A Framework for Preserving and Managing Indigenous Knowledge using Mobile Phones
Case Study: Kampala District (Uganda)

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Dedication

This dissertation is dedicated to my wife Mrs. Cecilia N. Kamugasa and my son Jethro E. Kamugasa for giving me all the necessary encouragement and support throughout the entire course.

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List of abbreviations

ICT	Information and communication technologies
IK	Indigenous Knowledge
KM	Knowledge Management
NGO	Non-government organization
NITA-U	National Information Technology Authority – Uganda
OECD	Organization for Economic Co-operation and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNICEF	United Nations Children's Fund

Abstract

This study was about proposing a framework which can be used in the preservation and management of indigenous knowledge with the use of mobile phones as an information and communication technology (ICT) enabler in Uganda. The degree at which indigenous knowledge is endangered today is unprecedented world over more so in developing countries which have generally adopted foreign cultures. The education system, rural urban migration, ways in which indigenous knowledge is transferred from one generation to another, and the association of indigenous knowledge with paganism among others are the reasons threating the existence of indigenous knowledge. Whereas the contribution of indigenous knowledge to sustainable development is undisputable, the fact that it is threatened is real and unless it is addressed, the indigenous communities risk losing their rich IK. The decision to use mobile phones in the preservation and management of indigenous knowledge was inspired by the contribution that mobile phones have had in other fields like agriculture, financial, and medicine to mention but a few. It is also evident that mobile phones are the most used means of communication today, with millions of Ugandans owning at least one phone. The preservation and management of indigenous knowledge will not only boosts the confidence of indigenous communities about the importance of their skills and knowledge but also promote the much sought after sustainable development. Management of indigenous knowledge will also help promote cross cultural understanding among indigenous communities.

Three knowledge management frameworks were critically analyzed, and used as a baseline for this study. The strengths and weaknesses of the frameworks were investigated to ascertain whether they can effectively be used to preserve and manage indigenous knowledge using mobile phones. The characteristics of IK were also put in perspective during the analysis. The study used a mixed research approach where both qualitative and quantitative methods were deployed simultaneously during data collection. Qualitative data was gathered through focus groups whereas quantitative data was gathered by using closed ended questions some of which were in questionnaires while others were embedded in the focus group discussion guides. The participants in the study were comprised of ICT policy makers (National information and technology authority – Uganda; NITA-U), local communities and ICT practitioners.

The results from the study indicated that majority of the population, agreed that indigenous knowledge was at the verge of disappearing and unless a purposeful effort was taken, indigenous knowledge would become extinct. Respondents were also in agreement that mobile phones would go a long way in preserving and managing IK.

Based on the findings from the study, a framework was proposed and validated by selected ICT policy makers and practitioners from NITA-U and other private institutions. Recommendations and limitations to the study were presented and future areas for research were also suggested.

CHAPTER ONE:

INTRODUCTION

Chapter one which is the general introduction presents the background of the study, statement of the problem and objectives of the study. It also covers the scope of the study, significance of the study, and definition of key terms.

1.0 Introduction

For many generations communities have relied on indigenous knowledge to make important decisions in relation to farming, health, natural resource utilization, and community development. Though indigenous knowledge had been ignored for long with many relating it to paganism, its importance and relevance has gained recognition world over and is being given due attention. A number of development agencies today, believe that to attain true sustainable development, indigenous knowledge has to be integrated in development programs making them more likely to succeed. World Bank (1998).

Unfortunately, indigenous knowledge faces a threat of extinction because of rapidly changing natural environments and fast pacing economic, political, and cultural changes on a global scale World Bank (1998). According to World Bank (1998) the tragedy of the impending disappearance of indigenous knowledge is most obvious to those who have developed it and make a living through it. The consequence for others can be harmful as well, when skills, technologies, artifacts, problem solving strategies and expertise are lost.

A lot of work has been done in the direction of preserving indigenous knowledge using ICTs though little has been done to guide how ICT can be used to preserve and manage indigenous knowledge. This study proposes a framework for the preservation and management of indigenous knowledge using mobile phones.

1.1 The background of the study

The marginalization of indigenous knowledge due the current wave of modernization has left many with questions on its relevance in the modern world and whether it is even necessary to have it preserved. However, the potential use of indigenous knowledge for project management, medicinal purposes, architecture and agricultural development has been widely acknowledged over the years (DeWalt, 1994; Hewson, 2015; Lwoga, 2010; Owusu-Ansah and Mji, 2013). As the potential contribution of indigenous knowledge to sustainable development in various fields gains continuous recognition, the need to build the capacity to preserve and manage it becomes more apparent. In Uganda, the Uganda National Cultural Policy 2006, indicates that indigenous knowledge has been marginalized, inadequately documented, and is in some cases threatened with extinction by modern knowledge and environmental degradation. Despite the fact that indigenous knowledge is disappearing, inadequate efforts to share and document it are made, and thus indigenous technologies are applied in isolation in developing countries Lwoga (2010). With indigenous knowledge primarily being held in people's minds, there is a risk of having it lost when the individual who has it passes on or suffers a memory loss.

There are documented concerns about documenting and sharing indigenous knowledge using ICTs and these typically refer to how intellectual property rights are handled, level of involvement of the indigenous community and ability of the local communities to use advanced technologies Ngulube (2002). The Uganda National Cultural Policy 2006 also mentions that there is an absence of frameworks that would provide information to innovators on who needs the innovations, how to find the users and when to approach the users.

It is therefore important to formulate a framework for preserving and managing indigenous knowledge before much of it is completely lost. The major concern here is how tacit knowledge can be identified, documented, stored and shared given its tacit nature.

1.2 Statement of the problem

Indigenous knowledge is what fundamentally defines local communities and affects the wellbeing of most of the population in developing countries. According to Das and Sarkhel, (2016) the world health organization estimates that eighty percent (80%) of the world's population still depends on

indigenous knowledge to meet their medicinal needs. Other than medicine, local communities additionally rely on indigenous knowledge in agriculture, ethics and food security. Unfortunately, this same indigenous knowledge is under threat and is likely to fade away if not managed appropriately.

Whereas there has been a raise in the design of models and frameworks towards indigenous knowledge management, little has been done to tailor these models to ICT. Efforts in indigenous knowledge management and ICT have mainly focused on developing digital technologies to store, capture, and distribute knowledge Zaman, (2013). The problem with this approach is that it neglects the community's ability to evolve and assumes that indigenous knowledge is a static resource. Adam (2007), mentions that while some people still remain skeptical about the direct contribution of ICTs to indigenous knowledge transfer and poverty alleviation, there are signs that ICT's can contribute to development goals and to the exchange of indigenous knowledge. Understanding the characteristics and defining tools that meet these characteristics must be clearly understood.

This study therefore aims at coming up with a framework that can guide the preservation and management of indigenous knowledge using mobile phones.

1.3 Objective of this study

The main objective of this study is to develop a framework for the preservation and management of indigenous knowledge using mobile phones. The mobile phones were integrated into the framework that was designed because the literature reveals that the majority of the population in Uganda own mobile phones. Additionally mobile phones are very flexible and cost efficient devices that offer adequate storage and computing capabilities to users.

1.3.1 Specific Objectives

i. To review existing literature about the preservation and management of indigenous knowledge in order to identify existing gaps, establish requirements, and justify the need to develop a framework.

ii. To develop a framework for the preservation and management of indigenous knowledge

iii. To validate the developed framework

1.4 Scope of the study

The study was carried out in Kampala district and the area was selected because it has different groups of people from different cultures from all over the country. The diversity in the composition of the people in the area made it possible to get informed views about the indigenous knowledge from different societies. The researcher is also well versed with the area and the framework developed best applies in this area because majority if not all people have access to mobile phones making the preservation and management of IK easier.

1.5 Significance of the study

There is overwhelming evidence that indigenous knowledge is endangered today and unless it is preserved and managed, it will be nonexistent sooner than later. The swift transformation in the habits of local communities, and lifestyles as a result of exposure to external influences as well as the education system has not made it any easier.

The ability of ICTs being used in the preservation and management of indigenous knowledge is still debatable despite the efforts that have already been taken in this direction. This could be attributed to the lack of guidelines to follow when such solutions are being implemented. ICTs can be used in the management of indigenous knowledge to document indigenous knowledge, raise awareness in communities about the value of indigenous knowledge as well as make indigenous knowledge available.

The proposed framework will provide systematic guidelines and directions on how to preserve and manage indigenous knowledge using mobile phones which will help avoid common mistakes and errors. Furthermore, the framework when used will promote a bottom up approach to development of applications which will be people/community oriented making such applications much easier to adopt.

1.6 Definition of key terms

Indigenous Knowledge: There are a number of definitions of indigenous knowledge though for purposes of this study, we shall adopt the definition by UNESCO (2009), which looks at indigenous knowledge as the skills, experiences, and insights of people that are unique to a particular culture or community.

Mobile phone: A mobile phone is a wireless handheld device that allows users to make calls and send text messages, among other features. A mobile phone may also be known as a cellular phone or simply cellphone.

Framework: A framework is a set of guidelines, principals and ideas that provide the basis or outline of how to achieve a desired position or even the components needed to achieve such a position.

Management: The organization and coordination of a group activities with a target of attaining a predetermined goal.

Preservation: An endeavor to protect and conserve and entity of significance

1.7 Chapter summary

This chapter laid the foundation for this dissertation by giving a background to the research problem related to the challenges faced in the preservation and management of indigenous knowledge. The chapter also mentioned the objectives of the study, the scope as well as the envisaged significance of the study.

CHAPTER TWO:

LITERATURE REVIEW

2.0 Introduction:

This chapter presents the theoretical foundation for the study. It also talks about the literature that was reviewed in relation to the objectives of the study which include the current state of indigenous knowledge, the need for preserving it, the efforts that have been put in place to preserve and share it, and the gap in the options that have been presented. Lastly the chapter looks at the role of ICTs in preserving and sharing indigenous knowledge. The chapter also defines the key words that have been used in the study.

2.1 Indigenous Knowledge

Indigenous knowledge a times also known as local or traditional knowledge refers to the skills, experiences, and insights of people that are unique to a particular culture or society World Bank, (1998). This broad body of knowledge and skills which is developed outside the formal education system is passed on from generation to generation and is deeply rooted in people's cultural values. Indigenous knowledge includes cultural heritage in the form of traditional stories, songs, dances and ceremonies that reflect beliefs related to spirituality, family, land and social justice. It includes potentially patentable knowledge about traditional medicines, foods, farm practices, architecture and construction, handicrafts, artwork and folk music Flavier et al, (1995).

2.1.1 Importance of indigenous knowledge

Indigenous knowledge, particularly in the African context, has long been ignored and maligned by outsiders. Today, however a growing number of African governments and international development agencies are recognizing that local-level knowledge provides the foundation for participatory approaches to development that are both cost effective and sustainable Warren (1996)

According to World Bank (1998), a country's ability to build and mobilize knowledge capital, is equally essential for sustainable development as the availability of physical and financial capital.

The basic component of any country's knowledge system is its indigenous knowledge. It is also noted by the International Development Research Center (IDRC) that most of the contributions to global knowledge or scientific knowledge have their origins in indigenous people most especially in the field of medicine; the medicinal properties of the neem tree *(Azadirachtaindica)*, which among others the international development research centre (IDRC) is researching. World Bank, (2015).

In Africa, indigenous knowledge has provided tribal people with solutions to common problems and has also been a rich source of data for the development of social science theories. Ancient African civilizations bore sophisticated knowledge systems deeply embedded in local culture and social politics. Local, indigenous knowledge resides in cultural memories. Emeagwali and Dei, (2009). For instance the traditional method of brewing in northeastern Nigeria is as old as the communities found in these areas. While the word beer may sound foreign to the inhabitants of this area, it has its own name "burukutu". At the heart of the traditional brewing process is the exploitation and use of enzymes Emeagwali and Dei, (2009).

Integrating indigenous knowledge with formal or global knowledge can help cab some of the challenges we face today. An example is when the indigenous knowledge for development program that is being run by the World Bank. In Iganga district, Uganda traditional knowledge systems have been leveraged to dramatically reduce maternal mortality rates. In the past, traditional care could not assist in complicated cases and the modern health service delivery system reached less than half the population of the district. To address the high mortality rates, local communities and officials built on the local traditional institutions to improve the reach and impact of modern prenatal and maternal healthcare services. The local initiative used and leveraged the system known and trusted by Ugandan women—the traditional birth attendant (TBA). The project provided the TBAs with walkie-talkies to communicate with public health service workers from their outposts. This enabled the TBAs in remote areas to become the referral system to modern healthcare. In cases of complications or emergencies, the TBA could now call in the modern mobile unit or refer the patient to the rural health center. As a result, maternal mortality in the Iganga district reportedly declined by 50 percent in three years! Musoke, (1999).

Research done by the Egyptian atomic energy commission on energy and material saving construction methods observed that curved roofs have a smaller surface area and require less building material for the same volume of indoor space. Computer simulations prove: the net heat gain of a dome can be 20% less than that of a flat roof; curved roofs allow the warm air to rise leaving cooler air at floor level. Openings at the top can provide " natural air condition" by very cross-ventilation; skylights on vaults and domes provide 4 to 5 times more light per unit floor area than low windows on vertical walls. Less window area is needed heating and cooling loads are reduced; rooms with curved roofs have a pleasant psychological effect on the occupants: they seem less oppressive than rooms with flat ceilings. It has become abundantly clear to informed practitioners that including traditional knowledge or indigenous knowledge is an important and helpful approach to modern project planning and implementation.

Indigenous knowledge has also been used in weather focusing and early disaster prediction by the Maasai in Tanzania, who use their natural grassland according to seasons. This requires a timing decision on when and where to move next. They predict droughts as well as weather related diseases by watching the movements of celestial bodies in combination with observing the date of emergence of certain plant species (Ole Kitolya). Such "early warning signals" of an approaching environmental disaster are used to determine any preventive measures, prepare for mitigation and decide on the course of the community in using the natural resources. Similarly, estimates of animal fertility can be drawn from such forecasts with implication on stocking rates and density.

2.1.2 Efforts towards preserving indigenous knowledge

A number of efforts have already been taken towards the preservation and management of indigenous knowledge world over and these are embedded in legislations and other practices. The Universal Declaration of human rights (UDHR) which was drafted by representatives with different legal and cultural backgrounds from all regions of the world, and proclaimed by the United Nations General Assembly in Paris on 10 December 1948 General Assembly resolution 217(III) A as a common standard of achievements for all peoples and all nations. It sets out, for the first time, fundamental human rights to be universally protected. In particular, article 27 gives everyone the right to freely participate in the cultural life of a community, to enjoy the arts and to share in scientific advancement and its benefits. The International Covenant on Economic, Social

and Cultural Rights (ICESCR) in article 15 also goes ahead to indicate the right to freely engage cultural conservation.

Uganda has also registered significant efforts towards the preservation of indigenous knowledge through;

i. Cultural institutions like kingdoms and chiefdoms are at the heart of preservation of indigenous knowledge in Uganda. Article 246 of the 1995 constitution of Uganda provides for the revitalization, strengthening and support of traditional/cultural institutions. These institutions have well laid out structures for upholding their cultural norms and communities lookup to them for identity.
ii. According to OECD, (2009), cultural tourism is one of the largest and fastest-growing global tourism markets. Uganda has taken advantage of this by promoting some communities like Batwa pygmies in the Bwindi impenetrable forest thus enabling the documentation and transfer of indigenous knowledge about such communities.
iii. The government of Uganda has charged statutory institutions like the national library of Uganda, Uganda National Cultural Centre, and local governments with the responsibility of promoting culture.
iv. Cultural sites like the Kasubi tombs are also being used by the government and cultural institutions to preserve and manage indigenous knowledge
v. Provision to promote culture has also been made in the constitution of Uganda. Objective XXIV of the Constitution states that cultural and customary values that are consistent with the fundamental human rights and freedoms, human dignity and democracy and with the Constitution of Uganda may be developed and incorporated in all aspects of Ugandan life. In addition, Objective XXV mandates the State and citizens to preserve and promote public property and Uganda's heritage. Further, the Constitution (Amendment) Act 2005, Article 6 provides for use of any other language as medium of instruction in schools, and Article 3 of the Constitution (Amendment) (No.2) Act 2005 mandates Regional Assemblies under the Regional tier system of governance to handle cultural matters relating to the traditional or cultural leader, clan and sub clan leadership, cultural and traditional practices (cultural funeral rites) and cultural institutions by establishing specialized committees for them.

