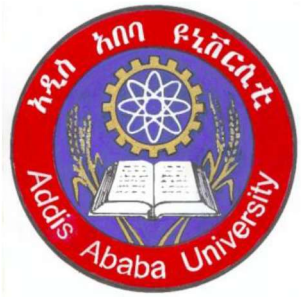

ADDIS ABABA UNIVERSITY

COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

SCHOOL OF INFORMATION SCIENCE

UNDERSTANDING THE ROLE OF STAKEHOLDERS IN FOSTERING SUSTAINABILITY OF ICT4D PROJECTS: TOWARDS A CONCEPTUAL FRAMEWORK

BY

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JUNE, 2020
ADDIS ABABA, ETHIOPIA

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COLLEGE OF NATURAL AND COMPUTATIONAL SCIENCES

SCHOOL OF INFORMATION SCIENCE

UNDERSTANDING THE ROLE OF STAKEHOLDERS IN FOSTERING SUSTAINABILITY OF ICT4D PROJECTS: TOWARDS A CONCEPTUAL FRAMEWORK

A Thesis Submitted to School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirements for the Degree of Master of Science in Information Science and Systems (*Information Systems Specialization*)

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Advisor: LEMMA LESSA (Ph.D.)

June 2020

Addis Ababa, Ethiopia

ADDIS ABABA UNIVERSITY

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UNDERSTANDING THE ROLE OF STAKEHOLDERS IN FOSTERING SUSTAINABILITY OF ICT4D PROJECTS: TOWARDS A CONCEPTUAL FRAMEWORK

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Declaration

This thesis has not previously been accepted for any degree and is not being concurrently submitted in candidature for any degree in any university.

I declare that this thesis entitled "UNDERSTANDING THE ROLE OF STAKEHOLDERS IN FOSTERING SUSTAINABILITY OF ICT4D PROJECTS: TOWARDS A CONCEPTUAL FRAMEWORK" is a result of my own investigation, except where otherwise stated. I have undertaken the study independently with the guidance and support of my research advisor. Other sources are acknowledged by citations giving explicit references. A list of references is appended.

Signature: _____

Andualem Aklilu

This thesis has been submitted for examination with my approval as a university advisor.

Advisor's Signature: _____

Lemma Lessa (Ph.D.)

ACKNOWLEDGMENTS

This research would not have been feasible first and foremost without the almighty God will and the affection, assistance, inspiration, and support I got from my advisor, study participant, workplace colleagues, intimate friends, and family members. Although there are others, I am thankful to send my modest and heartfelt special gratitude to the listed individuals below:

Dr. Lemma Lessa: Your critical research topic identification and title optimization as an advisor were very crucial to shape this study to the required standard. Your incredible, continuous, and persistent assistance was also invaluable from the very start to the conclusion of this study. Your immense effort and support to make this work happen in the eye of the international publication really valuable towards enriching my academic and career path.

Tesfaye Geremew, I am very thankful for your encouragement and motivation, as well as the guidance you showed for me during this thesis, starting from the initial pursuant of my MSc program enrollment and in addition, creating a conducive environment during the hard time of my life where I was and challenged to give up the thesis work.

Dr. Wokshet Lamenew: I am grateful for your motivation, encouragement, energetic vision, and support throughout the academic year, and linking my work with the right-hand advisor who makes the dream comes true.

Sr. Martha Fekadu and Dr. Degu Jerene, I am indebted for your concerned backing during the study and especially at the time of study setting selection, site arrangement, and data collection.

Study participants: Had you been not willing to answer my questionnaire, the whole thing would be different. Thank you for your endurance in responding to the extensive interview questions.

Yemsirach Wondimu, I am indebted for all the patience, overhaul, backing, and liveliness you provide me during a hard time of thesis work. Daniel Getaneh, Getu Alemayehu, Daniel Chimedesa, Eyob Girma, Alehegn Necho , Anwar Ibrahim, Netasnet W/Gorgis and Jemal Edris, Thank you so much for all your encouragement, support, and motivation during my academic year and this thesis work.

Thank you. All my loved family for the moral support given to me throughout my academic year. Above all, This will not happen without the help of almighty God. Thank you, God!!!

ABSTRACT

One of the determinant factors concerning stakeholders engaged in the development project is the degree of their role. Sustainability of the ICT4D project has a relationship with stakeholders' involvement. However, in the ICT4D domain, there is a lack of insight, theoretical models, and frameworks to understand stakeholder perspectives. Understanding the role of stakeholders in ICT4D in an effort towards the sustainability of ICT4D projects has become an Emergent Research agenda since the is a lack of knowledge of understanding and is not well understood.

An existing sustainable eHealth ICT4D project implementation framework is adopted and modified to build a conceptual research framework to conduct qualitative single case study. The aim of the analysis is to provide a better understanding of stakeholders' role in each IS Lifecyle of ICT4D project and to deliver the research objective. An interview and focused group discussion were applied in collecting qualitative data in addition to the use of secondary data source. A thematic analysis is employed to analyze the data collected aimed at simplifying an understanding of the role of stakeholders for the success and sustainability of eHealth ICT4D projects to produce impact.

Accordingly, creating a sense of project ownership and localization of eHealth ICT infrastructure, formulation of strategy, policy and guideline, resource mobilization, building good internal organizational process, scaling up exiting project service and sustaining the impact at scale, building local leadership commitment, adopting ICT4D knowledge management framework, conducting Post-Mortem ICT4D project research, alignment of the project objective and stakeholders effort with the country's ICT strategic vision and synergizing their team effort towards establishing a project sustainability controlling organization are found determining issues to improve and sustain the ICT4D project's service impact beyond the successful implementation of the project.

The finding can be used to better understand the stakeholder's role and align themselves to wards sustainability of ICT4D project for developing countries with similar projects objective, taking cultural. government and donor's needs compatibility in to consideration. However, it is still demanding to study further for a better understanding using in-depth exploration of role and testing the proposed theoretical framework quantitatively with an empirical data.

Keywords: ICT4D, Sustainability, Success, Stakeholders role, Stakeholders engagement, ICT4D

In memory of those who encouraged, supported and motivated me throughout my stay in the graduate program at School of Information Science, Addis Ababa University

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List of Acronyms

ACK	Agriculture Knowledge Center
AI4D	Artificial Intelligence for Development
ALERT	All Africa Leprosy Rehabilitation and Treatment
CBA	Cost-benefit Analysis
DS	Data Science
e-Health	Electronic Health
EMR	Electronic Medical Record
FMOH	Federal Ministry of Health
HIT	Health Information Technology
HSTP	Health Strategic Transformation Plan
ICT	Information Communication Technology
ICT4D	Information Communication Technology for Development
IS	Information System
ITU	International Telecom Unit
MDG	Millennium Development Goal
MDG	Millennium Development Goal
MoH	Ministry of Health
NGO	Non-Governmental Organization
PC	Personal Computer
PMBOK	Project Management Book
PSM	Project Stakeholder Management
TB	Tuberculosis
UN	UNITED NATION
UNCTAD	United Nations Conference on Trade and Development
USAID	United State Aid for International Development
USD	United State Dollar
WHO	World Health Organization

CHAPTER ONE

INTRODUCTION

This chapter aims to provide a detailed picture of the study about understanding the role of stakeholders in fostering the sustainability of ICT4D projects. It is aimed at developing a conceptual framework for sustainable ICT4D projects in attaining improved impact. The central focus is to iterate the problem concerning the sustainability of ICT4D projects sustainability in developing countries. The next subsection of this chapter will be pointed out how the agenda is a burning issue and needs to be addressed from the perspective of stakeholders' role. This section also points to the research gap of this study. Following the research questions will be presented before the objectives of the research are discussed. The chapter concludes by outlining the anticipated contributions to the domain of ICT4D.

1.1. Study Background

Continuous evolution and the spread of Information and Communication Technologies (ICTs) facilitate the phenomenal development of the society. In today's information era, the utilization of ICT opens opportunities in different spares of life. The ultimate result driven by technology uptake is economic growth and development. (Geris et al., 2017). To that extent, ICT has enabled society in many aspects. The Study of Pattinson (2017) indicated that among one of the ICT's pivotal role to the society; is that it drives changes. It promotes changes in societal behavior. Besides, it was mentioned that ICT is an enabler to society by minimizing the environmental impact of life as a means of living, job-related solutions, and entertainment trends. Pattinson (2017) also emphasized that research effort should be made to leverage the maximum uptake of ICT.

Information and communication technology for development (ICT4D) is comparatively a new paradigm in the academic discipline concerned with the use of ICTs for international development. Other interchangeable terms are sometimes used, such as ICTD and ITD. At the heart of ICT4D, the development intervention is emphasized beyond the utilization of ICT (Walsham, 2017). The effort towards the development that ICT plays can be termed as ICT for

development (ICT4D). The concern of ICT4D has shifted the utilization of ICT as a platform for transformative development. By utilizing the technology to address human and social needs is the issue of development, which is at the heart of ICT4D (Mario,2015). Hence the intervention of development should begin with the development of humans first.

The role of ICT in aiding developing countries has evolved ever since the inception of ICT has become a means of development intervention for nations. For instance, Heeks (2009), in his study, has described that the evolution of ICT4D in three phases: the first phase ICT4D 0.0, development and growth was characterized by the uses of computing devices for government and administrative office; the second phase is known by ICT4D 1.0 and falls from the mid-1990s to the late-2000s. In this phase, ICT was seen as a tool for development by the development community to cope up with the exponential growth of the Internet. The third phase, ICT4D 2.0, emphasizes the application of ICT should be considered as a means that can be adapted by people. The phase was started in the late 2000s. The adoption of the third phase focused on the use of ICT as a means of generating income by publishing electronic content. This enables the less privileged society that is under the shade of the digital divide to become producers and innovators.

The current trend of ICT4D is the new digital paradigm shifted from third-generation ICT4D to the use of ICT fetching knowledge from exiting data. Big Data revolutionize the transformation agenda of ICT4D enabled society how best to apply uptake of extracted knowledge for development trends (Hilbert, 2013). Hence the main focus of this trend is the application of big data for development.

Evidence from Hatakka (2013) revealed that although there is a maximum rate of ICT service propagation and uptake over the past years, the equally high failure rates continue to raise doubt as to whether ICT is contributing to development. This explains the increase in ICT evaluation studies should redirect at establishing whether and how ICT can contribute development. Developing currently countries introducing ICTs in order to address the digital divide. For instance, Vidal (2019) pointed out that that the use of ICT Digital Literacy is a program aimed at the elderly that allows reducing the digital gap by providing new opportunities for coexistence and interaction in today's world.

In a case study called "ICTs for growth," Maryam (2007) pointed out the fact that "unsustainability" will result in unintended consequences since there is a poor alignment with the initial goals. The point is that sustainable development is essential but challenging to implement. ICTs for development literature should be opened as Ciborra's suggested kind of crafting and improvisation. For developing countries, sustainable use of ICT is beyond the success of ICT4D. Based on the literature evidence from Heeks (2015) and Hakatta (2018), it was emphasized that stakeholder's role is one of the contributing factors to ensure the sustainability of ICT4D and their role is not well understood till. Hence, this research paper further provides insight on understandings the role of stakeholder in fostering the sustainability of ICT4D and contribute a domain knowledge on how the stakeholder interaction be managed.

1.2. Research Motivations

Ever since the attention of ICT for development emerged, sustainability considered as the nucleus of the ICT4D agenda. Many scholars, such as Ali & Bailur (2007), revealed that ICT4D sustainability is a burning subject matter that should be studied and addressed well. Besides, the work of Ali (2007) indicted that sustainability is the central concern of multi-sectorial "ICT for development" projects. The projects can focus on urban such as telecenters, education, and others. His study pointed out that the question that "what is sustainability" is? Furthermore, "how sustainability be accomplished? Will be the next shift and new paradigm of research concerning ICT4D. More IS research and pieces of literature should focus on sustainability beyond the effective utilization of ICT artifact.

Heeks (2008) iterated as an example of failed ICT projects for development that, many failed telecentre initiatives resulted in a focus on the sustainability of the initiatives. Until recent years the issue of sustainability for ICT4D is a burning issue among many researchers. According to the Study by Thapa et al. (2018), despite the significant attention given to new technologies, many cases have not achieved the desired result, let alone ensure sustainability.

In most research work such as Mananga et al. (2013), ICT4D sustainability is a crucial agenda in developing countries and is not sufficiently addressed. Project managers in this area face difficulty in

ensuring the ICT4D initiative, as it is very tough to address. Hence resolving the agenda of sustainability is a top priority as it optimizes IT investment failure in developing-nations.

Pieces of the literature showed that there are many agendas in focus on the sustainability of ICT4D. ICT for development literature distinguishes between five main types of sustainability: financial, social, institutional, technological, and environmental, given the origins of the term, probably the least-considered - environmental (Ali, 2007).

Developing countries like Ethiopia, obtain funding for most of the ICT projects, such as the use of Information technology as an innovative intervention to improve the quality of health service. Such initiate help Ethiopia towards assisting development. For example, most of them are donor fund ICT projects on the health sector are focused on the objective of enhancing the use of technology and innovation — the funding amount required and forecasted to be 273,749 USD in 2020 (FMOH,2015).

There is future funding for ICT projects on the areas of the health sector as a development intervention towards improving the quality of health care. One of them is USAID funding for automation of the Health Information system for five years. There is also an upcoming Digital Health Technology automation project for 3.5 years in Ethiopia on TB care. The implementation involves various stakeholders (UNITAD, 2019; JSI,2018). Besides, recent evidence showed that Ethiopia had been awarded 63 Million USD from USAID to implement various digital health projects for the coming years (USAID, 2019). This is one of the areas of ICT4D application that e-Health project in Ethiopia that needs the attention of sustainability.

Various literature written on ICT4D differentiates between five main categories of sustainability: financial, social, institutional, technological, and ironically, given the origins of the term, probably the least-considered - environmental (Proenza, 2001; Delgadillo et al., 2002; Stoll and Menou, 2003; Kumar, 2005; Ali & Bailur, 2007). According to Lessa (2015), on the case study in one of the ICT4D area (e-government) projects, the issue of sustainability cannot be detached from its success in ICT projects. The interrelatedness of success and sustainability goes beyond what has been identified as five-pillar of sustainability by Ali & Bailur et al. (2006). The work prevailed that what has to be sustained is the benefit or the service of ICT4D.

Heeks (2016), on his work concerning ICT4D sustainability, pointed out that one of the main priorities and a researchable area can be stakeholder's aspect. This is for the very reason that starting

from ICT4D 2.0 to the current evolution of ICT4D-Big Data, most of the project requires a huge amount of funding from donors' source and requires Collaboration among different parties. Besides, there are new implementing actors introduces in recent ICT4D projects. Therefore, it is argued that all should exert their maximal effort to deal with the issue of ICT4D sustainability from the perspective of stakeholders' aspect.

1.3. Statement of the Problem

According to the study conducted by Chourabi et al. (2012), not only implementing ICT infrastructure, but also the design and development and sustaining of new ICT-based services requires significant stakeholders' involvement. In similar terms, even though there is an overlapping and competing objective, stakeholders should work towards attaining the project goal. This interaction also requires working on the same platform, and shared goals and demands shared technical standards (Perera et al., 2013).

There are also pieces of evidence from existing literature that major factor that fosters the development of unsustainable Heath Information system is the mismatch roles, poor alignment of the partnership interests, roles and obligation of the stakeholders involved during the process of ICT project initiation to closure (Honest, 2007). Among those stakeholders who are misaligned in their strategies and poorly interacted are donors, project implementers, and government bodies. (Honest, 2007).

Based literature from Lessa (2015), citing the work of Rowley (2011) revealed that as of 2011, the attention of stakeholder groups is becoming a growing concern to be the pillar in order to ensure the longstanding sustainability of successful ICT project that is towards public governance services. Accordingly, stakeholders should engage themselves with a shared understanding and should play their role in order to maximize long term benefit out of the service.

Besides, Hatakka et al (2018) pointed out that "there is also a shortage of understanding of the roles of diverse stakeholders in development efforts using ICT." Key stakeholders, such as national government, non-government organizations, and international donor agencies, all play significant roles. However, we need a clearer understanding of “the effectiveness of different development

efforts undertaken by the different actors and the roles that each actor could and should enact in the development process" (Hatakka et al , 2018). In most recent studies from Kaur (2019) argued that Information and Communication Technology for Development (ICT4D), "there is lack of formally capturing stakeholder perspectives and lack of knowledge related to stakeholder interactions." Understanding the role of stakeholder interaction can provide a piece of domain knowledge in sustaining ICT4D project objectives and critical for ICT4D sustainability.

1.4. Research Questions

While sustainability can be accomplished from the different viewpoints for ICT development projects, a recent study has shown that sustainability is not well researched concerning stakeholder position and engagement (Hatakka et al ,2018; Kaur ,2019). As Ethiopia is one of the developing countries and ICT projects are being funded from donors, the role of stakeholder involvement in this issue should be further explored. The following questions are, therefore, be answered in this study.

- How does the stakeholder role look like concerning ICT4D project sustainability in Ethiopia?
- How stakeholders' role is managed in attaining ICT4D project sustainability in Ethiopia?

Existing literature mentioned that involving stakeholders is often seen as a means to more successful information and communication technologies for development (ICT4D) projects. For example (Bailur, 2007) argued that it could be suitable to research ICT4D projects by taking both the viewpoint of stakeholder theory and using the tools of stakeholder analysis. His study also indicated that to this end, stakeholder analysis could be used both as a benchmarked template to evaluate what has been done with stakeholders on an ICT4D project. Besides, his work highlighted that the theory could also serve as a lens to understand who stakeholders are, their behaviors, and how they are managed.

The existing literature of Nameere (2014) overcome the challenges of Sen's (1999) work and enhanced capability approach. Accordingly, development through the use of ICT viewed as a process that comprises the provision of opportunities (capabilities) from an ICT resource, as well as exploiting the chances to understand development benefits. The conversion of resources to opportunities and opportunities to develop benefits is facilitated or inhibited by various contextual factors. Development from the capability perspective is both people-centered and multidimensional.

Based on the stakeholder theory and the capability approach, the answer to these research questions contributes a theoretical proposition to the domain knowledge. Besides, the second question answer the magnitude of impact on sustainability. Thus, finally, a theoretical framework and proposition are proposed as to how stakeholders impacted the sustainability of ICT4D services about the role.

1.5. The objective of the Study

The overall objective of the study to propose a conceptual framework and based on the study result to provide a theoretical proposition that will help to better understand the role of stakeholders for ICT4D project sustainability in Ethiopia.

To address the general research objective, below are lists of specific and primary activities executed in this research,

- To provide a literature review of the theoretical proposition on the role of stakeholders and Capability approach.
- Understanding the existing ICT4D sustainability framework.
- Develop a conceptual research framework.
- Conduct qualitative analysis from interview.
- Examining existing project ground cases
- Propose a revised conceptual and theoretical framework.
- Based on the revised conceptual framework to develop theoretical proposition.

1.6. Scope of Research

This study examines one of the ICT4D areas of eHealth that is the use of ICT for health-specific ICT intervention on the selected cases of e-health project as a ground case to be investigated. Due to the availability of data, study setting conveniences, and based on ICT project management experience in the areas of health. The study focuses on one of the ICT4D initiatives, i.e., the eHealth project in the ALERT center.

