's grace that I have been surrounded by the right individuals and resources, and I am truly humbled by this incredible opportunity.

I would like to extend my deepest appreciation to my beloved Mokiri Kemhe family, who have been an unwavering source of support and encouragement throughout this entire endeavor. To my loving wife, Peace Msonde, your patience, understanding, and unwavering belief in me have been my pillar of strength. Your constant love and support have given me the courage to pursue my academic aspirations. I am eternally grateful for your presence in my life.

To my two precious children, Jayce Justine and Jair Justine, you have brought immeasurable joy and inspiration into my world. Your innocent smiles and infectious laughter have been a constant reminder of the importance of this research journey. Your understanding during long nights of study and your unconditional love have been my motivation to persevere and succeed. Thank you for being my greatest blessings.

I am indebted to my esteemed supervisors, Prof. Michael Kisangiri and Dr. Edith Luhanga, for their exceptional guidance, mentorship, and unwavering belief in my abilities. Their expertise and dedication have been invaluable throughout my studies at the Nelson Mandela African Institution of Science and Technology (NM-AIST). From shaping my research proposal to conducting the actual research and finally writing this dissertation, their tireless efforts and support have been instrumental in the successful completion of this work. I am profoundly grateful for their wisdom, encouragement, and constructive feedback.

I would also like to express my gratitude to the entire team at the School of Computational and Communication Science and Engineering (CoCSE). Their invaluable contributions, critical feedback, and continuous support have significantly enhanced the quality of my work. I am indebted to each and every member who has provided guidance, encouragement, and constructive criticism when needed. Your collective efforts have undoubtedly played a crucial role in shaping the outcome of this research.

I extend my deepest gratitude to the Belgian government through the VLIRIOUS Project for their generous financial support, which has enabled me to conduct this research and complete this dissertation. Their investment in my education has been instrumental in making this journey a reality.

Furthermore, I would like to acknowledge the remarkable assistance and support provided by Prof. Linus Munishi, Dr. Francis Moyo, and Ms. Joyce Rugakingila during the data collection, system development, and testing phases. Their expertise, generosity, and kindness have been instrumental in overcoming challenges and achieving meaningful results.

In conclusion, I am deeply grateful to all those who have contributed to the successful completion of this dissertation. Your support, guidance, and encouragement have been invaluable, and I am truly fortunate to have had you by my side. I would like to express my heartfelt appreciation to my family, supervisors, the Belgian government, and all those who have played a role in this remarkable journey. May our collective efforts continue to make a positive impact in the field of research and beyond.

Thank you all from the bottom of my heart.

DEDICATION

I would like to dedicate my dissertation work to my father, Mr. Mokiri Kemhe, and my mother, Mary, for their support in helping me complete my Master's degree.

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LIST OF ABBREVIATIONS

CBPR	Community Based Participatory Research
CM	Community Member
EO	Extension Officer
DAICO	District Agricultural, Irrigation, and Cooperative Officer
DBMS	Database Management System
DFD	Data Flow Diagram
GDP	Gross Domestic Product
HTTP	Hyper Text Transfer Protocol
ICT	Information and Communication Technology
IT	Information Technology
JSON	JavaScript Object Notation
PHP	Hypertext Pre-Processor
RAD	Rapid Application Development
NM-AIST	The Nelson Mandela African Institution of Science and Technology
SDLC	System Development Life Cycle
TCRA	Tanzania Communications Regulatory Authority
UAT	User Acceptance Test
UE	User Experience
UI	User Interface
UML	Unified Markup Language
XML	eXtensible Markup Language

CHAPTER ONE

INTRODUCTION

1.1 Background of the Problem

Researchers' efforts are critical in assisting community members in avoiding inappropriate options, as well as in answering their questions and providing information to policymakers and other stakeholders about effective practices. Researchers must build relationships with communities in a number of ways, including introducing research, getting permission, giving feedback, and easily sharing knowledge (Hammond & Cooper, 2011). The ultimate goal of the research is twofold: to advance knowledge frontiers (theoretical contribution) and to facilitate the resolution of practical problems or issues confronting communities (practical contribution) (Fussy, 2018). To achieve this noble goal, research knowledge should be disseminated to relevant and potential audiences both in academic and non-academic circles. However, most researchers focus the majority of their research/knowledge dissemination efforts on a small subset of a specialized audience in the academic community (Ashcraft *et al.,* 2020). When researchers do engage in dissemination outside academia, the main modalities used are workshops, videos, and other virtual tools for providing results based on the findings (Wilke *et al.,* 2018), however, engaging research users with research and providing them with the ability to read a briefing on the research, attend a conference or seminar, be research partners, be involved in advising and shaping the research project in some way, or engage in some other kind of activity that makes them aware that the research exists can hinder community uptake of research findings (Morton, 2015).

Dissemination of knowledge-based interventions is primarily made up of researchers engaging the target audience (who are key stakeholders) through various channels using targeted strategies (Wilke *et al*., 2018). The goal of knowledge dissemination is to transfer knowledge within and across settings, ensuring that all people who possess knowledge are competitive in their lives (Gresh *et al.,* 2017). Additionally, it is intended to reduce knowledge development duplication in situations where concepts, ideas, science, and technologies overlap (Curtis & DeMaio, 2017). This is in addition to broadening one's perspective and improving one's idea quality. Today, information technology is regarded as a component of knowledge management as well as a means of delivering and disseminating knowledge to a wide range of audiences. Various traditional approaches to knowledge dissemination, such as registration, submission,

commenting, acceptance, improvement, implementation, publication, and recognition, have been simplified for administrative ease (Nasution, 2018). The relationship between research and practitioner endeavor is not easy, it needs deliberative attention from both researchers and practitioners to thrive. There are range of barriers in research and practitioner contexts to effective exchange and knowledge transfer.

Partnership and collaboration between communities and researchers during dissemination can build up to greater involvement of communities throughout the research cycle i.e., from research objectives planning, data collection, analysis of results and implications, to dissemination. The core characteristics of participatory research are equitable power distribution, trust and mutual commitment, and an openness to knowledge gained from participants' experiences (Harris *et al.,* 2016). Relationships with researchers enable community members to work as equal research team members to shape the study design to disseminate study findings. Researchers can profit from these partnerships by learning about their community partners, gaining credibility, visibility and validity in the community's work offered. Strong connections with community champions have contributed to foster confidence between community and researchers (Islam *et al*., 2015).

Scientific research into evidence-based interventions' dissemination and implementation (D&I) aims to understand successful strategies for the adoption and sustainability of evidence-based interventions, and it is closely linked to public policy (Tabak *et al.,* 2013). Such involvement can help ensure what researchers are doing is relevant to the challenges which communities are facing and makes it accessible and ultimately reaches its intended communities (Bromley *et al.,* 2015). Frequently, researchers meet with the communities through workshops, videos, and other virtual tools for providing results based on the findings. Also, social media platforms can be used for disseminating findings to the community. In addition to that, different means have been used by researchers to involve participants in their research but still challenging for some places in which communities failed to get the findings and to put them into practice.

Mobile and web applications are an increasingly popular means of offering community services such as knowledge sharing and communication between two parts. The increasing usage of mobile applications has been boosted by the increasing adoption of smartphones as well as 3G and 4G networks around the world. Tanzania is experiencing a massive increase in mobile communication and internet usage; Tanzania Communications Regulatory Authority (TCRA) provided their quarterly report of June 2021 showing that almost 45 million people (equivalent

to 80% penetration) registered mobile subscribers as well as about 25 million people with internet access as shown by Figs. 1 and 2 (TCRA, 2021).

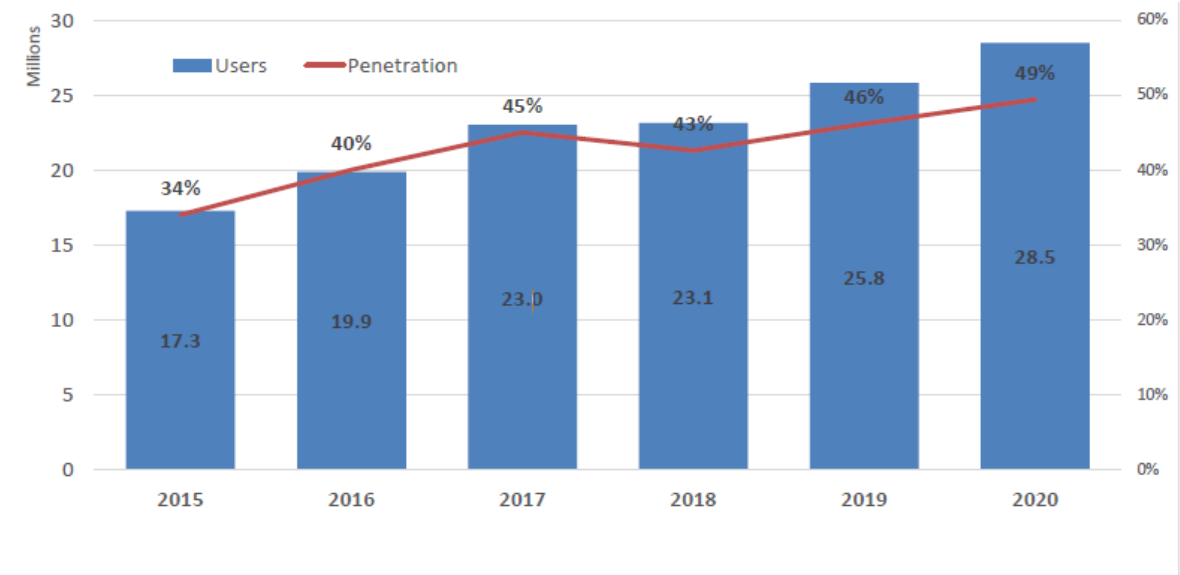

Figure 1: Internet penetration in Tanzania (TCRA, 2021)

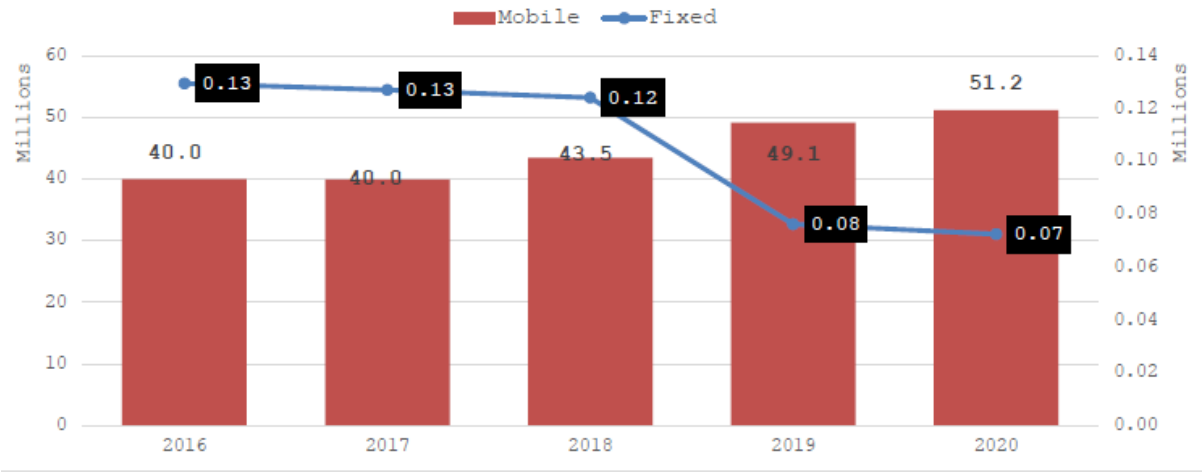

Figure 2: Mobile and fixed lines penetration in Tanzania (TCRA, 2021)

Mobile applications are used as a tool in providing different services and products to communities and prove one of the powerful communication channels for information and knowledge dissemination. The increasing penetration of radio and TV channels for broadcasting the dissemination of information, as well as the growth of wireless and mobile technologies, make the important use of mobile applications for providing best practices to communities as a result of an improvement in information dissemination.

This study aimed at developing a mobile application for research knowledge sharing and dissemination.

1.2 Statement of the Problem

Currently, research knowledge is only rarely disseminated to communities, and usually through manual approaches such as focus groups, which is inefficient and ineffective (Angula & Dlodlo, 2016). Socio-economic development requires a collaboration between researchers and communities, for effective exchange, it's important to have an adequate tool to organize and collect research findings over a long time and to be applicable in the fields (Hurley *et al.*, 2016). It is therefore important to empower researchers on knowledge repackaging and dissemination, and to enable communities to be able to easily access knowledge in their areas of interest and to communicate problems for further research to researchers. To address this gap, there is a need for innovative solutions such as mobile applications that facilitate the sharing and dissemination of research findings to decision makers and communities (Naeem, 2019). This study aimed to explore how a mobile application for research knowledge sharing and dissemination could be designed for the Tanzanian context, using Monduli and Mto wa Mbu as a case study.