2.1.3 Erosion of indigenous knowledge systems

Despite the efforts that have been put in place to preserve and manage indigenous knowledge, there is a threat to the existence of indigenous knowledge and it is likely to disappear if it is not properly addressed. The rate at which the way of life of indigenous communities is changing seems to be unprecedented and could be credited for the loss of IK. According to Ngulube (2012), the influence of modern technology and education have led the younger generation to underestimate the utility of indigenous knowledge.

To make matters worse, there is a widely held view that anything associated with culture and hereditary values is pagan, and thus backward, as reflected by the vast number of urban Africans who feel embarrassed to associate themselves with their own cultural background **(Scienceafrica.com, 2014)**. Urbanization and globalization have not made things any better for indigenous knowledge. Many youth are abandoning their communities in the search for better "lifestyle" and opportunities in urban areas and other countries. This makes them lose touch with most indigenous people who could have ideally passed on this great wealth of knowledge.

As a result, many indigenous knowledge systems are at risk of becoming extinct. The tragedy of the impending disappearance of indigenous knowledge is most obvious to those who have developed it and make a living through it. But the consequence for others can be disadvantageous as well, when skills, technologies, artifacts, problem solving strategies and expertise are lost. It is therefore my opinion that this knowledge must be protected.

2.2 The role of ICT in the management of indigenous knowledge

Though a number of researchers have different arguments about the ability of Information and communication technologies (ICTs) being used in the preservation and management of indigenous knowledge Msuya (2007), there is proof that they can play a critical role in improving the management and preservation of indigenous knowledge.

ICTs play major roles in improving the availability of indigenous knowledge systems and enhancing its blending with the modern scientific and technical knowledge. ICTs include telecommunications technologies such as telephony, cable, satellite and radio, as well as digital

technologies, such as computers, information networks and software. For the purpose of this research, ICTs will refer to any telecommunication or digital technologies. Adam (2007) goes ahead to mention that ICTs can be used in the management and preservation of indigenous knowledge to specifically;

i. Capture store and disseminate indigenous knowledge so that traditional knowledge is preserved for the future generation
ii. Promote cost-effective dissemination of indigenous knowledge
iii. Create easily accessible indigenous knowledge information systems
iv. Promote integration of indigenous knowledge into formal and non-formal training and education
v. Provide a platform for advocating for improved benefit from IK systems of the poor

A number of projects have already been implemented where ICT is used to at least gather, share, transfer, and store indigenous knowledge examples of which are discussed in the following paragraphs.

2.2.1 Radio and television transmission

The way information is shared today has been greatly changed by both television and radio transmissions which are in position to reach a limitless number of people in the country, continent or even the world. The ability of now accessing radio and television over the internet has even made it much more accessible than before. Many programs have been set up on local radio stations here in Uganda that promote the preservation and sharing of indigenous knowledge for example the ***"Oguggwategubamuka"*** program on Bukedde TV that broadcasts information about the Buganda culture. The media has also helped improve the way particular information is disseminated such as announcements, obituaries, and meeting messages ***"okubika and okulanga in luganda, and okuranga in runyakitara"*** are common on local television and radio stations. Other communities have gone on to put in place "radio houses" with a microphone and loud speakers in strategic places where information can be passed on to the community members. Notable communities where these loud speakers cum radios can be found are the developing trading centers upcountry.

It is important to note that radios and television sets are powered by electricity which is not easily accessible to indigenous people and even those who could access it cannot afford to pay for it. The alternate sources of power also come at a cost that might not be met with ease by the indigenous people.

2.2.2 Online services

The Ulwazi Programme which is an initiative of the eThekwini municipality library in Durban, South Africa collects local / indigenous knowledge using a website designed to enable contributions and modifications from multiple users. Local knowledge is recorded on the wiki by field workers who are employed by the program and have great ties to their communities. Indigenous knowledge can be accessed by other communities through the library website.

A similar initiative is that of the Miromaa Language center, a not-for-profit organization supporting language documentation and conservation programs. The Miromaa language technology program is used for the documentation, conservation and dissemination of traditional languages in Australia. The Miromaa Program has been obtained for use in over 150 plus languages all over Australia and many more internationally. All this is done through a website which has full multimedia capabilities for attaching multiple sound, video and still images to each piece of language evidence recorded, it can also store digitised documents including PDF's, Word and Excel document formats.

Through a collaboration between Makerere University, Appfrica Lab and google; locals can now use the Google search engine to search the internet in Luganda a native language. This enables users to search in their local language providing extensive information that would not have been found.

2.2.3 Geographical Information Systems

Since the early 1990s indigenous peoples have extensively used GIS which has been applied to manage natural resources and conduct land use planning (Aberley 1993; Convis 2001; Bocco et al. 2001), represent their interests with the state Norweigan and Cizek (2004), gain land rights and sovereignty Poole (1995), and preserve the knowledge of elders and distribute it to younger generations (Duerden and Kuhn 1996; Laituri 2002; Tobias 2000).

Another rather interesting one is the Honey Bee Network of India which is a comprehensive multi media/multi lingual database of primary educational resources in native languages as well as information relating to new innovations and ideas, including, *inter alia*, horticulture, biodiversity, and herbal medicine. In the same way that honeybees thrive on pollen from flowers, the Honey Bee Network is designed around the principle of information and knowledge sharing for the common good. Just as taking nectar away from flowers does not make them poorer, the objective of the Honey Bee Network is to enrich the lives of the people who share their innovations and ideas by helping them realize the value of their knowledge. By facilitating the cross-cultural and multi -linguistic exchange of ideas, the Honey Bee Network provides an opportunity to tap into the creative component of indigenous knowledge systems. Unlike the more developed segments of urban society, the creativity of knowledge-rich peoples in rural and isolated areas goes largely unseen because they lack the necessary channels of sharing their ideas with the wider polity. By providing publicly available access points (e.g. kiosks) in remote villages throughout India, the Honey Bee Network affords these geographically disadvantaged peoples an opportunity to share their creations and ideas with their peers in other parts of the country and the global community.

2.3 Limitations of existing technology

The contributions of ICT in the preservation and management of indigenous knowledge cannot be downplayed as evidenced in the examples already presented in this chapter. A number of solutions have already been developed and deployed by various agencies and development partners as well as individuals but these have a couple of limitations as discussed below.

Just like the Ulwazi Pprogramme most online solutions rely on field workers who gather information for updating on the website and there is no guarantee that the information gathered will be verified or validity confirmed before it is published. There is no defined way of confirming that the IK acquired has been tested over and over again before concluding that it is usable. This implies that there is a possibility of publish IK that can be of harm to another society. The programme assumes that the field workers will gather information to the best detail yet they are like middle men in the gathering process. Equipping the real indigenous people to do this on their own would provide more detailed information.

Another issue identified with this model is that few of the indigenous people have the skills required to navigate, review and update websites. Though this is changing with the coming of mobile internet and social networks more indigenous people today can navigate online content. Also the complexity of operating some of the platforms like GIS blocks out indigenous people since they would require specialized skills to man these platforms.

The structure of indigenous knowledge is quite unique for each community and the approach being used by most of these models is top-down with the experts designing a solution and ensuring that indigenous knowledge conforms to it! In order to preserve indigenous knowledge technologies must be built with indigenous knowledge in mind not the other way round.

2.4 The need to have a framework for managing indigenous knowledge

Ngulube (2002), discusses the issues and concerns in the management of indigenous knowledge where it is noted that collection of IK is very laborious, time consuming and quite costly. He also highlights the importance of the storage and management of information if it must benefit humankind. The major challenges to the management and preservation of indigenous knowledge as presented by Ngulube (2001) are collection development policies, accessibility, storage and preservation media, and intellectual property rights.

i. Ngulube (2001) argues that the documentation and management of IK should be guided by collection development policies which clearly stipulate how IK is identified, validated, and stored.
ii. Intellectual property rights have to be considered as well in the management and preservation of indigenous knowledge. There are many definitions of intellectual property rights though for purposes of this research, we shall use that of the World Trade Organization (2016) which considers IP rights as the rights given to persons over the creations of their minds. Intellectual property rights usually give the creator an exclusive right over the use of his/her creation for a certain period of time. Having IPs will not only protect the indigenous communities but will also give them the comfort to share their knowledge well knowing that they are protected.

iii. Access to indigenous knowledge: According to Warren, McKiernan, Slikkerveer, and Brokensha, (1995), access to indigenous knowledge collected so far is too limited because it is not well organized in terms of being indexed and abstracted.

There must be a standardized way of gathering, documenting, storing and accessing indigenous knowledge. This will help promote consistence and guide developers to make indigenous knowledge more accessible and usable.

2.3.1 Analysis of knowledge management frameworks

Many knowledge management frameworks exist as discussed in the study by Heisig (2009) where one hundred and sixty frameworks were analyzed. Though there are very many knowledge management frameworks, little work has been done to direct these frameworks to indigenous knowledge and most focus on the management of world or scientific knowledge. We must appreciate that there is a significant difference between indigenous knowledge and scientific knowledge and according to Rahman (2000), this difference is vivid. Tinnaluck (2004) mentions a number of significant differences between indigenous knowledge and scientific knowledge. The following highlights the special features of indigenous knowledge which broadly distinguishes it from other knowledge. According to Ellen and Harris (1996), IK is;

i. **Local**, in that it is rooted in a particular community and situated within broader cultural traditions; it is a set of experiences generated by people living in those communities. Separating the technical from the non-technical, the rational from the non-rational could be problematic. Therefore, when transferred to other places, there is a potential risk of dislocating IK.
ii. **Tacit** knowledge and, therefore, not easily codifiable.
iii. **Transmitted orally**, or through imitation and demonstration. Codifying it may lead to the loss of some of its properties.
iv. **Experiential rather than theoretical knowledge**. Experience and trial and error, tested in the rigorous laboratory of survival of local communities constantly reinforce IK.
v. **Learned through repetition**, which is a defining characteristic of tradition even when new knowledge is added. Repetition aids in the retention and reinforcement of IK.

vi. **Constantly changing**, being produced as well as reproduced, discovered as well as lost; though it is often perceived by external observers as being somewhat static.

The sharp contrast between indigenous knowledge and scientific knowledge makes it very challenging to use existing scientific knowledge management frameworks to manage indigenous knowledge and thus the need for a framework particularly built with focus on indigenous knowledge. In this research, the researcher analyzed three frameworks that have been built towards indigenous knowledge in order to propose a framework that can appropriately be used for IK management for rural Uganda. Below, I present the frameworks.

2.3.1.1 Organizational Knowledge Management Processes: A Framework for Analysis of the Role of an Information System; Alavi and Leidner (2001)

Alavi and Leidner (2001), developed a systematic framework aimed at analyzing the potential role of information technologies in organizational knowledge management. Though this particular framework is not directly related to IK, the fact that it is grounded in the sociology of knowledge management makes it very important in this research. According to this framework, knowledge systems are made up of four socially enacted knowledge processes i.e. creation, storage/retrieval, transfer and application. The figure below is an illustration of the knowledge management processes suggested by Alavi and Leidner (2001).

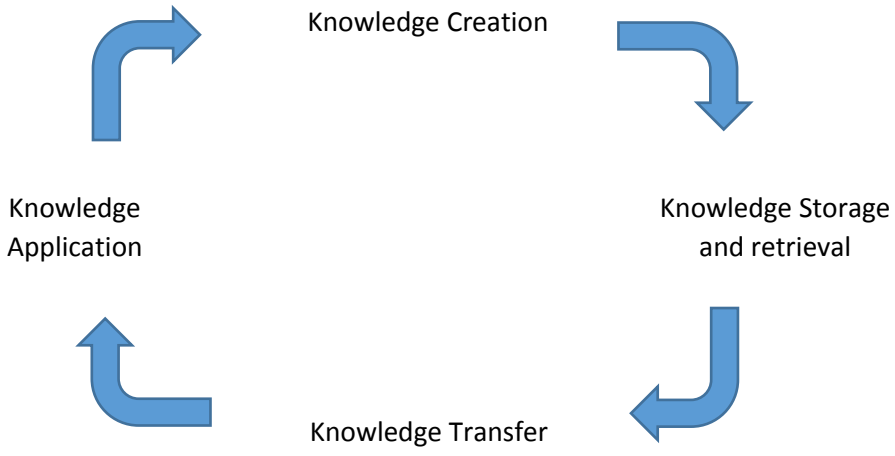

Figure 2.1: Alavi and Leidner: ***Knowledge management process***

i. The knowledge creation process according Alavi and Leidner (2001) involves the development of new content and replacement of existing content through social and collaborative processes. Knowledge creation in this framework is viewed as a continual interplay between tacit and explicit knowledge and a growing spiral flow as knowledge moves through individual, group, and organizational levels. The knowledge creation process suggested by Alavi and Leidner is based on four models identified by Nonaka (1994) socialization, externalization, internalization, and combination. These modes of knowledge creation are further described by Nonaka as follows; the socialization mode refers to conversion of tacit knowledge to new tacit knowledge through social interactions and shared experience among organizational members e.g., apprenticeship. This particular mode relates with the indigenous knowledge given its tacit nature. On the other hand, the combination mode looks at the creation of new explicit knowledge by merging, categorizing, reclassifying, and synthesizing already existing explicit knowledge. The other two modes, typically involve interaction and conversation between tacit and explicit knowledge. Externalization which according to Nonaka (1994) refers to the conversion of tacit knowledge to explicit knowledge is also very crucial for indigenous knowledge management.

ii. The second process in the framework (storage and retrieval) highlights the importance of keeping knowledge in a state that can be remembered and retrieved and this can be done in many forms including; written documentation, electronic databases, and codified human knowledge stored in expert systems. ICT tools can be effectively used to retrieve and store knowledge and a number of these have been developed on the market. Such tools can increase the speed at which knowledge can be accessed by searching through large chunks of data. Other than the speed of accessing data, ICT tools provide for storage of large data and provide for machine learning through artificial intelligence.

iii. The third process in the framework suggested by Alavi and Leidner (2001) talks about knowledge transfer which is equally an import aspect of knowledge management. Transfer occurs at various levels between individuals, groups and organizations. Alavi and Leidner (2001) go on to argue that due to the distributed nature of organizational cognition, the transfer of knowledge to locations where it is required is very important. This process is

built on the way Gupta and Govindarajan (2000) conceptualized knowledge transfer in terms of five elements:

i. Perceived value of the source unit's knowledge,
ii. Motivational disposition of the source (i.e., their willingness to share knowledge),
iii. Existence and richness of transmission channels,
iv. Motivational disposition of the receiving unit (i.e., their willingness to acquire knowledge from the source), and
v. The absorptive capacity of the receiving unit, defined as the ability not only to acquire and assimilate but also to use knowledge (Cohen and Levinthal 1990).

iv. Finally the application process describes how an organization can put to use all the knowledge that is created, stored and transferred. This is what actually gives the entity/ organization a competitive advantage over others.

The Alavi and Leidner framework for the analysis of the role of an information system describes very well the processes involved in the management of knowledge. The detailed process of knowledge creation, storage and transfer are specifically of great interest to the management of IK. It's however built for scientific knowledge and this presents the following weaknesses that do not make it suitable for the management of IK;

i. As noted by Ellen and Harris (1996), Indigenous knowledge is experiential rather than theoretical knowledge. It is reinforced by constant trial and error and is tested in local communities. The researcher believes that this makes it necessary to have a particular processes of evaluating and validating IK before it can be stored.
ii. The framework does not evaluate the usefulness of the knowledge created and therefore just manages it yet not all indigenous knowledge may be useful or necessary to share for instance female genital mutilation which human rights activists have labored to alienate is such. However this all depends on ones school of thought.

2.3.1.2 Indigenous Knowledge for development: A framework for action, World Bank (1998)

The World Bank in partnership with several organizations which collaborate under the Partnership for Information and Communication Technology for Africa (PICTA) believes that true global knowledge partnership will be realized only when the people of the developing countries participate

as both contributors and users of knowledge World Bank (1998). Through the Action for development framework, the World Bank proposes a way of raising awareness of the importance of IK and how to better integrate IK in development activities so as to improve the benefits of development assistance.