1.7. Significance of the Study

The finding from this research helps how similar, and other sectors of developing countries should tailor the role of stakeholders to ensure the sustainability of ICT4D project beyond the successful implementation. The study come up with a theoretical proposition or framework on how the stakeholders affect sustainability. The theoretical recommendations provide a very good insight into how the stakeholders' role and interaction should be viewed in sustaining ICT4D projects that are driven towards development. The finding benefits funding agencies on how to strategically potion themselves toward aligning their interests, strategies, and objectives with relevant stakeholders so as to ensure the long term successful sustainable ICT4D. The findings from this study provide how to sustain ICT4D initiates when the project is closed out, or the funding is discontinued. The finding also helps to sustain the survival of the service beyond the successful implementation and utilization of ICT.

1.8. Organization of Research

This thesis is organized into five chapters. Chapter one introduces Information Technology for Development (ICT4D), research background, and defines the statement of the problem, objectives, and significance of the research. Scope, limitation, and ethical considerations to conduct this study are also the focal point in Chapter one. Chapter two exhaustively reviews ICT, ICT4D, stakeholder, and their role ICT4D, Challenges of ICT4D Sustainability, and the theoretical framework. Chapter three presents the methodology on how to arrive at the find of the proposed research model, along with a research method to collect and analyze data. Chapter four the selected project overview. Chapter five is the data analysis section. Chapter six is all about discussions. Chapter seven the findings and theoretical framework development. Chapter eight concludes all the critical points of the thesis, suggest future works, and presents some recommendations.

CHAPTER TWO

LITERATURE REVIEW

The main purpose of this chapter is to present recent literature written to show stakeholders' roles and the way it is managed as their role is crucial for the sustainability of ICT4D. This chapter starts by showing the evolution of ICT4D, clarify basic concepts of ICT4D project success and failure, and how ICT4D sustainability is interrelated with success. In the middle of this chapter, the stakeholder's subsection is reviewed to explore their stake, role, engagement, power /influence, and interest in detail. The synthesis of this chapter continues to explore the capability approach, which is the most famous theoretical lens to see the ICT4D development perspective. Towards the end of this chapter, it summarizes the related works done, and the research gap identified. Finally, the conceptual research model is proposed.

2.1. Evolution of ICT4D

The term ICT4D stands for Information Communication Technologies for Development. ICT4D referred in the concepts of "development", "growth", "progress" and "globalization" Uwin and Tim (2009). It is often regarded as the application of for societal development perspective. Heeks (2016), on the other hand, associates ICT4D from the perspective of "digital development." According to the previous works of Heeks (2006), ICT4D derived from the theories and frameworks of various fields such as sociology, economics, development studies, library, information science, and communication studies.

The historical evolution of ICT4D can be broken down into three phases: Theses are ICT4D 0.0, ICT4D 1.0, IC4D 2.0 (Heeks, 2008). ICT4D 0.0: the first phase, for example, IT service utilization by a government organization is the main concern, ICT4D 1.0: the second phase characterized by the emergence of the internet and the growth of internet led firms in the industrialized nation where the attention of Millennium Development Goals, ICT4D 2.0: the third phase is more emphasis is given on shifting the service user from being consumers of ICT-based information to revenue generator of their own (Heeks, 2008).

According to Etta (2002) and Heeks (2008), there are three key issues to be considered as a lesson learned during the transition from the version of ICT4D 1.0 to ICT4D 2.0. These are:

- *Sustainability*: The main reason why the issue of stainability brought in to attention was that the rate of failure of many ICT4D projects to deliver the service and the question of survival were clearly observed. Hence a new initiative on ensuring the sustainability of such an ICT4D project becomes the central tone of ICT4D 2.0 and onwards.
- *Scalability*: To mention one of the services in ICT4D 1.0 telecenter, few individuals who can access the service site are those who are benefiting. This is due to the limited reach of individual telecentre projects. Hence scaling up the service for those in need and remote becomes the agenda afterward.
- *Evaluation*: Provided that the emergence of ICT4D 1.0 was typically based on propagandas and was not adequately supported with evidence, the actors were advocating their benefit as there was no accountability of evaluating the impact of the service beneficiaries. Hence a new initiative of evaluation of the impact becomes an integral concern in ICT4D 2.0 and afterward.

The current evolution of ICT4D brought a paradigm shift in the digital era using big data. Exiting literature from Blumenstock et al. (2015) and Jane et al. (2016) emphasized that the current evolution of ICT4D focused on the use of big data for development. Then the evolution quickly led to AI4D (Artificial Intelligence for Development) (Mann, 2018). In other words, the importance of Artificial Intelligence becomes more viable as a primary source of innovation in the economy and society beyond sensing big data.

2.2. ICT4D Project

Unlike the objective of another ICT project, ICT4D projects are focused on delivering ICT services and benefits to the poor. Thus, the gap between the poor and the rich be narrowed. For instance, such ICT projects that can assist a citizen in improving creating, sharing, and enhancing knowledge, make production and transactions more efficient and cost-effective and stimulate networking amongst parties. ICT4D projects also seek to bridge the "digital divide" in developing countries by delivering the information accessible for those in need. Besides, what makes the ICT4D project unique is that a project initiation is a demand-driven approach and significantly requires the participation of the local community. (Dijkers et al., 2018).

2.2.1. Typical Nature of ICT4D Projects

- Poverty focus. According to World Bank (1999), it is pointed out that addressing the problem caused by poverty, enhancing development and empowering socio-economic change is also the objective of ICT4D projects
- Tailored towards supporting the capability of Developing Nation. ICT4D project strengthens the capability of many developing nations (UNDP, 2005).
- Focus on poor citizens. According to Heeks (2008), what makes ICT4D project different from other ICT projects is that beneficiaries are the poor.
- It requires enormous funding and donors' contribution. Heeks (2008) also pointed out that the funding requirement for the version of ICT4D projects requires a considerable amount in addition to the requirements of external funding.
- ICT4D is a new paradigm in development and academic discipline than traditional ICT project perspective in terms of complexity, implementation methodology, research, and orientation towards impact than beyond utilization of ICT service. Walsham (2017) reiterated that Information and Communication Technology for Development (ICT4D) is a comparatively new concept in the academic as well as research concerned with the use of ICTs for international development.
- Implementation of the ICT4D project requires significant various stakeholders' interactions. Unlike other countries, developing countries face such challenges complicated stakeholders' interaction (Muranga Njihia and Merali, 2013; Kaur et al., 2019). Especially in recent years, the interest and use of partnerships in ICT4D are becoming a growing concern (Ismail et al., 2018; Kaur et al., 2019).
- Unlike any other ICT project, the life cycle stage of the ICT4D project goes to the impact on individual and societal levels. Various literature such as Bailure (2007) identifies the four important life cycle stages of ICT4D project as development, adoption, use, and impact.

2.3. ICT4D Sustainability and Challenges

The issue of sustainability was first emphasized and raised within the environmental domain at the conference held at Rio in 1992, at that time the concept of 'sustainable development' was the central concern on many international conference agenda. (Honest,2007). It is clear that the desires of the current generation must be addressed adequately before meeting the needs of future generations.

Extent literature from Ali (2007) also considered on "ICT for development" case studies, ICT4D project that ended in "unsustainability" with respect to their initial aims resulted in unintended consequences. There are various areas of sustainability that ensure the success rate of ICT4D projects. Accordingly, ICT for development literature distinguishes between five main types of sustainability: financial, social, institutional, technological, and ironically, given the origins of the term, probably the least-considered - environmental (Proenza, 2001; Delgadillo et al., 2002; Stoll and Menou, 2003; Kumar, 2005; Oyomno, 1996; Harris et al., 2003; Whyte, 1999; Baark and Heeks, 1998; Colle and Roman, 2003, Ali 2007).

Financial or Economic sustainability refers to the long-term ability of ICT projects to generate enough income to fulfill the cost required for both operational and maintenance. The revenue generated from ICT projects additionally should cover sufficiently for broken and obsolete equipment (Proenza, 2001). Economic sustainability is by far the most common challenge for many of the ICT4D projects in developing nations, which continue to be donors funded for a finite period (Harris et al., 2003). Hence, in this case, to overcome this challenge, multiple channels of funding need to be secured in case some funders decide not to follow through with the project (Tino,2003).

Technological sustainability refers to the capacity of the technology to provide service and the survivability stay for a more extended period. The existence of technology should not be accompanied by a significant change in hardware or software. Besides, the change in hardware and software is not alter its availability or durability (Misund and Hoiberg, 2003). Kiggundu (1989) also mentioned that maintainability, operationally easiness for use, flexibility, robustness, and also the availability and capability of both technical and managerial human restore are the aspect to be considered in technology sustainability. The most common challenges Technological sustainability is related to Economic sustainability; this is because acquisition and maintenance cost of ICT devices usually requires huge investment both capital as well as running expense. The other challenge of technology sustainability is that the more frequent change in user requirements. For example, Ali and Bailure (2006) underlined that if the technology does not reflect the current change, the sustainability of the service will be in question.

Social sustainability demands active participation and user engagement. Such aspect of sustainability consider the following issues; these include accommodating local traditions, consideration of differences among the communities, empowering most neglected groups, sharing and aligning ICT project goal with local beneficiaries and continue to adapt changes to the need of local community (Gómez and Casadiego, 2002; Harris et al., 2003; Stoll and Menou, 2003, Delgadillo, 2004). According to Mansell and When (1998), the common and possible challenges of social sustainability arise whenever there is a conflict of interest between the parties. The tension among the beneficiary groups will lead to failure in the sustainability of ICT projects. (Kumar and Best, 2006). Mansell and Wehn (1998) also justified that due to the complex nature of social impact performance indicators, the magnitude of social sustainability impact is difficult to be quantified.

The central theme of institutional sustainability cannot be detached from the concept of social sustainability. Institutional sustainability requires the approval and involvement of stakeholders in ICT projects. (Stoll and Menou, 2003; Madon, 2005; Kumar and Best, 2006; Harris et al., 2003; Colle, 2005; Iyer, 2005). Evidence from Kuriyan et al. (2006) and Avgerou (2000) also revealed that political process and acceptability by political actors are the pillars for institutional suitability.

At last ironical sustainability is one of the components of green IT. For instance, Kumar and Best (2006) mentioned that consideration of environmental friendliness and reusability at the time of disposal in the design of ICT artifact is one factor for environmental sustainability. Evidence from existing literature of Lessa (2015) revealed that “yet, much of this literature also summarizes unsustainable ICT projects as having suffered in one or more of these areas. Still, others such as Heeks (2003) state that the majority of ICT for development projects fail because of the design-reality gap”.

According, to Lessa's (2015) study, it was identified that ICT4D challenges might vary depending on the areas of intervention, for instance, Dzhusupova et al. (2011) classified seven main challenges influencing the sustainability of one of the ICT4D project intervention areas of e-government programs. The study was done in developing countries. Such challenges include ownership, leadership, vision and strategy, institutional capacity, design versus reality, capacity and awareness, and dependence on external assistance.

On the other side of the ICT4D intervention area, the e-health donor role is key for sustainability (Honest et al.,2007). For example, other researchers (e.g., Wood-Harper and Bell, 1990; Walsham et al., 1988 and Mursu et al., 2000) cited that most development-oriented IT projects in developing countries financed through funding agency and the government expects much of expert and technical support from donors. This is significantly creating a dependency on to ensure the sustainability of the service. As a result, in developed nations, sustainability is very much at risk of failure, especially if it is donor-funded IS projects.

2.4. ICT4D Projects Success vs. Failure

2.4.1. Success

In both domains of project management and well as literature from Baccarini (1999) indicated that there are two wings to consider while dealing with the concept of project success: project management success and product success. In the domain of project management, success is all about achieving the deliverables and milestones within the specified project constraints such as budget, time, quality objectives, and the on the management style of how the project is executed. On the other hand, product success deals with how effective the final deliverable meets the customer requirement. On the other hand, Freeman and Beale (1992) reviewed the project management literature, identified seven common metrics as agreed for evaluating project successes; five seem to be used than others frequently: technological effectiveness, performance quality, management, and business effect (mainly customer satisfaction), growth of individual and industrial and business performance. Other views of "project success may be assessed by different interest groups—stockholders, managers, customers, employees, and so on." (Stuckenbruck, 1986; Prabhakar, 2007). Therefore, assessment requirements for project performance must reflect different opinions.

Coming to the IS project management, Milis and Mercken (2002) categorized seven standard measures of ICT project success. The aggregate of each category measures the successful ICT project. These are good project idea selection, project definition, project plan, management involvement & support, project team composition, change management, project resources, and relationship management. On the other hand, DeLone and McLean (2003) argued on their study and framed a

working and broader definition of IS Success by integrating six pillars: individual impact, information quality, IS use organization impact, system quality, and user satisfaction.

2.4.2. Failure

According to Heeks et al. (1999), the failure of ICT projects can fall into four major categories. These are a total failure, partial failure, replication failure, and sustainability failure. The failure of sustainability has been defined as involving an ICT initiative "...that succeeds at the beginning however fails to meanwhile…. " (Heeks et al., 1999 cited in Heeks, 1999, p.13). Such ICT project failure of sustainability cannot prevail in the longer term. The failure to sustain ICT projects is a critical challenge faced by developing countries (Heeks, 2002). Unlike other classification of ICT project failure, the most pressing issue for ICT4D project is sustainability failure. For example, various researcher (e.g., Badsar, et al.,2011; Braa et al., 2004; Heeks, 2008; Keniston, 2003a; Keniston, 2003b; Marais, 2011; Walsham and Sahay, 2006) emphasized that the issue of ICT projects sustainability in developing countries by far the most challenging agenda and is not well addressed. As a result, it needs to be well researched. More efforts should be exerted to solve the sustainability of ICT4D projects.

According to evidence from existing literature of Heeks (1999) and Heeks (2002) that the sole justification for finding a remedy of sustainability failure in developing countries is that the government and funding agency has a budget constraint to implement ICT4D projects. As a result, there is a high likelihood of failure in the ICT4D project in developing nations. On the other hand "projects where the key stakeholders and the targeted beneficiaries are not involved in scope identification face, much rebellion during the implementation phase as stakeholders is likely to disown it due to the feeling of not being part of the initiative from the word go" (World Bank, 2010) (as cited in Ouma,2017). Hence it can be deduced that the failure of the ICT4D project is strongly related to the failure to sustain such ICT initiative and disregarding the role of relevant stakeholders that are at the heart of project benefit.

2.5. ICT4D Critical Success factor

Since implementation ICT4D project requires a new role of actors and complex (Heeks, 2015), considers all critical success factor of ICT project (Milis and Mercken,2002; McLean, 2003). There

are other critical success factors to be considered beyond. For example, Dijkers (2013) reviewed several literatures written on ICT4D project Critical Success Factor (CSF) and itemized. Table 2.1 Summarizes the list of critical success factors together with the related Literature source.

2.6. ICT4D Success vs. Sustainability

Even though the focus of several authors, researchers, and scholars have contributed literature on the domain knowledge of ICT4D project success and failure, an emerging issue of success and sustainability of ICT4D becomes pivotal in the domain. For instance, Lessa (2015) revealed that there is difficulty in materializing and interrelate successful as well as sustainable ICT4D project initiatives such as e-government, particularly in developing nations for various reasons. Such an initiative also has limited study focus as to how long-term sustainability is attained (Furuholt & Wahid, 2008).

Scholars suggested several approaches, methods to make the ICT4D projects successful. As literature from Dijikrs (2014) showed that ICT4D projects are a demand-driven approach, and their goal is to bridge the digital divide in developing countries, user collaboration can improve success. His work pointed out that using Agile can only work and successfully since it also improving team communication, enhancing organizational learning, and by frequently delivering software. However, high rates of failure exist for ICT4D projects (Marias, 2012). Failure in ICT4D project could also mean sustainability failure (Heeks et al. ,1999, Heeks, 2002; Badsar et al. 2011; Braa et al., 2004; Heeks, 2008; Keniston, 2003a; Keniston, 2003b; Marais, 2011; Walsham and Sahay, 2006), i.e., unsustainability in ICT4D domain is ICT4D project failure. Hence it is quite transparent that ICT4D project success does not grant the totality of sustainability.

Description of (CSF)	**Literature Sources**
Monitoring and evaluating project progress regularly.	(James, 2004; Maepa, 2003; UNDP ,2001),
Align with demand-driven approach.	(Maepa ,2003; UNDP ,2001; Conradie, 2003; Kora ,2002; Kumar, 2003)
inclusion of relevant skills must be built and trained.	(James, 2004; Maepa ,2003; UNDP,2001; Conradie ,2003; Kora ,2002; Kumar, 2003),
Efforts must be made to retain staff.	(TinaJames,2004; Kumar, 2003),
Project ownership must be given to local parties.	(Maepa ,2003; UNDP ,2001; Kora,2002).

Establishing economic sustainability.	(Tina James,2004; Ravishankar,2015; Tina James ,2004)
Local partnerships must be built to achieve synergies.	(Maepa ,2003; UNDP ,2001; Conradie, 2003; Kora ,2002; Kumar, 2003)
The creation of local content must be facilitated.	(James, 2004; UNDP ,2001; Conradie, 2003; Kumar, 2003).
Political context must be analyzed and considered.	(James, 2004; UNDP,2001; Conradie, 2003; Kora ,2002; Kumar, 2003)
Project must have a project champion.	(Tina Jame, 2004; Maepa ,2003; UNDP ,2001)
The right technology must be chosen.	(James ,2004; UNDP ,2001; Conradie, 2003; Kora ,2002; Kumar, 2003)
Cultural understanding of the local community must be developed.	(Krauss,2016; Mursu et al,2013)
Trust between the local community and outside parties must be built.	(Krauss,2016; Sandep et al,2015)

Table 2. 1 Summaries of Critical Success Factor (CSF).

Sustainability is still essential and is the central concern of the ICT4D agenda. Marias (2012) justified the sustainability of ICT for Development (ICT4D) initiatives remains a continuing fear and projects naturally have a high rate of failure. Sustainability issues have shifted from requirements for external support via governments or funding agencies to self-sufficiency (mainly) based on economic viability because unsustainability is a form of failure, and this implies that sustainability is not the same as a success. However, it is necessary for success (Heeks, 2005).

Finally, Lessa (2015) contended that the two concepts (sustainability vs. success) are interrelated and, therefore, should not be detached. Especially successful ICT4D project demands the long-term survivability of ICT4D service (Honest, 2007; Korpela et al. 1998; Misund and Hoiberg, 2003; Pieterse,2005; Hunter et al., 2016; Ali 2007). Weather sustainability treated from technological, social, environmental, institutional, political perspective (Proenza, 2001; Delgadillo et al., 2002; Stoll and Menou, 2003; Kumar, 2005; Oyomno, 1996; Harris et al., 2003; Whyte, 1999; Baark and Heeks,

1998; Colle and Roman, 2003, Ali,2007), a meaningful ICT4D success will be reflected and argued only if there is a sustainable ICT4D in place (Lessa,2015).

2.7. Capability approach for ICT4D sustainability

In the field of development research and practice capability approach became popular in the mainstream work Sen (1985, 1999). The capability approach defines what constitutes development from the perspective of ICT utilization. Development, according to Sen, is the extension of freedoms (opportunities or capabilities) to enable people to govern their way of life (Sen, 1999; Chambers & Conway,1992; Hatakka & Lagsten, 2012). Development is more than the provision or access to a resource, e.g., ICT: it is about what ICT can enable people to be or do given their contextual aspects. Sen (1999) also pointed out that "assessment of progress has to be done primarily in terms of whether the freedoms that people have [or value] are enhanced." The debates on the global human development agenda are increasingly influenced by the capability approach (Bass et al.,2013).