1.3 Rationale of the Study

The rationale behind this study is rooted in the existing gap in research knowledge dissemination to communities and the need for innovative solutions to address this challenge. Currently, the dissemination of research knowledge to communities is limited and often relies on manual approaches like focus groups, which are inefficient and ineffective (Angula & Dlodlo, 2016). This gap hinders the collaboration between researchers and communities, which is crucial for socio-economic development and effective knowledge exchange (Hurley *et al.*, 2016).

To facilitate effective exchange and collaboration, there is a demand for a tool that can efficiently organize and collect research findings over time and be easily applicable in various fields. Empowering researchers with knowledge repackaging and dissemination skills and enabling communities to access knowledge in their areas of interest and communicate research needs to researchers are important steps towards addressing this gap.

A potential solution lies in the development of a mobile application that can facilitate the sharing and dissemination of research findings to decision-makers and communities (Naeem, 2019). Such a mobile application would provide an accessible and efficient platform for researchers to package and disseminate their knowledge, while also enabling communities to easily access the information they need and communicate their research needs to researchers.

This study aimed to explore the design of a mobile application for research knowledge sharing and dissemination tailored to the Tanzanian context, with a specific focus on the case study of Monduli and Mto wa Mbu. By examining the potential of a mobile application, the study seeks to bridge the gap between researchers and communities, enhance knowledge exchange, and empower both researchers and communities in their collaborative efforts towards socio-economic development.

By developing and implementing a mobile application for research knowledge sharing and dissemination, this study aims to contribute to the advancement of knowledge dissemination practices in Tanzania. The findings of this study will inform the design and development of a user-friendly and context-specific mobile application, which has the potential to facilitate effective collaboration, improve access to research knowledge, and foster socio-economic development in Tanzania and similar contexts.

1.4 Research Objectives

1.4.1 General Objective

The main objective of this research is to develop mobile application for research knowledge sharing and dissemination.

1.4.2 Specific Objectives

The study aimed to achieve the following specific objectives:

(i) To identify researchers' and community members' requirements for research knowledge sharing and dissemination.

(ii) To develop mobile application for research knowledge sharing and dissemination.

(iii) To validate the mobile application through user experiences.

1.5 Research Questions

The study intended to answer the following questions:

(i) What is the knowledge sharing and dissemination needs of researchers and community members?

(ii) What features and functionalities should be included in a mobile application to effectively facilitate research knowledge sharing and dissemination among researchers?

(iii) What are the perceptions and experiences of researchers and community members regarding the usability and usefulness of the mobile application for knowledge sharing and dissemination?

1.6 Significance of the Study

With the developed linkages platform for communities and researchers, it is possible to get simple, timely access to important information and best practices. The correct use of the created platform may substantially reduce the financial and time costs incurred by both community members and government officials. This is because extension officers and government officers should not have to physically and frequently visit villages for meetings about challenges in accessing or knowing best practices or recommendations such as land use and farming practices consultation, which can also be accessed via the developed electronic platform. This is critical in allowing individuals to obtain therapy and suggestions without being revealed, recognized, or subjected, thus preserving their issues.

A community-based participatory research approach discovers and builds on the strengths, resources, and relationships of the community. In order to improve general health and well-being in the community, individuals and organizations can collaborate with one another to establish collaborative networks that will harness their skills and resources. Using participatory research, local policymakers can make informed decisions based on the findings of studies. In participatory research, community members assist academic researchers in interpreting research findings for policymaking by providing information about the local context (Harris *et al.,* 2016). Community partners frequently provide knowledge on how local governmental entities have already tackled the topic under consideration. Understanding such local experience assists researchers in planning studies, contextualizing findings, and advocating for

programmatic and policy reforms. Researchers may make incorrect policy suggestions that ignore crucial prior experiences if they do not get contextual information from community partners.

Furthermore, the created platform connects communities and researchers by allowing them to create interactive media materials comparable to workshops given by researchers and incorporate questions from researchers into the program to collect additional survey answers. It will also allow farmers to search for subjects, read material, message researchers, and researchers to create and organize dissemination content, as well as receive and react to messages.

1.7 Delineation of the Study

This study focuses on exploring the design and development of a mobile application for research knowledge sharing and dissemination in the Tanzanian context. The study will specifically focus on Monduli and Mto wa Mbu in Arusha, Tanzania, and the communities participating in its five VLIR projects, namely Mto wa Mbu and Monduli Arusha. The participants will include researchers, community members, and government officials involved in these projects. The research objectives encompass exploring the gaps and challenges in research knowledge dissemination, assessing the potential benefits of a mobile application, identifying the features required for user-friendliness, evaluating the feasibility of implementation, and assessing the potential impact on collaboration and socio-economic development. The study will employ a mixed-methods approach, utilizing interviews, surveys, focus groups, and usability testing to collect qualitative and quantitative data. The significance of this study lies in its potential to enhance knowledge exchange, bridge the gap between researchers and communities, and contribute to socio-economic development in the Tanzanian context and beyond.

CHAPTER TWO

LITERATURE REVIEW

2.1 Knowledge Dissemination Situation in Tanzania

Knowledge dissemination is proved important in linking the communities and researchers for social-economic development. Knowledge dissemination aims for transferring knowledge to be used for education and modification or implementation of new practices. The implementation of the knowledge aims to fit a better solution, delivering the findings and support of the effective interventions by providers, organizations, and communities' interactions.

Despite the fact that participatory research is used in a variety of ways, one aspect that all practitioners share is a commitment to de-centered research "expertise." The knowledge of community members is regarded as legitimate and expert in nature. Members of the community may be involved at any stage of the research process, from issue identification to the formulation of research questions; through research design, data collection, and analysis; and finally, through writing and dissemination (Jull *et al.,* 2017). Participatory research objective is to emancipate participants and thereby effect social transformation. While community members may delegate certain responsibilities (e.g., data analysis) to researchers for certain projects, they should ideally be involved in all aspects of the project (Kezar & Maxey, 2016). Internationally, the involvement of knowledge users in research is gaining momentum (Leavy, 2017). Researchers will benefit from this familiarization because it will help to dispel the growing belief that research is conducted primarily for publication and academic qualification attainment rather than as something that can be used to directly impact society and bring about development.

Currently, making research results available to members of both academic and non-academic fraternities is essential for performing both academic and developmental responsibilities successfully. However, attempts to communicate research findings outside of academic circles remain restricted, ignored, and seldom questioned (Fussy, 2018). The use of social media platforms such as Twitter and Facebook have also been used for the ease of accessing and rapid dissemination and sharing of information to reach many audiences than traditional methods of communication and the workshops that government officials use to convey knowledge to the

communities, but developing a tool that will assist the society in finding the applicable practices has been a priority for the government (Dong *et al.*, 2020).

2.2 The Use of ICT Technologies in Tanzania

The widespread availability and widespread use of information and communication technologies (ICTs) are altering the way individuals and businesses conduct their business, Information and communications technology (ICT), refers to a broad variety of software, hardware, telecommunications, and information management methods, applications, and devices. These are used in conjunction to generate, produce, analyze, process, package, disseminate, receive, retrieve, store, and alter information (Taylor, 2015). Mobile and web apps have become more popular as a crucial medium for accessing and disseminating information and knowledge in a variety of industries, including health, banking, agriculture, security, and control systems. Because of the widespread availability and coverage of mobile technology, as well as the low cost of mobile devices, mobile technology has emerged as a potent communication and behavior modification tool (Mduma & Kalegele, 2017).

Tanzanians use mobile technologies in a variety of ways, including mobile health (m-health), mobile money transactions (for example, M-Pesa), and mobile banking. In recent years, mobile technology has outpaced all other media in terms of information transmission, becoming the fastest expanding medium overall (Qiang *et al.*, 2011). Agriculture is important for the economic and social growth of most developing nations, particularly in the developing world. Agriculture production and sustainability are improved via the analysis, dissemination, and application of information to farmers and farming communities (Zhang *et al.*, 2016). Smartphones serve as an example of how to overcome the difficulties of linking communities and may act as a catalyst for the mobilization of information via various mobile apps or web applications, among other things (Mahapatra, 2020).

Mobile communication and internet use are increasing dramatically in Tanzania, according to the Tanzania Communications Regulatory Authority (TCRA), which released its quarterly report for March 2021 showing that nearly 52 million people (equivalent to 80% penetration) have registered as mobile subscribers, with approximately 30 million people having internet access (TCRA, 2021).

In Tanzania, there is a pressing need for the use of mobile and web applications in the dissemination of knowledge. Fussy (2018), recommended that researchers and other

stakeholders of education should first and foremost be aware that disseminating research results would be just as important as creating information or doing research. This familiarity helps to undermine the increasing conviction that research is done only for the sake of publication and academic qualification rather than as a direct tool for societal change and development. Particularly, the distribution of knowledge to community members to improve their behaviors should utilize web and mobile technologies to reach many individuals for greater effect and coverage.

2.3 Related Knowledge Dissemination Applications

Knowledge dissemination is proved important in linking the communities and researchers for social-economic development. Knowledge dissemination aims for transferring knowledge to be used for education and modification or implementation of new practices. The implementation of the knowledge aims to fit a better solution, delivering the findings and support of the effective interventions by providers, organizations, and communities' interactions.

Many methods have been suggested by different researchers on how the research findings should be disseminated across the community and the different tools used. Restuccia *et al.* (2016), developed mobile-based participatory research as one of the tools used to disseminate research findings that involve the communities, organizational representatives, and researchers which improves communication and strengthens the relationships. The study may have limitations in terms of generalizability to other contexts, as it was conducted in the context of a specific community-engaged research project.

Owiny *et al.* (2014), highlighted the potential of mobile technologies in accessing, creating, and sharing information. However, the study has limitations in terms of its focus on the use of mobile technologies in the agricultural sector.

Wilson *et al.* (2010), defined knowledge dissemination as the transfer and sharing of research findings, skills, and experiences among researchers, universities, Research and development institutions, industries, charities, non-governmental organizations, and the wider community to promote the uptake of research-based knowledge in policy, practice and service development. Limitation of this study is that it focuses primarily on conceptual frameworks for disseminating research findings, rather than empirical studies of dissemination practices. As such, their findings are more theoretical in nature and may not fully capture the nuances and complexities

of real-world dissemination efforts. Another limitation is that the study is limited to the healthcare context, which may not fully generalize to other fields of research.

Knowledge dissemination in research has been used to reduce the gap between researcher's findings and practices by sharing findings that are applicable in the communities (Brown *et al*., 2017) and using the findings to improve the accessibility of the practices for the intended community.

Veer-Ramjeawon and Rowley (2017) conducted a study on knowledge sharing practices and perceptions among researchers in developing countries. They found that while researchers in developing countries recognized the importance of knowledge sharing, there were several barriers that hindered effective knowledge sharing, including limited access to resources, lack of incentives, and inadequate infrastructure. The study was based on self-reported data and may be subject to social desirability bias.

Thoma *et al*. (2018) pointed out that social media is a critical tool for the dissemination of knowledge and researchers' findings to practitioners. Researchers use social media to convey information, like posting an article that links findings on Twitter, so individuals get access to that information, share the information, and connect with the researchers without any challenges. The limitation of this study is that it is limited to a specific field of research (emergency medicine) and may not fully generalize to other fields. Additionally, while the study found that social media promotion with infographics and podcasts was effective in increasing readership and dissemination, it did not directly measure the impact of this increased readership on policy or practice. As such, it remains unclear whether the increased readership actually led to meaningful change or impact. Finally, it is important to note that the effectiveness of social media promotion may depend on factors such as the quality and relevance of the research itself, the target audience, and the specific social media platforms used.

The use of social media platforms such as Twitter and Facebook enable the accessing, rapid dissemination, and sharing of information to reach more audiences than traditional methods of communication (Dong *et al*., 2020). Developing a tool that can help society to find the applicable practices conducted in respectable areas can do better than using social media for knowledge dissemination.

Kerner *et al.* (2005) tried to explain how community engagement is involved in study findings and the evolution or testing of the result. And the problem comes when the community needs the results and to know the best practices.

Coyne and Carter (2018) presented the map of my community application which some organizations working in collaboration with communities in making changes and support any work from the community, and to achieve all the practices remain difficult and require multiple knowledgeable users and adequate tools which can help in disseminating findings easily. A range of different tools have been used but some are more active than others (Chambers, 2018).