The proposed action for development framework is built on the Alavi and Leidner (2001) framework processes though it goes ahead to introduce two more processes. The processes are defined as knowledge recognition, and identification, validation, recording and documentation, storage in retrievable repositories, transfer and dissemination.

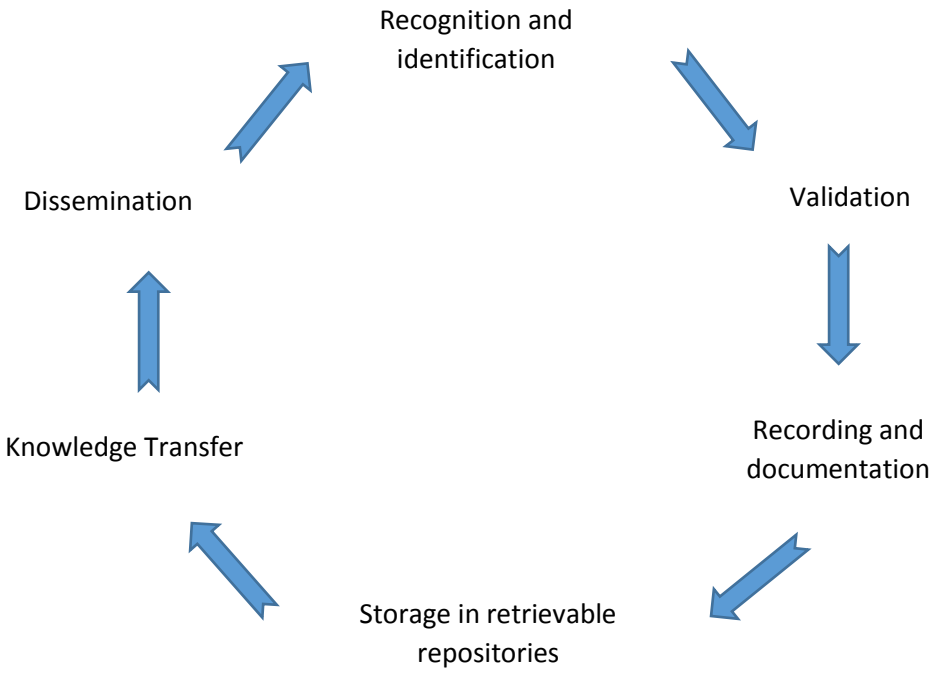

Figure 2.1: World Bank, Framework for action

i. **Recognition and identification**: Some IK may be embedded in a mix of technologies or in cultural values, rendering them unrecognizable at first glance to the external observer (technical and social analyses may, therefore, be required to identify IK).
ii. **Validation**: This involves an assessment of IK significance and relevance (to solving problems), reliability (i.e., not being an accidental occurrence), functionality (how well does it work?), effectiveness and transferability.

iii. **Recording and documentation**: Recording IK and its documentation is a major challenge because of the tacit nature of IK (it is typically exchanged through personal communication from master to apprentice, from parent to child, etc.). In some cases, modern tools could be used, while in other circumstances it may be appropriate to rely on more traditional methods (e.g., taped narration, drawings).

iv. **Storage in retrievable repositories**: Storage is not limited to text document or electronic format; it could include tapes, films, storytelling, gene banks, etc.

v. **Transfer**: This step goes beyond merely conveying the knowledge to the recipient; it also includes the testing of the knowledge in the new environment. Pilots are the most appropriate approach in this step.

vi. **Dissemination**: Dissemination to a wider community adds the developmental dimension to the exchange of knowledge and could promote a wider and deeper ripple impact of the knowledge transfer. We presume that the awareness, pilot applications, and "mainstreaming" are necessary steps required for a successful integration of IK into the development process which could help in managing indigenous knowledge. Higher education institutions need to play a role in harnessing and disseminating indigenous knowledge for sustainable development providing the knowledge base and transmitting of new skills. Libraries can be used for collecting, preserving and disseminating indigenous knowledge.

The framework proposed by World Bank introduces a process of validation which is a very important process in the management of IK. This process typically checks and rechecks that is being shared is of significance and relevance to the society. The processes also confirms that the IK being shared was not a rare occurrence but is consistent and can be relied on. World Bank (1998) recognizes that this process must also ensure that IK is effective and transferable.

However this framework does not consider external factors that influence the processes involved.

2.3.1.3 The Global Knowledge Management Framework

Finally, I looked at the Global Knowledge management framework (GKMF) which describes the components and influence factors of knowledge management in distributed global settings. The framework by Pawlowski and Bick (2012) identifies the key aspects when designing knowledge

management processes and systems and can be used for two main purposes i.e. guiding the development processes by providing a solution space and success factors for decision makers as well as implementers and acting as a reference for researchers to compare research in the field by providing a common set of context descriptions as well as aspects influencing the success of knowledge management solutions.

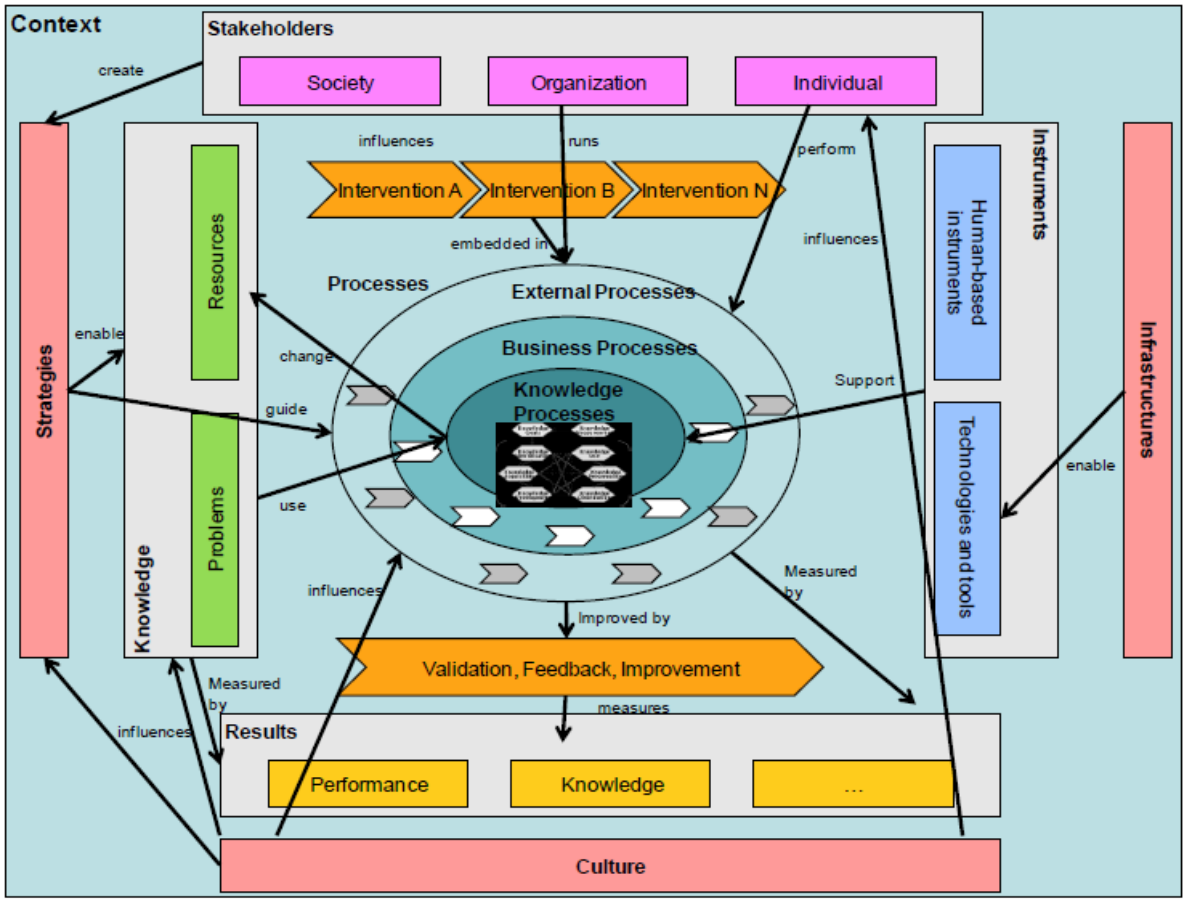

Figure 2.3: Global Knowledge Management Framework

i. **Processes:** Just like the first two frameworks analyzed, the core of the global knowledge management framework is described by processes on the three levels i.e. *business processes* – which ideally refer to the core processes of an organization. These business processes are then supported by knowledge management processes including knowledge identification and knowledge sharing.

ii. **Stakeholders:** The category stakeholders describes characteristics of participating stakeholders. This can be related to individuals (e.g., preferences, interests), organizations

or societies. The stakeholder category is in most research works an important factor. In many cases it is seen as a constraint as research investigations are done for certain target groups or types of organizations. Whereas these characteristics are mostly part of the context, other aspects are subject to research analyses, in particular barriers. Pawlowski and Bick (2012).

iii. **Instruments and interventions**: in this section, the framework discusses activities to realize the knowledge processes specifically technology and human-oriented instruments. The interventions are aimed at enabling the knowledge management processes.

2.3.1.4 Conclusion

Interestingly, most of the frameworks mainly focus on the knowledge management processes and tend to neglect other important aspects that have influence on the processes identified for example; culture, stakeholders, policies and the infrastructure. Though the Global Knowledge Management Framework by Pawlowski and Bick (2012) does describe factors that influence knowledge management in detail, it only looks at knowledge from the global perspective. It also does not consider policies and national laws that may have an impact on how indigenous knowledge is managed.

2.4 Mobile Phone technology

According to International Telecommunication Union (ITU), Uganda's communication sector is one of the fastest growing in Africa and this is largely because of the expansion of mobile telephony. Uganda currently has three major players in the telecom industry that is MTN Uganda, Airtel, and UTL. A number of other service providers have also entered the market which has in turn raised the competition. These include Africell formerly Orange Uganda, K2, Smile, and Smart.

Because of this competitiveness, prices have fallen and average revenue per user (ARPU) is decreasing ITU (2015). The competitiveness amongst the telecom players has pushed them to expand into rural areas and other communities that had previously been left out. The government has also backed major initiatives to expand telecommunication services and the Internet to rural

areas, partly supported by a universal service fund known as the Rural Communications Development Fund (RCDF) **ITU (2015)**

Essentially, the RCDF is intended to act as a means of intervention to ensure that basic communication services of acceptable quality are accessible, at affordable prices and at reasonable distances, by all people in Uganda. **ITU (2015)**

According the Uganda Bureau of Statistics (UBOS), there was 10 percent increase in telephone subscribers from 16.7 million subscribers in 2012 to 18.3 million subscribers in 2013. Subsequently, the national teledensity increased by 6.4 percent from 48.8 lines per 100 people in 2012 to 51.9 lines per 100 people in 2013.

One of the most significant highlights of the 2014 statistical abstract in relation to mobile usage is the fact that talk time decreased by 70.5 percent from 14,092 million minutes in 2012 to 4,157 million minutes in 2013 which was attributed to the adaptation of other forms of communication like Whatsapp, Viber and Over the top (OTT) services. This trend is one that all mobile app innovators should keep in mind.

Table 2.4: Telephone Subscription and talk time 2009 – 2013

Service	**2009**	**2010**	**2011**	**2012**	**2013**
Subscribers(number '000)	**9,617**	**13,155**	**17,161**	**16,671**	**18,341**
Fixed Telephone(number '000)	233	327	464	314	272
Cellular Phone(number '000)	9,383	12,828	16,696	16,356	18,068
Teledensity (lines per 100 population)	31.4	41.4	52.1	48.8	51.9
Talk time(traffic, million minutes)	**7,147**	**10,038**	**13,028**	**14,092**	**4,157**
of which off-net	na	1,392	2,531	2,352	781
on-net	na	8,515	10,285	11,494	3,309
International (outgoing)	121	130	213	246	67

Source: Uganda Communications Commission

Many application developers have taken advantage of this tremendous increase in mobile phone usage and have started delivering solutions targeting mobile users. One of the most significant solutions in Uganda at the moment is Mobile money which was introduced in March 2009 by Uganda Telecom and MTN Uganda, and later by Airtel (then Zain). "Mobile money" as commonly referred to by many provides a mobile banking platform that offers customers the ability to perform

financial transactions like deposits and transfers of funds as well as purchase of some limited range of goods and services using their mobile phones. This provides a relatively cheap and convenient means through which family members and friends exchange financial assistance in the form of remittances especially in remote areas with limited or no access to formal financial institutions like banks **Munyegera and Matsumoto (2014)**. Many businesses have also embraced mobile bank as a measure of reaching a wider market.

According to Uganda communications commission, the number of mobile money subscribers grew by 3% up from 17.99m in the 3rd quarter of 2014 to 18.53m subscribers in the 4th quarter and the balance on customer accounts grew as well by 4.3% up from UGX 228.6bn to UGX 238.3bn. The number of mobile money agents grew by 16.8% up from 67,319 to 78,593. While the number of transactions grew from 31.4m to 49.4m resulting to a 57.1% growth. The value of transaction increase from UGX 1.7 trillion to UGX 2.3 trillion, resulting to a 36.2% growth. The financial inclusion insights report states that mobile money accounts are by far the most common form of digital financial accounts.

Table 5.2 Mobile Money Services in Uganda

	As of September 2014	As of December 2014	Variations (%)
Number of Mobile money subscribers	17,988,640	18,528,542	3.0
Number of Transactions	31,447,990	49,417,873	57.1
Value of Transactions	1,700,471,516,750	2,315,584,758,218	36.2
Balance on customer accounts	228,578,087,774	238,313,178,031	4.3
Number of mobile money agents	67,319	78,593	16.8

(Source BOU)

Source: Uganda Communications Commission

The health sector too has been influenced by mobile technologies. The Ministry of Health with support from UNICEF and FIND Diagnostics launched mTRAC an innovation using SMS to track the health facility stock of essential medicines like the anti-malarial drug ACT **(UNICEF, 2015)**.

mTRAC allows health facility workers to send government reports by SMS, including real-time data to map facility stocks. The aim is to avoid unnecessary stock-outs and to ensure transparency and accountability for the drugs. Using mTRAC, the Ministry of Health will receive real-time information on medicine stocks, and district health offices will be able to successfully lobby the National Medical Stores for resupply based on their ability to present reliable and timely data.

U-report is another service that has taken advantage of the growth of mobile technologies. It is a free SMS service designed to give young Ugandans a voice on issues they care about. U-reporters are given an opportunity to participate in the decisions that affect them and take an active role in the development of the country (**UNICEF, 2015)**

Users register for free by texting "join" to 8500 on their mobile phone to become a U-reporter. Each week, U-reporters answer a free SMS poll or question on issues dealing with health, child protection, school, safe water, and more. Poll results are published in newspapers, reflected on radio, and placed directly into the hands of Members of Parliament. All SMSs are free, a vital element in removing the barriers to participation. (**UNICEF, 2015)**

2.6 Chapter summary

Chapter Two provided the review of literature. The literature review discussed the following issues: an overview of IK, the importance and relevance of indigenous knowledge in sustainable development, the overview of KM practices, current state of managing and protecting IK, knowledge management frameworks, and mobile phone usage in developing countries.

CHAPTER THREE:

RESEARCH METHODOLOGY

3.0 Introduction

This chapter describes the methodology that was used in the research. In this section, the researcher specifically explains the research design, study population, procedures used in sampling data, tools and methods used to collect data, analyzing the data collected, validating and reliability of the collected data, and research ethics.

3.1 Research design

The research was designed to follow the mixed method research which is a combination of both qualitative and quantitative research. This approach was chosen because the researcher wanted to get an in-depth understanding of the problem that would not have been derived by using either the qualitative or quantitative. The researcher was in position to get a broader and deeper understanding of the problem and managed to leverage the strengths of each while offsetting their weaknesses.

Other than the advantages mentioned above, using the mixed method offered the researcher the opportunity to examine the same phenomenon using a number of different means. It was primarily used for complementary purposes, in which quantitative data was used to boost the description of the sample participants and qualitative data. Mixed method was also used because it is recommended by IK studies as an effective method to collect different types of data which can be used to confirm the validity and consistency of IK of a certain locality Kiptot (2007).