The word "capability" in ICT4D research tends to refer to an individual's ability to use technology (Zheng, 2009). In comparison, in capability approach, the term "capability" refers in practice; this means more attention to issues promoting human well-being, directing policy efforts towards health, education, and sustainability in addition to economics (Saito, 2003). The capability approach views ICT as a type of commodity that is meaningful only in the ways that it enhances human capabilities. This avoids the risk of seeing ICT as intrinsically good as if the use of technology in itself was a valuable achievement. This perspective of the capability approach provides emphasis on the extent to which utilization of technology enhances people's abilities to determine and realize their way of life through ICT4D projects.

2.7.1. Evaluation criteria of Capability in ICT4D

The multidimensional nature of the approach argues for a holistic evaluation of wellbeing that is not only limited to income since wellbeing consists of aspects that income cannot satisfactorily measure (Deneulin, 2006). Hence the goal of evaluation based on the nature and purposes of evaluation, which in turn means assessment criteria includes either of the three option: the opportunities (capability set), the achieved functioning's, or both.

On the other hand, literature evidence from Grunfeld (2007) identified that the ICT4D evaluation perspective should be seen from three-dimension: cost-benefit, macro-economic level, and project evaluation. His work pointed that the evaluation approach should focus on what is important from a human development perspective besides it was clearly seen that there is a strong relationship between capabilities, empowerment, and sustainability on the one hand, and on the other effective macro-level policy, supportive mesostructured, and resources at the micro-level.

2.8. Stakeholders

The term "stakeholder," the way these days use it, first seemed in an internal memorandum at the Stanford Research Institute (now SRI International, Inc.), in 1963. The term was meant to test the concept that stockholders are the only group to whom organizations need to be accountable or would cease to exist (Freeman, 1984). According to the PMBOK (2013), a stakeholder is an individual, group of individuals, or institutions that may influence, be influenced, or consider itself/themselves to be benefited by a verdict, activity, or by the outcome of a project. Stakeholders may be actively engaged in the project or have interests/importance that may be positively or negatively affected by the performance or completion of the project. In similar terms, the stakeholder can affect or be affected by a project that the focal organization implements in the fulfillment of its objectives (Freeman, 1984; Olander, 2007).

A broad definition of stakeholder was also given by R. Phillips (2003), who defined stakeholders as parties contributing and/or being affected by a decision-making process. The above definition obtained from literature referred that anyone with any form of relationship either with the institution or project is stakeholder since there is a mutual stake or interest. Similarly, Freeman (1984) also expands on this definition to include "any group or individual that can affect, or is affected by, the accomplishment of a corporation's purpose.". From the above literature, it can be said that the stakeholder's domain can consist of both internal and external, owners and investors, retailers and contractors, government agencies and media outlets, individual citizens, and society at large. Stakeholder management domain knowledge, the most commonly used category to differentiate stakeholders is using power versus influence matrix (Gavin and Pinder, 1998).

IT project domain, stakeholders are individuals and organizations that are actively involved in the project implementation, or whose benefits or interest may be affected as a result of IT project

execution or project completion. The contribution made by different people to any IT project is the principal criterion for identifying stakeholders. Besides, stakeholders for whom the system is designed for are located in the functional departments and are referred to as users or end-users or line managers (Probi et al., 2005). “The stakeholders engaged in the systems development include IS managers, systems analysts, programmers, end-users, and Business Managers, as well as IS managers, Technicians, and specialists” (Probi et al., 2005), as illustrated on the work of Kenneth (2008). In addition to IT project stakeholder, ICT4D project involves a new form of stakeholder. For instance, Heeks (2015) viewed that the introduction of new actors and multi-level stakeholders are the emerging forms of stakeholder in ICT4D 2.0 and afterward. Luoma-aho and Paloviita (2010), also the users of the term "actors" is more preferred to express "stakeholders" as the term actors include both human and non-human stakeholders. Examples of heterogeneous elements are people, institutions, documents, and technical objects (Law et al., 1992).

Lelea et al. (2014) suggested that in a transdisciplinary research project, multi-stakeholder platforms can be seen as one means of institutionalizing the effort of stakeholders in a transdisciplinary research project. According to their study, the multi-level interaction and platform among stakeholders have been illustrated in Such a platform that brings stakeholders who belong to one activity system in the same groups and consolidate their level of interaction for the success of ICT4D. Heeks (2015) also asserted the need to maintain ICT4D expertise centers in addition to the growing acceptance of multi-stakeholder formation is an evolving agenda. Besides, his work conquered that successful implementation of ICT4D requires openness and accountability, with multi-stakeholder partnerships. Taking on the worldview of multi-stakeholder participation such that it becomes the only conceived benchmark for ICT4D processes (Heeks,2015; Bardelli-Danieli 2011; UNCSTD,2011).

2.8.1. Stakeholder Theory

Ever since the term stakeholder became familiar first by Freeman in 1984, the origin of stakeholder theory happens to be popular in the various management literature (Bailur, 2007). In line with this, Preston (1990) used the theory to segregate the stakeholder group of General Electric Company into four: shareholders, employees, customers, and the general public. According to Freeman (1984), understanding of stakeholder theory needs further work to develop. Hence, at the time of theory evolution, it divided his broad stakeholder groups into internal (customers, employees, suppliers, owners) and external (government, competitors, special interest groups, even terrorists).

Parmar (2010) et al. highlighted that if stakeholder theory is adopted and applied as a unit of analysis to understand the relationships between a business and the group of people and persons who may or will be impacted by it, then the three problems be addressed in a better way. Evidence from Donaldson & Preston (1995) (as cited in Parmar et al. (2010)) distinguishes and elaborated four major components of stakeholder theory. These are:

- *Descriptive Stakeholder Theory* it is about finding a factual answer about what managers and companies do. For example, literature evidence justified that descriptive stakeholder theory is a pioneer in organizational behavior literature and describes the nature and behavior of stakeholders involved in a system. The descriptive component uncovers how an organization interacts with its stakeholders (Brenner and Cochran 1991; Jawahar and McLaughlin 2001).
- *Instrumental Stakeholder Theory:* These are an effort towards pointing out the outcomes of specific managerial behavior. These theoretical component stress that organizations should consider key stakeholders as this leads to success and competitive advantage (Bailur,2006). Pfeffer and Salancik (1978) also underline the importance of Instrumental stakeholder theory from perspective resource dependency. In other words, it means that without interactions and transactions with critical groups, an organization will fail.
- *Normative Stakeholder Theory:* The theory discloses answer for "what managers or corporations should do from an ethics perspective?". Similarly, normative stakeholder theory is concerned for stakeholders as an end and should be treated well according to the principle of fairness (Mellahi and Wood,2003; Phillips,1997). Parmar et al. (2010) argued finally concerning normative stakeholder theory is a valuable perspective to see peoples, since all have an equal and legitimate interest in a safe and stable life, human beings tend to be affected by any decision. Also, he pointed out that all should equal opportunity and similar consideration as others.
- *Managerial Stakeholder Theory:* The need for practitioners in the areas of stakeholders' management is the final view of this theory (Parmar et al.,2010).

Finally, Parmar et al.,2010 argued that various scholar's debate mentioned all pillar of stakeholder theoretical components is critical for meaning full stakeholder theory. The application and adoption of each part of stakeholders have their methodology and importance. For example, Donaldson & Preston (1995) assert that the normative part is the heart of stakeholder theory; the other parts of the theory play an integral role. To conclude, the study of Parmar et al. 2010 disclosed that the larger

portion of scholars argue that stakeholder theory is first, and most fundamentally, a moral theory that specifies the obligations that companies have to their stakeholders.

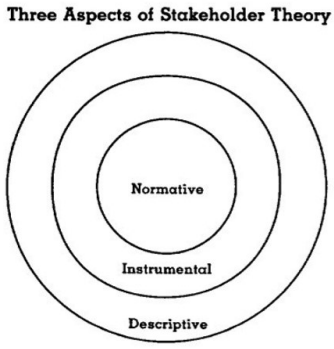


Figure 2. 1 Aspects of stakeholder theory (Donaldson & Preston,1995). Source NDAYISHIMIYE (2018)

To conclude the discussion of this section of the literature, the stakeholder theory consists of various normative cores that are towards providing a remedy for two problematic domains. These cores are aimed at providing an answer for "what is the purpose of the organization" and "who does management have a responsibility" questions.

2.8.2. Project Stakeholder Management

According to PMI (2013), Project Stakeholder Management (PSM) is a process that applies methods, techniques, theories, and models that are important in deciding the project's effect or influence of the stakeholders (people, organizations, society, or government, etc.). It is also mentioned that in the book of PMBOK guide that the goal of project stakeholder management is to analyze stakeholder expectations and their impact on the project. The other purpose of PSM is to build suitable management strategies for active stakeholders' engagement. Finally, PSM is valuable for project execution as well as for decisions making purposes.

Existent literature from Caroll and Buchholtz (2006) identified that the first step in the process of stakeholder management in an organization takes the key practical considerations to identify "who the stakeholders are?" Similarly, PMI (2013, pp 391) also provides an overview of the Project Stakeholder Management processes that include the following: “identifying stakeholders, plan stakeholder management, manage stakeholder engagement, and control stakeholder engagement.”

2.8.3. Identifying and Classifying Stakeholders

Various researchers such as Lukviarman (2008) believe that using the stakeholder approach classifying into various groups considered as important to take stakeholder preference into account in each activity and step of the business process. Classifying stakeholders focus on overseeing relationships that are critical to an organization's success.

The origin of classifying stakeholders is from the foundation concept of stakeholder theory (Freeman, 1984). Accordingly, the literature from Freeman classified stakeholders in broader groups. These are: internal (customers, employees, owners, suppliers) and external (competitors, government, special interest groups, even terrorists). It is also argued that key stakeholders are plays a pivotal role in the organization since key stakeholders hold high power to impact and have the highest interest in the business. Other literature evidence also highlighted that the identification of key stakeholders and understanding their objectives are significant to accomplish organizations' success (Bourne, 2009).

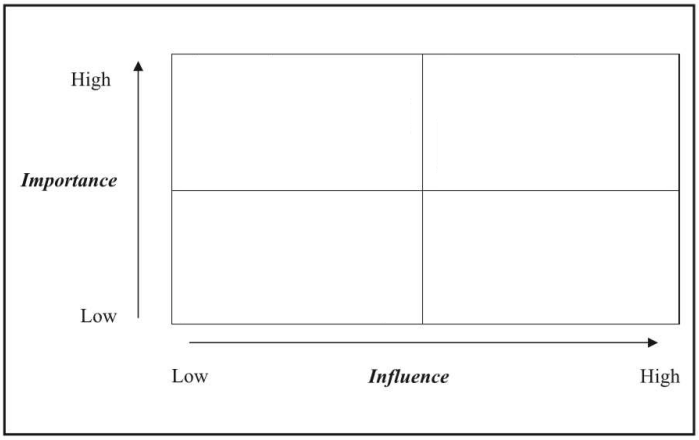
Much of the literature written on stakeholders' management domain revealed classified stakeholders as primary and secondary. (Mitchell et al., 1997; Savage et al., 1991; Clarkson (1995). The primary stakeholders are those who have formal, official, or abide by the contract agreement and have a direct and a lion-share of financial influence on the business. Clarkson (1995) also labeled primary stakeholders as those "those whose participation is a blood for the survival of the organization." If these primary stakeholders take out their participation or become unsatisfied with the service of the system, "the ongoing concern of the organization will be in trouble" (Clarkson,1995). On the other hand, it is argued that secondary stakeholders are heterogeneous, and their participation is not directly related to the organization's economic activities; however, they can put effort to influence the organization in another way (Savage et al., 1991). Clarson (1995) also argued that secondary stakeholders have the "the ability to influence public opinion against or in favor of the organization performance."

Finally, the most appropriate ways of classifying stakeholders (particularly in development literature) to distinguish between stakeholders is that of importance versus influence, whereby importance illustrates a stakeholder whose problems, needs, and interests are the priority of the intervention, and influence of "how powerful the stakeholder is?" (Gavin and Pinder,1998).

2.8.4. Mapping ICT4D Stakeholders

Evidence from Renken and Heeks (2013) indicated that champions are a key driver of stakeholders in the success of the ICT4D project. Involving stakeholders is often considered as a means to more successful information and communication technologies for development (ICT4D) projects Bailure (2007). ICT4D Success and sustainability are interrelated (Lessa, 2015). Adapting general definition of stakeholders (Freeman,1984) to a specific definition of ICT4D project stakeholders: "a stakeholder in an ICT4D project is any group or individual who can affect or is affected by the achievement of the project's objectives". It was argued that this definition, on its own, is comprehensive and would and required more work to refine the working definition better. To this end, Renken and Heeks (2013) underlined the approach to stakeholders that was well illustrated by Bailur as "the most appropriate method to classify stakeholders in the development field. The view of categorizing helps to segregate and put demarcation between "stakeholders" is that of "importance versus influence," Under this imperative, the importance refers to "priority of the intervention is needed for those stakeholders whose issues, needs, and interests are critical for the ICT4D sustainability of the project" and influence refers to "the extent to which the stakeholders put power on the project sustainability" Bailure (2006). Hence based on Bailure (2006) work the approach of classifying ICT4D project stakeholder as importance/influence approach will enable to understand better, differentiate, group and classify in terms of their key importance and involvement (i.e., role) in the project (Renken and Heeks, 2013).

Figure 2. 2 Stakeholder importance vs influence map. Gavin & Pinder (1998) (Source: Bailure,2006)



2.8.5. Conceptual Framework for Stakeholder Analysis

Exiting Literature evidence from Bailur (2006) highlighted that the earlier concept of stakeholder was related to firms such as the private sector and industrialized nation, nowadays the importance of stakeholder analysis has shifted, and it is highly pronounced in development projects. Furthermore, he pointed out that a conceptual framework for stakeholder analysis will provide a clear understanding of stakeholders' role and engagement area. According to Bourne L. (2009), the role of stakeholders is affected by interest, rights (legal or moral), ownership, and contribution in the form of knowledge or support.

In general, the conceptual framework for stakeholder analysis adopted and assumes that the role of stakeholders may have a direct relationship with the success. To better understand the nature of this relationship and to enrich the concept of 'who can be stakeholders?' and 'why are they important?', it is essential to discuss the nature of any relationship between stakeholders and the activity in the project organization (Bourne, 2009) (as cited in Melese 2018).

The theoretical lens used for this thesis consists of three main stages, as suggested by Bailur (2006). This approach is legitimized by the fact that it has been adopted in previous stakeholder theory-based ICT4D studies mentioned above. According to Bailure (2007), the initial phase of stakeholder analysis is to examine who (the stakeholders) that are affected by a project, their interest, how they react and why, and what their history is and then to undertake a coalition analysis—namely, finding out how they interact with other groups. It is also argued that identifying stakeholders regarding their level of interest and power provides an opportunity to bring those stakeholders within the judicial process who might have interest and authority to bring sustainability-related performance and who might have an interest in different sustainability-related issues as well (Zsolnai, 2006). Heidrich et al. (2009) also proposed a multidimensional scoring mechanism that allows the different roles of stakeholders to be considered and then rated on power, legitimacy, urgency, as proposed by Harvey (2011) and additionally on the importance and the time-span of influence.

Bailur (2007) emphasized that a repeating process of identification can improve the result of stakeholder identification since there is the various obstacle that prevents to see essential and invisible. It is also cited in the literature that is iteratively conducting stakeholder analysis increase the number stakeholder that was not initially expected to appear (Pouloudi and Whitley's,1997). Similarly, researchers revealed that stakeholder analysis is akin to a 360-degree approach, but there

is still a debate about the identification, types, and level of stakeholder (Harvey, 2011). Zimmermann and Maennling (2007) also underlined that the 'stakeholder landscape' is by no means a stable one. It constantly changes according to interests, changes in external conditions, and the different phases of the process", In similar works stakeholder analysis enables us to understand that stakeholders could exert influence (which could be technological, economic, social, political or managerial) in more than one way and to a varying extent (Freeman,1984). This justifies that stakeholder analysis is essential in project sustainability.

Once iteratively identifying the stakeholders is done, the next step will be to identify their stake (Bailure, 2006). This is the second stage of stakeholder analysis that aimed at providing the insight to understand "what organizational strategies are important to manage these stakeholders implicitly or explicitly" (Gavin and Pinder,1998; Gosling and Edwards, 2003) depicted a that will illustrate the stakeholder involvement in concerning their relative importance. Table 2.1 shows that this scale as to whether to inform, consult, offer partnership, or give control to a stakeholder group. Evidence from similar research revealed that scaling is done at each phase of development project life cycle: identification project/analysis to planning, cost/benefit analysis (CBA), implementation, and monitoring & evaluation. To put in a nutshell, a stakeholder analysis approach helps to understand any activity in the project or a set of transaction bargains that are possible sources of conflict among the stakeholder group (Freeman 1984).

Finally, literature evidence from Harvey (2011), stated that the first stage of the stakeholder analysis generates the list of stakeholders, the second stage is to build the roles and effects table, and the third stage is to rate the stakeholders on specified dimensions. The figure outlines a stakeholder conceptual framework analysis that provides Understanding and addressing stakeholders in development projects.

	Inform	Consult	Partnership	Control
Identification/analysis				
Planning				
CBA and resource allocation				
Implementation				
Monitoring and evaluation				

Table 2. 2 Stakeholder Management technique at Different Project Life Stages (Source: Bailure,2006)

Bailure (2007) illustrated the below flowchart (adapted from Freeman 1984; Pouloudi and Whitley 1997; Gavin and Pinder 1998; Gosling and Edwards 2003) that summarizes all of the conceptual stakeholder analysis frameworks.

Identifying the stakeholders

- Understand their behavior
- Aim to anticipate how they might work together or why conflicts might arise. This stage might have to be repeated several times.

Plan strategies

- Plan how to manage the stakeholders, such as mapping the stakeholders.
- Understand what responsibilities they will hold.
- Determine their scale stakeholders as be informed, consulted, involved in a partnership, or given control of a project?

Determine whether concessions are needed if the previous management strategies do not work.

Finally, literature evidence from Harvey (2011), stated that the first stage of the stakeholder analysis generates the list of stakeholders, the second stage is to build the roles and effects table, and the third stage is to rate the stakeholders on specified dimensions. Figure 2.6 outlines a stakeholder conceptual framework analysis that provides Understanding and addressing stakeholders in development projects.

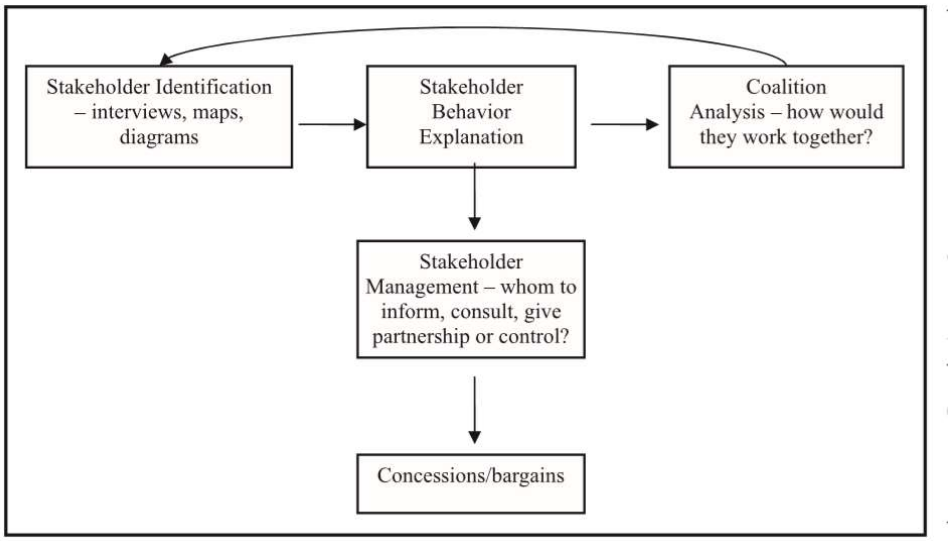


Figure 2. 3 Understanding and addressing stakeholders in development projects: A stakeholder framework.