Hammond and Cooper (2011) developed the use of participant information clip which contains videos whereby people participate and give details of the problems facing the community through the workshop, and these strategies may be appropriate for many projects, for the community is challenging because people fail to get the clips in real-time when it is needed and maybe insufficient or ineffective.

Furthermore, Smartphones have been identified as one of those effective innovations that a large number of people in the developing world use to share knowledge, information and communicate (Hossain & Ahmed, 2016). According to Mahapatra (2020), smartphones are an example of overcoming the challenges in connecting the communities and being a catalyst for mobilizing knowledge through different mobile applications or web applications.

2.4 Conceptual Framework

The conceptual framework shown in Fig. 3, has been developed based on the requirements that have been gathered and analyzed previously. The mobile application, as well as the web-based application, will be included in the complete system.

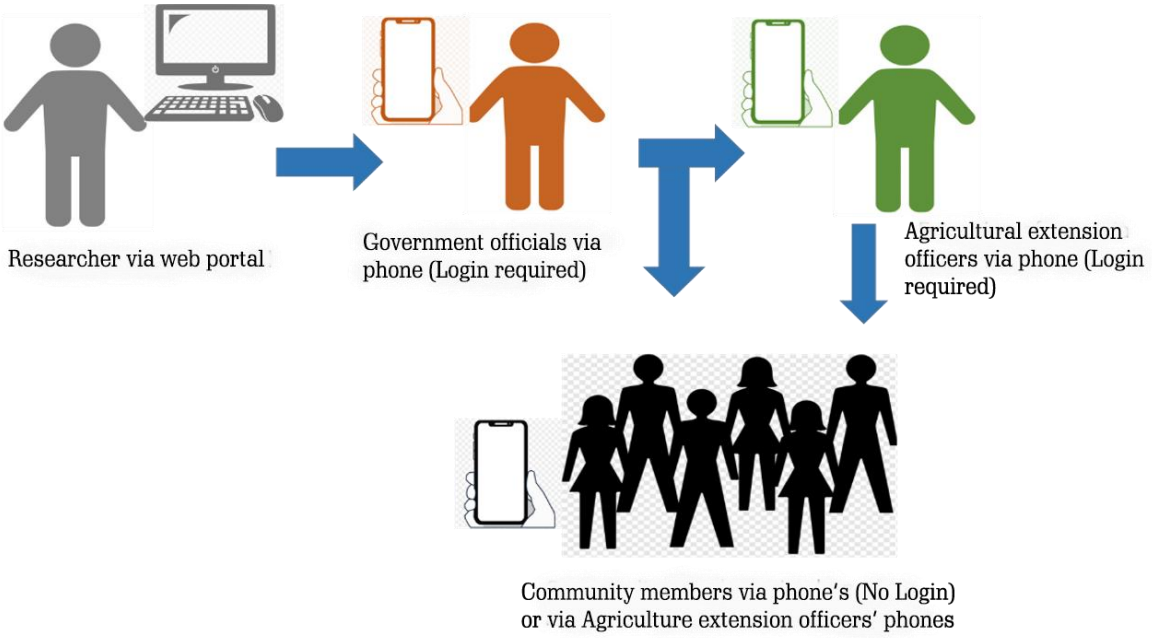

Figure 3: Conceptual framework

CHAPTER THREE

MATERIALS AND METHODS

3.1 Study Area

This study was based in Arusha Tanzania as presented in Fig. 4. Arusha was chosen because it is the place where several studies from the VLIR-UOS project at NM-AIST are implemented. Monduli and Mto wa Mbu District were used as the areas for data collection and validation of the developed prototype since over the VLIR-UOS projects were implemented in the villages over the past 9 years, and the villagers had frequent interactions with the researchers during this time.

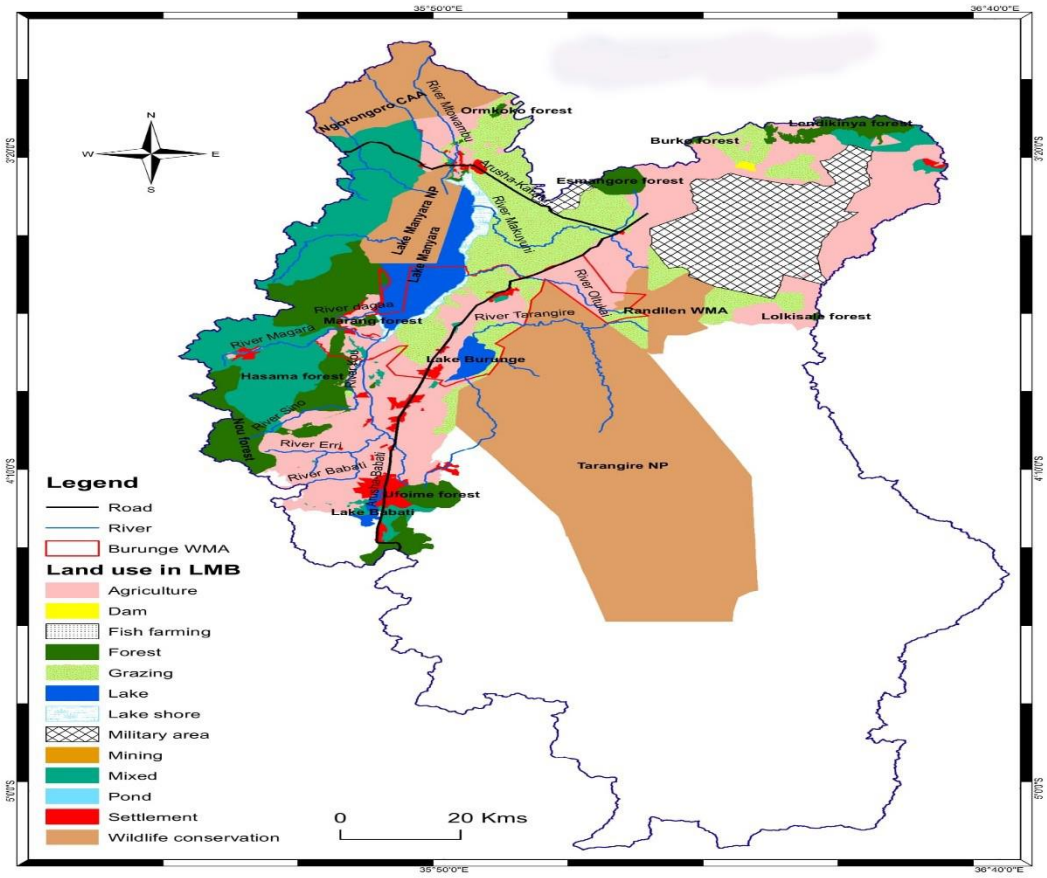

Figure 4: Study Area

3.2 Research Design

The research design is a method and structure for finding answers to research questions. It outlines everything a researcher must accomplish, from the formulation of a research topic and its operational implications through the final data analysis (Schoonenboom & Johnson, 2017).

This study's design focuses primarily on the creation of a knowledge dissemination platform to improve access to practices. The following activities were included in the study design: assessing people's acceptability and comfortability with the current practice of obtaining all information from practitioners; collecting and assessing needs for the knowledge platform, and developing the platform. Figure 5 presents a Design-based approach (Jayatilleke *et al.*, 2018).

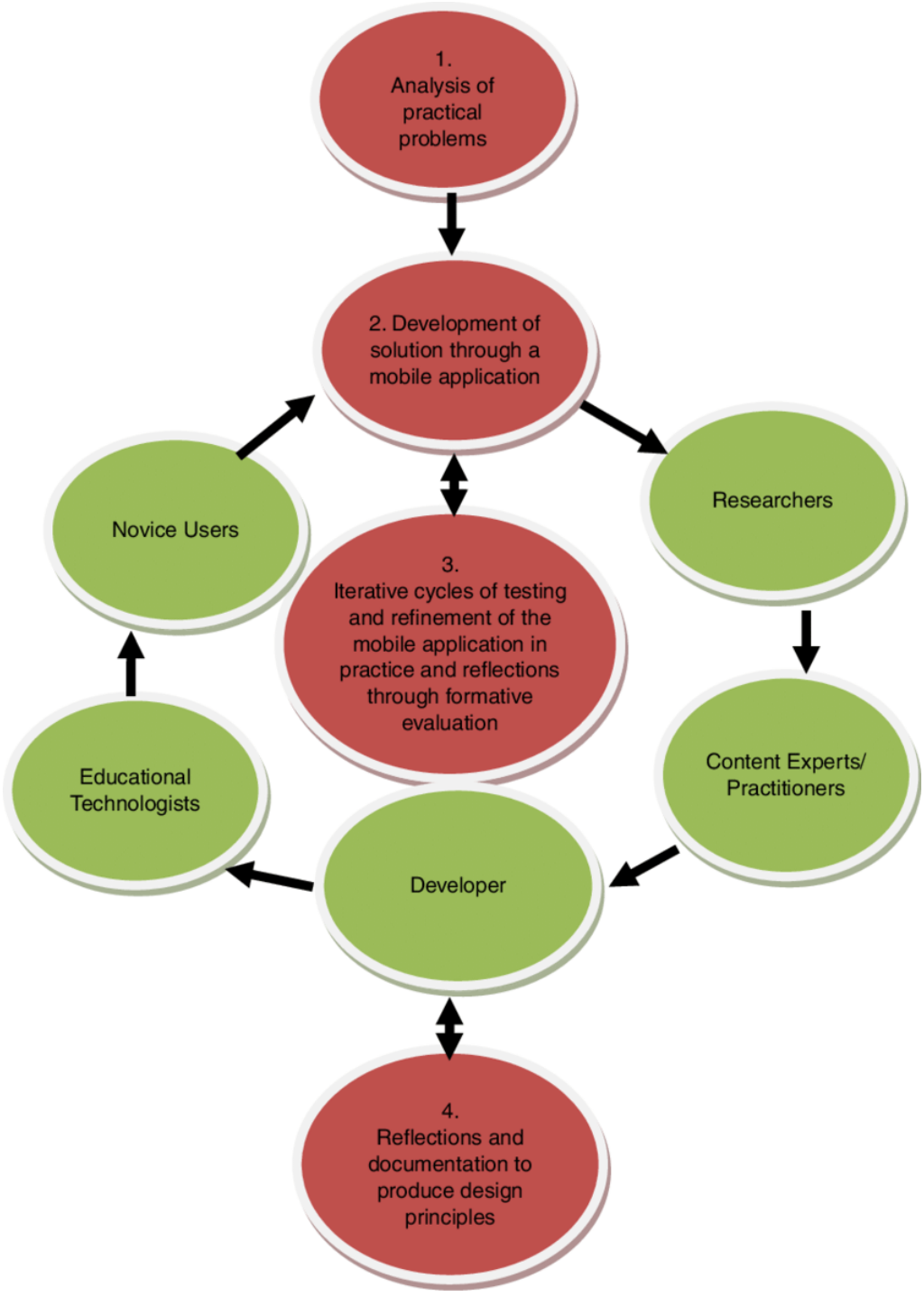

Figure 5: Design-based approach (Jayatilleke *et al.*, 2018)

3.3 Research Methods

Research methods are the tactics, processes, or techniques that are used to collect data or evidence for the purpose of analyzing it in order to uncover new knowledge or improve understanding of a subject (Mohajan, 2018). There are different types of research methods and according to this research we use mixed methods (explanatory mixed-method) also called sequential mixed method.

We use mixed methods because mixed methods are the combination and integration of qualitative and quantitative research. In qualitative research, we use interviews and focus groups whereby villagers, government officials, extension officers, and researchers are involved. Also, in quantitative research, we use surveys or questionnaires whereby villagers participated fully in providing data based on the best of providing findings from the researcher.

3.4 Population

Population refers to a collection of elements from which a subset can be selected (a sample). It refers to the entire group of people, objects, or events that fall into a particular category (Spiegel *et al.*, 2020). This study focuses on villagers, specifically livestock and agro farmers, extension officers, government officials, and researchers located in Arusha Tanzania. The target population is the intended group of people that were researched, for the information which was required to be ascertained. The target population is the source of data, of which the research question is answered. To obtain meaningful data in response to the research questions, this study surveyed 106 respondents, both male and female. In this study, all people were considered as everyone is entitled to access the knowledge.

3.5 Sampling Technique

Sampling is the process of picking suitable members of a population to represent the population's attributes and features (Taherdoost, 2016). In this study, we used purposive sampling with the researchers and district officers, as they served as key informants. Community members were sampled randomly. Each individual invited to participate in this study did so voluntarily after a process of informed consent.