The figure below explains the process that was followed in this research

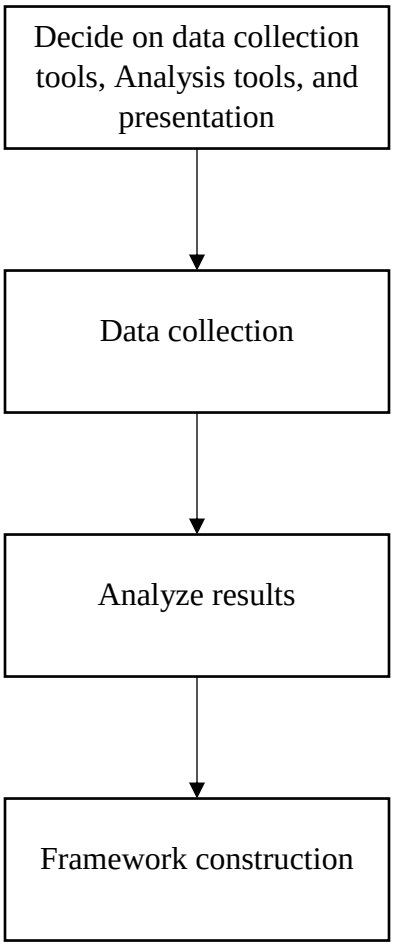

Figure 3.1 Research Methodology that was used

3.2 Data collection methods and instruments

The purpose of data collection was to gather quality data so as to produce good and reliable results. Focus groups were used to collect in-depth data from respondents with targeted characteristics, while questionnaires were used to collect quantitative data that was used to validate the data gathered in the focus groups. The researcher also observed some of the behaviors of the indigenous people in some instances in order to seek an understanding of indigenous knowledge mostly embedded in local functions.

The figure 3.2 below gives a summary of the data collection process that was followed.

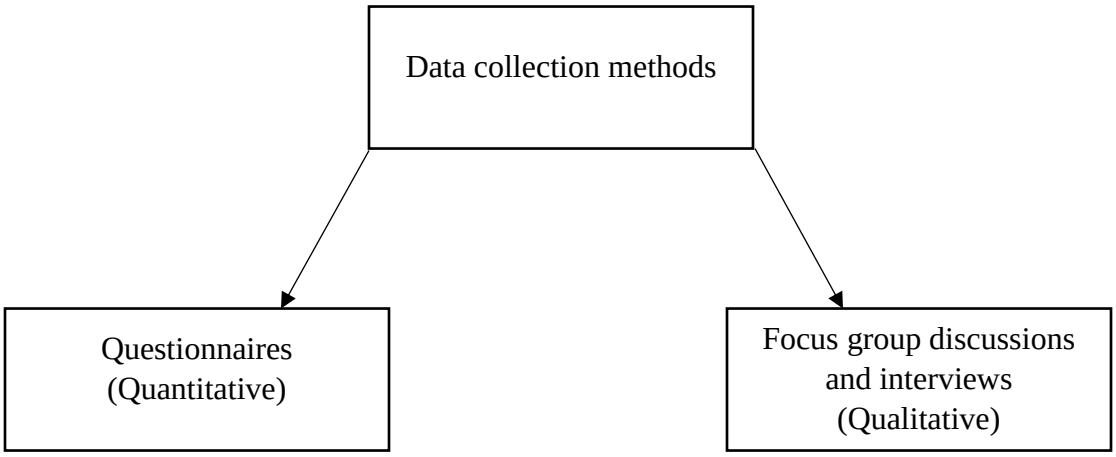

Figure 3.2: Data collection process that was used

3.2.1 Questionnaires:

Questionnaires were used because they allowed for the respondents to answer questions freely without interference from the researcher and they were also assured of confidentiality hence expecting responses that are not biased. Questionnaires were also used because it made it easier for the researcher to collect data from a large sample size at a relatively affordable cost compared to other methods. Data gathered using questionnaires is easily quantifiable and was used by the researcher to compare and contrast data gathered from the focus groups with an aim of eliminating any bias. The questionnaires were designed with each question attempting to get information about the objectives of the research.

The questionnaires were printed and shared with the respondents in hard copy although due to some respondents' busy schedules, others were shared through email.

The researcher selectively determined the respondents based on their knowledgeability in the area of indigenous knowledge, ICT policy and or, software development. This technique was used on purpose given that the sample size was small and the area of study was so specific.

3.2.2 Focus group discussions

On the other hand, the choice to use focus groups was mainly driven by the desire to allow the respondents to express themselves freely and extensively even in a context that the researcher may not have thought of before. This helped generate a great wealth of information that later guided the development of the framework. According to Anna, et.al. (2008), a focus group should not exceed six or seven participants (eight at a maximum) and it should also be no smaller than three people. If it grows large, there are possibilities of people breaking off to talk in sub-groups and leave people out of the discussion and if it is too small it may be hard to keep the conversation going in enough depth for the participants not to feel intimidated by the situation. In this research, each focus group consisted of three to six.

Each member of the focus group was given an opportunity to present their views and no participant was let to dominate the discussion. In some instances, the focus group moderator ensured that each participant took a turn to explain their opinion on the question before discussing the next question.

Both qualitative and quantitative data were collected concurrently between January 2016 and June 2016. This was done to make comparison between the data easier Driscoll, et.al. (2007).

Figure 3.3 provides a summary of the focus group process

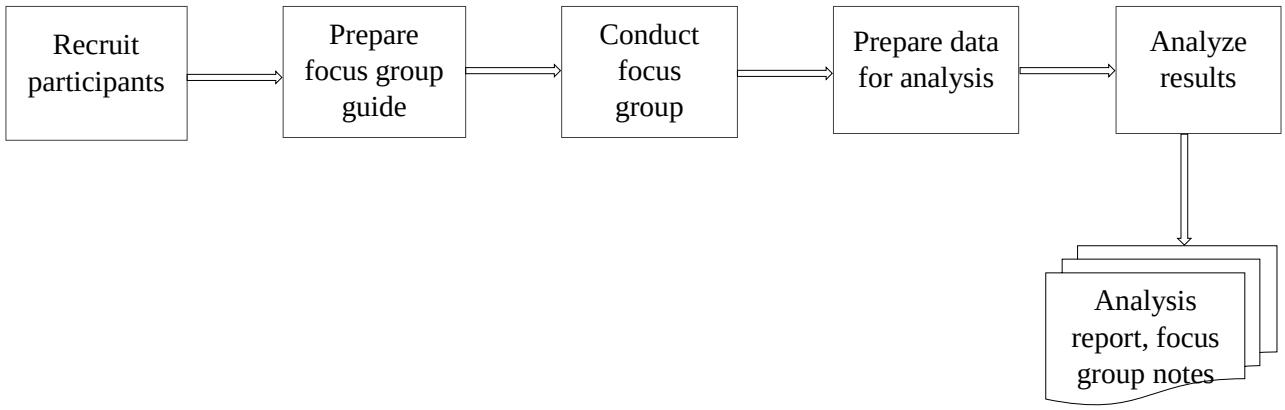

Figure 3.3: Focus group process

3.2.2.1 Recruitment of participants

One of the major parts of planning the focus group was the identification of the most suitable individuals to participate in each focus group. When recruiting for focus groups, the researcher

made sure that participants selected for each group met the requirements established for inclusion in each focus group. In this research, participants in the focus groups were both ICT professionals involved in policy formulation and individuals who are part of indigenous groups in Kampala district. The participants were also a representation of the community in which the research was conducted. Individuals who attach great value to indigenous knowledge like the representatives of the Kabaka in Buganda *"Abatongole" – officers of the order of the shield and spears* Royal Ark, (2006) as well as solutions developers who rarely interact with the indigenous community were both selected to give the research a rich feel of both sides. These were put in different focus groups given that they had quite a number of differences when it came to social judgment. Putting them in different groups was also done to ensure that participants could feel free with each other and can freely share their experiences without shying away.

After a group of viable recruits had been established, each of them was called to confirm their interest and availability. The proposed time and location for each focus group was communicated ahead of time. Forms for tracking invitations, and focus group schedules were designed and can be viewed in appendix I.

3.2.2.2 Prepare focus group guide

To implement the focus groups successfully, proper planning had to be done to ensure that the researcher got the most out of the study.

While preparing for the focus group guide, the researcher put the following in perspective; the reasons that led to the decision to conduct focus group, the desired output from the focus group, profiling the respondents, and scheduling the group discussions.

The focus group guide was designed to basically outline the issues that the researcher wanted to discuss and this came directly from the study objectives included in chapter one. The guide was also designed to ensure that all necessary material is covered and time is evenly allocated to participants with an interest of limiting dominance.

Given that the researcher intended to use three focus groups, a pre-test of the guide was conducted with peers to ensure that it is refined before being presented to the selected groups.

3.2.2.3 Conducting focus groups

The focus group discussions were conducted by a team of two people; the moderator who facilitated the discussion and the assistant moderator who took notes during the discussion. At the beginning of each focus group discussion, the moderator would outline the purpose and format of the discussion to set the group at ease. Participants were encouraged to freely share their mind and reminded that divergent views were welcome.

After the introduction, the moderator followed the focus group guide to ask questions with extra probing of the participants to detail the basis for their conclusions and recommendations. It is helpful to follow the focus group guide as much as possible when facilitating a focus group, to increase the credibility of the research results (Data Collection Toolkit, 2007). At times participants gave incomplete or irrelevant answers and the moderators had to ask their own questions to help obtain richer responses.

To balance and ensure that each participant has an opportunity to contribute in the discussion, the searcher considered the following;

i. Addressed questions to individuals who were reluctant to talk
ii. Gave nonverbal clues (look in another direction/at other participants or stop taking notes when an individual talks for an extended period)
iii. Politely summarized the points, then refocused the discussion; the group was reminded of the need to ensure that everyone had a chance to participate and that the researcher wanted to allow adequate time for all questions.

The focus group discussions were recorded by hand written notes taken by the assistant moderator. The assistant moderator tagged letters to identify each participant and mapped their responses in an effort to keep them anonymous. As recommended by (Onwuegbuzie et. el, 2009), the assistant moderator used the matrix in table 3.1 below to facilitate the information gathering process.

Table 3.1: Information gathering matrix

Focus group question	Member 1	Member 2	Member 3	Member 4	Member 5	Member 6
1						
2						
3						
…..						

The following notations can be entered in the cells:

A = Indicated agreement (i.e., verbal or nonverbal)

D = Indicated dissent (i.e., verbal or nonverbal)

SE = provided significant statement or example suggesting agreement

SD = provided significant statement or example suggesting dissent

NR = did not indicate agreement or dissent (i.e., nonresponse)

Using Table 5 above allowed the researcher to count the number of focus group members falling into each category, which appeared in the final report. Using counts provided richer information than would be obtained by using qualitative data alone.

3.2.2.4 Analyze results

To utilize information obtained from focus groups, the researcher had to analyze Analyzing data involved the development and assignment of themes and categories and looking for patterns and contrasts. It also involved interpretation of the meaning of the data collected.

As part of the analysis phase, at the end of each focus group discussion, the moderator and the assistant moderator prepared an interview summary sheet reducing information into manageable themes, issues and recommendations. Each summary sheet contained a code for each participant, reason for inclusion, points made, insights got from the participant during the discussion and any other observations.

To help organize data into categories, the researcher assigned abbreviated codes and/or words and placed them against ideas and themes identified. Each category created was also assigned a descriptive name. The researcher used table 3.2 below to identify and label the different categories to sort responses to questions.

Table 3.2: Form for coding categorize

Question	**Categories** ***(List responses from respondents and categorize them based on emergent themes)***
1.	
2.	
3.	
4.	
5.	

The researcher then identified patterns and connections between the categories that had been identified earlier. This was done by putting together the ideas expressed in each category and carefully identifying the similarities as well as the differences.

Qualitative software programs facilitate data storage, coding, retrieval, comparing and linking, but the analysis is done by human beings. The software speeds up the process of locating coded themes, grouping data together in categories, and comparing passages in transcripts or incidents from field notes Lwoga, (2009). In this study, both qualitative and quantitative data was analyzed using Microsoft excel. Though many generally consider Microsoft excel as a quantitative tool, its structure and data manipulation features can be utilized for quantitative analysis Meyer et al, (2009). Microsoft Excel is suitable for small data and provides ready means of sorting and storing data. Though other software like Nvivo 10 could have been used, the researcher did not take them on because of the effort required to master their use and their cost of acquisition.

The results from the focus groups were presented using visual displays to help communicate findings in a clearer manner. These included figures and tables.

3.2.2.5 Validity and reliability

According to Patton, (2000), validity and reliability are two factors which any qualitative researcher should be concerned about while designing a study, analyzing results and judging the quality of the study. Validity and reliability specify how the researcher was in position to convince the audience that the research findings are worth it and should be given a look.

In this study, the following efforts were taken to ensure reliability and validity;

Iterative questioning; the researcher intentionally asked the same questions in different ways to a respondent. In cases where there was a contradiction in the responses provided by the respondent, the researcher discarded the data. According to Shenton, (2004)**,** where contradictions emerge, falsehoods can be detected and the researcher may decide to discard the suspect data.

As recommended by Shenton, (2004), peer scrutiny of the study was used. The new perspective that each individual had to offer helped challenge some of the assumptions done by the researcher whose closeness to the study might have inhibited their ability to view it with real detachment. The opinions raised also made part of the research input and improved the study design.

3.3 Literature review

A critical review of existing published literature was done by the researcher with an aim of gaining a deeper understanding of the research subject as well as identifying gaps that need to be addressed. The literature review was also done with an aim of clarifying the opinions of the researcher. The process below was followed during the literature review. Review literature also enabled the researcher to acquaint themselves with latest relevant contributions of others in the area of indigenous knowledge management and ICT. Figure 3.4 adopted from university of Leicester summarizes the approach that was used during the literature review.

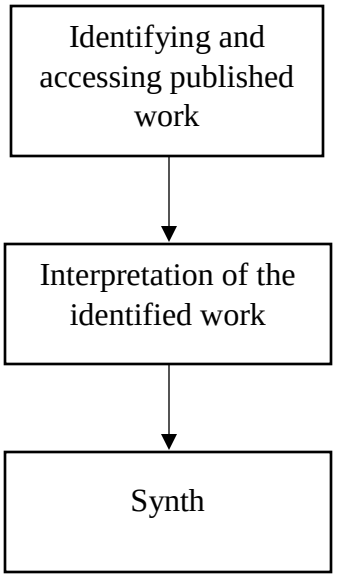

Figure 6.4 Literature review approach

Most of the literature reviewed was accessed online namely published periodical journals, academic papers and websites. The researcher was very critical in choosing which publications to use given that a lot of information can know be accessed online and not everything was beneficial. Books were also used in the process of reviewing literature.

The literature gathered was then interpreted and streamlined into an expressive flow of data explaining what has been read before being grouped and documented in themes relating to the research.

3.4 Study population

In this research, the study population included two categories of respondents namely the local community because they are the main producers and consumers of indigenous knowledge meaning they had a great interest in the management of indigenous knowledge. Their livelihood greatly depends on indigenous knowledge and it is in their best interest to have it preserved. By including the local communities in this study, the research was informed by a more in-depth understanding of indigenous knowledge. Specifically, the respondents in the local communities included opinion

leaders, elders, and *"abatongole"* officers of the order of the shield and spears in Buganda kingdom.

Secondly, the study included ICT policy makers and mobile application developers. This particular category was included because they are involved in the key process of developing both policies and software's that can be used to manage indigenous knowledge. Officers from the National Information Technology Authority – Uganda (NITA-U), Software developers from HRP Solutions, and SIGMA Data were specifically talked to. A number of conclusions were derived and used in the development of the proposed framework for managing indigenous knowledge using mobile phones.

3.5 Sampling procedure

This section discusses the sample size, and sampling technique that was used in the research and explains why they were used.

3.5.1 Sample Size

Kaahwa (2008) presents a sample as a portion of the population whose results can be generalized to the entire population. The sample size used for the research was one hundred and thirty four (134) respondents of which ten (10) were key informants, one hundred (100) questionnaires were given out and twenty four (24) respondents participated in focus groups.