Sources: Freeman (1984); Pouloudi and Whitley (1997); Gavin and Pinder (1998); Gosling and Edwards (2003).

2.8.6. Theoretical framework for stakeholders' analysis

Various literature before this section expressed that the relationship among stakeholders is of a pivotal role in strengthening organizational activity and ensure project success. (Bailure 2006; Stuckenbruck, 1986; Prabhakar, 2007; Freeman 1984). Hence project and corporate policy document should clearly state the understanding of the power and interests of each stakeholder. In line with this, especially literature evidence from Gavin and Pinder, 1998; Bailure, 2006; Renken & Heeks, 2013; Bourne 2009, Zsolnai, 2006) contend that a better understanding of stakeholder power and interest requires critical identification of stakeholder.

Zimmermann and Maennling (2007) showed by providing an example of how their power and interest differentiate stakeholders (represented by ovals of different colors). Labeling the stakeholders is following the problem/issue the project focuses on. Addressed project activities to stakeholders are based on the different quadrants (A, B, C, D in Figure 2.6). Similarly, another study showed that a stakeholder matrix expresses the importance of the stakeholder matrix as a means to different stakeholders (Lelea,2003).

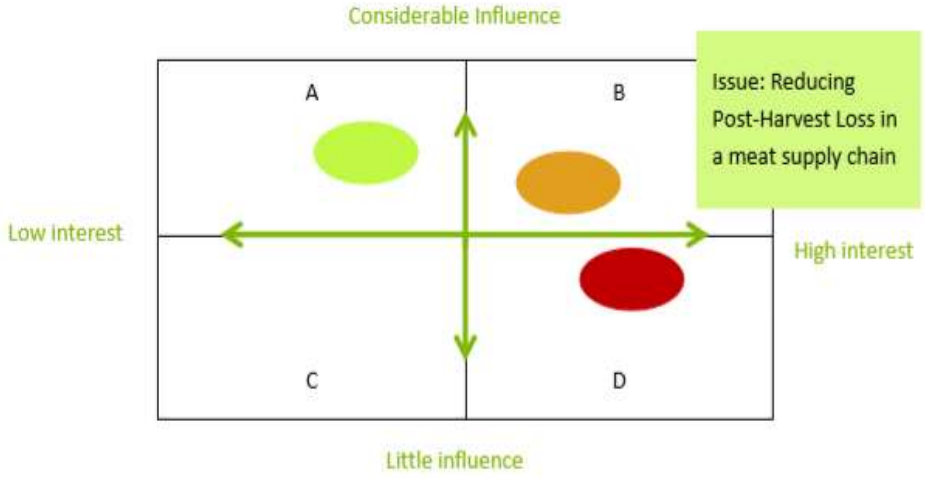
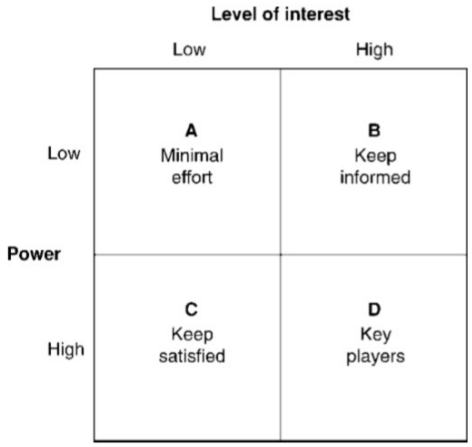


Figure 2. 4 Theoretical frameworks (Power and Interests) (Source: Lelea et al.,2014)

According to the literature evidence from Newcomb (2003), a stakeholder matrix/mapping is used to categorize stakeholders concerning the power that they bear versus interest in the project. He developed a matrix illustrated in figure 2.5. He showed that "stakeholders with little interest and little power to influence them to belong in (Zone A) will demand minimal effort on the part of the project manager to monitor." Zone B stakeholders are those with "a high level of interest in the project's engagement, but little power to influence them will need to be kept fully informed of the significant decisions which have been made, so that good communication with this type of stakeholder is essential." Highly and equally labeled important stakeholders belong in Zone C and D. Clearly, the adequacy of decisions to the key players in Zone D is a major consideration when formulating project strategy but often the stakeholders in Zone C are the most difficult to manage. Their level of interest in the organization's strategies will remain low as long as they feel satisfied with the policies adopted; if they become dissatisfied then, they can easily increase their interest and transfer to Zone D because of their powerful position, thus becoming key players. The problem of repositioning stakeholders from Zone C to Zone D exists in both matrixes. Again, there is a need to monitor and control the position of stakeholders in Zones A and B because, while they lack power, they may have a disproportionate influence on the more powerful stakeholders (Newcomb,2003).

Figure 2. 5 Stakeholder mapping: power/interest matrix (Source: Newcomb, 2003)



Hence the theoretical framework or proposition can be drawn and proposed based on the above literature. It can be inferred that the process of creating these pictures is stakeholder mapping to explain the role of the organization's stakeholders. A common approach is to map each stakeholder group's interest and power or influence on a quadrant (Bryson,1995). Once the mapping of stakeholders is completed, the next phase is to prioritize groups while offering enough details to maintain fewer powerful groups satisfied. Eden and Ackermann (1998) proposed a theoretical framework to engage stakeholders based on the work of Bryson. Figure 2.8 shows the conceptual framework to engage stakeholders.

2.8.7. Detail Assessment of Stakeholders

Literature evidence from Lelea et al. (2014) identified various stakeholders' power, resources, and relationships, as well as other criteria to be assessed in more detail. According to their work Table, 2.4 was developed to help guide this analysis. For instance, 'power' relates to the influence a person has, which can be based on very different capacities. On the one hand, 'power' can refer to a particular official function or authority. Influence or power can also be deduced as a collective effort between individuals, such as when people pool their resources in groups or work strategically on an issue. Understanding this information might also help to determine the possible commitments of various stakeholders to a research project; or resolve challenges that would restrict their participation and involvement (Lelea et al. ,2014).

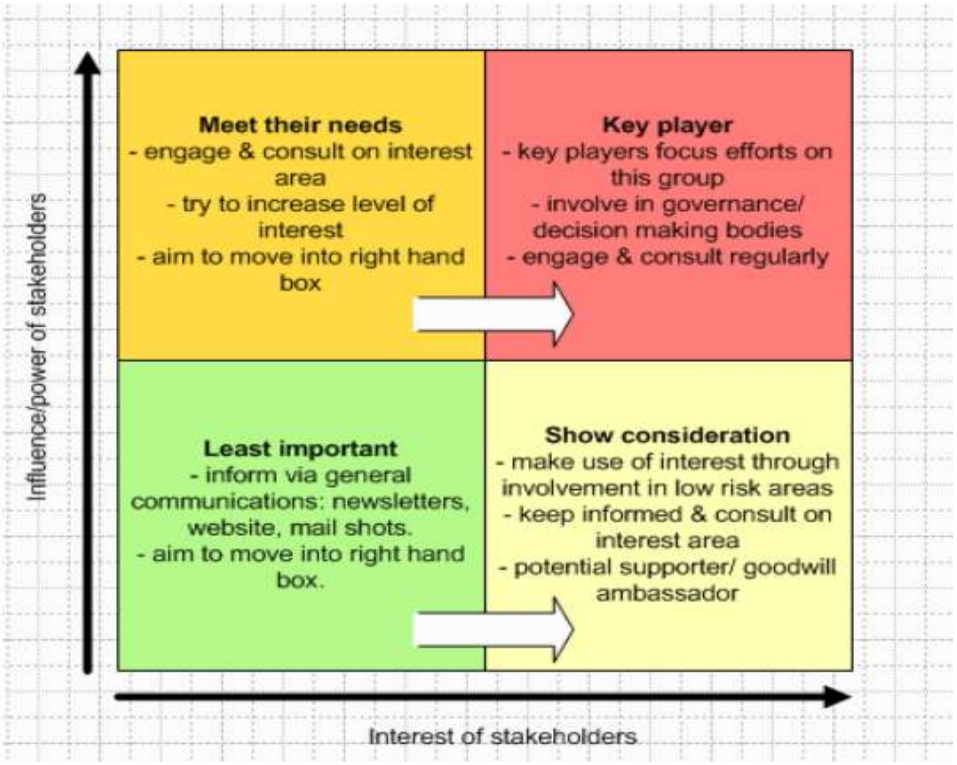


Figure 2. 6 Power versus interest grid

Adapted from Eden and Ackermann (1998: 121-5, 344-6)

Issue	**Goal(s)**	**Questions to be addressed**
Power	Examine power differences between actors that may be important for the issue/problem to be addressed	• How does the actor influence another actor's roles and scope of action? • How is the actor influenced by other actors concerning his/her role and scope of action? • What is the actor's authority in terms of Setting objectives and norms? • Are you allocating or denying resources to other actors? • Are you defining others' tasks and responsibilities? • Are you controlling access knowledge/information? • Allocating rewards/recognition/sanctions? • Channel messages to superiors and external bodies?

Interest	Describe the actors' interest(s) concerning the problem/issue the project focuses on	• What is the actor's interest in the issue/problem? • What prior experience does the actor have on the problem/issue to be addressed? • What potential benefits and risks arise for him/her if the issue is addressed/the problem is solved? • To which degree are the actor's interests coherent or conflictive with other actors' interests? • What options exist to increase the actor's interest and engagement, or to dismantle obstacles?
Relationships	Describe the relationships between actors, e.g., with regard to distance, degree of trust, and/or conflict.	• Which actors cooperate? • Which actors compete with each other? • Which actors tend to be disconnected from other actors? • Which degree of trust/mistrust is there between the various actors? • Which conflicts exist, and how explicit are they?

Table 2. 3 Table that shows questions to be addressed when assessing the stakeholder power, interest, and relationship. (Source: Lelea 2014)

Adapted from Zimmermann and Maennling (2007)

2.8.8. Stakeholder Performance Measurement

The Domain of Performance Measurement is a critical issue to be addressed to delineate the domain of performance concept (Venkatraman and Ramanujam, 1986). From the view of strategic management, their work revealed that the Performance Management concept could be differentiated using three domains as follows: (as cited in the work of Lukviarman, 2008).

- The domain of financial performance, which is the narrowest definition of corporate success by using simple financial metrics that are intended to represent the company's achievement of economic goals (Lukviarman, 2008).
- The domain of financial and non-financial (operational) defines performance as a broader conceptualization of business performance, with an emphasis on organizational success as well as financial performance measures (Lukviarman, 2008).

- A domain of organizational effectiveness that is primarily used to measure the performance when various and contradictory existence of organizational priorities and the impact of multiple groups or stakeholders are superimposed (Lukviarman, 2008).

Another perspective of stakeholder performance measurement can be categorized in to qualitative and quantitative. For example, Cooper (2007) mentioned two approaches to measure stakeholder performances. Firstly, quantitatively measuring the stakeholder performance but do so in non-financial terms. The definition of multidimensional performance assessment is more aligned with the traditional financial statement and takes us away from it (Cooper, 2007). According to Cooper (2007), The second approach is to measure performance and translate the financial or economic impact of a company's operations on stakeholders. He further noted that this metric represents an impact on the financial value of stakeholders. Kaplan and Norton (2001) also implemented a balanced scorecard framework to evaluate four success prospects for stakeholders: economy, consumer, internal, creativity, and learning.

2.9. Identifying Stakeholder in the sustainability of Projects

According to Femmer et al. (2013), The definition of stakeholders for sustainability considers the condition of the analyst who works to assess or enhance the sustainability for the project context. According to their study, to ensure success, it requires distinguishing involved stakeholders. There are four approaches or models to apply to define these sustainability stakeholders to gain potential sources of information on stakeholders ' positions. The approaches are described in the following Table 2.3, and Figure 2.8 also shows the summary of the model diagram for each approach.

Approach	Description	Source	Task
Top-down	Analyze the dimensions and adapt them to the context to identify accountable roles	The sustainability dimensions are (individual, social, economic, environmental and technical)	The analyst explores each aspect on the basis of the above description and defines roles which are explicitly or implicitly linked to it
Instantiating	Establish a generic list for the particular context of the stakeholders involved in sustainability.	A standardized collection of stakeholders is used depending on the dimensions of sustainability.	Analyze the standardized collection and instantiate, where possible.
Iterating	Analysis and refining of a common model for sustainability iteratively.	Sustainability dimensions can be derived into a generic sustainability model in order to make sustainability explicit.	Check the model for the absence of stakeholders again and again. When you think of model elements, such as behavior, principles, and indicators, you can take a look at a series of questions. Who influences? Who is influenced? Who is really involved in this? How did a possible stakeholder come into being? The analyst will contact the possible stakeholder and adapt the definition appropriately.
Bottom-up	Examining the meaning, identifying the specific roles involved, and relating them to dimensions of the bottom up.	organizational diagram	The analyst explains the role played by stakeholders, for instance, in an organigram. Every position is then evaluated and associated with dimensions of sustainability.

Table 2. 4 Identification of stakeholders for sustainability Approaches (Adapted from Femmer et al.,2013)

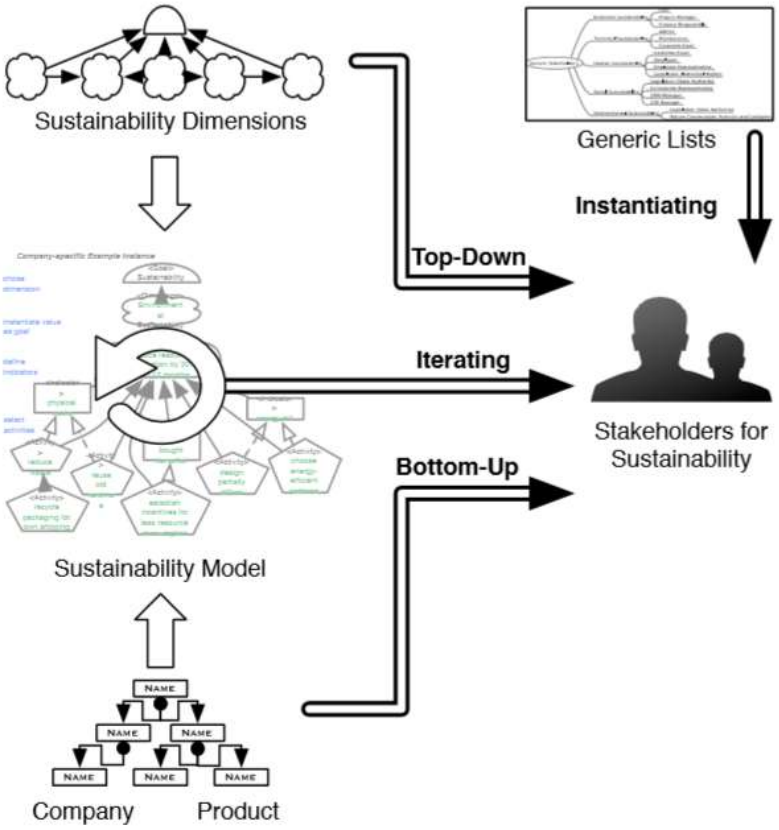
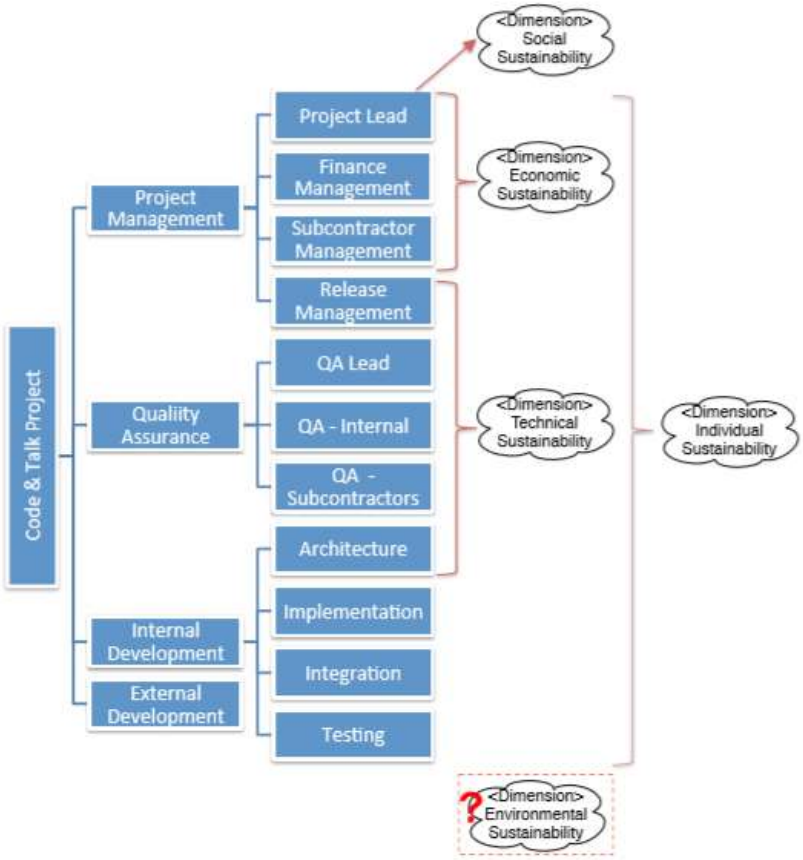


Figure 2. 7 Source for Sustainable Stakeholder (Source: Femmer et al.,2013)

Each of the approaches for identifying stakeholders has its pros and cons (Femmer et al. ,2013). The combination of methods offers a comprehensive set of stakeholders. Femmer et al. mentioned Top-Down identification provides a specific perspective on the dimensions of sustainability. Nevertheless, it's much less valuable for the instantiation of generic lists, because feedback is not more important than indicating sustainability dimensions. The success, therefore, depends completely on the innovation and intelligence of the individual carrying out the identification. Perhaps the most effective approach is generic lists, which is why these generic lists often are used to classify eligible stakeholders (Sharp, 1999).

The bottom-up approach is effective in identifying stakeholders down to the ground in the unit and individual level, i.e., with the interviews and other sources, it provides better insight. (Femmer et al., 2013). Simultaneously, Femmer et al. (2013) expressed that it is the most time-consuming method.

Figure 2. 8 Stakeholders identification - Bottom-up Approach. Source: Femmer et al. (2018).



2.10. Stakeholders Role in ICT4D sustainability

Stakeholder's role identification is an essential task in ICT4D sustainability. The language of multi-stakeholder engagement has been acknowledged in the domain of ICT4D but has gone beyond just rhetoric in two ways, as illustrated by an analysis of real-world ICT4D policy-making (Bardelli-Danieli, 2011). First, through the participation of members from different stakeholders in policy formulation and programming. Secondly, take a world view of the involvement of multi-stakeholders to become the only reference for ICT4D projects. This indicates that there is a certain optimism that ICT4D can only achieve inclusive results through inclusive methods Heeks (2015).