3.6 Data Collection

In this study, both quantitative and qualitative approaches were employed for collecting both primary and secondary data. The quantitative study was done using a well-structured questionnaire. The qualitative approach was implemented using unstructured interviews, casual talks and in-depth discussion (Igwenagu, 2016).

The questionnaire guide consisted of two parts: demographics (education level and phone ownership) and comfortability (perception of getting knowledge via mobile application). All of the questions in the aforementioned sections were self-contained. Participants were asked if they wanted to access information from researchers, government officials, and extension officers through a mobile application platform. The knowledge dissemination questionnaire guide focused on determining whether there is a demand for a platform for knowledge dissemination and whether government officials, extension workers, and researchers can provide those services via web and mobile applications. Moreover, the extension officers and government officials were interviewed on their consent on the specific and general requirements for the mobile and web applications to be developed.

3.6.1 Data Collection on Community Members' Readiness and Requirements

(i) Through a focus group discussion where researchers were also present

This study uses a focus group discussion in which community members and researchers were present. Community members presented their needs and requirements for accessing the information disseminated by researchers, and a number of requirements were presented.

(ii) Through a paper survey

This study looked at both published and unpublished documents, like reports, the Internet, statistics, and journals, as well as "grey literature" from different sources, like government reports, that talked about the agriculture and spread of knowledge in general.

(iii) Through direct observation

Direct observation was used to investigate how different types of applications disseminate knowledge to members of the community. Direct observation gives a researcher a more accurate picture of a real situation, which improves the research's validity and reliability

(Alston & Bowles, 2020). Additionally, secondary data was gathered from reviews of various related literature. Documentary reviews from published and unpublished documents such as reports, the internet, statistics, and journals, as well as other grey literature from various sources such as the Ministry of Agriculture Report and Land Mapping Usage in Arusha 2019 were used in this study.

3.6.2 Researchers' Readiness and Requirements

(i) Individual interview

After the identification of all key actors, the system requirements were collected qualitatively using unstructured interviews. The identified actors were interviewed on the specific and general needs and requirements for the system. During the interview and discussion with them, the important system requirements were noted down for requirement specification.

(ii) Focus group discussion

Following the interview, the prototype was presented in the validation stage, during the time researchers were given the opportunity to review the prototype and provide feedback; the actual feedback was then presented in the results.

3.7 Data Analysis

The data analysis process began with data coding. Data coding organized the information so that it could be easily entered into computer software and analyzed. R-Programming was used to analyze the data collected. Since the questionnaire's objective was to ascertain acceptance of existing practices and to ascertain the necessity of employing a knowledge sharing and dissemination application.

3.8 System Development Approach

The Software Development Life Cycle (SDLC) framework was used in the development of a mobile application for research knowledge sharing and dissemination. The system development life cycle (SDLC) is a collection of steps that serve as the foundation for most systems analysis and design methodologies (Davis, 2019).

From requirement acquisition to system implementation and testing, this study followed the Rapid Application Development (RAD) model. It was chosen to expedite the delivery of the

system within the specified timeframe. It emphasizes a rapid development cycle by delivering a high-quality system at a lower development cost than other traditional models. Additionally, RAD enables frequent developer-to-customer communication throughout the system development phases, ensuring customer satisfaction (Mishra & Dubey, 2013). Rapid Application Development (RAD) is an excellent fit for requirements that are well-structured and defined.

3.9 System Modelling

In this research, system modeling was done before integrating web and mobile applications. The functional requirements were mapped into data flow diagrams (DFD) during the system modeling process. Using UML rules and artifacts, graphical languages were used to analyze the system requirements. Using UML's graphical language, a software system's artifacts can be specified, visualized, constructed, documented, and communicated. It includes artifacts like use case diagrams, system flow diagrams, and class diagrams, amongst others (Rajagopal & Thilakavalli, 2017).

To model the system, the Visual Paradigm was used for mapping the collected requirements into the use case diagrams of subsystems. The establishment of the use case diagrams was useful in developing the information DFD and the conceptual framework of the developed mobile and web applications.

3.10 System Implementation

Various software development tools were used during the implementation of this platform. Computer programming languages, databases, and integrated development environments are among the tools available.

3.10.1 System Implementation’s Tools

(i) Android Studio

Android Studio is a program that allows you to create Android applications. Android Studio comes with a slew of libraries that make developing Android apps a breeze. The client application in this study is built on the Android operating system. Because of Tanzania's high user penetration, Android was chosen for this study. Android is an open-source mobile operating system designed for smart mobile devices such as phones and tablets (Craig &

Gerber, 2015). The mobile application portion of this study was implemented using Android Studio. It was chosen because of its built-in functionalities and libraries.

(ii) eXtensible Mark-up Language (XML)

The eXtensible Markup Language (XML) is a programming language that was created to display, store, and transfer information independently of other software and hardware (Yergeau *et al.,* 2004). eXtensible Markup Language enables the electronic sharing of self-describing data formats and structures by providing a common syntax for information exchange between applications. Additionally, it is open-source software that is well-supported and replete with technical documentation (Bray *et al*., 2000)

Extensible Markup Language (XML) was primarily used in this study to develop the user interfaces for an Android mobile application. This was due to its low cost (free), ease of offloading and reloading data to and from the database, and ability to maintain the desired information and user interface appearance. The user experience on the mobile application is enhanced when the desired user interface is used.

(iii) Java

Java is an object-oriented computer programming language that was created to enable and develop the various features that comprise application software (Arnold *et al.,* 2005). It is typically advantageous for software development because it runs on a variety of operating software platforms, including Windows and UNIX variants. It ensures the quality of software development by being always fast, secure, portable, stable, and capable of performing multiple tasks concurrently (Savitch, 2019).

Java was used in this study for its core libraries, which were used to implement the functionalities and some advanced User Interface (UI) features in the android mobile application developed using the android studio. It facilitated the development of several complex features of the research study's developed mobile application.

(iv) Hypertext Pre-Processor (PHP)

It is a scripting language used on the server side to connect to and manipulate databases. Hypertext Pre-Processor (PHP) is well-known for its compatibility and ability to connect to a wide variety of databases concurrently without jeopardizing database security (Lamsal, 2020).

Additionally, PHP is an open-source program, which means it is available for free. Additionally, it provides the web application's dynamic functionality (Ullman, 2011).

Hypertext Pre-Processor (PHP) was used to script the linkage between the web-based system and the MySQL database in this study. From an application standpoint, it serves as a conduit for database connection and manipulation.

(v) JavaScript Object Notation (JSON)

JavaScript Object Notation (JSON) is an open-standard and programming language-independent file format that uses human-readable text to convey data objects that contain attribute-value pairs and/or array data types (Bray, 2014). It supports the most fundamental data types, including number (integers, floats, and double), String, Boolean, array, and null.

JavaScript Object Notation (JSON) was used to transmit an array of data from the mobile application to the web application and finally to the database during this system's development. This enables the database and mobile application to communicate more easily.

3.11 System Testing and Validation

A series of tests were conducted to ensure that the implemented system complied with the original specifications and requirements. These tests ensured that all bugs had been eliminated and that the final developed system met all quality requirements and satisfies the client's requirements. The finalized system was then validated by the stakeholders identified.

3.11.1 System Testing

The system testing was carried out in stages, beginning with unit testing and concluding with integration testing. Unit testing is the process of evaluating the functionality of a system's small, self-contained modules in solitude from other modules. This test was conducted throughout the development of each system feature. A single unit test enables the rapid exclusion of bugs at the lowest possible level. Throughout the development of this system, each independently functioning module was tested independently to identify errors contained within its boundaries.

Integration testing is a systematic technique for identifying errors in the interfacing of one module of a functioning system to another. Integrity testing was performed during the interface and/or connection of unit-tested modules. The systematic integration process resulted in the

development of a fully functional system. After that, the integrated system was moved to the production environment for User Acceptance Tests (UAT). User Acceptance Tests (UAT) was performed by system users while the system was validated against the previously specified requirements. To facilitate UAT, the fully functional system was hosted online and the mobile application was installed on the clients who took part in the test.

3.11.2 System Validation

A user experience (UE) survey was used to validate the developed system. This was accomplished by randomly sampling a subset of all identified actors in the system (Agricultural extension officers, Government officials, and Researchers). The mobile application was downloaded and installed on their devices. After three days of use, they were required to complete evaluation questionnaires.

3.12 Ethical Consideration

The Nelson Mandela African Institution of Science and Technology (NM-AIST) permitted this study before it began. Prior communication and permission were obtained from all parties involved before the beginning of data collection in Arusha.

This study adhered to ethical standards, such as protecting the respondents' privacy and maintaining the data's accuracy, integrity, and confidentiality. Samonas and Coss (2014), emphasized the importance of maintaining participant confidentiality throughout the research process to reduce participant uncertainty and anxiety. This, in turn, provides accurate and comprehensive information. Before asking respondents to complete questionnaires, researchers provided a brief explanation of the purpose of the study and its benefits. Only people who agreed to participate and were mentally and physically prepared for the study were included.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 Findings from the Respondents

4.1.1 Demographics Characteristics of the Respondents

Given that the study examined human perceptions of knowledge access via meetings and developed platforms, it is necessary to examine the respondents' demographic characteristics. Education level was one of the demographic characteristics of respondents considered in this study. This characteristic is critical in analyzing the trend of using the developed platform in place of the meetings held every three months.

The majority of the 106 respondents who agreed to participate in this study had tertiary education (n=39.62%)

Table 1: Demographic Characteristics

Demographic	Characteristics	Respondents	Percentage
Gender	Male	76	71.70%
	Female	30	28.30%
Age	18-29	29	27.36%
	30-39	48	45.28%
	40-49	10	9.43%
	50 and above	19	17.92%
Education	Non-Formal Education	9	8.49%
	Primary Education	24	22.64%
	Secondary Education	31	29.23%
	Tertiary education	42	39.62%

4.1.2 Mobile Phones Ownership of the Respondents

Only 8.2% of respondents do not own a mobile phone, while 26.3% own two or more. Additionally, (n = 65.5%) of all respondents reported owning at least one smartphone with internet capability. The detailed distribution of mobile phone ownership among respondents is depicted in Fig. 6.

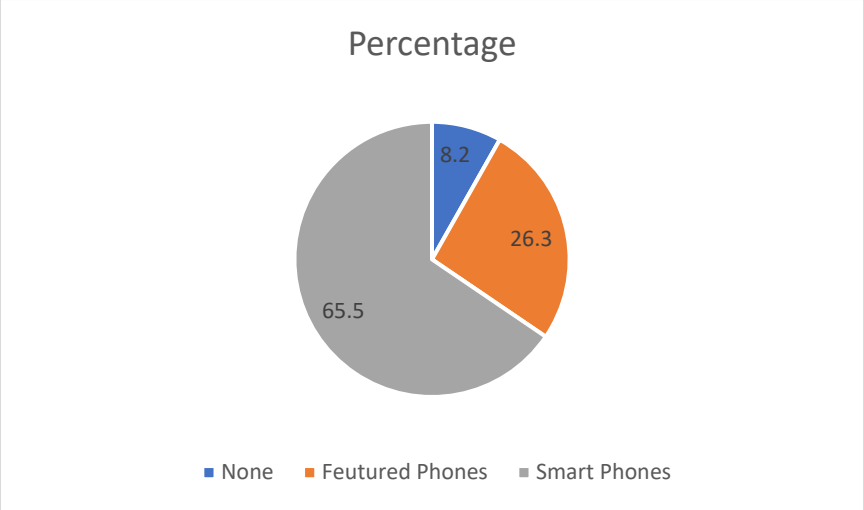

Figure 6: Mobile Phone Ownership

4.1.3 Respondents' Awareness of official Government Meetings

Only 88.68% of those polled were aware of the existence of government meetings, which took place every three months. Even fewer respondents 49.06% had attended the meeting at least once, with the majority 46.23% opting to seek knowledge and information from the extension officers' office or/and government offices. The 24.5% of respondents said they were uncomfortable visiting government offices due to lack of transport and long distance. The Table 2 and Fig. 7 provide a good summary of the situation.