3.5.2 Sampling techniques

Purposive sampling which is a method that is confined to specific types of people who can provide the desired information, either because they are the ones who have it, or they conform to some criteria set by the researcher was used in the research Lwoga, (2009). Purposive sampling was used to select key informants and focus group respondents. The researcher used his own judgment to select the respondents based on the expertise in the subject of the study.

Simple random sampling was used to select one hundred (100) respondents from a larger population to whom questionnaires were distributed. It was done by selecting and inputting 350 names in a bucket and randomly selected one respondent after another. The researcher used the

replacement method aimed at giving every member equal chances of being selected. This was used because the researcher did not know much about the people in the study area.

3.6 Ethical considerations

This study was guided by the ethical standards set by Uganda Martyrs University Nkozi. The researcher ensured that an introduction letter from the university was secured before starting the data collection. To avoid plagiarism, the researcher acknowledged all sources from other researchers that were used in the study. During data analysis, codes were used to ensure confidentiality of the respondents.

To ensure that the rights of the respondents were not violated, they were all first sensitized about the nature of the research, and the benefits the research intends to derive. The respondents were given an opportunity to ask as many questions about the research before having them enrolled. This ensured that all respondents joined the study with an informed consent.

3.7 Limitations of the Study

With the use of questionnaires, the researcher did not have the opportunity to probe for clarity where it was not given by the respondents. Time was also an issue as many of the respondents did not respond to the questionnaires in time and the key informants were hard to get hold of.

When processing data some responses were difficult to interpret or compute like the ‘don’t know responses or not sure’. Dealing with such responses was difficult when it came to presenting findings.

For the case of busy schedules of some respondents the researcher overcame this limitation by emailing the questionnaires to the respondents which allowed them to find suitable time within their busy schedules to respond.

3.8 Chapter summary

This chapter discussed a number of issues including the research design, study population, sampling procedure, data collection tools and procedure, data analysis, validity, and reliability as

well as the research ethics. This chapter also talked about why the research was deigned to be of a mixed research method.

The study gathered both qualitative and quantitative data and this was done for two major reasons the first being to enable the researcher gather an in-depth view of indigenous knowledge and secondly to check the accuracy of the data collected. The data that was collected in the study addressed the research objectives. The research findings are now presented in Chapter Four.

CHAPTER FOUR:

PRESENTATION OF RESULTS

4.1 Introduction

This chapter provides details about the responses from questionnaires, key respondents and focus group discussions. The findings of the findings of data gathered and each identified theme and sub theme are also discussed together with a detailed presentation. All data relating to a specific theme were grouped and presented together.

4.2 Presentation and Analysis

Out of the one hundred questionnaires that were distributed, only eighty-three were returned to the researcher by the respondents most of whom were youth between the ages of 24 to 32. Four focus group discussions with 5 to 7 people each were conducted with most of the respondents being subject matter experts.

The data is presented in the following sequence;

1. Characteristics of the respondents
2. Identification of the importance and relevance of indigenous knowledge
3. To investigate the existence of frameworks to preserve and manage indigenous knowledge
4. To determine the role of mobile phones in the preservation and management of indigenous knowledge
5. Determine the challenges to managing indigenous knowledge using mobile phones
6. To propose a framework to preserve and manage indigenous knowledge

4.2.1 Characteristics of respondents

Although the characteristics of the respondents were not mentioned as part of the objectives of the study, the researcher found it necessary to present data about them because the background of the respondents could without a doubt explain the responses received. The study described the

characteristics of the participating respondents in the questionnaires, focus group discussions, and key respondents in terms of gender, religious affiliation, education level, age and ownership of mobile phones.

4.2.1.1 Characteristics of the respondents in the questionnaires

In the questionnaires, 83 respondents participated in the study, where 62 were men and 21 women. As indicated in table 4, the majority of the respondents 49 (59.04%) were between 20 to 29 years old, 29 (34.94%) were between 30 to 39 years old. Only 4 (5.81%) respondents were above 40 years of age with one respondent not specifying their age. From the table it is also clear that the majority of the respondents were youthful.

Table 4.1: Age ranges of respondents to the questionnaire

Age range	**No. of respondents**	**Percentage**
20 – 29	49	59.04
30 – 39	29	34.94
40 – 49	3	3.61
50+	1	1.20
No response	1	1.20
Total	**83**	**100**

80 (96.38%) of the respondents in the questionnaires had a formal education and could read and follow basic instructions. Of these, 57 (68.67%) had an education level equivalent to a bachelor's degree and above, 22 (26.5%) had a diploma and only 1 (1.2%) had a certificate. 3 (3.61%) of the respondents in the questionnaire were unlearned. Male respondents accounted for the highest number of learned respondents overall with 62 (74.69%) and females accounting for 21 (25.31%) as shown in table 4.2 below.

Table 4.2: Level of education by gender for questionnaire respondents

Highest level of education	Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
None (Unlearned)	3	3.61	-	-	3	3.61
certificate	-	-	1	1.20	1	1.20
Diploma	17	20.48	5	6.02	22	26.5
Bachelors	42	50.60	15	18.07	57	68.67
Total	**62**	**74.69**	**21**	**25.31**	**83**	**100**

The majority of the respondents to the questionnaires 72 (86.75%) were Christians with 55 (66.27%) males and 17 (20.48%) females. Few Muslims 9 (10.84%) were part of the respondents and a section of atheists and apatheist each was presented by 1 (1.2%) among the questionnaire respondents. Religion plays a big role especially in the beliefs of people in relation to indigenous knowledge. Table 6 below, shows the details of the respondents in relation to their religion and gender.

Table 4.3: Religious affiliations of the questionnaire respondents

Religious affiliation	Gender					
	Male		Female		Total	
	No.	%	No.	%	No.	%
Christians	55	66.27	17	20.48	72	86.75
Muslims	6	7.23	3	3.61	9	10.84
Atheist	1	1.20	-	-	1	1.20
Apatheist	-	-	1	1.20	1	1.20
No response	-	-	-	-	-	-
Total	**62**	**74.7**	**21**	**25.29**	**83**	**100**

Table 4.3 shows the responses given when participants in the questionnaires were asked about the ICT tool that they used most. Sixty two (75%) of the respondents mentioned that they preferred using mobile phones, 5 (6%) used computers, 1 (1%) radios and 15 (18%) other tools. The youth accounted for the largest number who preferred using mobile phones and this could be attributed to the technology wave that has taken up the country. All the respondents acknowledged to owning one or more mobile phones and mentioned that that they use them very frequently with 37 (44.5%) of the respondents mainly using social media for communication, 22 (26.5%) mainly using the mobile phones for voice calls, 15 (18%) mainly using emails on their mobile phones. A small percentage of the respondents 9 (11%) preferred to use their mobile phones for short messages (SMS) as shown in figure 8.

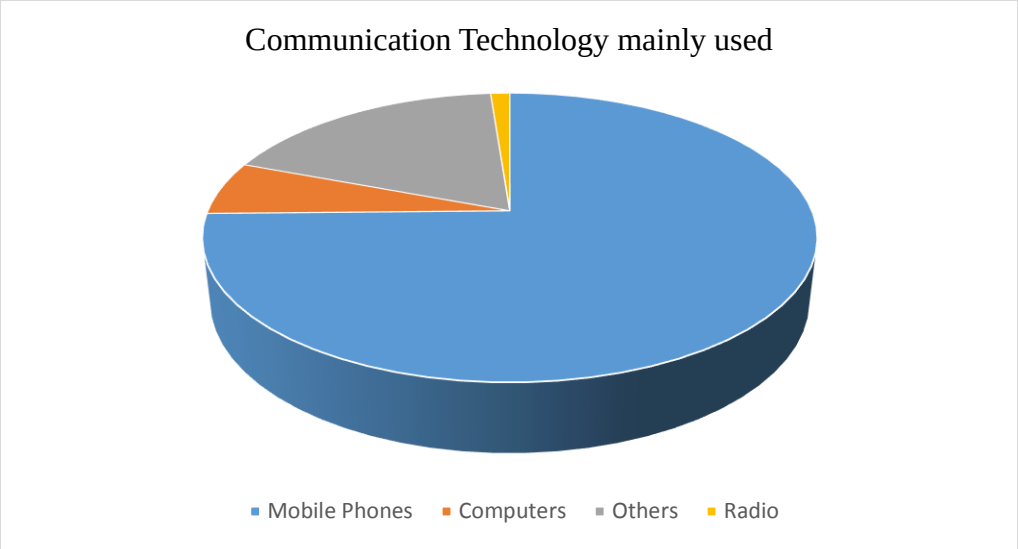

Figure 4.1: Social Media Usage

Figure 4.1, below further goes on to show that respondents in the age range 20 to 29 mostly used social media for their communication followed by those in the age range of 30 to 39. It was also observed that the older respondents preferred conventional methods of using the mobile phone that is voice and short messages.

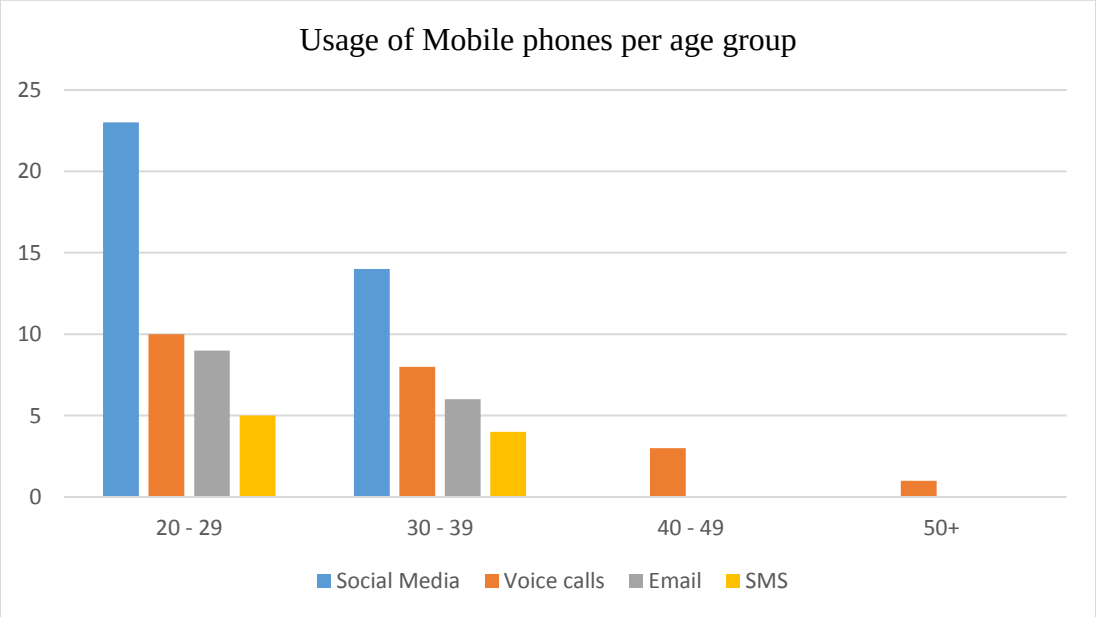

Figure 4.2: Mobile phone usage per age group

The choice for use of particular functionality on a mobile phone by the respondents in the questionnaire was greatly influenced by ease of use and the fact that respondents had colleagues who used the same technology each at 30 (36.14%), closely followed by affordability 20 (24.1%). It was also noted that most of the respondents who preferred conventional ways of using the mobile phone stated that they did so because of its ease to use.

Table 4.4 Reasons for choice of technology used on mobile phones

	Affordability		Ease of use		Trendy		friends use it		None responsive		Total	
	No.	**%age**	**No.**	**%age**	**No.**	**%age**	**No.**	**%age**	**No.**	**%age**	**No.**	**%age**
Voice	4	4.82	10	12.05	-	-	8	9.64	-	-	22	26.5
SMS	6	7.23	3	3.61	-	-	-	-	-	-	9	10.84
Social Media	6	7.23	12	14.46	1	1.2	18	21.69	-	-	37	44.58
Email	4	4.82	5	6.02	-	-	4	4.82	2	2.41	15	18.07
	20	24.1	30	36.14	1	1.2	30	36.14	2	2.41	83	100

4.2.1.2 Characteristics of the respondents in the focus groups

Twenty four respondents participated in the focus group discussions, where 17 (70.83%) were male, and 7 (29.17%) female. A total of four focus groups were held with subject matter experts. The study participants for focus groups discussions ranged between four and seven respondents per session. The Majority of the participants 15 (62.5%) were between 30 and 39 years, while 6 (25%) above 40 years with only below 3 (12.5%) 29 years. 19 (79.17%) of the respondents had attained a level of education above bachelor's degree with the 2 (8.33%) having diplomas and 3 (12.5%) certificates.

4.3 Discussion of findings

This section presents a summary and interpretation of the findings and provides a basis for the construction of the indigenous knowledge management framework.

4.3.1 Respondents attitude towards indigenous Knowledge

Of the respondents to the questionnaires, the majority 76 (91.57%) opined that indigenous knowledge is still relevant in the present day with 7 (8.43%) believing that it is no longer relevant

and out dated. Those that believed that indigenous knowledge was irrelevant mainly cited practices that violate human rights and are associated to sorcery, lack of proof that indigenous knowledge really works, and inconsistence in the application of its application. On the other hand, those that believed that indigenous knowledge is relevant, had either used indigenous knowledge or had heard of someone who had used it especially in health or agriculture. It was evident though that there was a lack of ownership of indigenous knowledge among the respondents especially the youth. It was common for most of them to refer to the elders as the custodians and benefactors of indigenous knowledge.

4.3.2 Would it be important to integrate indigenous knowledge with modern knowledge?

The findings indicated that 75 (90.36%) of the respondents to the questionnaires believed that it would be better to integrate indigenous knowledge with the modern knowledge; with 39 (46.99%) strongly agreeing and those who agreed being 36 (43.37%). A similar response was got from the focus group discussions where participants supported the integration and repeatedly mentioned that this would make it much easier to foster development in indigenous communities. For instance having a curriculum tailored to me the needs of indigenous communities and delivered in local dialect was one of the areas identified for integration. Some practices were better done away with. An example given was that of female genital mutilation among the Sebei in eastern Uganda which most participants agreed was a violation of human rights. Also important to note is that 41 (49.4%) of the respondents that preferred to integrate new practices in indigenous knowledge were in the age group of 20 – 29 followed by 36 (43.4%) in the group of 30 – 39 and 5 (6%) in the age group of 40 – 49 as shown in table 8 below. However not all agreed that there was a need to integrate IK with modern or western knowledge and this was noted among the respondents above forty years of age. On being prompted to explain why, they cited the fear of the new practices overriding the core values of indigenous knowledge. This is a feeling that was held by focus group A which was predominantly made up of indigenous people. One typical response was

> *"We have already lost a lot due to western culture! Look at the dress code, ladies today no longer mind about what society thinks. It would not shock you for a lady to visit her in-laws wearing a really short skirt. This is an abomination in our culture but is fine in the*

west and importing such culture totally degrades our values. I would not recommend this at any point."

Table 4.5: Responses on whether IK should be integrated with Modern knowledge

It would be better to integrate new practices in IK	Respondent's age bracket									
	20 – 29		30 – 39		40 – 49		50 +		Total	
	No.	%	No.	%	No.	%	No.	%	No.	%
Strongly agree	20	24.1	16	19.3	3	3.6	-	0	39	46.99
Agree	19	22.9	15	18.1	2	2.4	-	0	36	43.37
Disagree	1	1.2	2	2.4	-	0	-	0	3	3.6
Strongly disagree	-	0	-	0	-	0	-	0	-	-
No response	1	1.2	3	3.6	-	0	1	1.2	5	6.02
Total	**41**	**49.4**	**36**	**43.4**	**5**	**6**	**1**	**1.2**	**83**	**100**

4.3.4 Does Uganda have the appropriate laws to manage and preserve indigenous knowledge?

Respondents were asked whether they thought that Uganda had laws in place that promote the preservation and management of indigenous knowledge. The question intended to assess the level of awareness of the population in relation to laws pertaining indigenous knowledge. Interestingly, majority of the respondents in the questionnaires 44 (53%) believed that Uganda does not have laws to protect indigenous knowledge, with only 36 (43%) acknowledging the existence of national laws and regulations. 3 (4%) of the respondents confessed to not knowing as shown in figure 9 below. Though there are policies in place and laws enshrined in the constitution of Uganda, the population interviewed had no idea about such laws in fact it is evident the respondents had a feeling that government has not done much in preserving and managing indigenous knowledge yet it has the potential of boosting the economy to the much desired middle income country.