Stakeholders may affect the operation, goals, growth, and even sustainability of an organization. Stakeholders are potentially able to threaten or support an entity (Gibson, 2000). Bailure (2006) has also suggested that stakeholder engagement is often seen as a way to improve the performance of ICT4D projects According to the literature from Lessa (2015) on one of the ICT4D areas ' applications, in general, it is important to take into consideration their level of impact during the implementation and operation of the e-government, and different stakeholders have a different interest, position, and influence on the e-government. Many owners, while others have high power and value. Identifying stakeholders ' strengths and desires helps to build trust and consensus, explaining the value of a proposed project; and building strong, inclusive civic engagement programs. The participation of stakeholders in the project plays a significant role in the progress of ICT4D initiatives (Bailur 2006; Neville and Menguc 2006; Pade-Khene et al. 2013; Proches and Bodhanya 2015). Likewise, combined with inefficiency or missing interactions between stakeholders, ICT4D projects add complexity (Proches and Bodhanya, 2015).

Bailure (2007) emphasized the need to examine the position of stakeholders and to have a temple to evaluate what has been achieved for stakeholders on an ICT4D project and to use it as an analytical tool to identify who stakeholders are, their actions and how they are handled are relevant for the success of the ICT4D project. Hakkata et al. (2018) also emphasized that the effort to understand stakeholder's role is widely acknowledged that ICTs can foster positive development, the question of how changes are made is still not fully understood — since in the absence of common understanding among these stakeholders, achieving sustainability outcomes becomes a formidable task (ITU, 2015). Annex I of the literature comprises lists of various understandings on the roles of different stakeholders for the sustainability of ICT for Development from several literature sources.

Figure 2.10 showed and identified the stage of the ICT4D project lifecycle, where a prospective stakeholder study in development informatics research is applied.

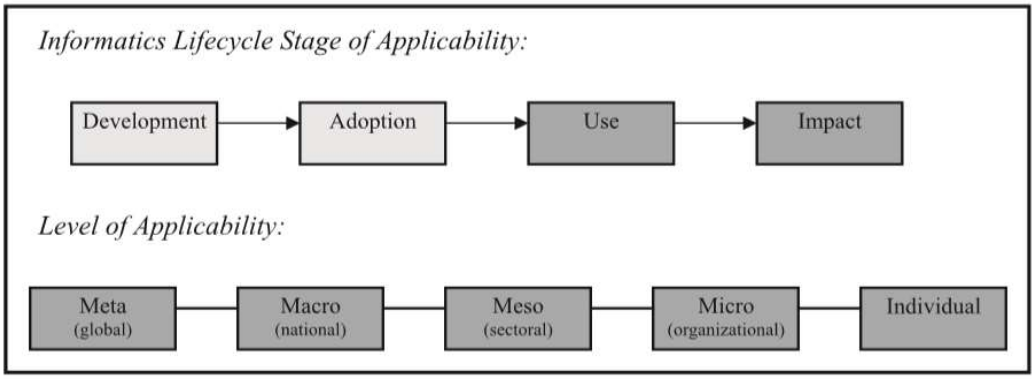


Figure 2. 9 Applying a stakeholder perspective in development informatics research (Source, Bailure (2007: p76)

2.11. Overview of e-Health in Ethiopia

E-health (electronic-Health or Digital Health), as defined by the World Health Organization (WHO) is "the cost-effective and secure use of Information and Communications Technologies (ICT) in support of health and health-related fields, including healthcare services, health surveillance, health literature, and health education, knowledge and research" (Blaya, Fraser & Holt,2010). On the other hand, Oh et al. (2005) (as cited on Toycan (2017)) on their systematic review of the development of working definition, expressed eHealth as a set of technological themes in health today, more specifically based on commerce, activities, stakeholders, outcomes, locations, or perspectives.

Ultimately the goal of e-health to improve the safety of patients and minimize expense associated clinical service. For example, literature from (Shekelle, Morton & Keeler,2006) supports the evidence that Electronic medical records (EMR) systems, internet-based telemedical and m-health applications, for example, are critical information systems that improve the quality of healthcare services. Certain competitive advantages of e-health include access to information related to the current state of health, e-prescription, support systems for clinical decisions, structured information sharing between different units, and the improved administrative system. (Ludwick & Doucette, 2009; Meier, Fitzgerald & Smith, 2013).

Another study showed by Burney, Mahmood & Abbas (2010) inspected the emerging technologies in e-health in the context of developing countries. The findings of Burney et al. (2010) showed that the quality of the healthcare services offered to patients is significantly improved by e-health

application technologies such as telemedicine, m-Health, Bar Code technology, radiofrequency recognition, and clinical decision support systems, image digitizing & collaboration network.

A number of e-health programs are currently being conducted in Ethiopia (USAID,2019; UNITAD,2018; FMOH,2015). And the funding required to sustain the national digital health programs is immense in nature and is most supported by donors. Like other developing countries, Ethiopia is facing several challenges in eHealth implementation. According to FMOH (2014: p4), the Ethiopian healthcare system is facing several challenges and fight to attain on the impact on the Health Sector Development Plan (HSDP IV) / Millennium Development Goal (MDG)s targets and using limited economic and human resources and innovative strategies efficiently.

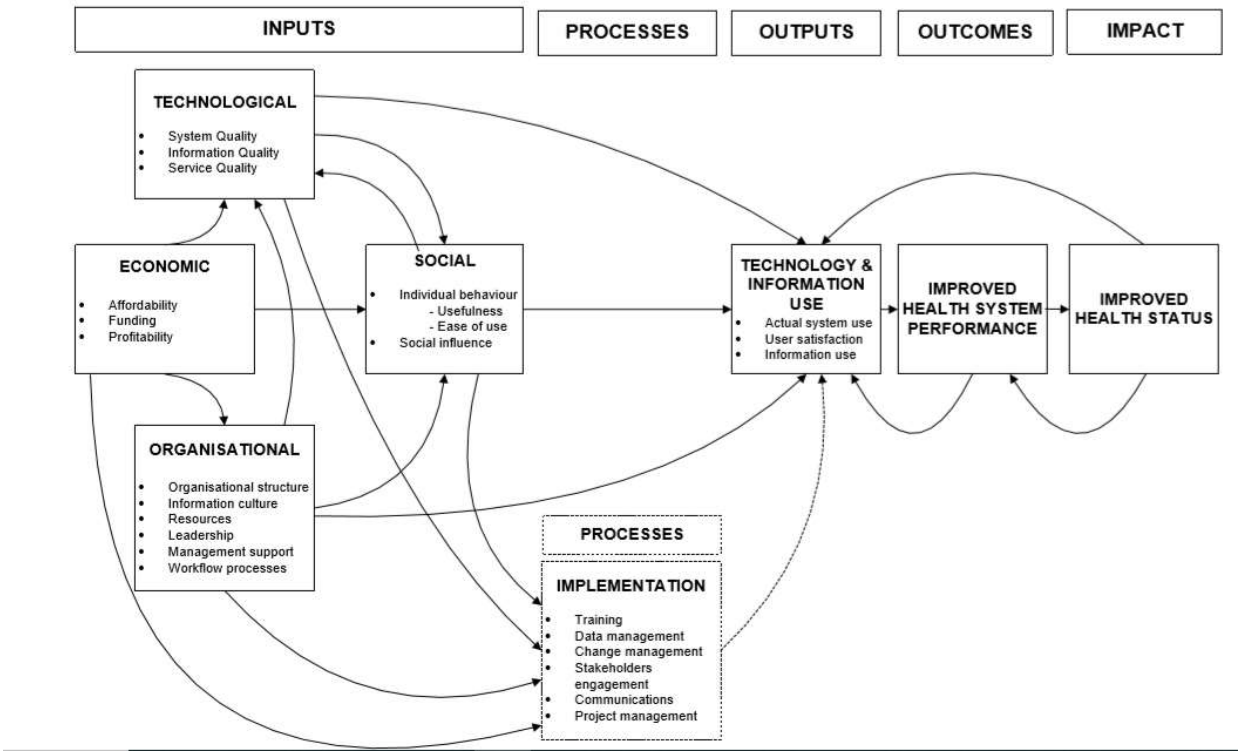
According to FMOH (2014), The following issues exist in healthcare and e-health: 1) The Healthcare Sector Challenges: Shortage of medical practitioners, the prevalence of new diseases, productive health services across the whole region, and luck of new technologies and medications. 2) Challenges of the eHealth systems: human resources (such as ICT professional, Health IT professional, other qualified staff), infrastructure issues (hardware, electric power, network connectivity, software package), leadership, and funding agencies. For example, Ali and Bailure (2006) underlined that if the technology doesn't reflect the current change, the sustainability of the service will be in question. In addition, the aforementioned challenges mentioned are strongly related and are in the umbrella of ICT4D sustainability pillar. There has been evidenced by various ICT literature that there are five pillars of sustainability: financial, social, institutional, technological, and ironically, given the origins of the term, probably the least-considered - environmental (Proenza, 2001; Delgadillo et al., 2002; Stoll and Menou, 2003; Kumar, 2005; Oyomno, 1996; Harris et al., 2003; Whyte, 1999; Baark and Heeks, 1998; Colle and Roman, 2003).

2.12. Sustainable e-Health framework

A discussed in the above section, the stakeholder's role is an essential process in ensuring the sustainability of ICT4D projects. For instance, Fanta & Pretorius (2018), Creswell & Sheikh (2012), Wentzel, & Limburg (2012) highlighted that the involvement of key stakeholders in the process of eHealth implementation, starting from the planning phase to reduce resistance, increase acceptance, and meet stakeholder needs are critical to consider. As a result, Fanta & Pretorius (2018) framework

was developed for eHealth sustainability to understand the components, description of factors, relationship, and how they interact. Figure 2.1 shows the framework for eHealth project sustainability

Figure 2. 10 Conceptual frameworks for sustainable e-Health (Source: Fanta1& L. Pretorius (2018: p139))



2.13. Related works

Author	Project	Title
Honest et al. (2007)	Mozambique and Tanzania health information systems (HIS) in developing countries.	The challenges of sustainability of health information systems in developing countries: The Case of comparative studies of Mozambique and Tanzania.
De Zoysa et al. (2013)	Agriculture Knowledge Centre (AKC) project for the purposes of the study is a government sector ICT4D project that targets agricultural development	ICT4D Project Sustainability: An ANT-based Analysis
Ndayishimiye (2017)	Vrygrond Community Lab, South Africa	The effects of community participation on sustainability in an ICT4D project: A Case of Vrygrond Community Lab in South Africa
Kaur (2019)	IT for social impact Project-India site, delivered by an Australian University	Unpacking Actor Interactions in ICT4D Ecosystem
Malin & Karin (2014)	The Urb@n Case	Stakeholders' Views on ICT And Sustainable Development in An Urban Development Project
Femmer et al. (2013)	Top-Down Approach: Munich Software Company Instantiation Approach: Car Sharing Platform Bottom-up Approach: Project Organigram Sustainability Model Iteration Approach: RE Conf 2013	Who Is the Advocate? Stakeholders for Sustainability

Table 2. 5 List of Related work in relation to ICT4D sustainability and Stakeholder theory

2.14. Summary of related works

There are many explanations for the survival of ICT4D. Various literature discussed above supports the fact that the role of stakeholders is one of the contributors to ICT4D's sustainability. Since sustainability has become one of the critical adaptability strategies and recent research agendas, many studies have been conducted in the field of factors and levels, models and theories, benefits and drawbacks, opportunities and challenges, and so on. We will, therefore, seek to review a few closely related works for this research in this section. Marias (2011) has explained the need to create a' strong network of shared interests of all community actors ' to contribute to sustainable development and to achieve sustainability, and to construct a supplementary link amongst stakeholders by aligning their different interests by taking their mutual interests into consideration and by keeping with the horizontal interdependence of self-confidence. This means more work should be done into ICT4D sustainability engagement with the stakeholders.

Bailure (2006) conducted a study and suggested that Involving stakeholders are often realized as a mechanism to more successful ICT4D projects. Hence, it can be appropriate to study ICT4D projects by taking both the viewpoint of stakeholder theory and with the tools and technique of stakeholder analysis. His study analyzes the telecenter projects to illustrate the application of a stakeholder perspective, selecting the specific case of the Gyandoot telecenter in Madhya Pradesh, India. Using stakeholder theory to examine exiting cases will be the best practice template to assess what has been done with stakeholders on an ICT4D project. Furthermore, Bailure (2006) carried out a study which indicated that stakeholder participation is often regarded as a means of making ICT4D projects more effective. His research analyzed the telecenter projects in Madhya Pradesh, India, which demonstrate the application of the stakeholder's perspective. A best practice framework to determine what has been done with stakeholder theories in the context of an ICT4D initiative is developed. He also indicated that because it is far more challenging to include stakeholders than many of the authors cited above to look to the future of ICT4D projects from a stakeholder viewpoint. Bailure (2006) suggested that an overview of multinationals companies such as Microsoft, HP, or Cisco and even local software suppliers would be of interest to count stakeholder theory to analyze the perspective.

A comparative study of the Health Information System (HIS) in Mozambique and Tanzania was carried out by Honest et al. (2007). His research defined three connections as important to the

sustainable development of the eHealth project. The relations amongst the “Ministry of Health (MoH's) and funders,” “MoH and the company for the eHealth application developer,” and “donors and the eHealth system developer company.” He also noted that the main factor used for the creation of an unsustainable Health Information System is the poor alignment of stakeholders. (especially key stakeholders such as donors, developers, and MoH) with their priorities, roles, and responsibilities. There are also other particular guidelines as a solution suggested by Bailure. These include successful cooperation between stakeholders, alignment of a shared network to address long-term user and organizational needs, and stakeholder engagement, especially in developing sustainable human resource skills and capacity building.

Further related work by De Zoysa et al. (2013) indicated that a difficult challenge faced by project managers is the complexity of managing ICT4D initiatives in developing nations. Addressing this issue is important; for example, the cost of opportunity in developing world contexts of IT investment failure. His research investigates the feasibility of ICT4D programs through a case study of an ICT4D massive-scale government-wide initiative supporting agricultural development in a developing nation in South Asia. The study identified two network forms (i.e., global and local) and nine essential interactions that impact the sustainability of the ICT4D project. A major contribution is a strategic guide to the development and support of key players or stakeholders for the success of ICT4D programs. He clarified that "there is a crucial factor in supporting the project in creating, improving and transforming such relationships" and "The nature of the vital relationships described" are important to focus on. In connection to the future work, De Zoysa et al. (2013) suggested the analysis, definition and alternate approach to project sustainability in comparison to ICT4D projects on the basis of vital power relations in actor-networks and emphasize the importance of approaching project sustainability as an ever-shifting and complex concept that needs pro-active management.

Through looking at how ICT is spoken about during the urban development planning phase, anyone will understand how different actors view and integrate (or not) the technology in the design and development of urban areas, and how they try to achieve objectives. The findings showed that the ways in which ICT is talked about at the political and practical levels are widely divergent. Their argument revealed that both technologies are accepted as fact and, at the same time, need to be investigated. The study indicated that "there are yet naïve ideas and understandings of what ICT

stands for and how it can be used for various purposes for the promotion of sustainable development among stakeholders" (Malin et al., 2014: p1).

Kaur & Ahmed (2019) recently reported that successful stakeholder identification and participation were related to positive project outcomes in the literature on information systems. Nonetheless, there is a lack of systematic understanding of the stakeholder viewpoints, and a lack of current knowledge about stakeholder interacts can be an obstacle to achieving the ICT4D project objectives in Information and Communication Technology for Development (ICT4D). Their research analyzed the case of IT for the social impact of an Australian University's Project-India platform. Their research aimed at exploring the question of stakeholders, by suggesting how IC T4D projects can be better understood by the lens of Actor-Network Theory (ANT), and at the direct engagement between stakeholders. The recommendations suggested that ICT4D initiatives could be subject to ANT logic to describe relationships and interactions between stakeholders more clearly. Besides, it was demonstrated that the interaction mechanism is central to the creation and stabilization of such networks. A further study on the views of the participant on ICT4D for the social impact initiative will be of future work.

Concerning the issue of stakeholder identification and role Femmer et al. (2013:p1) explored four methods of identifying stakeholders for sustainability in a given context: top-down, bottom-up, instantiating, and iterating. In turn, they evaluate the effectiveness of each solution through a small case study. Since the stakeholders are the key individuals to determine if any goals are achieved, it is crucial to identify the sustainability stakeholders in a given context to successfully implement sustainable assistance. Their findings showed that the Bottom-up strategy was used in IT systems and management action on realistic case studies on IT project management. In fact, they explained a very realistic that the Bottom-up approach provides a clear identification view as involves workers with interviews and many observations effectively down-to-earth.

Simultaneously, it is A more relevant work of Ndayishimiye (2017) focused on determining the key stakeholders of a project and how they are managed and investigate the extent to which Community participation in a skills development initiative affects its sustainability. His study was based on the analyzed data; in the project planning phase, various stakeholders were also not engaged, but the Vrygrond Society was portrayed. His studies have shown that engagement and sustainability are

strongly related. Other results showed that there was an element of discrimination, and yet the community laboratory of Vrygrond appeared to be sustainable. It was a result that the University of Cape Town and Pforzheim University has agreed to provide financing and organizational assistance to sustain the initiative. In conclusion, his study showed that social and socio-cultural issues need to be addressed as soon as they appear.