Table 2: Respondents Awareness toward attending government official meetings

	Respondents	Percentage
I am aware of the existence of government meeting	94	88.68%
I have attended the meetings at least once	52	49.06%
I attended the meeting to seek information	43	40.57%
I attend the meeting because of the specific situations	14	13.21%
Never attended the meeting in the past year	81	76.42%
I attended the meeting once in the past year	17	16.04%
I attended the meeting more than twice in the past year	21	19.81%
I am comfortable visiting the government office	49	46.23%
I am not comfortable visiting the government office	26	24.52%

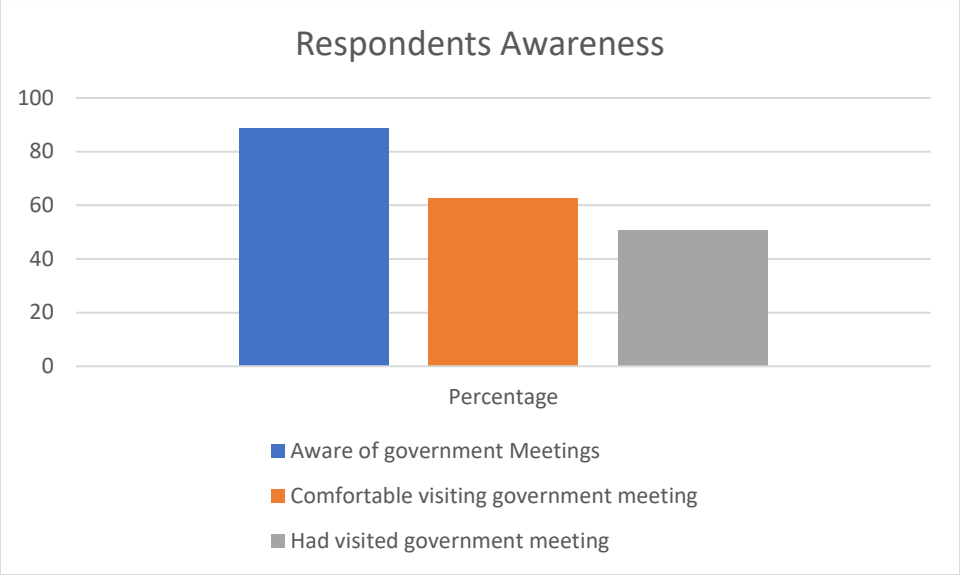

Figure 7: Respondents Awareness

4.1.4 Community Members Knowledge Seeking Pattern

The data showed that 48.3% of respondents prefer to use the internet to seek information about good agricultural practices. However, 38.9% of respondents stated that they gained knowledge by visiting government offices and 33.9% attending official meetings. The pattern of knowledge-seeking by community members, as determined by the respondents, is depicted in Fig. 8.

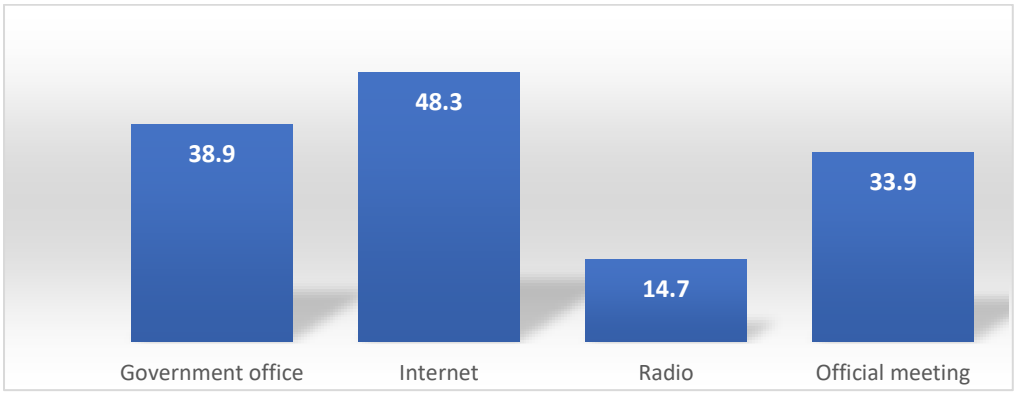

Figure 8: Community Members Knowledge Seeking Pattern

4.1.5 Towards Accessing Knowledge Online

Almost 72.9% of respondents indicated a proclivity for accessing and searching for various types of information via online media sources. Additionally, 82.6% of respondents believed they could access reliable information if there was an online platform, and 71.5% went even

further, indicating they desired to a platform which would be easier for them to access information. Table 3 summarizes this information.

Table 3: Towards Accessing Knowledge Online

	Respondents	Percentage
I accessed knowledge or information from the Internet	76	72.9%
I believe I can access the information through an online platform	102	82.6%
I would prefer to have the platform in accessing information and knowledge	112	71.5%

4.2 Requirement Definitions

4.2.1 Functional and Non-functional Requirements

The gathered system requirements were classified into functional and non-functional requirements in this study. These serve as guidelines for the information system's implementation (Laplante, 2017). Tables 4 and 5 detail the functional and non-functional requirements.

Table 4: Functional requirements for Knowledge sharing and dissemination application

Requirement	Description	Actor
User Registration and Accounts Management	All community members must register with the system and create their own user profiles; the system will provide each client with a username and password.	Community Members
	All extension officers, researchers, and government officials must be registered in the system according to their credentials and roles.	System Administrator
	The system should provide the ability for the system administrator to delete or suspend a user account.	System Administrator
Knowledge Management	System administrators should manage the uploading, editing, and/or removing of the disseminated knowledge such as best practices, guidelines, and another disseminated knowledge	System Administrator
	All registered and authorized users should be able to view the posted knowledge.	All users of the system
Report Generation	The system should be capable of producing a variety of reports for additional stakeholders, such as researchers and policymakers.	System Administrator
Recommendations and Feedback	Extension officers, researchers, and government officials should be able to set, edit and/or remove recommendations and/or feedback for a particular community member based on his/her information.	Extension officer, Researcher and Government official
	The system should allow all the registered and authorized community members to receive and view the recommendations, the recommendation history and/or feedback.	Community Members
User Support	For any difficulties, the system should allow all users to request and receive technical support.	All Users of the System

Table 5: Non-functional requirements for knowledge sharing and dissemination application

Requirement	Description
Security	The system should restrict access to disseminated knowledge and related information to authenticated users.
Responsiveness	The system should support short response time
Maintainability	The system should be easily maintained, i.e., the system admin should be able to add new functionalities/features.
Usability	The system should meet the user requirements
Operating System	The mobile application is android based operating system

4.3 System Modelling

4.3.1 Conceptual Use Case

The interaction between the various actors (system administrator, community members, and practitioners) is depicted in Table 12 of functional requirements. Table 12 of functional requirements Using the use case diagram, it is possible to further analyze the interaction. A use case diagram depicts the anticipated functionality of a system from the perspective of the system user, as well as interactions between users (external actors) and the system under consideration (Vilain *et al.*, 2000). Figures 8 depict the complete functionality of the mobile application system for knowledge sharing and dissemination, depicted at a high level of abstraction.

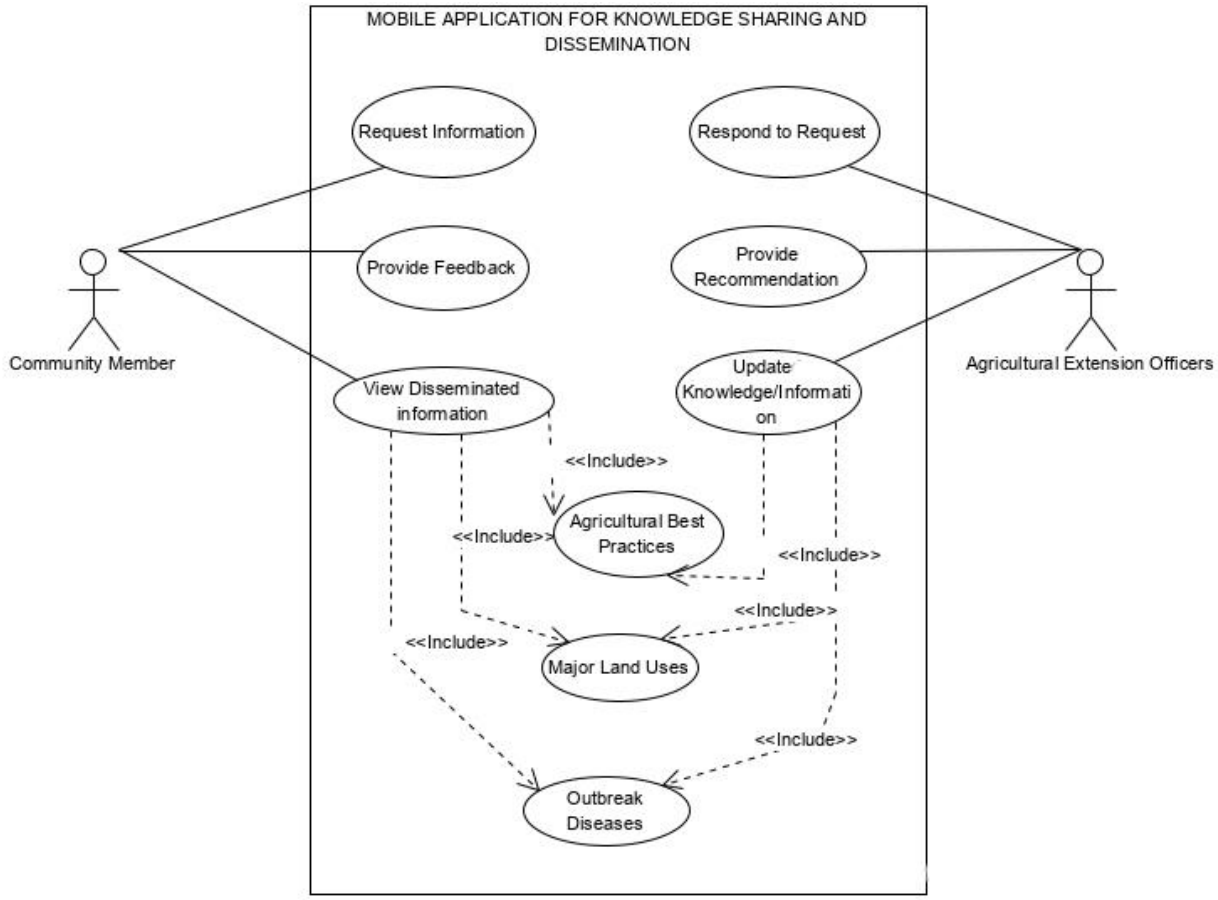

Figure 9: Use Case Diagram

4.3.2 Data Flow Diagram (DFD)

The DFD diagram (Fig. 10) depicts how the information will be transferred from one actor to another in the following scenario. The knowledge and recommendations will be accessed by the registered user solely through the mobile application.

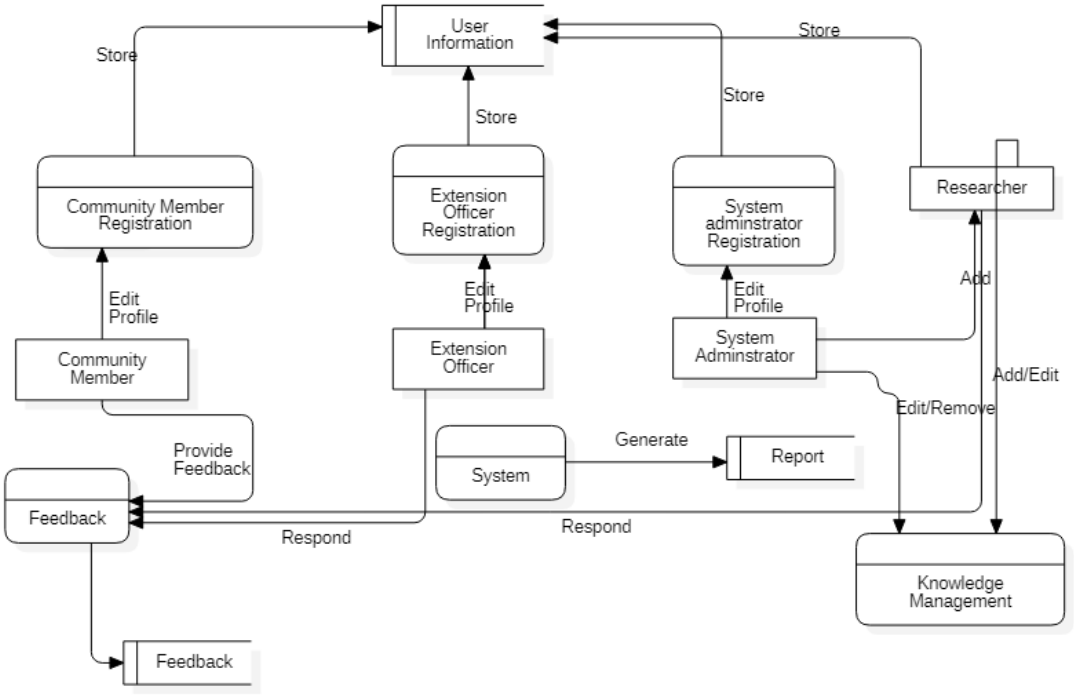

Figure 10: Data Flow Diagram

4.4 System Implementation

4.4.1 Database Implementation

MySQL is a database management system that is used to support the mobile and web applications that are part of this system. Several JSON and PHP scripts have been employed in the connection between the database and the application to allow for smooth and consistent data manipulation (including data insertion, updating, retrieval, and deletion). The database schema consists of five (5) tables, each of which is represented by an entity-relationship diagram, as shown in Fig. 11.