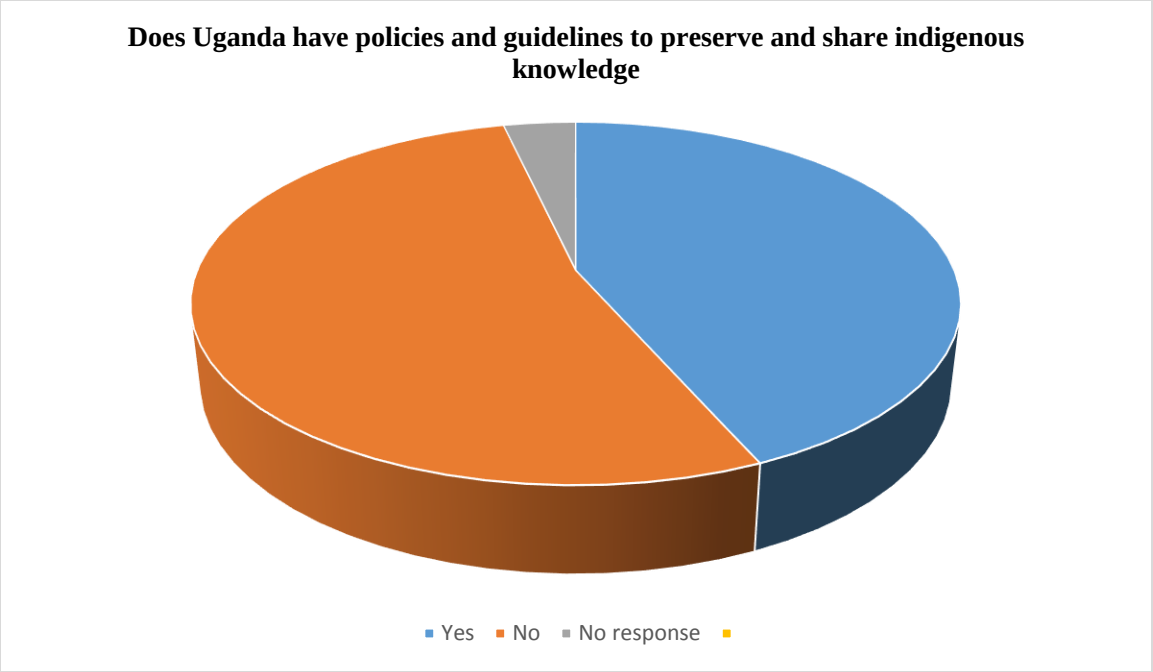

Figure 4.3: Responses in relation to existence of laws to preserve and manage IK

4.3.5 Has indigenous knowledge been misrepresented?

To assess whether indigenous knowledge is currently presented in a proper manner, the respondents were asked for their opinion. Majority of the respondents to the questionnaires opined that indigenous knowledge had been misrepresented with 60 (74%) agreeing, and 18 (22%) disagreeing on this matter. Not only did the majority believe that indigenous knowledge has been misrepresented, they also shared a view that the youth today have not embraced indigenous knowledge and this could probably be attributed to the misrepresentation of indigenous knowledge and poor publicity that it has got. Figure 10 below shows that 52 (62.65%) of the respondents to the questionnaires believe that IK has not been embraced by the youth today, with 26 (31.33%) believing that it has and only 5 (6.02%) preferred not to respond.

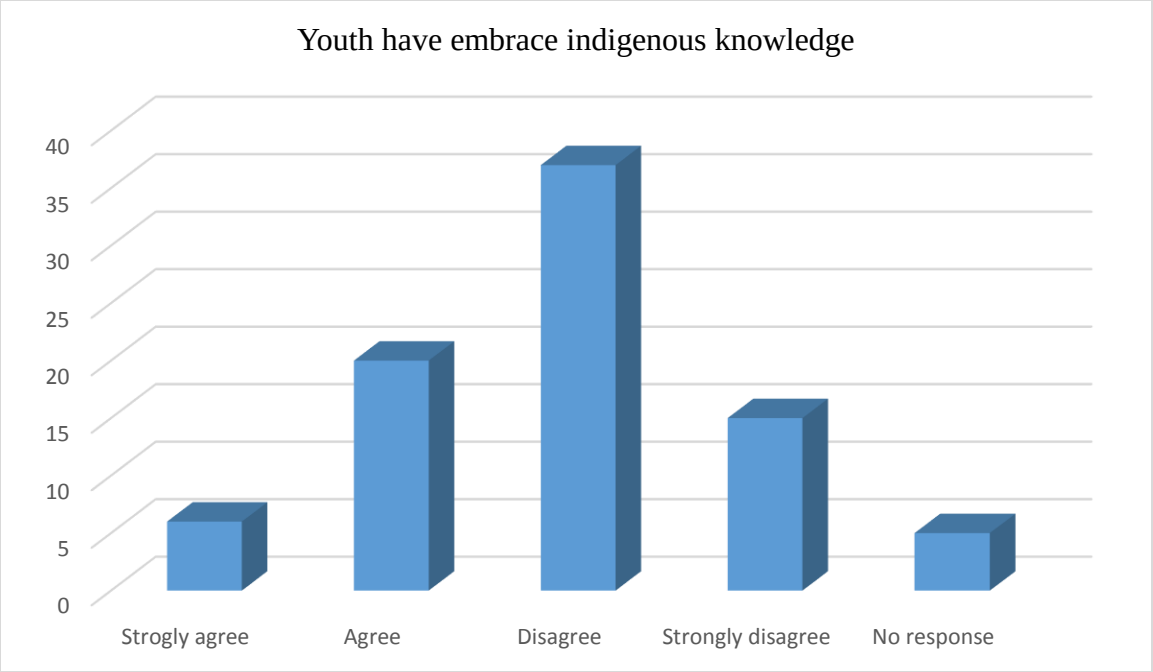

Figure 4.4: Have the youth embraced indigenous knowledge

Though results from the focus group discussions showed an agreement as well, their major interest was in the possible causes to why the youth have not wholly embraced indigenous knowledge. The resilient points that were made by the 24 respondents who were engaged in the focus group discussions as follows, 9 (37.5%) of the respondents believed that youth have not embraced indigenous knowledge because the leaned generation has labeled indigenous knowledge to be backward, irrelevant and or to be pagan practice, with 7 (29.17%) opining that indigenous knowledge is passed on from generation to generation by elders in society in most cases parents who have since neglected this particular role due to their busy schedules! *Everyone seems to be chasing after something of late that children are left to house helps to raise yet they themselves have little to nothing to pass on in relation to indigenous knowledge said one of the respondents in focus group A*. 4 (16.67%) of the respondents blamed the gap on the education system that was initially framed by the colonialist to serve their interests and has not put emphasis on the importance of indigenous knowledge while another 4 (16.67%) did not agree with the above causes mentioning that the gap was something that was bound to happen overtime and nothing could have stopped it from occurring.

It was evident from the focus group discussions that all the respondents believed that something could be done to raise awareness about indigenous knowledge among the youth which could possibly improve the perception that the youth have about indigenous knowledge. 16 (66.67%) of the respondents from the different focus groups opined that if indigenous knowledge was to be presented in a more formal way indicating the opportunities that it presents, its relevance to the community, and proof that it indeed does what is said about it, then the youth would embrace it. Furthermore majority of those that preferred indigenous knowledge to be presented in a formal way 12 (75%), would wish for practices that are assessed to no longer be of benefit to society be left out. 8 (33.33%) of the believed that the use of technology would improve access to IK and also help the youth embrace indigenous knowledge since they have a great appeal to technology. Though some of the respondents were quick at mentioning their reservation on the effect that technology would have on the originality of indigenous knowledge. The major concern was the ability of passing indigenous knowledge without having it misrepresented. It was also noted through the focus group discussions that the smallest number of respondents preferred the conventional way of passing on IK calling upon elders especially to take on their central role.

4.3.6 The potential of using mobile phones in the preservation and management of IK

The respondents were asked about the role of ICT in the management of indigenous knowledge and whether they believed that mobile phones could be used to preserve and manage indigenous knowledge. All respondents in both the questionnaires and focus group discussions were quick at acknowledging the significant contribution that ICT has had in the management of indigenous knowledge with many citing the use of Radio and TV to transfer information to millions of people at a go. However a few of the respondents in the questionnaires 21 (25.3%) were inclined at believing that mobile phones could not be used to preserve and manage indigenous knowledge with in the current environment. On the other hand, 62 (74.7%) of the respondents in the questionnaire agreed that mobile phones could be used in the transfer and management of indigenous knowledge. For those who believed that mobile phones could be used in the preservation and management of indigenous knowledge also mentioned that this would only be possible if indigenous knowledge is properly documented in a manner that is understandable by the consumer without any distortion.

4.4 Framework construction

To build the framework, the researcher ensured that all the components and processes identified during the research together with their interlinked objects were built into one manageable environment. The framework was informed by both the review of existing work relating to indigenous knowledge management and ICT as well as the research findings. In the review of literature, three frameworks were critiqued (Organization Knowledge management processes; Alavi and Leidner (2001), Framework for action; World Bank (1998), and Global Knowledge Management Framework; Pawlowski and Bick (2012)) as shown in table 9 below.

The first step was to identify the processes and components of each of the frameworks with the aim of determining their strength and weaknesses. Based on the characteristics of indigenous knowledge backed up with constant review of literature, the researcher then identified key processes common in the frameworks and those that could be used to support IK management.

The research findings recognized how and when mobile phones can be used as well as the role of stakeholders in the process of preserving and managing indigenous knowledge. The influence of the cultural context was also emphasized in the research findings with the majority of the respondents agreeing that its role cannot be down played.

Furthermore, 62 (74.7%) of the respondents in the research questionnaire concurred that mobile phones could be used in the transfer and management of indigenous knowledge with emphasis on the processes of documentation, storage and transfer. Though the government of Uganda has put in place the Uganda National Culture policy (2006) with an aim of guiding the formal and informal systems of managing culture at all levels, respondents opined that the government has not done much in terms of legislations and policies to promote IK. However despite this feeling, it was proposed that the framework among others be guided by existing and new legislations.

Finally, because of the constant changing nature of indigenous knowledge, it was suggested that there be a process to review already documented IK to ensure that it is still relevant and applicable. This process was included as part of the framework. For further research, a process recommending integration of IK with formal/ western knowledge was also included in the framework though it was not covered fully since it was not one of the objectives of this research.

In the table below, the researcher discusses the processes, strengths, and weaknesses of the frameworks analysed.

Table 4.6: Processes, strengths and weaknesses of the frameworks analyzed

Framework	**Processes**	**Strengths**	**Weaknesses**
Organization Knowledge management processes; Alavi and Leidner (2001)	1. Knowledge creation 2. Knowledge storage and retrieval 3. Knowledge transfer 4. Knowledge application	The processes defined in the framework are relatively elaborate and are in position to facilitate the management of knowledge	1. The process are relatively elaborate but may not be so practical for indigenous knowledge because of its unique nature. 2. The framework does not consider external factors that could have an influence on the management of IK
Framework for action; World Bank (1998)	1. Recognition and identification 2. Validation 3. Recording and documentation 4. Storage in retrievable repositories 5. Knowledge transfer	1. Indigenous knowledge is embedded in local taxonomies and cultures making difficult to identify. Having a process to identify IK is very important if it is to be preserved. 2. Validation is also very key because it would be very	Does not talk about the role of stakeholders and other external factors that can have an impact on the IK management process making it the outcomes unpredictable

	6. Dissemination	dangerous to preserve IK based on hearsay especially in fields like health and agriculture. Ensuring that IK is tested to be delivering it purpose helps preserve only that which is relevant and of benefit	
Global Knowledge Management Framework; Pawlowski and Bick (2012)	Is built with a number of layers 1. Processes (Business processes, knowledge processes, and external processes) 2. Stakeholders and context 3. Instruments and interventions	1. Introduces the concept of stakeholders which the other frameworks did not talk about. The influence of stakeholders in any process cannot be down played 2. The framework also activities that will help realize the knowledge management processes	The framework is so generic and is intended for formal, and systematized environments making it difficult to be used for managing indigenous knowledge which is quite unique given its characteristics of being tacit, experiential and constantly changing.

The complete framework consists of the following;

4.5 Proposed framework

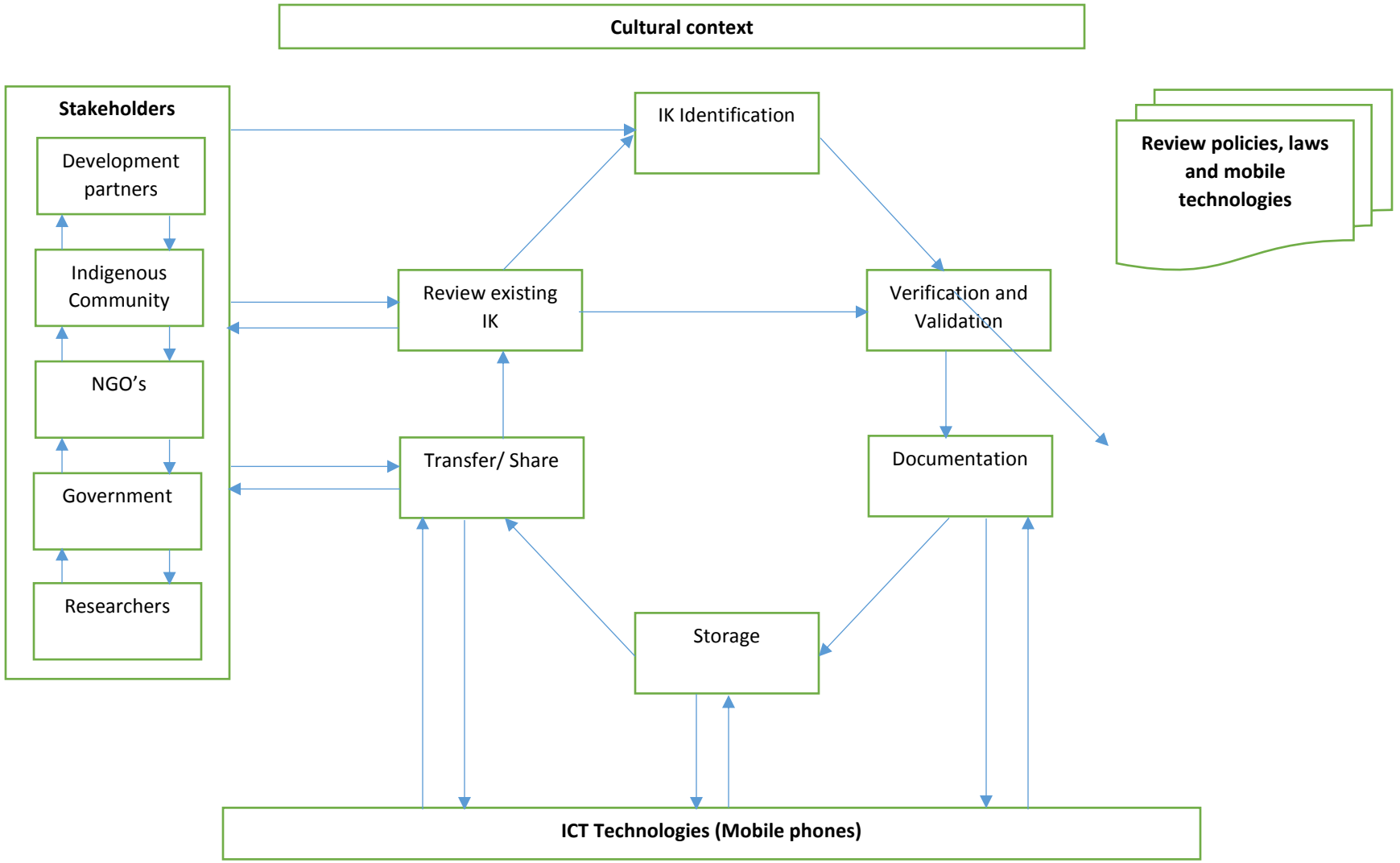

Figure 4.5: A framework for preserving and managing Indigenous Knowledge using mobile phones

The researcher proposes a framework based on the research findings and literature reviewed. Specifically, the World Bank (1998) framework for action is built upon because it comprehensively talks about key processes in managing indigenous knowledge. The researcher however combined the knowledge sharing and transfer process into one process. As it is noted by Paulin and Suneson (2012) knowledge transfer and knowledge sharing are sometimes used synonymously or are considered to have overlapping content. Though a number of researchers argue that these two are different Paulin and Suneson (2012), the close similarities prompted the researcher to have them as one processes. In the later stage the researcher introduced a process to review existing indigenous knowledge and this is mainly because indigenous knowledge is so much dependent on the community and environment which changes at times. This means that indigenous knowledge today may not necessarily be as relevant if the environment in which it is working has changed. Keeping indigenous knowledge in constant review will enable communities to only pass on relevant information to the next generation and it's on this premise that I deemed it necessary to have this process to ensure that IK is reviewed frequently.