2.15. Research gap

The methodology employed to classify stakeholders in past works was well established from literature on the sustainability position of projects like the Femmer et al. (2013) study. Ndayishimiye (2017: p57) has followed a system for the identification of stakeholders in his research by meetings with stakeholders and validating their views by double-checking their opinion with others. Primary and secondary stakeholder perspectives have also been employed on the basis of knowledge of Clarkson's (1995) work. He then proceeded further analysis according to the work of Bailure (2007). Although Bailur (2007, P.67) suggested that "perhaps the most common method used (particularly in development literature) to distinguish between stakeholders is that of importance versus influence, whereby importance illustrates a stakeholder whose issues, needs, and interests are the priority of the intervention, and influence is how powerful the stakeholder is." Basically, the classification will be done once the appropriate identification of stakeholders was made towards sustainability. Both their work doesn't clearly indicate how an initial list of stakeholders is generated towards the sustainability pillar. For example, Ndayishimiye (2017: p58) stated that *"The development forum, UCT, Vrygrond Trust were particularly key in identifying all the key stakeholders for the Lab"* In other words, Bailure (2007: p12) mentioned that *"it appears that the stakeholder analysis stopped at the first step of the first stage, namely, the stakeholder identification. Here stakeholders such as the community members, government officials, and the Gyandoot team were identified".*

In Ndayishimiye (2017: p58) and Bailure's (2007) work, the original list identification approach used was not well defined. This research thus incorporates what Femme et al. (2013) presented to stakeholders to be more aware of the role of stakeholders in the ICT4D sustainability project and of how this is being done in the light of the sustainability aspect function. The research then continues with Bailure (2016) (identification, interpretation, and qualitative stakeholder analysis framework)

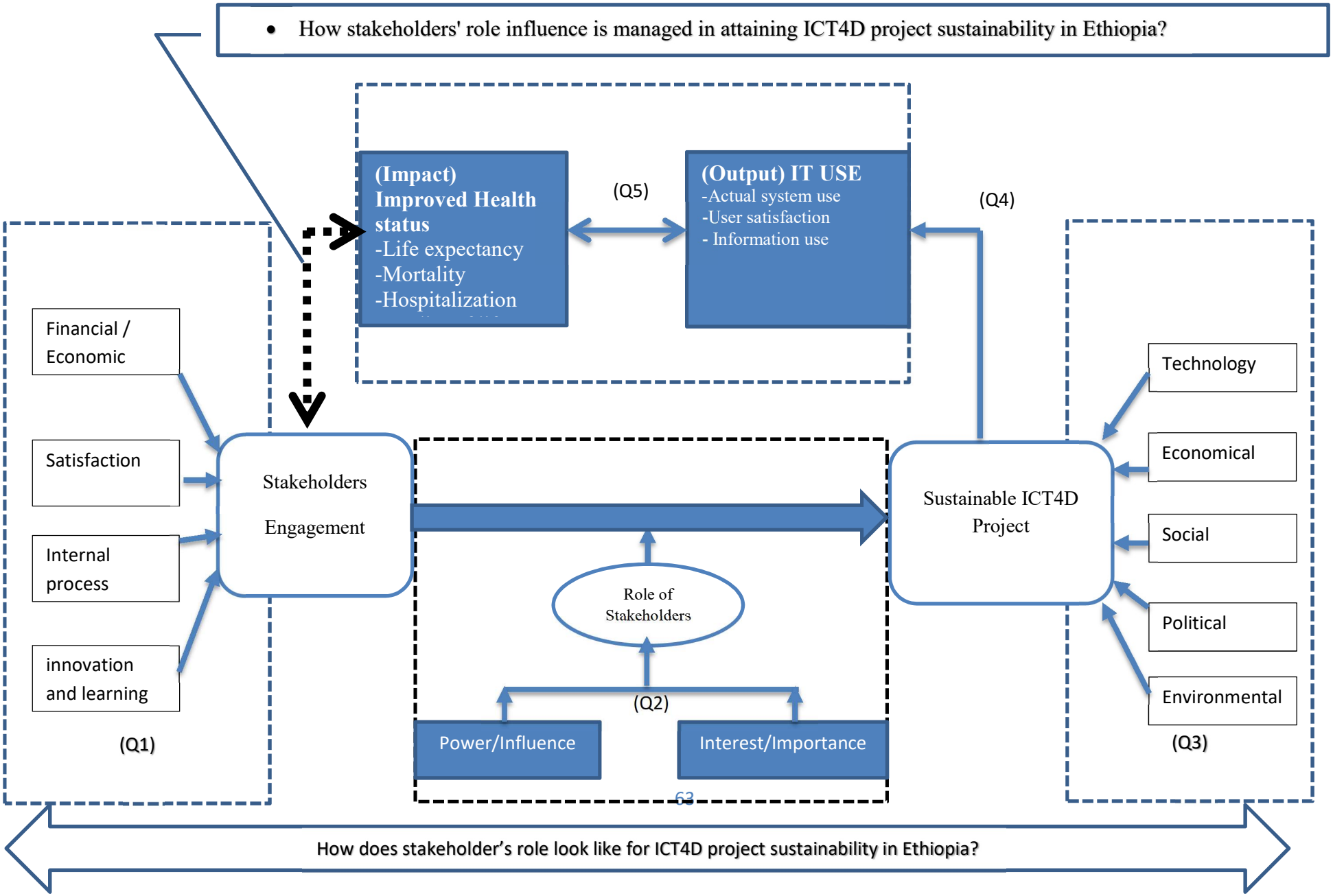
and other literature-based stakeholders' analytical framework. The model proposed by Femmer et al. (2013) is also open for any researchable dimension of ICT project sustainability.

In addition to this analysis of the capability approach to the system is taken, and the feasibility of the ICT4D project is evaluated. Although Ndayishimiye (2017) quoted and included Sustainability Livelihood (SL) frameworks in his literature, his finding was not viewed from ICT4D sustainability frameworks. He neither used the capability approach nor the sustainable livelihood framework to assess the development sustainability aspect of ICT4D.

Although the above related work attempted to answer the various aspects of stakeholders' role in ICT4D project, the stakeholders' role towards ICT4D sustainability is not well understood. The current lack of knowledge related to stakeholder interactions may be one of the barriers in fulfilment of ICT4D project objectives Kaur & Ahmed (2019). This is due to the fact that new and multi-level interaction among the stakeholders in ICT4D 2.0 (Heeks, 2016). Hence This research will provide pieces of domain knowledge and on how to understand stakeholder's role and examine how their role influence is managed from development perspective. According to Zheng et al. (2017) there is limited focus on developing contexts of ICT4D; the majority of the research highlights case examples of ICT applications (Ferguson et al. 2013; Zheng et al. 2018). The study will incorporate future works cited by the literature to examine, adopt an existing sustainable ICT4D framework and made a modification towards stakeholders' engagement and include new technique of analysis to answer the research question.

2.16. Research Conceptual Framework

Figure 2. 11 Proposed Conceptual Research Framework (Modified and Adopted from Fanta and Pretorius (2018) and Bailure (2007))



Legend:

(Q1): Understand and identify what aspects of stakeholders' measurable attributes are essential to consider in ICT4D projects?

(Q2): Understand what role of stakeholder is important and identify how it affects the sustainability of ICT4D projects?

(Q3): Understand what aspects and features of ICT4D sustainability are important to consider in ensuring the sustainability of ICT4D projects?

(Q4): Identifies the output of ICT4D project outcome and what role of stakeholder should be important to maximize the output of a sustainable ICT4D project?

(Q5): Understanding the aspect of ICT4D impact and outcome performance factor needs to be considered and stakeholders' role to improve the impact of a sustainable ICT4D project?

2.17. Description of research conceptual framework components

This section discusses and provides insight into "the source, what components lie in the conceptual framework, and how they are related? And "why the relationship between components of a conceptual framework exists?". Accordingly, various literature on section 2.8 mentioned that stakeholders are the key and the heart of ICT4D project sustainability. And hence the leading (Q1) in block one answers initially based on the literature evidence support discussed in section 2.8.9. The principal attributes to consider concerning measurable performance indicators for stakeholders are financial, level of satisfaction rate, internal organization process, and innovation & learning which is the modification of the framework of Fanta and Pretorius (2018).

The central component "role of stakeholder" is with the stakeholders' attribute power/influence and interest/importance situated at the heart of the research conceptual framework components. Various literature evidence on section 2.10 supported that involvement, interaction, roles, and engagement of stakeholders are often seen as a way to improve the performance of ICT4D projects and have s significant contribution to the sustainability of ICT4D. Accordingly, the answer for (Q2) provides an understanding of what kind of role a stakeholder should have to sustain the ICT4D project. Various literature supported that stakeholder theory provides excellent insight and lens to examine stakeholder's role. The process of creating these pictures is stakeholder mapping the goal is to explain the role of the organization's stakeholders. A common approach is to map each stakeholder group's

interest, and power or influence on a quadrant is the most prominent in development projects stakeholders' analysis. Literature evidence from Lelea et al. (2014) identified various stakeholders' power, interest, resources, and relationships, as well as other criteria to be assessed in more detail to understand stakeholders' roles. With respect to eHealth projects, Fanta & Pretorius (2018) identified five process factor that converts the input of the eHealth project to output, Project management, stakeholder engagement, communications, change management, training. The degree of stakeholders' engagement is determined by the different roles that stakeholders have. Discussion of section 2.9 pointed out that different stakeholders have different levels and types of power and interest. Stakeholders' engagement is often seen as a way to improve the performance of ICT4D projects. Hence their level of impact during the implementation and operation. Therefore, their role from the perspective of their interest and power could be one researchable unit analysis in the framework which is the modification of the framework of Fanta and Pretorius (2018) and Bailure (2007).

The third block depicted the pillars for the sustainable ICT4D project. Section 2.6 provides various literature evidence that a sustainable ICT4D project should be treated from the technological, social, environmental, institutional, and political perspectives. Hence the answer to (Q3) provides a better understanding regarding the critical pillars of ICT4D sustainable project that a stakeholder's role will affect which is adopted from Fanta and Pretorius (2018) and Bailure (2007).

The conceptual framework components are next to block three linked to the output (IT Use) of ICT4D projects. According to the literature evidence in section 2.12, it was indicated that, like any other ICT project, the eHealth project would have its unique output or result — accordingly, the answer to the specific output of the ICT4D project will lead the direction to answer the research question. Besides, as discussed in section 2.10, Bailure (2007) identified the "use" or in the case of Fanta1& Pretorius (2018) framework. The "output" should be considered in the study as a unit analysis to understand the role of stakeholders. Studying the stakeholder's role at use level increase the quality of research finding. Bailure (2007:p76) also emphasized that "some form of stakeholder analysis is an element of almost all ICT4D research—including research on key issues of sustainability, impact and best practice and recommended that if anyone is to analyze the applicability of a stakeholder perspective to the informatics lifecycle (as seen in Figure 2.11)" adopted from Fanta and Pretorius (2018) and Bailure (2007).

The fourth block consists of the output and impact of the ICT4D project. Literature evidence in section 2.12 supported that the outcome of a sustainable eHealth project improves health system performance. Capability Approach is used as a lens to understand this aspect. Section 2.7 provides evidence that evaluating the issues in promoting human well-being, efforts towards improved health, education, in general, enhances human capabilities are the main focus. Evaluating from this perspective avoids the risk of seeing ICT as intrinsically good as if the use of technology in itself was a valuable achievement or impact beyond ICT use. Accordingly answer to Q5 provides an understanding of identifying what performance factor of the outcome of the eHealth project needs to be considered and measured by the stakeholders to improve the impact of the eHealth project adopted from Bailure (2007) and a modification of Fanta and Pretorius (2018).

Since the primary purpose of this study is to provide a better understanding on how ICT4D project impact and stakeholders role should be understood, the broken link in the proposed research conceptual framework leads and provides the answer to "How does the role of stakeholders be managed in improving the individual & societal capability by sustaining ICT4D?". Besides, various recent literature discussed in section 1.3 supported that stakeholders, such as state government, non-government institutions, and international donor agencies, all play significant roles. Though we need a stronger understanding of the effectiveness of different development undertaken by stakeholders involved in the project, i.e., the roles that each stakeholder could and should enact in the development process needs to be understood well. To conclude, Failure (2007, p76) works contend that "it is potentially useful to examine stakeholders' role at all stages, i.e., from research on the initial development of technologies through to research on the development impacts of technologies." This is the modification of Fanta and Pretorius (2018) and Bailure (2007) framework.

2.18. Sources of the components of the conceptual framework

Based on the modification of Fanta & Pretorius (2018) and Bailure (2007) framework for sustainable implementation of the eHealth project, the following summary table showing a description of the components of the proposed conceptual research framework is developed.

Construct	Indicator	Literature Source
Stakeholders Engagement	Financial / Economic	Lukviarman, 2008
	Non-Financial and Operational	Lukviarman, 2008
	Level of Satisfaction	Oliver,1996 Fornell et al. ,1996
	Internal/organizational Process	Lukviarman, 2008
	Innovation and Learning	Eccles and Pyburn,1992; Kaplan and Norton,1992;Atkinson and Epstein, 2000: p.28.
Stakeholders Role	High Power and High Interest	Eden and Ackermann,1998: 121-5, 344-6
	High Power and Low interest	Newcomb,2003; Eden and Ackermann, 1998: 121-5, 344-6
	Low Power and High Interest	Newcomb,2003; Eden and Ackermann,1998: p121-5, 344-6
	Low power and low interest	Newcomb,2003; Eden and Ackermann,1998: 121-5, 344-6
Social	Individual perceptions	DeLone et al., 2013; Fanta & Pretorius, 2018
	Social factors	DeLone, 2013; Fanta & Pretorius ,2018
	Active Participation	Gómez and Casadiego, 2002; Harris et al., 2003; Stoll and Menou, 2003, Delgadillo, 2004;Fanta & Pretorius ,2018
Organizational / Intuitional	Organizational structure	Lluch, 2011;Fanta & Pretorius, 2018
	Information culture	Aqil et al., 2009; Fanta & Pretorius, 2018

	Resources	Aqil et al., 2009.; Fanta & Pretorius ,2018
	Management support	Al-Mamary, 2014; Fanta & Pretorius, 2018
	Organizational policy	Cresswell et al., 2012 Fanta & Pretorius, 2018
	Workflow processes	Aziati et al., 2014; Fanta & Pretorius ,2018
Financial	Affordability	Jones et al., 2011; Stroetmann et al., 2015; Fanta & Pretorius ,2018
	Funding	Torre-Diez et al., 2015; Fanta & Pretorius, 2018
	Profitability / Revenue generation	Proenza, 2001;Fiksel, J. 2003; Fanta & Pretorius, 2018
	Financial incentives	Stroetmann et al.,. 2015;Fanta & Pretorius, 2018
Output	Actual system use	FMOH, 2015; Chen, Y. 2011 ; Mutingi & Matope, 2013;Fanta & Pretorius, 2018
	Users' satisfaction	Fanta & Pretorius, 2018
	Information use	Aqil et al., 2009; Fanta & Pretorius, 2018
	Availability of Policy and Procedure	FMOH, 2015
Outcome	Decision-making	FMOH, 2015; Fanta & Pretorius, 2018
	Supply chain system	FMOH. 2015. Fanta & Pretorius, 2018
	Emergency management	FMOH. 2015. Fanta & Pretorius, 2018
	Clinical service	FMOH. 2015. Fanta & Pretorius, 2018
	Healthcare cost	FMOH. 2015. Fanta & Pretorius, 2018
	Health Infrastructure	FMOH, 2015

Impact	Life expectancy	Elbert et al., 2014; Fanta & Pretorius, 2018
	Morbidity	Elbert et al., 2014 Fanta & Pretorius, 2018
	Mortality	Elbert et al., 2014 Fanta & Pretorius, 2018
	Hospitalization	Elbert et al., 2014 Fanta & Pretorius, 2018
	Quality of life	Elbert et al., 2014 Fanta & Pretorius, 2018
	Transformation Health Sector	FMOH, 2015.

Table 2. 6 Summary Literature evidence on construct and indictor of sustainable eHealth project framework (Modified and Adopted from Fanta & Pretorius (2018))

2.19. Summary of the literature review section

The purpose of the literature review was to explain the role and management of stakeholder roles in ICT4D sustainability. In this necessity, the first segment explained the history and summary of the ICT4D initiative. This section discussed and highlighted the evolution as it ranges from ICT4D 0.0 to current ICT4D for Big data. Besides, it has been pointed out that ICT4D projects are uniquely identified from other ICT projects in that: the focus is poor, colossal funding is required, donor support is required, complex and massive, and there is a need for significant stakeholder and multi-stakeholder interactions to ensure successful implementation.

The central theme of the literature review based on numerous facts that ICT4D project success and sustainability cannot be separated and sustainability is a raging topic in today's ICT4D environment. Multiple critical success factors for ICT4D have been identified, including active engagement and stakeholder participation. Two theoretical dimensions and lenses have been addressed to understand the role of stakeholders objectively, how they are handled, and assess the impact of sustainability success of ICT4D initiatives. Such theories are the theory of stakeholders and the approach to capability.

Several literature pieces of evidence also cited as to have the role of stakeholder can be viewed at the end of the literature review accordingly relevant work has also been identified on the areas of ICT4D project sustainability and stakeholder interaction. Accordingly, the literature examined and suggested that current ICT4D stakeholder interactions and roles need more refinement of theories/models/frames to understand better how stakeholder roles are handled and to promote the need for a new theory to understand their interactions better.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1. Introduction

This chapter follows the last section, which dealt with the related body of knowledge on the role of stakeholders in the ICT4D project in particular towards sustainability. It continues by providing insight into how the study paradigm tries to understand the role of stakeholders, provided that it is the most unaddressed and yet potential researchable area of ICT4D domain. This chapter also aims to deliver an overview of the research methodology used in the field of ICT4D sustainability. Subsequently, the section focuses on the discussion of research philosophy, approach, relevant theories (i.e., inductive & deductive), methods, data collection, and data analysis techniques. Eventually, a triangulation technique is used to illustrate how the case study and qualitative survey results justified by the result of the domain expert interview.

3.2. Research Philosophical paradigm

The word "research philosophy" refers to knowledge creation and development of the characteristics of knowledge / determining knowledge attributes (Sunders,2016). Existing literature from Tuli (2010) also pointed out that selecting the design of research and methodology depends on the philosophical perspective that directs the study nature, in particular, the assumption towards nature of reality and people (ontology), the theory of knowledge that tells the researcher (epistemology) and how the understanding can be obtained (methodology). Literature data from Crotty (1998) evidenced that these three theories ultimately guide understanding of research questions, methods, and analysis & interpretation of results.

Guba and Lincoln (1994) (as cited on Myers, 1997) suggested that there are four underlying types of "paradigms" for qualitative research: positivism, post-positivism, critical theory, and constructivism in social science research. Three of them belong to qualitative IS research. According to Myers (1997) also evidenced that in the field of information systems (IS), there are three central philosophical perspectives: positivism, post-positivism, critical theory. *Interpretivist* researchers

begin here by assuming that it is only through social constructions such as language, consciousness, and shared meanings to access the reality (given and socially structures). Interpretivist believe that the reference to knowledge (given or built from a social point of view) is restricted to social constructions, such as language, awareness, and mutual significances (Myers, 1997). Hence this study base on the Interpretivist philosophical aspect and conclude the work towards the direction of the research.

3.3. Research Approach

Fundamentally there are three categories of research approaches Qualitative, quantitative, and mixed (Gorover,2015).

- *Quantitative* (Positivism and Post positivism): as the approach of measurements and numbers.
- *Qualitative* (Constructivism & Transformative): as the approach of words and images.
- *Mixed Methods* (Pragmatism): the approach of measuring, numbers, words, and images.

Creswell et al. (2003) also identified the six most often used designs, which include three concurrent and three sequential designs. One of those designs is the mixed-methods sequential in exploratory design. According to Creswell et al. (2003), mixed-methods sequential exploratory design, which implies using qualitative data to be collected on an identified ground case to develop an empirically testable theoretical model or framework. Hence this research will employ a mixed sequential to arrive at the desired research output. This is because that this research first use qualitative study to develop the proposed theoretical framework and proposition and in the future work a quantitative method can be deployed to develop structural modelling equation and test the proposition and theoretical framework.

3.4. Inductive and Deductive Theory

There are two fundamental categories of reasoning theories or approaches in research that are derived from the mental reasoning model: inductive and deductive reasoning (Bara and Bucciarelli, 2000). Through inductive reasoning, the researcher generates the hypothesis or theories that prompted the entire process (Bryman, 2008). Hypothesis and arguments are the outcomes of research with an inductive approach. Saunders et al. (2009) also underlined that the inductive reasoning strategy

enables the construction of theory to advance a better understanding of the phenomenon and to generate hypotheses about what is occurring from the information obtained by researchers.

On the other hand, Silverman (2005) argued that deductive approach significance depending on the methods used. Through deductive reasoning or theory, the researcher deduces a statement, which must then be investigated empirically according to what is established in a particular field (Bryman, 2008).

This research tries to combine both an inductive and deductive approach depending on the time available. Domain knowledge is extracted from the literature review and structured interviews. An initial inductive approach was adopted to enable the research to explore and build a theory from the information collected. A deductive approach will be deployed by surveying using a questionnaire based on the interview findings to confirm the theory based on the time available for this thesis.

3.5. Research strategy

Johannsson (2014: p2) emphasized that research strategy as the overall roadmap for the execution of the research or study. A research strategy provides a blueprint for planning, executing, and monitoring the investigation. Therefore, the research strategy selected for this research is a case study.