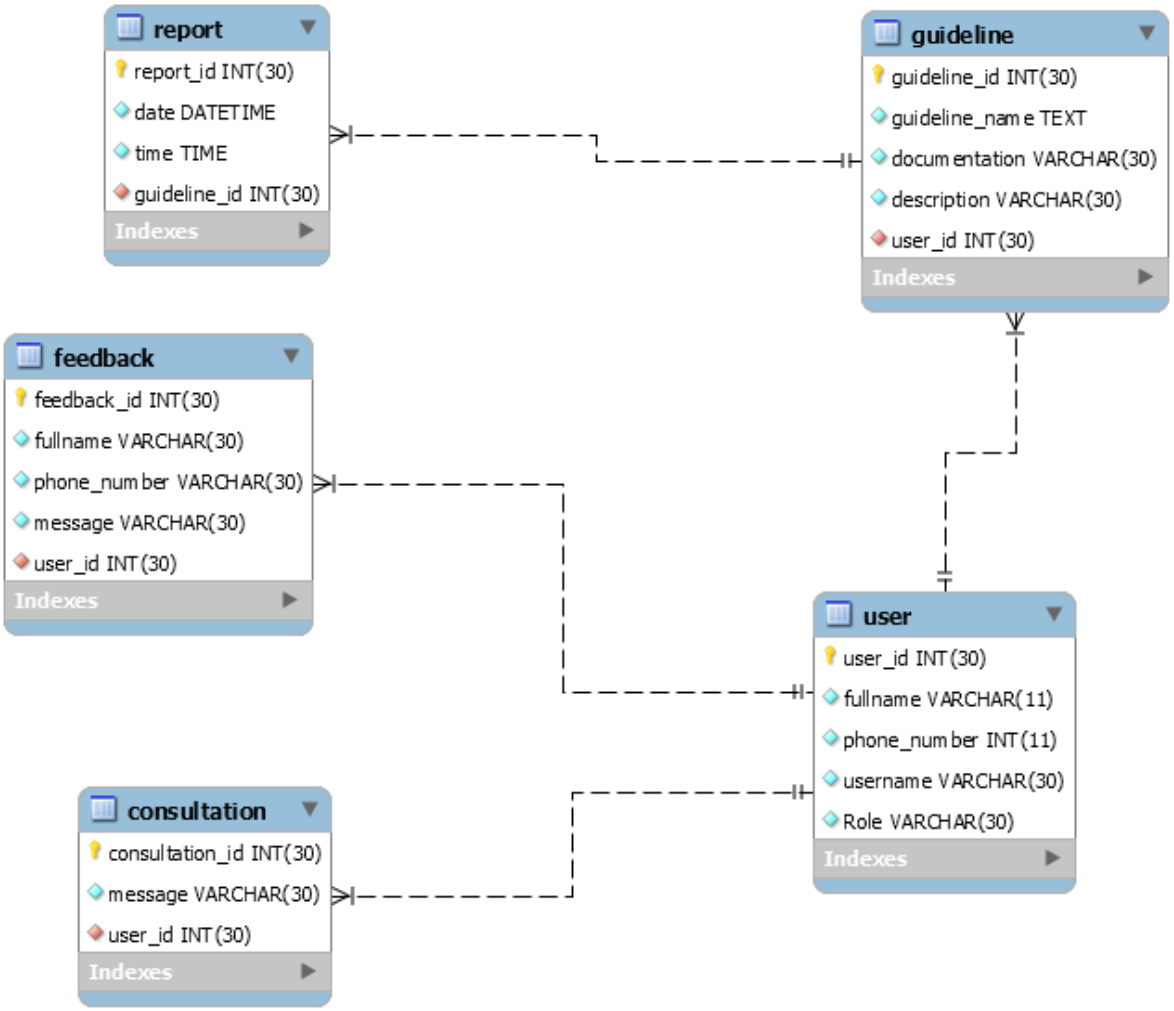

Figure 11: Entity Relationship Diagram

4.4.2 Mobile Application Implementation

The mobile application was developed based on the Android platform. It includes simple and intuitive user interfaces that facilitate interaction between the user and the application. The illustration below depicts the system's user interface.

Before attempting to log into the system, the user must have an account that has been activated and registered. During the registration process, the client will be required to provide personal information that will be useful to the system. Some of these specifics, such as the person's name and phone number, are shown in Fig. 12.

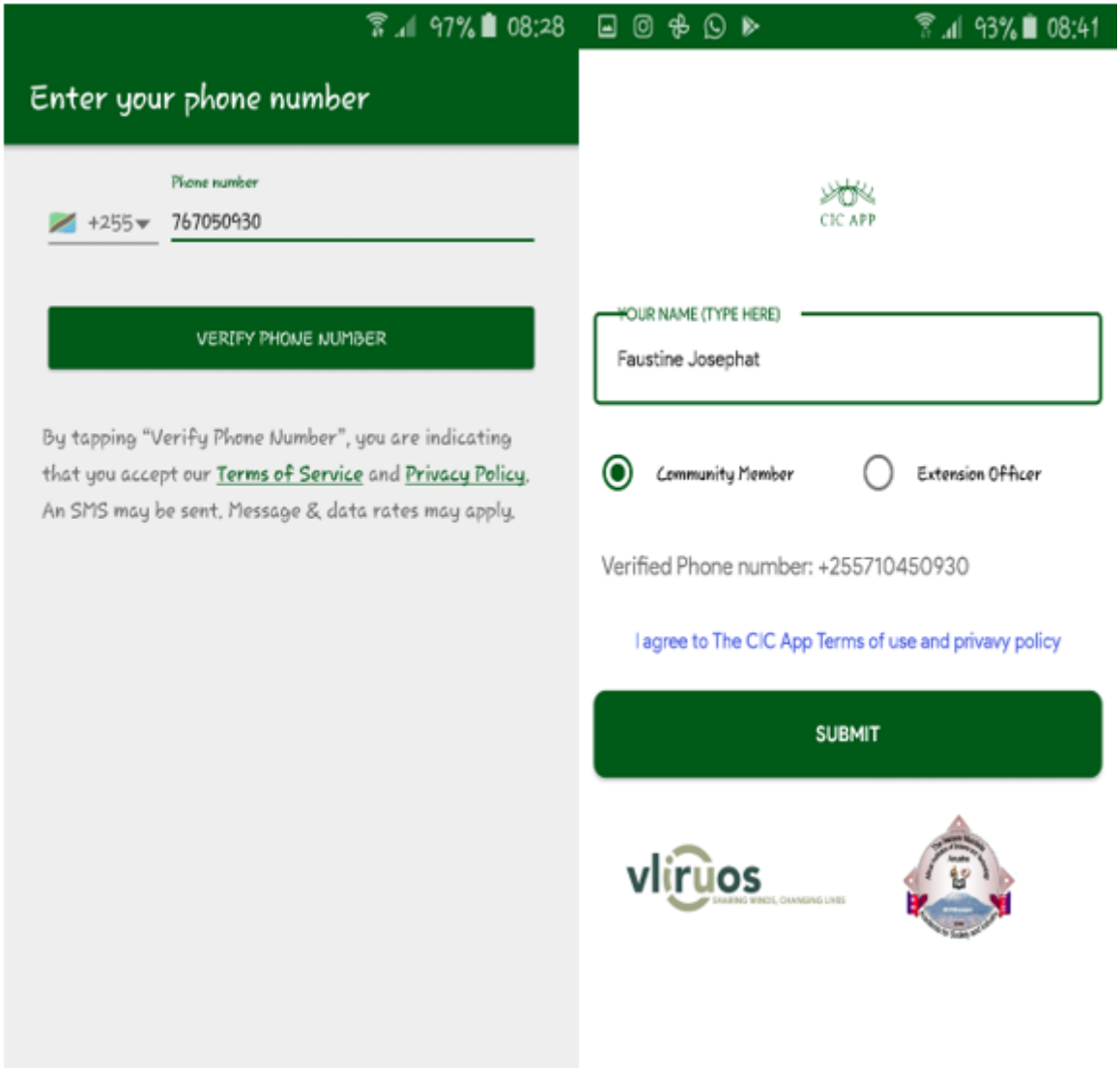

Figure 12: Login Interface

After completing the registration process successfully, the client will be prompted to enter his/her unique display name. Following a successful login, the client will be presented with a menu containing all the disseminated information/knowledge. Figure 13 shows the menu UI.

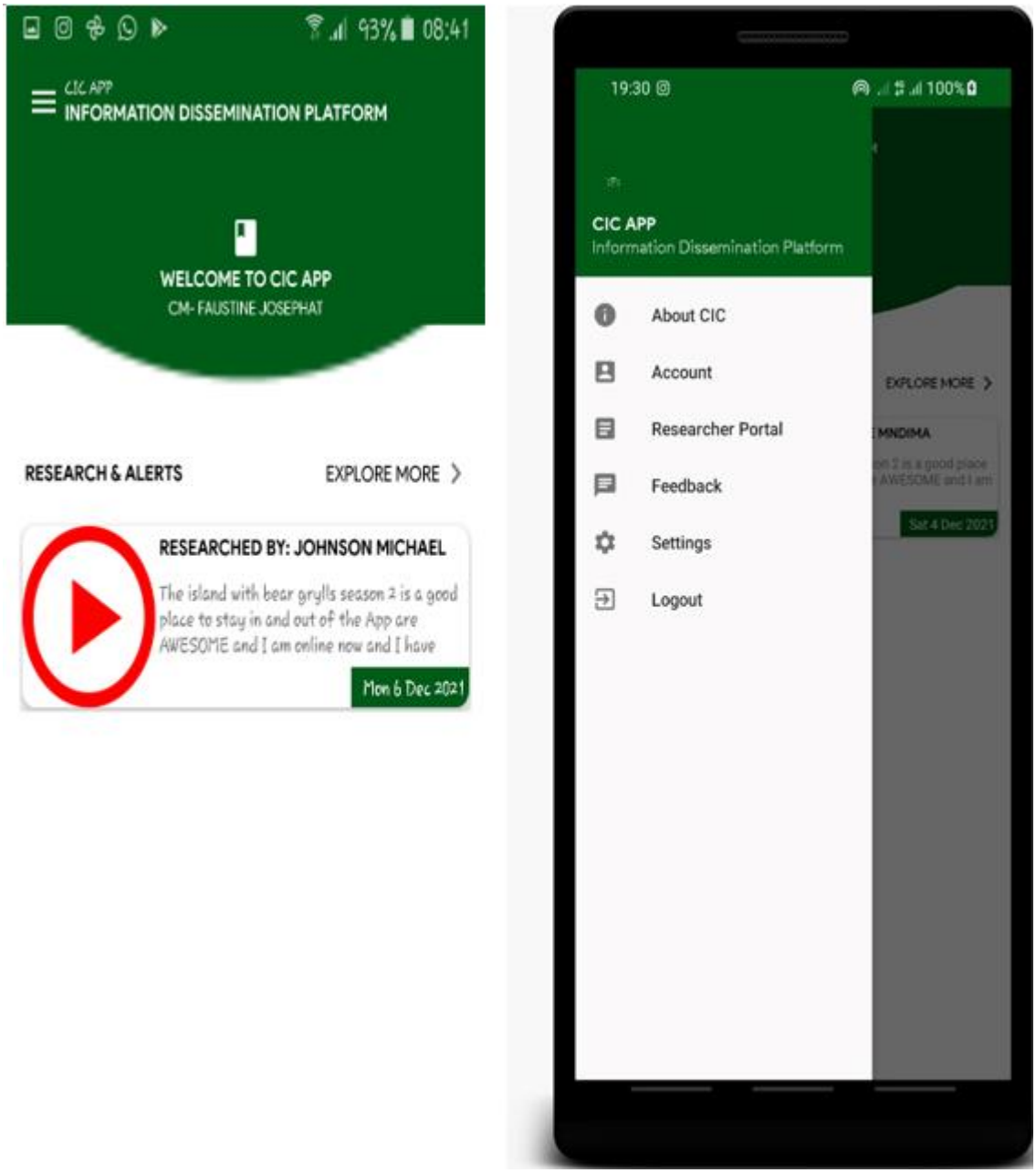

Figure 13: Menu Interface

The client can access his or her profile and even make changes to their personal information. Figure 14 illustrates how the specifics are displayed and how they can be updated. Additionally, the mobile application provides a logout option to protect the client's confidentiality and anonymity. This option will end the session of communication between his or her profile and the system. As a result, no one can access his/her account.