The researcher then built on the World Bank framework for action to include factors that would definitely affect the process of managing and sharing indigenous knowledge. These were typically based on my research findings as well as literature review. Among the factors to consider are; stakeholders, cultural context, laws and policies both at national and local level, and technology infrastructure. These external factors as will be referred to in this paper can either have an influence on one or more of the process in the IK management or enable one or more of the processes. In the sections that follow, I discuss each of the processes in more detail.

The fact that indigenous knowledge by its nature being deeply hidden within cultural values cannot be explicitly identifiable as knowledge, its identification can be difficult. It is at times unrecognizable by external observers and is challenging to have it isolated for recording. It is therefore necessary to specifically perform social and or technical analysis to identify certain IK within a community.

After IK has been identified, it is very important that this knowledge is verified and validated. Not all IK identified is relevant for societies and this processes seeks to ensure that the IK gathered is significant and relevant, reliable, functional and can be effectively transferred to another

community. Stakeholders should be involved in the process of verification and validation. As mentioned in World Bank framework for action, Transfer of IK from one community to another may in some cases prove difficult. This is because most IK is stored in tacit form, which in certain circumstances may make it transferable only through direct practice and apprenticeship. Proof of an efficient process at the point of origin does not necessarily ascertain its efficacy under seemingly similar conditions in other locations.

The next step of documentation involves the recording of identified and validated indigenous knowledge. As already mentioned in the previous chapters, documenting IK is a challenge because of its tacit nature. The recording may require audio-visual technology, taped narration, drawings, or other forms of codifiable information. In case the tacit nature of a practice does not lend itself to such recording, information about locations, individuals or organizations that can demonstrate or teach a practice could be used as a pointer to the source of IK. ICTs will be used to enable the process of documenting and in this particular framework, and I propose the user of mobile phones.

After documenting IK, it should then be stored in an understandable and retrievable format. The documenting process as described in the World Bank framework, will typically involve categorization, indexing, making it accessible and conserving. Mobile phones can also be used as a technology to enable this process by electronically storing and indexing the documented IK.

The indigenous knowledge sharing and transfer process is aimed at ensuring that IK is conveyed to the intended recipient and has the expected outcome. Mobile phones can be used in the process of sharing and transferring the information and the stakeholders are typically engaged in this process.

The next process is a change to the framework proposed by the World Bank and involves the review of existing known indigenous knowledge. This particular process seeks to ensure that already identified and shared indigenous knowledge is still relevant to a community and thus worth keeping in society. In the previous chapters, we have already seen how dynamic indigenous knowledge can be and therefore it might sometimes become obsolete or might also change to address emerging problems. In situations where the knowledge is obsolete, it should be archived and only shared for research and historical purposes. In instances where there is a change to address

emerging challenges, the IK should either be identified or if it is pretty straight forward it should be verified and validated.

Stakeholders

Most of the existing knowledge management frameworks that have been fronted concentrate on processes. This tends to neglect an aspect of people as stakeholders which cannot be done away with especially with indigenous knowledge given its tacit nature. Literally all the processes in the proposed framework require an interaction with stakeholders. It is general knowledge that for any project to be successful, the interests of stakeholders must be met. The researcher decided to include stakeholders in the framework because of the feedback generated from the research as well as literature review.

Identifying stakeholders helps identify all organizations, groups of people and individuals that will be affected by the management of indigenous knowledge directly or indirectly. For this particular research, I took the definition of a stakeholder as fronted by FAO (2005), which is defined a stakeholder as an institution, organization, or group that has some interest in a particular sector or system. Also: individuals and constituencies contributing, either voluntarily or involuntarily, to wealth-creating activities, and who are therefore potential beneficiaries and/or risk bearers of its operations.

Stakeholders typically have different interests which can sometimes be similar/convergent or even differ/conflict from group to group. Ensuring that these interests are properly managed can help have a successful implementation of an indigenous knowledge management system.

Below are the stakeholders that were identified with details of how they influence the indigenous knowledge management processes.

i. ***Development partners:*** Development partners may include international bodies like World Bank, United Nations Environment Programme, European Union, USAID to mention but a few that have dedicated time and funds to help promote sustainable development in rural areas. There major interest is promoting solutions that will ensure sustainable rural development. The World Bank has specifically put in place an

indigenous knowledge for development program highlighting the importance of Indigenous Knowledge. According to World Bank, (1997) the basic component of any country's knowledge system is its indigenous knowledge. It is clear the level of interest that development partners would have in the indigenous knowledge management process.

ii. ***Indigenous communities:*** Indigenous communities are the producers and in most cases consumers of indigenous knowledge. Their input is very crucial in the process of identifying, validating and verifying, as well as application of indigenous knowledge. Given that they are the ones who have used this knowledge for years, they can testify to its usefulness. According to UNEP, Indigenous people and their communities have a historical relationship with their environments and are generally descendants of the original inhabitants of such environments. In view of the interrelationship between the natural environment and its sustainable development and the cultural, social, economic and physical well-being of indigenous people, national and international efforts to implement environmentally sound and sustainable development should recognize, accommodate, promote and strengthen the role of indigenous people and their communities. Other than the reasons highlighted above, indigenous communities use indigenous knowledge as a source of income and any decision on how this knowledge is managed will directly affect them and thus they should be involve

iii. ***Non-governmental organizations:*** According to results from my research, NGO's have a big role to play in the process of managing indigenous knowledge. UNCTAD (2004) specifically mentions the following roles that are played by NGO's in the local communities;

a. Increasing understanding among rural people, development workers and policy makers of the value of men's and women's distinct local knowledge and skills related to the management of agro-biodiversity for food security.

b. Strengthen the capacity of key partner organizations participatory research and communication for development methods in their work with rural communities to document local knowledge and share information with communities.

c. Promote awareness of the fact that both men and women farmers are custodians of knowledge

iv. ***Government:*** Government looks at indigenous knowledge from a number of perspectives. The first perspective is that indigenous knowledge is a source of revenue given that government can collect taxes from the locals thus of very great importance. Secondly as a mandate, the government is supposed to ensure development of her citizens and the process of managing indigenous knowledge helps promote sustainable development thus of great interest to the government. The government is also responsible for setting laws and policies and there should be in position to set them with consideration of indigenous communities in mind. This implies that also indigenous knowledge management should ensure that it is with in the national regulation.

v. ***Researchers:*** Allot of research is being done in the area of indigenous knowledge especially in agriculture, health, environment management, culture and even education to mention but a few. Researchers are in the framework will be in position to contribute and consume indigenous knowledge.

Cultural context

According to Nakata M. (2002), validating indigenous knowledge out of its cultural context may only satisfy an outside researcher's need, or even solve a technical problem in development but it may undermine the knowledge system itself. Nakata M. (2002) goes ahead to argue that recovery and preservation of endangered indigenous knowledge led by local communities would not be the same as that led by scientists because of the different cultural contexts. He says that without a doubt, the collection and documentation of Indigenous knowledge by the development and scientific communities is a very partial enterprise, selecting and privileging some Indigenous knowledge whilst discarding and excluding others. Of course, if what Indigenous communities choose to document is of no apparent value to others, then the cost of documentation may be an obstacle. Putting the cultural context into perspective in the proposed framework will ensure that no knowledge is lost during the identification, validation and documentation of indigenous knowledge.

Technology infrastructure:

Information and communication technology (ICT) presents a number of tools that can be used effectively to document, store, transfer and share indigenous knowledge. The research results show that ninety percent of the responds in the questionnaires do agree that mobile phones can be used to effectively document, transfer, and share indigenous knowledge. It is upon this background that I proposed the use of mobile phones in this particular framework though any other technology can be easily used.

4.6 Framework Validation

The proposed framework was validated to test and evaluate its effectiveness. The process started with the researcher who sought validation among independent respondents by sharing questionnaires with them which provided an opportunity to gather feedback.

The researcher used mainly Likert scale and a few open ended questions to gather feedback from the respondents. According to Likert (1932) cited in Turner, (1993), Likert scales can be effectively used to measure respondents' attitudes, feelings and opinions which are hidden constructs that are generally thought of as unobservable individual characteristics. Based on the strength of the Likert scale to measure opinions and attitudes, the researcher designed a questionnaire which was distributed to 15 respondents to critique and evaluate the proposed framework.

The questionnaires were made up of Likert scales which were used to measure the attitudes and opinions of the respondents on a scale of 5 - points. The response scales used the following anchors; 1 = Strongly Agree, 2 = Agree, 3 = Neutral, 4 = Disagree, 5 = Strongly Disagree. To avoid any ambiguity, all questions were phrased in a manner that only one characteristic could be measured at a time. The Likert scales were scored in such a way that for each item, the highest score indicated the most popular of the characteristics.

Complete questionnaires were returned, analyzed and the following are the results;

4.6.1 Presentation of results.

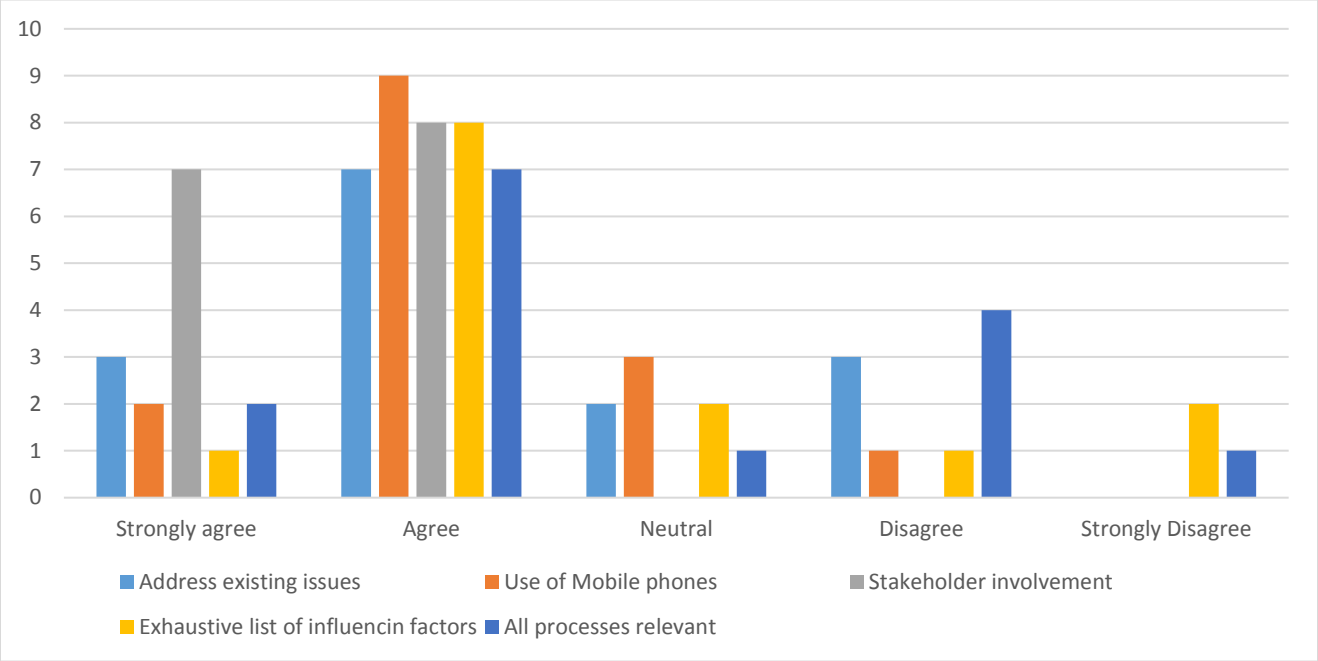

Figure 4.6 framework Validation results

The majority of the respondents 10 (71.43%) agreed that the proposed framework would be in position to address the challenges faced in the preservation and management of indigenous knowledge with 7 (46.67%) agreeing and 3 (20%) strongly agreeing. A minority number of 2 (13.33%) on the other hand, had reservation on whether the framework would achieve what it was intended for and 3 (20%) of the respondents disagreed with the usability of the framework.

Of those that agreed that the framework could address the challenges in preserving and managing indigenous knowledge, 8 (80%) strongly agreed that the framework was good and the rest 2 (20%) thought it to be average.

Most of those that had reservations on whether the framework could be useful had their concern originating from the ability of the indigenous people to interact easily with mobile phones. However others cited the cost of accessing mobile services as another possible hindrance to the proposed framework and thought that the element of cost should be factored into the framework. Aware about the reservations, 9 (60%) of the respondents agreed that the framework could be used to implement the management and preservation of indigenous knowledge with the aid of mobile

phones, 2 (13.33%) strongly agreeing bringing it to 11(73.33%). Only 1 (6.67%) respondent disagreed that the framework could support mobile phones to aid the preservation and management of indigenous knowledge.

Despite the fact that some of the respondents had reservations on the frameworks ability to address the indigenous knowledge management challenges, 12 (85.71%) of the respondents had a good attitude towards the framework and agreed that it would tremendously serve its purpose.

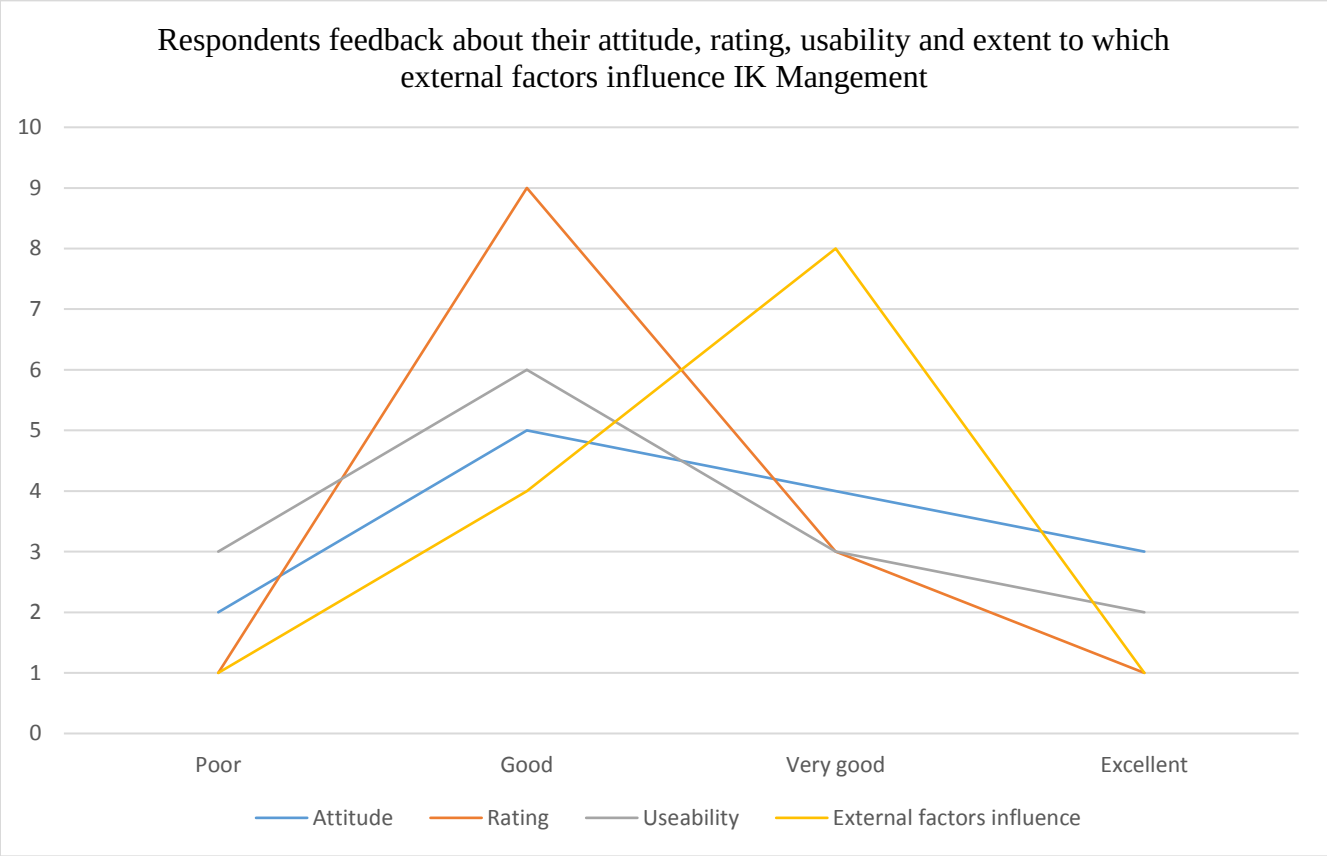

Figure 4.7: attitude, rating, usability and extent to which external factors influence IK Management

The findings also indicated that though the majority 11 (78.57%) agreed that the framework could ensure mobile applications intended for indigenous knowledge are developed in a controlled environment, a few of the respondents 3 (21.43%) had reservations on whether this would be

possible. All the respondents agreed that involving stakeholders in the process of preserving and managing indigenous knowledge was very important and integral part of the proposed framework.