Johannsson (2014) also identified the research strategy as an experiment, survey, case study, ethnography, grounded theory, action research, and phenomenology. " Because of the interpretative role assumed in this analysis and the form of research questions are tailored to "how...?" case study is an appropriate strategy" (Benbasat et al., 2002) (as cited in Lessa, 2013). Besides the use of techniques such as the collection from multi-source data, the application of triangulation, and exploratory forms, it is best to be used for this study. Existing literature suggests that, as technology is relatively novel, the case study strategy is ideally fit to the IS discipline (Benbasat et al., 2002) and (Alavi and Clarson,1992; Yen 1994; Orlikkoski and Baroudi, 1991; Myerrs and Avison,2002) (as cited on Lessa,2015).

3.6. Case study research

This section provides steps and research design for conducting case studies. It includes a brief definition, the themes, and objectives, unit analysis, various stages of case study design such as site selection criteria, data collection method, data analysis exposition, etc.

3.6.1. Case Research Definition

The case study gives details to other strategies to understand complex problems and acquire meaningful insight. For instance, Johannsson (2014) contend that "case study focuses on examining one phenomenon in natural setting" (which in this case ICT4D sustainability) "to be investigated, and it offers a detailed, in-depth description and insight of that instance or cause" (in our case role of stakeholder). Jonssons (2014) cited that typical instance can be a person, a company, a department in an organization, a project, an IT system, or a regulation.

A holistic definition stated that:

> "The *case study method explores a real-life, contemporary bounded system (a case) or multiple bounded systems (cases) over time, through detailed, in-depth data collection involving multiple sources of information… and reports a case description and case themes*" (Creswell, 2013, p. 97).

3.6.2. Case themes and merits

Myers and Walls (2002) summarized the justification for the merits of case study as: by the ability to place people, organizations, events, and experiences concerning their social and historical context, by the knowledge of treating the entire topic of the study in sated of focusing on a specific topic, the inclusion of multiple methods - triangulation- are implicit and seen as a strength, by the ability to see a single or a limited number of cases to manage data collection task when resources are limited and by the flexibility in data collection strategy (Phondej, 2011). Hence ground case project is selected in this research, which is under investigation to understand the role of stakeholders for ICT4D projects (eHealth) satisfy the above set of criteria, and the objective of the study is also aligned with the merits listed above.

3.6.3. Case study design and selection

There are two stages of the case study: single-case design stage and multiple-case design stage (Yin, 1984). A single case study setting is valuable to examine a particular case. According to Myers and Walls (2002, p84), it is stated that single-case study is appropriate if the case is a "revolutionary case" (i.e., if the situation was not previously investigated scientifically or yet to be researched), represents "critical case" for well-formulated theory and if the case is severe to be addressed. On the other hand, If the study objective is the definition of hypothesis or theory checking, the multi-case design is desirable (Myers and Walls,2002).

According to Gustafsson (2017), the difference between the two stages is that the researcher examines multiple cases to see the variations and the correlations between scenarios. According to his study, the other difference lies if the amount of desirable result depends on the context, the expertise, and the volume of detail new cases acquired. Another difference is that the researcher can analyze the data both within each situation and across situations (Yin, 2003). Multiple-cases design can be used to predict contradictory results for anticipated purposes or to predict similar findings in studies (Yin, 2003).

Myers and Walls (2002) also concluded that at first theory generation, the single case study project analysis is most helpful, and the researcher may use multiple case studies projects for further exploration and comparison. Hence this research focused on one ICT4D application (eHealth project) and uses a single case study first to understand the role and interaction of stakeholders among them and then to frame how their interaction be managed towards sustainability of ICT4D. Bonoma (1985) also underlined that the uses of a single-stage study enable the researchers to know first-hand, correct terminology, and meaning for the study of the phenomena.

3.6.4. Designing the case study

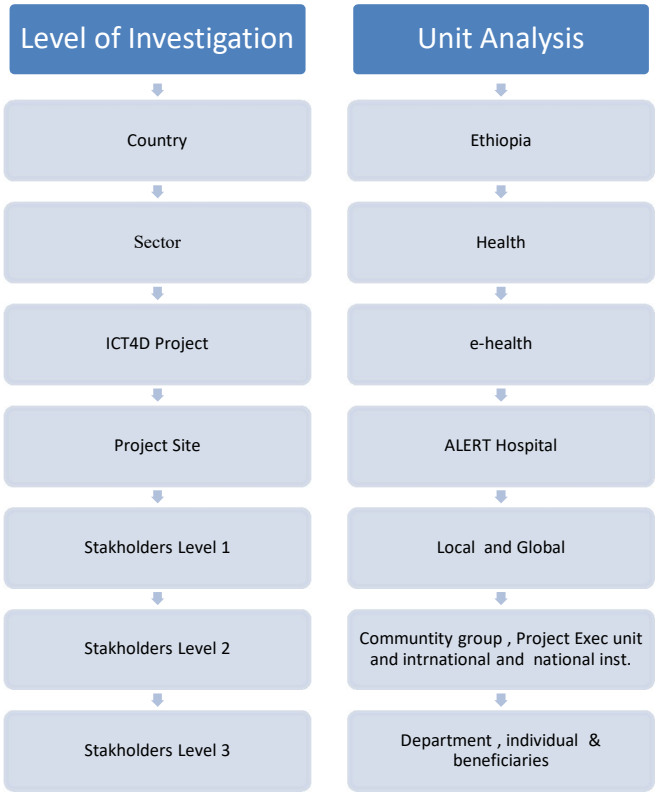
A research design is a logic that links the data to be collected to the initial questions of a study. Yin (2003) also noted that research design is an attempt to connect the start to the end of a study the analysis design is a conceptual plan" In other literature too, the research design facilitates research to be as efficient as possible in terms of effort, time, and cost. (Kothari, 2004).

For the case study, Yin (2003) recommended that there are five components of research design; a study's questions, propositions, units of analysis, the logic linking the data to the hypotheses, and the criteria for interpreting the findings. For instance, the Unit of Analysis: specifies whether the research examination level focus on data collection of individuals, groups, organizations, movements, countries institutions, etc. (Neuman, 2006; and Zikmund, 2003). Hence this research uses the concepts with analysis units to design a study and understand the stakeholders' role. The unit of analysis is divided into six units as illustrated in Figure 3.1.

The other unit analysis to consider is each stage of the IS lifecycle of the ICT4D project. As indicated in section 2.16, Figures 2.11 and 2.12, the research conducted an analysis of Stakeholder engagement and investigation stakeholder role at output, outcome, and impact stage of the sustainable ICT4D project.

3.6.5. Case Research Type selection

There are three different main types of case studies (Yin, 1994; Creswell, 2007). Literature from Johannsson (2014) extended the types into four by adding a longitudinal study. These are descriptive, explanatory, longitudinal study, and exploratory. Johannsson (2014) pointed that exploratory is used



for generating research questions or hypotheses that can be used in other studies, and it is particularly valuable when a researcher enters a new area where little is known, and the literature is scarce.

Figure 3. 1 Unit of Analysis, Adapted from (Phonder 2001: p6)

As mentioned from the literature above, the ICT4D stakeholder interaction domain is not well researched and still unaddressed; it needs theory/model/framework development. Furthermore, in the process of investigation the variable of interest from stakeholder's perspective (power/influence vs. interest/importance), from ICT4D project perspective (success/sustainability vs. failure/unsustainability) and from (individual and societal capability (high impact vs. low impact) to be better understood. Hence this research uses an exploratory case study to understand the sense of how stakeholder roles will look like towards ICT4D sustainability and how stakeholder's roles are managed in attaining ICT4D sustainability in the middle of the analysis. Besides explanatory case study will be deployed to reflect the causal relationship and to identify the cause and effect of ICT4D sustainability.

3.6.6. The technique for case study

This subsection provides a brief description of the technique for a case study to select a site, collect data, and analyze & explosion.

3.6.6.1. Site and case selection

The factor that dictates a single case design also determines site selection. Yen (1984) defines two criteria for potential site selection: First, where a similar result is predicted, may be used. The second site may be chosen for theoretical replication. Hence for this study ALERT Hospital project site is selected for a case study.

To obtain the most precise understanding of the issue, it is essential to choose the cases for inclusion carefully. Crowe et al. (2011) identify the decision on how to pick a case for analysis is important due to the current nature of the situation, which is of real attention to the researchers.

The data must also be accessible, i.e., the persons involved are willing to spend time with the researcher, and data can be obtained relatively easily. The potential for learning is another essential

consideration in selecting cases and is a different criterion than representativeness. It may be more valuable to learn much from an unusual example than a little from a typical case (Stake, 2005). Hence this research select eHealth projects (project cases that are completed in ALERT Hospital and Training center such as the use of Videoconferencing for Telemedicine and Blended Learning, which is currently sustainable). For the sake of convince, as mentioned above, and due to the researcher's project engagement in the ALERT hospital project site on eHealth, the above project case is selected.

3.6.6.2. Sampling technique

The sampling methods could either be nonprobability or probability (Taherdoost,2016). For this research on qualitative interviewing, a convenience sampling technique is used. Purposive or convenience sampling is a non-probability method that helps the researcher to select the department and the right people from the stakeholders involved in ICT4D. Literature supported that a purposive sampling technique is used by several qualitative researchers to identify and select information-rich cases in situations where resources are limited (Patton, 2002). This technique usually includes the process of selection and choice of a group of people who are aware of the study domain area and the interests of the researcher. (Creswell & Clark, 2011).

On the other hand, the Snowballing method is deployed for this study. According to Lelea (2014), Snowball sampling is a method commonly used where initially selected individuals are asked for redirecting the researcher to people related to the study area or referring of other persons to talk to 'downstream' towards producers, and 'upstream' towards consumers. Thus, In this study Snowballing is employed to identify the invisible stakeholder who is challenging to be determined by the researcher but might significantly affect ICT4D sustainability starting with the first purposely selected Project Manager. Due to the convenience and the scope of the study, this research used qualitative interview of 10 individuals with a focused group discussion of three individuals. The professional mix of the interviewee are Project Manager, Regional Project Directors, Training center Director, WoredaNet ICT coordinator, ICT Directorate Director, ICT and WoredaNet Service Team Leaders, Health Professionals and Sustainability Consultant.

3.6.6.3. Data collection methods and Instruments.

There are various techniques for data collection. For instance, in qualitative IS research, Yin (1984) identified five modes of data collection that is employed for the purpose of case studies: documentation, archival record, interview, direct observation, and physical artifact.

The methods used for this work are listed below. There are three essential techniques which should be taken into account for the collection of data. The first and third are from the primary data source, and the second one is from the secondary source.

Primary data source

Interviews are appropriate where little is known about a specific subject, or where detailed information is insufficient and to undertake in-depth meaning, to gain from participant experience and the most commonly used in qualitative research (Sandelwaski, 2006; Babbi,2007; Coughlan,2009). Interviews may be structured, semi-structured, or unstructured (Kelin & Myers, 2009). Semi-structured interviews, questions that may be used as a leading question are drafted; it allows the respondent to respond to a sudden question raised. For example (Coughlan, 2009) evidenced that the discovery interview is an example of a semi-structured interview to allow the participant to express their own experience and instead of answering a series of questions. This enables the researcher to gain a new concept.

For this study, the semi-structured interview is deployed. The responses is recorded using a voice recorder. The questions were developed in line with the conceptual framework proposed for this study. The questions address all the elements of the stakeholder theory and capability approach to gain a better understanding of the role of stakeholders towards ICT4D sustainability.

3.6.6.4. Instrument validity

The validity of the questionnaire is checked against three techniques. These techniques are essential to triangulate the instrument validity. According to (Cresswell 2007), Grounded theory research is used to improve the validity and reliability of the research results – through triangulation. Hence a pilot testing is used to check the question correctness. According to Peterson et al. (2004), a Pilot test of the questionnaire was employed to investigate the validity of this new questionnaire. Yin (2009)

also underlined that pilot testing of interview questions allows the researcher to identify the problems early and set the data collection strategy.

The second technique is to send the revised questions as per the comments obtained from pilot testing. The goal of expert input is to confirm the consistency and the alignment of the revised question towards stakeholder theory and capability approach.

The third technique is to revise comments obtained from the expert with the research advisor as to how the questions are directed to the goal of the study.

3.6.6.5. Interview preparation

Brounéus (2011) highlighted that preparation for the interview is a critical and initial move before conducting the interview. Accordingly, figure 3.2 is adopted and shows the process of preparation for the interview from the work of Brounéus.

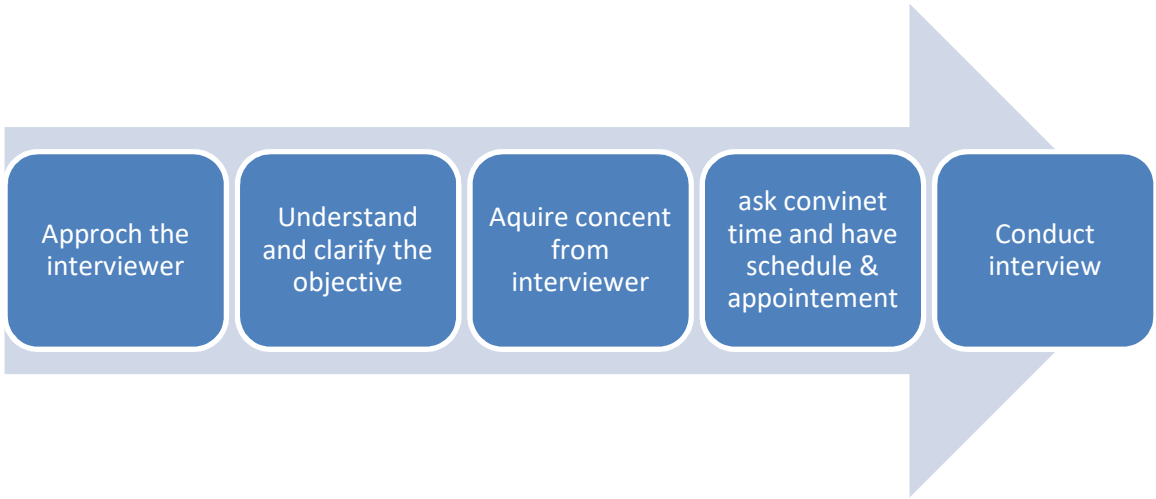


Figure 3. 2 Process of interview preparation (Adapted from Brounéus (2011))

3.6.6.6. Procedure for conducting an interview

Brounéus (2011) also identified the following steps to conduct an interview:

- *Step 1: Introduction*: Begin the interview with thanks for taking the time to meet you. Speak from where you are and define the goal of the study, including practical implications (for example, 'to better understand …', 'to help improve …'). Brounéus (2011) also stressed the need to digitally record the interview by seeking permission to take the proper steps.

- *Step 2: Initial questions on the background* (age, marital status, children, religion, ethnicity, occupation, etc.) are Important for kick off the dialogue; the respondents must answer relaxed, realistic questions and give an overview and background for the interview of the ' living conditions' questions. Brounéus (2011).
- *Step 3 - Mid-interview:* The discussion then progresses to questions that have greater emotional and intellectual demand. The focus of the detailed interview is this part, and it is the nucleus of the interview. The questions here should be theory-based. In this step, asking follow-up questions is often a challenge for beginners at this step because they are already thinking about their next issue rather than just listening critically (Rossman and Rallis, 2003).
- Step 4: *Closing the interview*: It is useful to outline and review some of the major points addressed by the respondent on the topics you have been exploring. Striking a balance between using follow-up questions and deciding when the time has come to close is the learning point in this step (Johnson, 2002).

Secondary data sources.

Evidence from Yen (1984) suggested that archival documents are the sources of secondary data for qualitative IS research. There are also various contents in document archival; for example, Bowen (2009), on his study, mentioned that document could contain text (words) and a photographic image captured without the involvement of the researcher. For this study, various archival secondary printed or electronica materials are used. To mention the possible sources from literature.

The study by Bowen (2009) noted that such records exist in collections, newspaper archives, organizational records, and corporate or administrative documents. The intent of the documented analysis is finally to substantiate the facts obtained from the interview and establish context or background evidence for the initiative. Hence for this study used document analysis from various sources that are published and are listed in the above literature section. The document should contain relevant information and could be used as a source of data regarding existing IC4D project ground cases on the eHealth area.

3.6.6.7. Data analysis

According to literature evidence from Tin (1984), the findings of case data analysis in the IS study largely depend on the researcher's interpretive ability. As mentioned in section 3.5 for this research case study strategy is selected. Accordingly, the focal point of the case studies is a series of propositions or theories (Miles and Huberman, 1994). The principle of case research analysis will guide the development of such a proposition or theoretical framework.

As mentioned in section 3.6 of this paper, Analysis in a case study means looking for a series of events, activities, mechanisms, or knowledge that are embedded in data. When the subjects have been created, the idea or the context for which it has happened is defined. (Neuman, 2006; and Yin, 2003). In related literature, the analysis proceeds from the research question to defining the purpose, the expectation, the choice of design is followed, and finally, the relevant data to be uncovered. (Ndayishimiy, 2017).

Phondej et al. (2013: p6) also pointed that case study analysis as it involves "examining, sorting, categorizing, evaluating, comparing, synthesizing, and contemplating the coded data as well as reviewing the raw and recorded data." Veal (2005) also summarized the three main methods of case analysis which was initially identified by former researcher work Burns (1995) and Yin (2003): pattern matching(relating exiting theory with what could be expected), explanation building (developing a logical/causal interpretation of what is found via the lens of theories) and explanation (interpretation of data or time-series observations).

Literature from Guest et al. (2011), thematic analysis is formulated, which merely combine pattern matching and explanation building. According to their work thematic analysis involves a comparison of code frequencies, recognition of code co-occurrence, and interactive overview of data set coding relationships. Besides, their study highlighted that thematic analysis provides an effort to leverage the reliability of findings that goes beyond word-based reviews. Figure 3.3 shows the steps in conducting thematic analysis and tips on how to do thematic analysis.

Qualitative data can be analyzed using NVivo software. According to Hilal and Alabri (2013), Nvivo is the qualitative data analysis software package developed to manipulate the 'coding' task, is considered the finest in this respect". NVivo facilitates the analysis, management, creation, and

interpretation of the content of qualitative data. NVivo could be taken as a perfect tool for researchers since it makes it easier for people to combine their work in a unified project. This software superficial in handling contents and map concepts, retrieving data, visual representation, and reporting. Wang (2008: p1) also justified that "basic features and primary tools of NVivo which assist qualitative researchers in managing and analyzing their data are described."