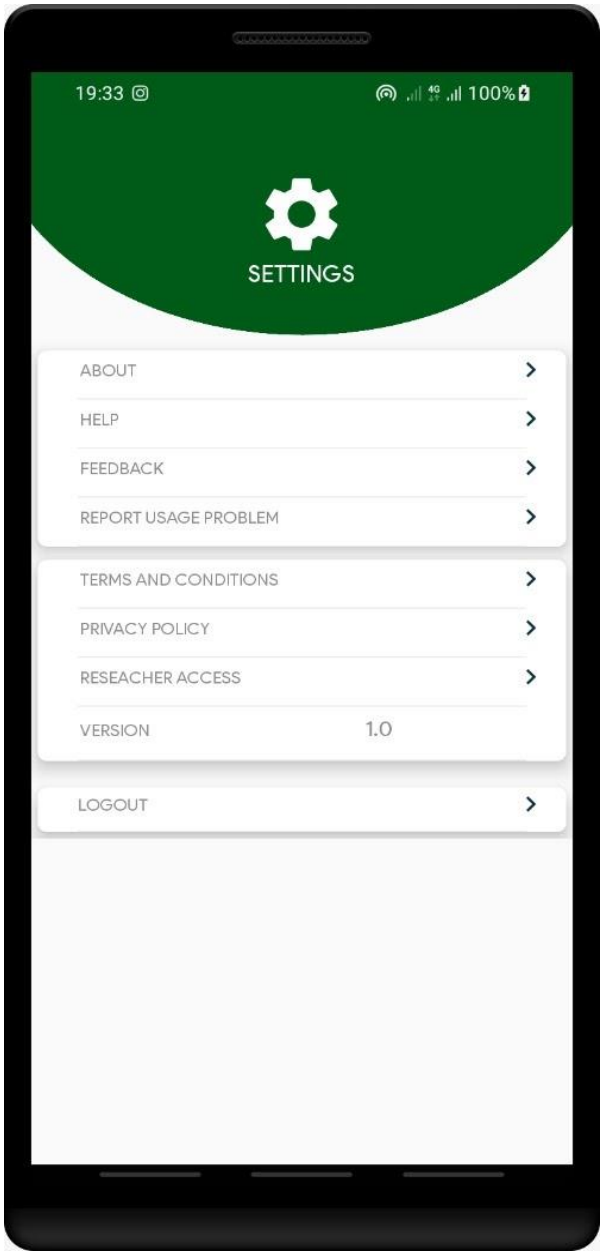

Figure 14: Setting Interface

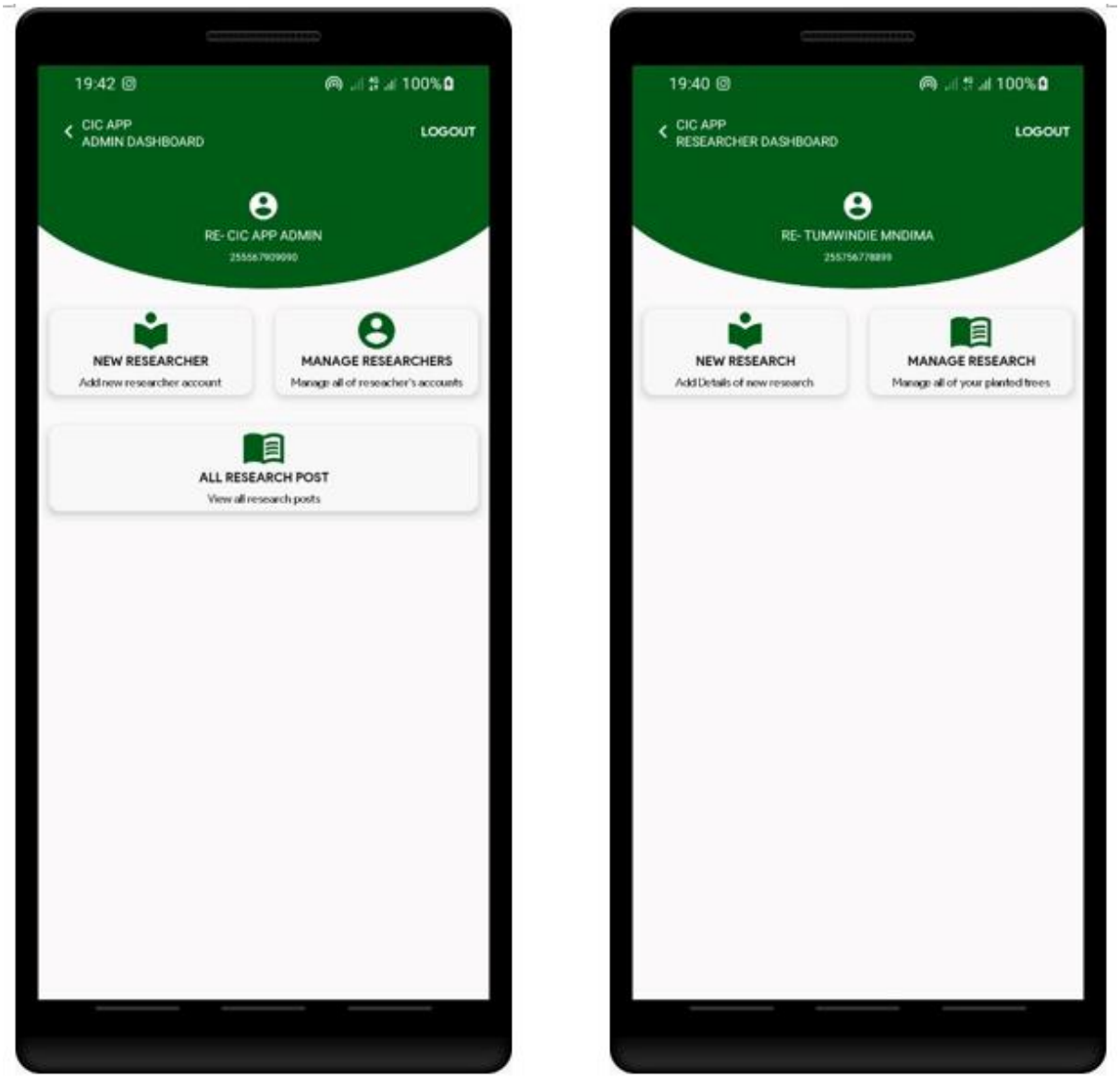

Figure 15: Researcher dashboard and system administrator dashboard

Figures 15 shows the interfaces for researchers and system administrators, respectively, each type of user has a unique account that is associated with a specific set of responsibilities.

It provides interfaces for researchers as well as for system administrators. Researcher will login in the system and can add new research and also can manage research for the case of updating his/her disseminated information.

System administrator will add new researcher, manage researcher and also see and manage all disseminated research posts from the researchers and also can be able to delete and suspend the researcher as shown in Fig. 16.

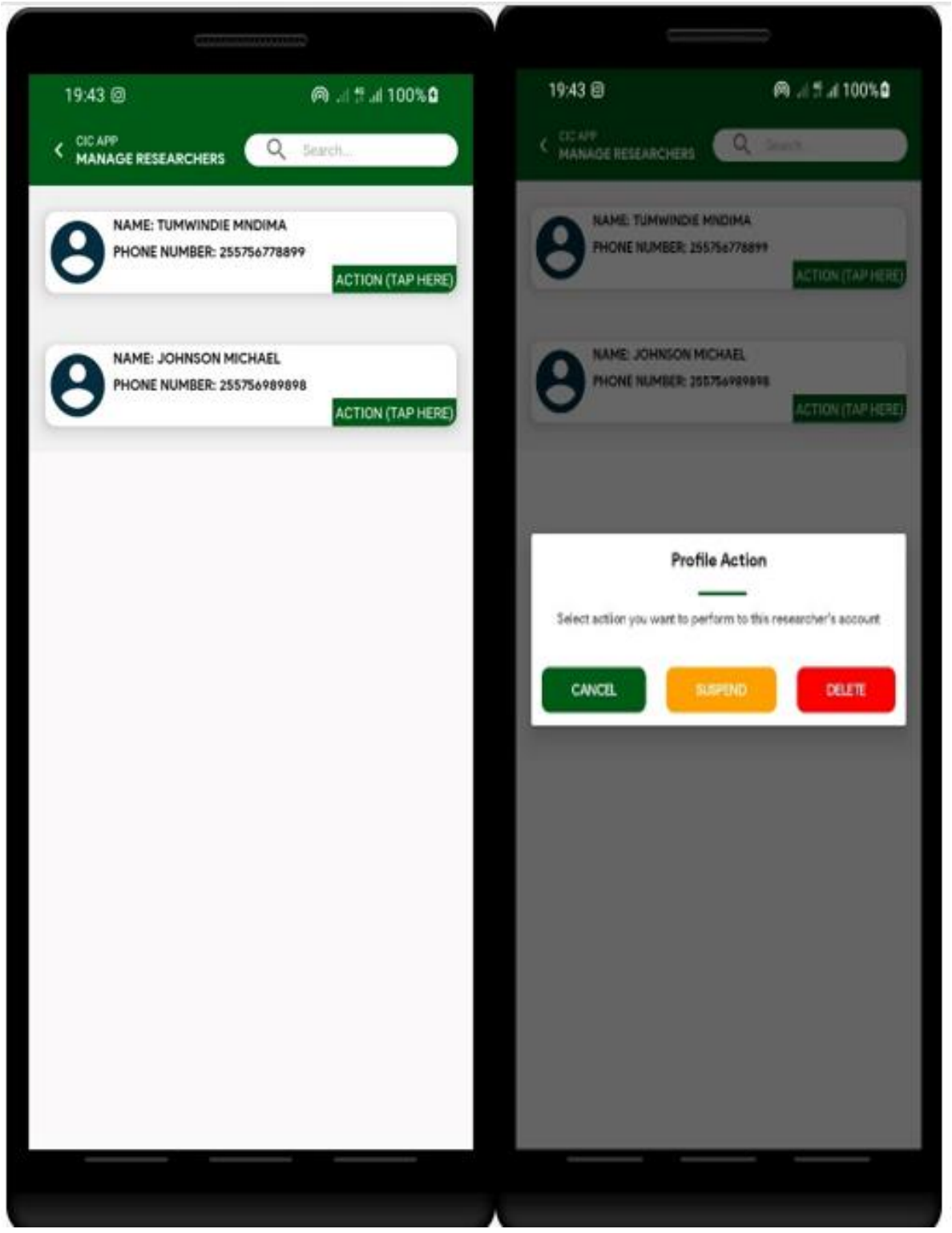

Figure 16: Manage researcher interface (Manage researchers (Suspend and Delete))

4.5 System Validation

4.5.1 System Testing

Modules of the system were tested to ensure they functioned according to the system's defined requirements. The following table summarizes the test results for the various modules that were evaluated.

Table 6: System's modules testing results

System Requirement	Test Result
The mobile application must be compatible with the Android operating system.	PASS
The system must allow registered users to log in and out of their accounts.	PASS
Clients who are not yet registered must be able to register themselves with a unique username through the system.	PASS
The system must provide the system administrator with the ability to create, suspend, or delete a user account for Extension officers, researchers, and government officials.	PASS
The system's administrator should be able to upload and/or delete disseminated knowledge and other related information.	PASS
All successfully logged-in users should be able to view the disseminated knowledge.	PASS

4.5.2 User Acceptance Testing

After the system was fully developed, it was placed in a practical environment to validate user acceptance. Twenty people took part in this system validation survey, including 15 community members who downloaded the mobile application to their smartphones, two extension officers, one researcher, and one government official. All participants were given three days to familiarize themselves with the system before completing the survey questionnaires. The survey results were calculated using the mean score on a five-point scale (5 being strongly agreed, 4 being agreed, 3 being uncertain, 2 being disagreed, and 1 being strongly disagreed), as shown in Table 7.