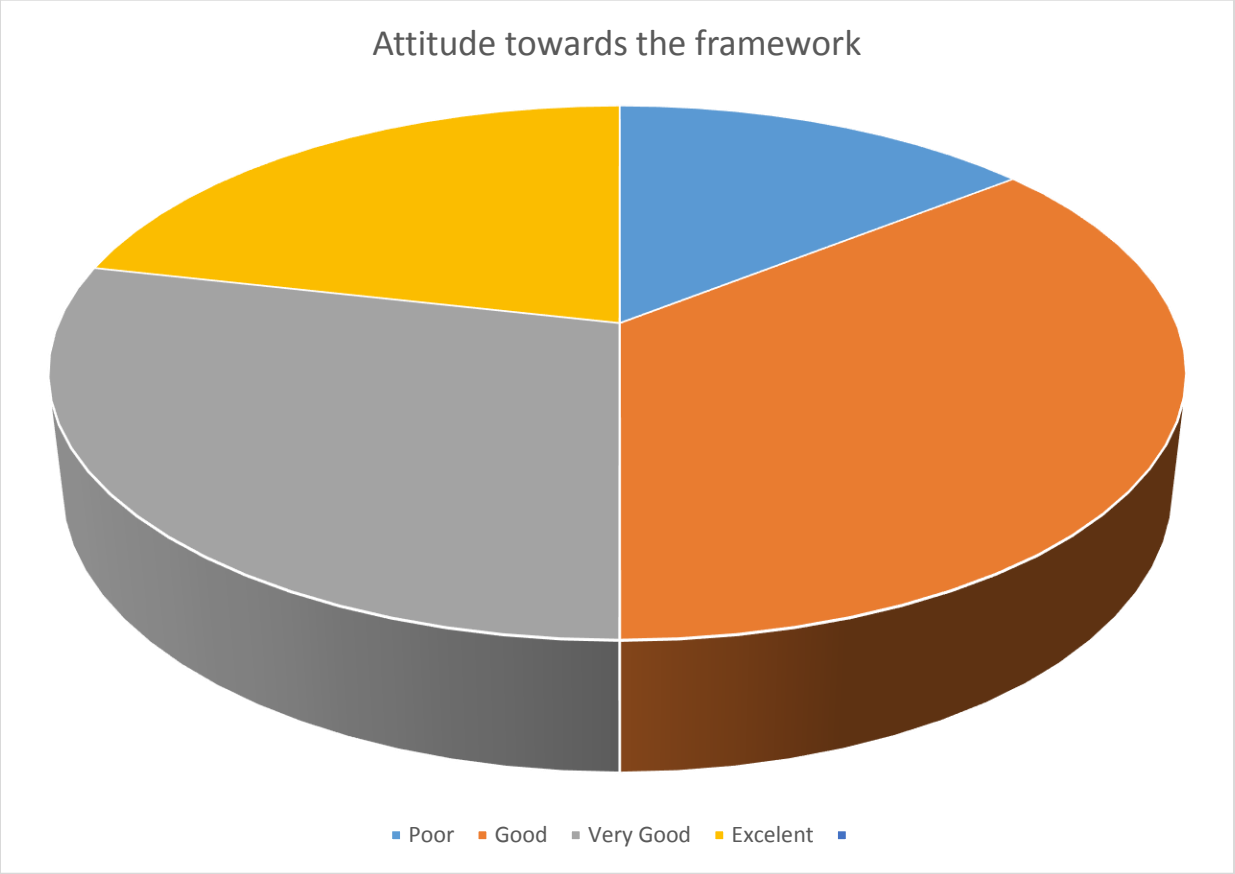

Figure 4.8 Attitude towards the framework

4.7 Chapter conclusion

This chapter presented a detailed description and analysis of the responses received from respondents and their interaction with the researcher. It also presents the results of the findings from the research as well as proposes an indigenous knowledge management framework. The chapter also discussed the results from the validation of the proposed framework

CHAPTER FIVE: SUMMARY, CONLUSION AND RECOMMENDATIONS

5.0 Introduction

This chapter presents a summary of the findings, conclusions, limitations to the study, recommendations and areas of further study. The summary of the findings of the study is presented with the research objectives in mind and the conclusion is presented based on the literature review and data presented in chapter four. This will be followed by the limitations to the study before discussing the recommendations and areas for further study.

5.1 Summary of findings

Most of the respondents in the study who happened to be youth, agreed that indigenous knowledge was vital and pivotal to community development but had not been given due attention. Even though Uganda has laws and policies discussing how indigenous knowledge should be managed, it was evident in the study that the majority of respondents were not aware of the existence of such laws and legislations. Few of the respondents acknowledged having used IK in the past which may sound true to the perception that is held by many that the leaned population has disregarded indigenous knowledge. The lack of interest was mainly attributed to elders neglecting the role of passing on knowledge, failure to use modern communication tools to share indigenous knowledge, association of indigenous knowledge with backwardness and paganism, as well as government's failure to raise awareness about the importance of indigenous knowledge.

The study also observed that the use of ICTs as enablers with specific interest in the mobile phone has already had a significant impact in communities and has influenced a number of processes in health, finance, education, how people socialize, and agriculture to mention but a few. This has been attributed to the general affordability where almost everyone can own a mobile phone, the speed with which communication has been made faster, the fact that the younger generation quickly and seamlessly takes on technology and the opportunities presented by the use of these technologies. It's against this that majority of the respondents believed that mobile phones can be

used in the preservation and management of indigenous knowledge. However it was also noted that this could only happen in a controlled environment without which it would close to impossible to manage IK.

The respondents proposed that among the issues to be addressed was the ability to validate and show proof beyond reasonable doubt that indeed indigenous knowledge did what the owners say it did. This can only be achieved through testing acquired indigenous knowledge in various conditions to verify the output. A need to also raise awareness about the importance and necessity to protect indigenous knowledge was identified. It was the researcher's view that in order to address the risen issues, it would be necessary to involve all stakeholders in the preservation and management of indigenous knowledge.

5.2 Conclusions

The findings of this study indicate that there is a critical need to preserve and manage indigenous knowledge in order to nurture sustainable development. Without a doubt, the use of mobile phones (ICTs) as an enabler would boost the process of preserving and managing indigenous knowledge. Unfortunately, the development of mobile applications has no guideline to follow when designing solutions and there is a risk of having many applications purported to manage indigenous knowledge yet they are just holding distorted pieces of information. The main objective of this study was to propose a framework that can be used as a standard in the development of solutions to manage indigenous knowledge. Though the framework has been built with mobile phones in mind, it can as well be used for managing indigenous knowledge using other ICT tools.

The researcher believes that the proposed framework can be effectively used to preserve and manage indigenous knowledge since it has been validated and found to be acceptable. However, because of time and the earlier set objectives, the framework was not tested to see how it can improve the preservation and management of indigenous knowledge.

5.3 Contributions

This study proposed a framework that can be used in the preservation and management of indigenous knowledge using mobile phones although the framework can easily be used by other

information communication technologies in the preservation of indigenous knowledge. The researcher believes that with proper guidelines, institutions and communities have a better opportunity to preserve the rich indigenous knowledge for the generations to come.

Though it was not the objective of this study, the researcher was in position to identify the need to integrate indigenous knowledge with formal/ knowledge.

5.4 Recommendations

In line with and the conclusion emerging from the study, the following recommendations are made:

1. It is clear that indigenous knowledge provides cost effective ways of handling some known problems but a number of youth today are not aware of this. The government and other development agencies should devise ways of raising awareness about the importance and relevance of indigenous knowledge.
2. The government should develop policies and laws to protect the indigenous people and their innovations. These should also take care of the identified stakeholders. The indigenous communities are reluctant to share their knowledge for the fear of it being taken on by intruders without giving any benefit in return. Putting in place intellectual property laws that protect IK would go a long way in easing it's sharing and thus preservation.

5.5 Limitations of the study

The following were observed as some of challenges faced in accomplishing this study:

1. The time allocated to the study was relatively short and some critical tasks were not fully done; for instance the proposed framework was not fully tested.
2. Most of the respondents were on the extreme of either sides; either just an expert in indigenous knowledge or ICTs but not both. This therefore gave the researcher a feeling that responses might have been a little different should the respondents have had relevant knowledge in both fields.

3. Explaining the essence of the study was not easy to some of the respondents who could not immediately see the need for their involvement.

5.6 Areas for further research

i. Integration of indigenous knowledge with formal knowledge to foster sustainable development.

ii. Factors influencing the adaptation of mobile applications in the preservation and management of indigenous knowledge

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Appendix I: Research Instruments

Questionnaire

Dear Respondent,

I am a MSc. in ICT Management, Policy & Architectural Designs candidate of Uganda Martyrs University. Part of the requirements for the award is a dissertation. My study is towards a framework to preserve and share indigenous knowledge using mobile phones in rural Uganda.

Within this context, I request you to participate in this study by answering the questions attached. You are kindly required not to leave any option unanswered.

Any data that you provide will strictly be for academic purposes only and no information of such kind shall be disclosed to others.

Thank you for your positive response.

Regards,

Julius C. Kamugasa

INFORMED CONSENT

I am giving my consent to be part of the research study of Julius C. Kamugasa that will focus on a framework to preserve and share indigenous knowledge using mobile phones in rural Uganda.

I shall be assured of privacy, anonymity and confidentiality and that I will be given the option to refuse to participate and the right to withdraw my participation at any time. I have been informed that the research is voluntary and the results will be given to me if I request for them.

Initials: ……

Date: ……

Part 1: DEMOGRAPHIC CHARACTERISTICS OF THE RESPONDEDS

1. Gender (Please tick) i. Male ☐ ii. Female ☐
2. Education level
   i. Diploma ☐ ii. Bachelors ☐ iii. Masters ☐ iv. Ph.D ☐
3. Age

   i. 20 – 29 ☐ ii. ☐ – 39 iii. ☐ – 49 i☐ 50+
4. Occupation (Specify) _____
5. Religious affiliation
   i. Christian ☐ ii. Muslim ☐ iii. Atheist ☐ iv. Others (Specify) _____
6. Family Size
   i. < 3 ☐ ii. 3 – 6 ☐ ☐ 6 +
7. How many people own a phone in your household
   i. 1 ☐ ii. 2 – 4 ☐ iii. ☐5+

Part 2: DETERMINE THE IMPORTANCE AND USE OF MOBILE PHONES

Kindly circle the most appropriate answer. You can write your response where need arises.

8. Communication technology mainly used (Specify) _____
9. How many members of the family own mobile phones
   i. 1 ii. 2 – 4 iii. 4+
10. Who is the major user of the mobile phone at your home _____
11. Do you agree that mobile phones have significantly influenced your communication methods
    i. Strongly Agree ii. Agree iii. Do not agree iv. Strongly disagree v. No response
12. What is the average number messages you receive in a week
    i. 0 ii. 1 – 3 iii. 4 – 6 iv. > 7
13. What is the average number messages you send in a week
    i. 0 ii. 1 -3 iii. 4 – 6 iv. > 7
14. What feature do you use most on your mobile phone.
    i. Internet ii. SMS iii. Voice calls iv. Whatsapp v. Viber vi. Other Specify

15. What is the major reason for using the feature mentioned above
    i. Affordability ii. Ease of use iii. It is trendy iv. Most of my friends and family use it
16. Who do you call most (Specify) _____

PART 3: DETERMINE THE IMPORTANCE OF INDIGENOUS KNOWLEDGE

Kindly use the following rating guide on the right hand side of each question: **1 = strongly agree, 2 = Agree, 3 = Disagree, 4 = strongly disagree**

17. Indigenous knowledge is important and should be preserved
18. Indigenous knowledge has often been misrepresented
19. Youth today are aware of the importance of indigenous knowledge
20. Uganda has the right policies to preserve and share indigenous knowledge
21. There are known ways of validating indigenous knowledge
22. It would be okay to transfer knowledge from one generation to another
23. It would be better to integrate new practices in indigenous knowledge to accommodate for the changing world.
24. It would be impossible to transfer indigenous knowledge using mobile phones because it is too specific.

Focus group guide:

Focus group question guide:

1. Let's do a quick round of introductions. Can each of you tell the group your name, your area of specialty, your views on technology and indigenous knowledge?
2. In your opinion, does Uganda have the right policies and strategies to preserve indigenous knowledge? Do you think mobile phones can be used to preserve and share indigenous knowledge?
    a. How can they be used
    b. In what ways have mobile phones been helpful to you?
    c. In what ways do you feel that the mobile phones have fallen short in helping indigenous knowledge?
3. Now imagine that you are part of a committee of people designing a framework for the preservation and sharing of indigenous knowledge using a mobile phone. This is a framework that may guide the preservation of indigenous knowledge, sharing and marketing our culture.
    a. What are the factors that you will make sure your committee considers in designing this framework? What are the things that you are sure would attract indigenous people to use mobile phones for knowledge sharing?
    b. Who are the stakeholders that you are likely to consider during the development of this frame work?
    c. Which phases would you consider in you framework and why?
    d. How would you ensure that the indigenous people that hold their knowledge as a source of capital are protected by this framework?
4. At this point we'd like to hear you views about developing a framework for the preservation and sharing of indigenous knowledge using a mobile phone. Is it necessary anyway to have one? If your answer is yes, how do you envisage it guiding all involved stakeholders; solution developers, the indigenous community (contributors), the consumers of the indigenous knowledge and the government to mention but a few?
5. Is there anything else we haven't discussed yet that you think is important for designing a mobile phone framework to preserve and share indigenous knowledge?

Framework Validation questionnaire

1. The proposed framework will address existing indigenous knowledge management challenges.

   Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

2. The proposed framework can help ensure that mobile phones can support the management of indigenous knowledge?

   Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

3. Involving stakeholders in the management of indigenous knowledge is important

   Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

4. All the six processes in the proposed framework are relevant to the management of indigenous knowledge.

   Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

5. The framework's external influencing factors; stakeholders, culture, policies, and technology infrastructure is an exhaustive list of factors that can influence the management and preservation of indigenous knowledge.

   Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

6. Your attitude towards the proposed framework is generally good.

   Strongly Agree ☐ Agree ☐ Neutral ☐ Disagree ☐ Strongly Disagree ☐

7. Would you propose to have another process added to the framework? Why?

……

……

……

8. Would you propose to remove a specific process from the framework? Why?

……

……

9. Would you suggest any other factor other than the ones mentioned in 8 above

……

……