According to the research, the mean for each validated aspect was greater than 3.5, indicating that the majority of selected sample respondents strongly agreed with the developed system's quality and capability. The system's sampled users even recommended that the government should deploy the developed system to disseminate knowledge to community members.

Table 7: The system's user acceptance validation response

Aspect of Validation	Number of Respondents					
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree	Mean Score
The system's user interfaces are visually appealing and interactive.	0	0	1	8	11	4.52
There are no issues with compatibility between the system and your mobile phone and/or your computer's web browser.	0	1	2	5	12	4.46
I require additional training and technical assistance to fully utilize this system.	13	4	3	0	0	1.75
The system's contents are simple to grasp and comprehend.	0	1	1	5	13	4.80
Overall, I am pleased with the way this system works.	0	0	0	5	15	4.60
I will recommend others to use this system	0	0	0	5	15	4.60
I will use this system for accessing, sharing, and disseminating knowledge	0	0	0	6	14	4.72
The system is useful and helpful in accessing the Agricultural best practices	0	0	4	6	10	4.13

4.6 Discussion

The study's findings indicate that the majority of community members continue to obtain knowledge or access information by visiting government offices or meeting with government officials. Surprisingly, this study reveals a sharp decline in the use of traditional ICTs such as radio for information access. This is in contrast to previous research, which indicated that the

majority of people obtained information about agricultural best practices through workshops and radio programs (Mtega, 2018).

The study reveals that the majority of community members are aware of the existence of quarterly meetings with government officials. However, not everyone who is aware of these meetings is comfortable and willing to attend to obtain pertinent information, receive recommendations, or provide feedback. A sizable proportion of respondents indicated that they are uncomfortable attending meetings or visiting government offices, citing distance as a barrier. These findings corroborate several previous studies that demonstrated that when farmers abandon sound farming practices, poor yields and eventually low productivity result. Poor yields result in higher poverty rates, decreased government revenues, and possible farmworker downsizing (reference yields).

Furthermore, this study discovered a significant increase in the number of people seeking agricultural-related information via internet sources. According to Zhang *et al*. (2016), there is a significant amount of effort required for people to gain access to internet-based agricultural information. Several previous studies indicated that advancements in Internet technology significantly increased agricultural information access (Khan *et al.*, 2019). Additionally, the study reveals that the majority of respondents believed they could access knowledge distributed to them via the mobile application platform. Additionally, the study reveals that people's desire for a mobile application platform is strongly influenced by their education level and ownership of mobile phones. The researchers in this study even endorsed the need for a mobile application for knowledge sharing and dissemination. Additionally, the study's findings indicate that the majority of researchers are capable of disseminating knowledge to community members via online means.

Additionally, the results of this study demonstrate that the vast majority of people own mobile phones, and in particular at least one smartphone. These findings are consistent with the Communication Statistics Report published in July 2021, which shows a significant increase in the use of mobile communication and internet access penetration, which is equivalent to 80% and 40%, respectively, in comparison to the previous year (TCRA, 2021).

CHAPTER FIVE

CONCLUSION AND RECOMMENDATIONS

5.1 Conclusion

The purpose of this research was to develop an integrated research knowledge dissemination platform in Tanzania, Monduli and Mto wa Mbu as case study. The study-assessed people's acceptance and comfort with the current state of knowledge and findings access, as well as the need for a mobile platform. Additionally, the study not only identified and established functional and non-functional requirements for the proposed mobile platform but also developed the platform (which consists of an android mobile application and a web-based system) for knowledge sharing and dissemination.

This research discovered that the increasing use of mobile communications technologies, specifically the internet, can be beneficial for knowledge delivery. The majority of respondents to this study indicated the importance of having a mobile application platform for knowledge dissemination. Researchers, extension officers, and government officials all endorsed this need. Additionally, researchers, extension officers, and government officials implied the need for a mobile application platform for research knowledge dissemination, even implying that they were prepared to offer this service online. The study's findings imply that knowledge provision requires the use of ICT, particularly mobile technology. Technology usage is critical, even more so in this established communication era, when the majority of people own mobile devices with internet access capabilities.

5.2 Recommendations

The findings of this study highlight the need for active engagement and utilization of the developed research knowledge dissemination and sharing platform by researchers, community members, and government officials. The increased number of individuals seeking information and knowledge through online sources, coupled with the absence of an official application for delivering such knowledge, underscores the importance of addressing this gap.

To ensure the effective utilization of the platform, it is recommended that a collaborative approach be adopted in designing the mobile application for research knowledge sharing and dissemination at Monduli and Mto wa Mbu in Tanzania. Input from both researchers and

community members should be sought to ensure that the platform is tailored to meet their specific needs and requirements.

Key considerations for the design of the mobile application include prioritizing user-friendliness and accessibility. This can be achieved by incorporating clear navigation and search functions, making it easy for users to find and access relevant research knowledge. Additionally, the platform should include features such as multimedia content, enabling the dissemination of research findings through engaging and interactive formats. Interactive discussion forums should also be integrated to foster knowledge exchange, collaboration, and networking among users. Furthermore, real-time updates should be provided to keep users informed about the latest research findings, events, and news.

Regular updates and active promotion of the mobile application will be vital to ensure its broad reach and impact. Continuous efforts should be made to update the platform with the latest research findings and actively promote its use among the target audience. This can be achieved through targeted marketing strategies, collaborations with relevant institutions, and leveraging existing networks.

To ensure that the mobile application effectively meets the needs and expectations of researchers and community members, it is recommended to validate the user experience through usability testing and feedback mechanisms. This iterative process will allow for continuous improvements and enhancements based on user input, ensuring that the platform remains relevant and user-centric.

The successful implementation of the mobile application holds significant potential in various aspects. It can strengthen collaboration among stakeholders, facilitate the dissemination of research findings, and contribute to socio-economic development.

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APPENDICES

Appendix 1: Sample Interview Questions

1. What type of platform should all the resource collection and dissemination be handled from?
2. How do you want to give the recommendation?
3. Currently how you do the follow up with extension officers?
4. What do farmers/extension officers desire to learn from researchers?
5. What is the key information you want field officers to have from your reports while out and about (on their mobiles)?
6. What support do you need to provide quick and easy guidelines for farmers?
7. How should resource collection and development be handled?
8. What format do you prefer for knowledge dissemination? Video clips? Documents?
9. How long taking you to get feedback from researchers?
10. What technology you prefer? SMS? Mobile Application? Web?

Appendix 2: Sample Questions for the System's Validation

Aspect of Validation	Number of Respondents				
	Strongly Disagree	Disagree	Not Sure	Agree	Strongly Agree
The system's user interfaces are visually appealing and interactive.					
There are no issues with compatibility between the system and your mobile phone and/or your computer's web browser.					
I require additional training and technical assistance to fully utilize this system.					
The system's contents are simple to grasp and comprehend.					
Overall, I'm pleased with the way this system works.					
I will recommend others to use this system					
I will use this system for accessing, sharing, and disseminating knowledge					
The system is useful and helpful in accessing the Agricultural best practices					

Appendix 3: Sample Questions for Testing System Result

System Requirement	Test Result
The web system should be compatible with all browsers, and the mobile application must be compatible with the Android operating system.	
The system must allow registered users to log in and out of their accounts.	
Clients who are not yet registered must be able to register themselves with a unique username through the system.	
The system must provide the system administrator with the ability to create, suspend, or delete a user account for Extension officers, researchers, and government officials.	
The system's administrator should be able to upload and/or delete disseminated knowledge and other related information.	
All successfully logged-in users should be able to view the disseminated knowledge.	

Appendix 4: Code for System

```
package co.record.cicapp;
 import androidx.appcompat.app.AppCompatActivity;
 import android.content.Context;
import android.content.Intent;
import android.content.SharedPreferences;
import android.os.Bundle;
 import static co.record.cicapp.PhoneVerificationActivity.SUCCESSUSER_PREFERENCES;
 public class SplashActivity extends AppCompatActivity {
    SharedPreferences mySharedPreferences;
     @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_splash);
        displaySplash();
    }
     public void displaySplash() {
        Thread mythread = new Thread() {
            @Override
            public void run() {
                // TODO Auto-generated method stub
                try {
                    int displaytime = 4000;
                    int waittime = 0;
                    while (waittime < displaytime) {
                        sleep(100);
                        waittime = waittime + 100;
                    }
```

```
                super.run();
            } catch (InterruptedException e) {
                // TODO Auto-generated catch block
                e.printStackTrace();
            } finally {
                mySharedPreferences = getSharedPreferences(SUCCESSUSER_PREFERENCES, Context.MODE_PRIVATE);
                if (mySharedPreferences.contains("verifiedphone")) {
//                    startActivity(new Intent(SplashActivity.this, MainActivity.class));
                    Intent a = new Intent(getApplicationContext(), MainActivity.class);
                    startActivity(a);
                    finish();
                } else {
                    Intent a = new Intent(getApplicationContext(), PhoneVerificationActivity.class);
                    startActivity(a);
                    finish();
                }
            }
        };
        mythread.start();
    }
}
```

RESEARCH OUTPUTS

(i) Research Paper

Kemhe, J. M., Luhanga, E. T., & Kisangiri, M. (2022). Mobile Application for Research Knowledge Sharing and Dissemination: The Case of NM-AIST Tanzania. *Journal of Software Engineering and Applications*, *15*(7), 209-219.

(ii) Poster Presentation

Appendix 5: Poster Presentation

A MOBILE APPLICATION FOR RESEARCH KNOWLEDGE SHARING AND DISSEMINATION: THE CASE OF MONDULI AND MTO WA MBU ARUSHA

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INTRODUCTION

Researchers' efforts are critical in assisting community members in avoiding inappropriate options, as well as in answering their questions and providing information to policymakers and other stakeholders about effective practices. Researchers must build relationships with communities in a number of ways, including introducing research, getting permission, giving feedback, and easily sharing knowledge (Hammond & Cooper, 2011). The ultimate goal of the research is twofold: to advance knowledge frontiers (theoretical contribution) and to facilitate the resolution of practical problems or issues confronting communities (practical contribution) (Fussy, 2018). To achieve this noble goal, research knowledge should be disseminated to relevant and potential audiences both in academic and non-academic circles. However, most researchers focus the majority of their research/knowledge dissemination efforts on a small subset of a specialized audience – the academic community (Ashcraft, Quinn, & Brownson, 2020).

This study aimed at developing a mobile application for research knowledge sharing and dissemination.

OBJECTIVES

Main Objective

The main objective of this research is to develop a mobile application for research knowledge sharing and dissemination.

Specific Objective 1

To identify researchers' and community members' requirements for knowledge sharing and dissemination.

Specific Objective 2

To develop mobile application for research knowledge sharing and dissemination.

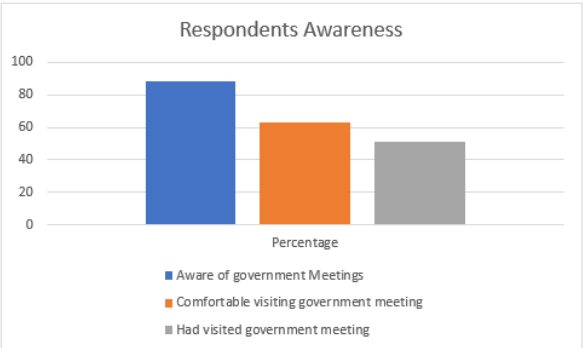
Specific Objective 3

To validate the mobile application through user experiences.

RESULTS

This chapter summarizes the findings from the data analysis, requirement formulation, and system development phases, as well as in-depth discussions of the findings concerning the research's specific objectives. The study's first specific objective was to determine whether a knowledge dissemination platform could be a viable strategy for knowledge sharing in Tanzania. The second objective was to define requirements for mobile and web applications. Thirdly, we designed and developed mobile and web applications for knowledge sharing and dissemination. The final objective was to validate mobile and web applications via user experiences.

Only 8.2(%) of respondents do not own a mobile phone, while 26.3(%) own two or more. Additionally, (n = 65.5%) of all respondents reported owning at least one smartphone with internet capability. The detailed distribution of mobile phone ownership among respondents is depicted in Figure 1 below and Figure 2, show Respondents awareness



CONCLUSION

The purpose of this research was to develop an integrated research knowledge dissemination platform in Tanzania, Monduli and Mto wa Mbu as a case study. The study-assessed people's acceptance and comfort with the current state of knowledge and findings access, as well as the need for a mobile platform. Additionally, the study not only identified and established functional and non-functional requirements for the proposed mobile platform but also developed the platform (which consists of an android mobile application and a web-based system) for knowledge sharing and dissemination.