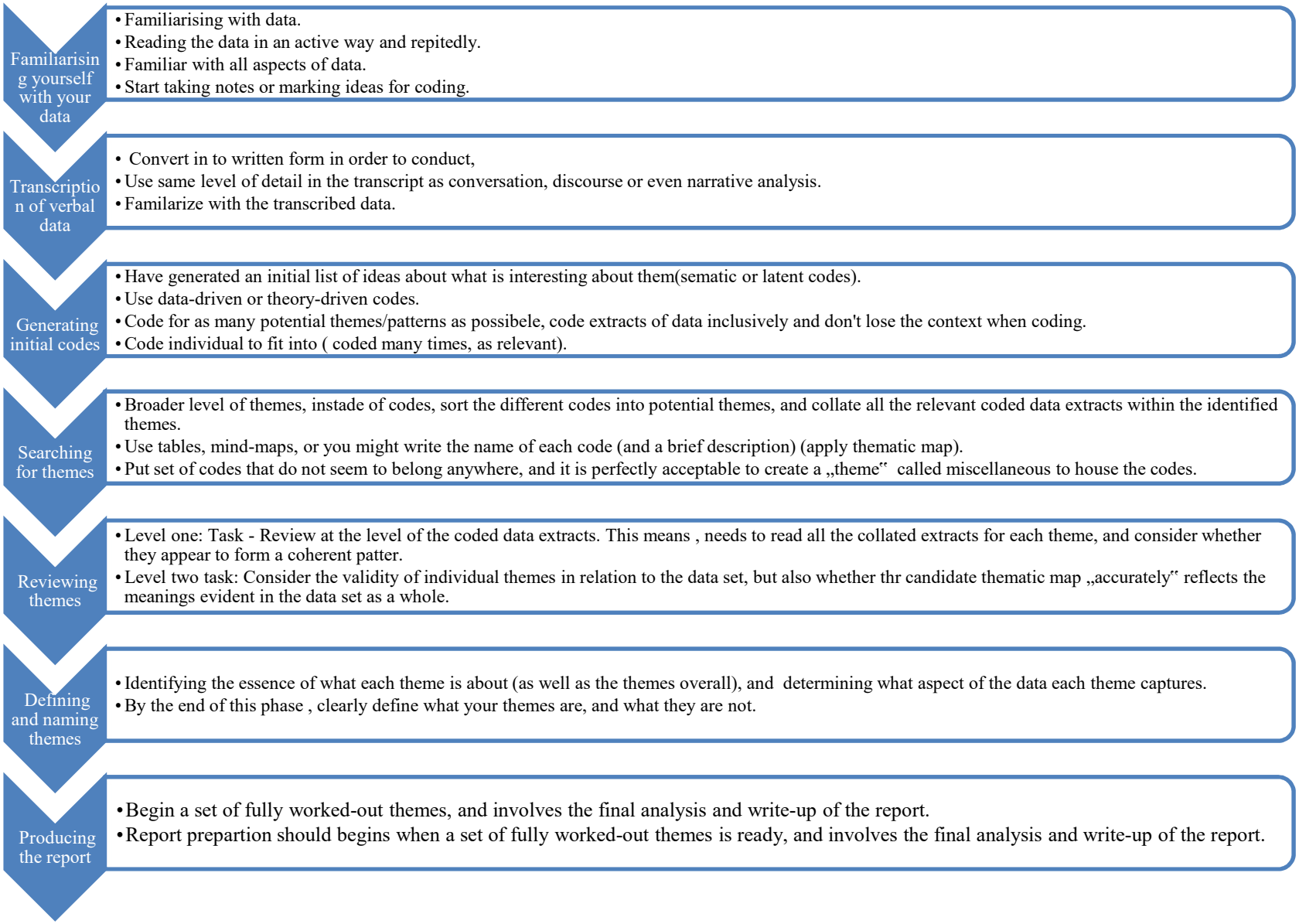


Figure 3. 3 Steps in Thematic Analysis (Adapted: Braun and Clarke 2006)

3.6.7. Reliability and Validity

According to Yin (2009). Four key measures have generally visualized the validity and reliability in qualitative research: reliability, construct validity, internal validity, and external validity. Hence this research employed the four dimensions of validity and reliability measures. Table 3.1 shows the four dimensions of reliability and validity test in a case study, their tactic, and stages of the research phase. The table was taken from (Phondej et al., 2011: p127), but for this research, the goal section column is added to show their relative importance.

Test	**Goal**	**Case study tactic**	**The phase of research in which tactic occurs**
Construct validity	To ensure that bias and subjectivity are limited throughout the research (Lessa,2015).	Use multiple sources of evidence Establish a chain of evidence Have critical informants review draft case study report	data collection data collection composition
Internal validity	To ensure that the extent to which causal relationships are established (Yin, 2009).	Do pattern-matching Do explanation-building Address rival explanations Use logic models	data analysis data analysis data analysis data analysis
External validity	To assesses the analytical generalization of the research findings (Yin, 2009)	Use theory in single-case studies Use replication logic in multiple-case studies	research design research design
Reliability	To ensuring the ability and replicate the research by applying its operations and procedures and achieve similar results (Yin, 2009).	Use a case study protocol Develop a case study database	data collection data collection

Table 3. 1 List of four reliability and validity measures Sours: (Phondej et al., 2011: p127)

3.7. Triangulation

Triangulation is typically connected with research methods and designs (Heale and Forbes, 2015). Other literature also evidenced that triangulation may be the use of multiple theories, data sources, techniques, or investigators in the study of a single phenomenon as it helps to validate the finding of the research (Tashakkori and Teddle,2003). In this research, expert interview and input were done with a high-level expert in the areas of project sustainability to triangulate finding as part of final

work validation. According to Roberta (2013), "triangulation in research is the use of more than one approach to researching a question." The aim is to increase confidence in the findings through the confirmation of a proposition using two or more independent measures. The combined effect of findings from two or more demanding approaches provides a more comprehensive picture of the results than either approach could do alone.

3.8. Research Design Process Summary

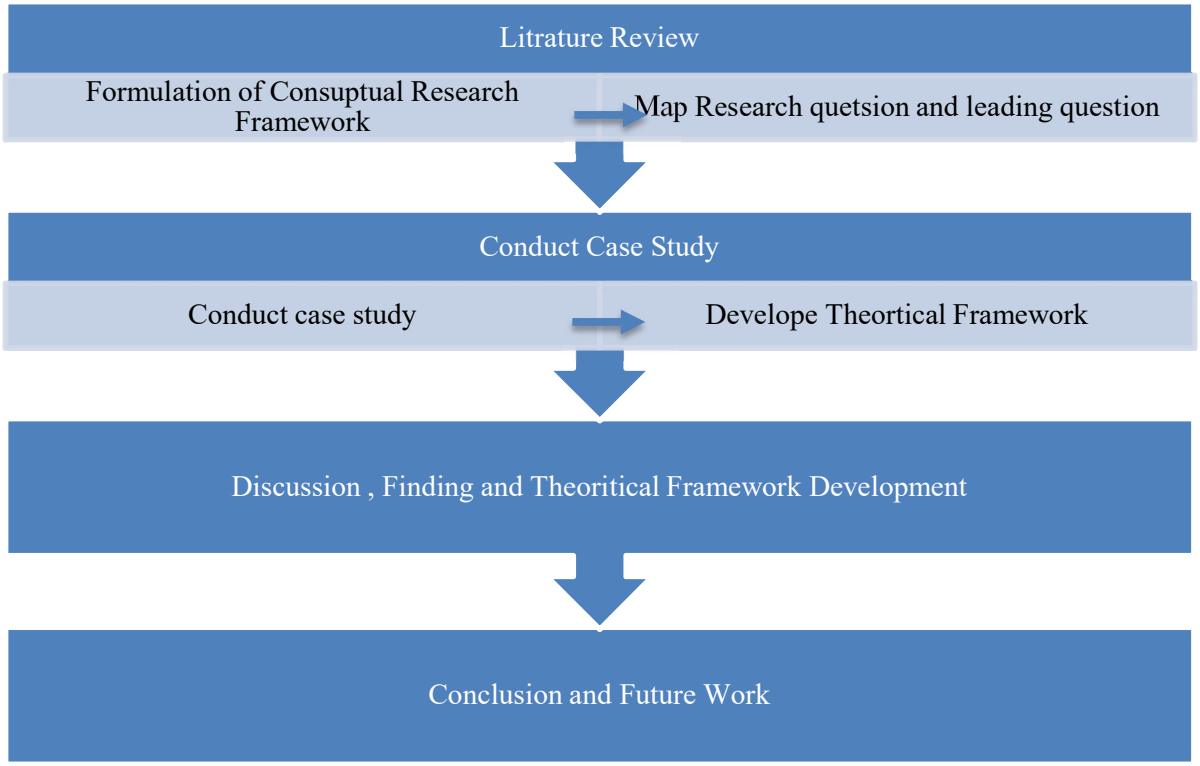


Figure 3. 4 Flowchart of Research Process

3.9. Chapter Summary

In the above section of methodology, the chapter discussed each component of research design, approach, strategy, methods, data collection technique, analysis, research validity & reliability measure, and triangulation. These are aimed at achieving the final findings. The core and detail discussion of the chapter was on the two major research strategy components: a case study intended to identify and formulate the proposed theoretical framework for stakeholder's role towards ICT4D sustainability to be tested empirically. In the discussion of both research strategies, there was an essential component to measure the integrity and consistency of research out by using qualitative reliability and validity assessment criteria. Triangulation technique was highlighted at the end of the

chapter to justify the findings by both approaches using ICT4D domain experts and other credible sources. The next chapter will discuss data collection instruments and the existing ground case study section.

CHAPTER FOUR

ANALYSIS

This section presents data analysis. It starts by giving project case overview. The thematic analysis is deployed, as previously discussed in the methodology chapter. The audio recordings of the interviews were transcribed soon after the interviews were conducted. The transcription was done with transcribing software. Besides, the field note is taken while conducting the interview. The interview is then be transcribed. Accordingly, relevant words, phrases, sentences, or sections were labeled or coded. Such labels were about actions, activities, concepts, differences, opinions, processes, or other items that are found relevant. I utilized open coding to summarize critical themes emerging using NuVivo. The analysis is based on the aspects of the stakeholder theory (Normative, Descriptive, Instrumental and managerial) and capability approach. The data collection started from the VCBL Project manager from the owner organization and the regional director of the project implementer to identify first who the key stakeholders. Besides secondary published data sources such as published technical highlights, newsletters, magazines, and annual reports are used to support the evidence.

4.1. The Video Conferencing Based Blended Learning (VCBL) and Telemedicine Project Case At ALERT

4.1.1. Selected Project Case Background

Ethiopia is one of the high TB-burden countries in Africa, with about a third of TB patients reported as missing (WHO 2016). A shortage and frequent turnover of trained health professionals were among the critical obstacle to expanding access to TB services. For many years, the Ethiopian TB program relied on off-site (Traditional or Classroom, hotel based). Such kind of workshop-style training is intended to meet human resource training requirements in its national TB program (NTP). This off-site training approach was expensive and often led to staff attrition as health workers were required to stay away from their duty station for several days. With increasing pressure for domestic resource mobilization, new and cost-effective training solutions needed to be explored, such as the use of ICT in the Blended Learning (BL) Approach. Various scholars such as Greece (2017) supported that BL is the combination of online and face-to-face instruction. Online instruction involves the application

of Information and Communication Technologies (ICT) to the process of education. Several technologies can be used for online instruction.

According to Loi & Cat (2014), the students who took courses in perceive the Blended learning (BL) model are as effective as the traditional face-to-face model. Knowing these challenges, the Ethiopian Federal Ministry of Health (FMOH) circulated a directive to implement more cost-efficient, in-service training for health workers (FMOH, 2015).

Besides the FMOH (2015) regarding National Health Strategic Transformation Plan, the publication advocates the use of technology and innovation to enhance the quality of health service is one of the key strategic objectives. This involves strengthening the use of the existing technology, the introduction of new technology, technology transfer and development, and the use of local technology. It also addresses finding better ways of doing things through more effective products, processes, services, technologies, or ideas. Innovation is defined as the process of ideation, evaluation, selection, development, and implementation of new or improved products, services, or programs. Technologies and innovations are critical for environmental impact assessments and planning for tailored mitigation. (FMOH,2015).

According to McKee et al. (2018), Management Sciences for Health (MSH), under the supervision of the NTP and in partnership with the All-Africa Leprosy, Tuberculosis, and Rehabilitation Training Center (ALERT), initiated the BL approach for TB training in Ethiopia. The work was supported through two successive USAID projects (HEAL TB and Challenge TB [CTB]), and ALERT was a partner in both projects. The technical highlight of McKee et al. (2018) also pointed out that the process and outcomes of this successful partnership toward ensuring sustainable delivery of quality TB services in Ethiopia are described.

> ***"****Challenge TB and HealTB are the projects for the VCBL & Telemedicine project that was engaged in ALERT" ....and ... "ALERT Hospital. They are the host and the owners of the facility" ...." USAID it was our funder for these projects" ... Participant 3.*

Currently, the training center has been working to improve the learning approach more cost-effectively and efficiently through blended training by introducing video conferencing and eLearning platforms. To this end, the center has established a state-of-the-art video conference rooms and eLearning section with the support from MSH- Heal TB and Challenge TB project. (ALERT,2018). According to the evidence from McKee et al. (2018), Moreover, the scope of services provided through the video conferencing facility was expanded to include live clinical consultations on

multidrug-resistant TB (MDR-TB) services (McKee et al.,2018). Video-conferencing (VC) is a specialized form of telemedicine that uses technology to provide a real-time visual and audio patient assessment. (Kitamura et al., 2010).

In line with this, the training center has got a permission to access an infrastructure A 5 MB WoredaNet video data network and internet facility to access and train remote health professionals via video conferencing facility at woreda level (ALERT,2018). Originally, VC was developed to connect physicians with patients located in isolated areas at which climatic or geographical conditions render provider or patient transportation difficult and costly (Sezeur, 1998), resulting in inequalities in inpatient care (Woottoon, 1999). Dinevski et al. (2014) identified that examples of VC practice in telemedicine are: interdisciplinary team meetings, teleconsultation, and tele-education in a real-time, live, interactive way.

> "*The service that is provided by the project is conducting training using innovative technology to train remote health workers, and the second service provided by the project is telemedicine" ...Participant 5*

4.1.2. Project Organization Chart

The staff composition of the project organizational structure is constituted from each department of the ALERT center, and they are working for the based on the load on the effort they exert for the VCBL & Telemedicine project. The organizational structure is hierarchical and functional. The first form of the organizational structure adopted by Project Body Organization (PBO) was to establish Research and Development (R&D). It was the department in which projects were carried and other functional departments acting with the functional role. This structure was used in areas with a high degree of innovation, such as the use of IT, etc. In this type of organization, concepts like cooperation, autonomy, aggregation, and self-organization became essential, and more and more applicable (Sato, 2005). The Project team is lead by the project manager, who is responsible for the overall planning, scheduling, implementing, monitoring, and closing each year's project activity. The existing project organization is illustrated in Figure 4.4.

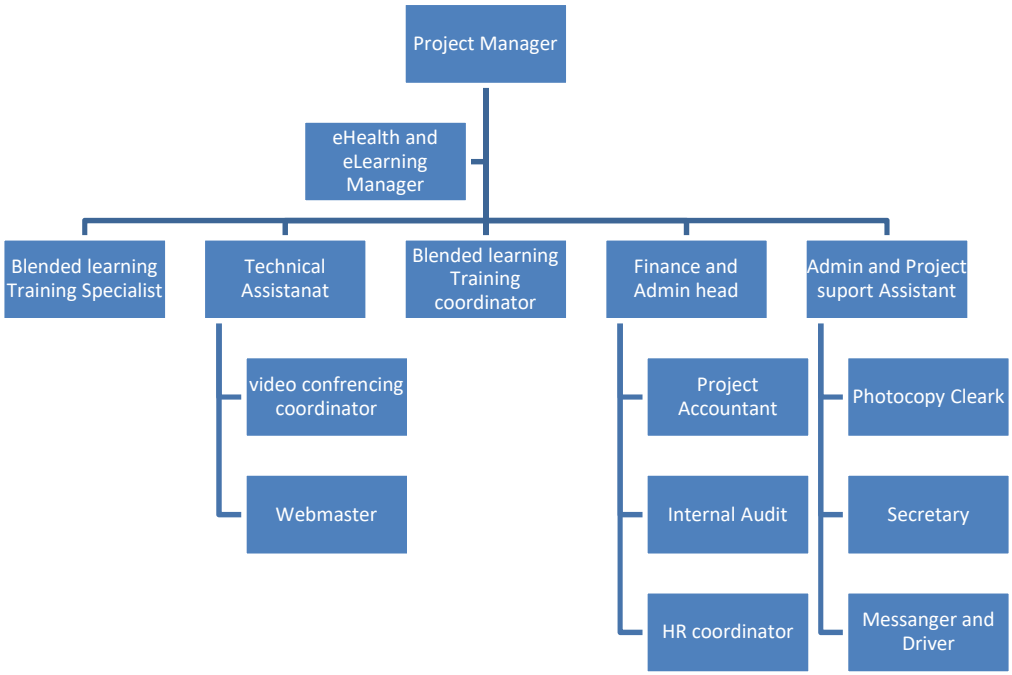


Figure 4. 1 VCBL & Telemedicine Project Organization Chart

Figure 4. 2 Picture Showing Telemedicine Plastic surgery Patients case Treatment

Figure 4. 3 Picture Showing Video Conferencing based TB Training for three sites from ALERT

Figure 4. 4 Picture Showing Telemedicine Plastic surgery Patients case Consultation

4.2. Project implementation approach

A staggered approach was taken, which began with a pilot who provided proof and then continued under normal conditions of the system. In both phases, in collaboration with the Warning training center and national health offices, MSH took on the role of strategic coordination; the pilot and scale-up phases provided financial support through HEAL TB and CTB, respectively (McKee et al.,2018).

Phase I (2014 - 2016)

The key goal of the pilot phase was to evaluate the effectiveness of BL in the training of healthcare workers in services in Ethiopia on national TB development content, particularly in comparison with conventional training techniques (McKee et al.,2018).

"When we start the project, the objective was to reduce the cost and time spent on traditional training as well as efficiency. for example, we reduced saved a total of 2-3 days than the traditional 5-6 days by a blended approach" **…Participant 2**

Phase II (2016 – 2018)

Based on the positive outcomes of the evaluation during the pilot phase, the BL approach was endorsed for routine implementation. To expand the use of the approach, the USAID – CTB / MSH Project provided additional infrastructure and technical and financial support. In this phase, the use of a Videoconferencing facility to train remote health professionals was adopted. The training is conducted for two days at the nearest vicinity of the WoredaNet videoconferencing center (McKee et al.,2018). The zonal or woreda (district) level of videoconferencing facility is located at the health professional work and residence town. The face-to-face online videoconferencing-based training is conducted from the ALERT center by connecting a maximum of five WoredaNet videoconferencing sites at a time.

"whereby we trained an instructional well-designed knowledge partly by video conferencing where ever they are for two days, and we brought them to here for two days to attend the skill part…" **…Participant 2**

Phase III (2018 – up to now)

In this phase, the scope of services provided through the video conferencing facility was expanded to include live clinical consultations on multidrug-resistant TB (MDR-TB) services. After the success

of BL training and MDR-TB live telemedicine consultations, other service units of the ALERT Hospital started using the facility to conduct specialty training in other clinical areas, including subspecialty training in plastic surgery and further grants is obtained to continue the use of the videoconferencing facility for Telemedicine of HIV/AIDS and Dermatology case consultation (McKee et al.,2018). Besides, ALERT center has been award grant from UNOPS / TB Reach Project – MSH to use existing video conferencing facility to train remote private health professional ALERT (2018).

4.3. Demographic distribution of the respondent

Table 4.1 shows the demographic distribution of the study participant

Demographic	**Category**	**frequency**
Gender	Male	3
	Female	4
	Not Mentioned	3
Age	21-30	1
	31-40	6
	41 -50	1
	51- 60	2
Academic Level	Diploma	0
	First Degree	4
	Post Graduate (MSc, MPH)	4
	Doctoral (Ph.D)	2
Work experience	1-5	1
	6-10	3
	11-20	6
Experience to work in the ICT4D project area	Yes	10
	No	0

Table 4. 1 Summary of the demographic distribution of study participant

4.4. Initial Stakeholder Identification

The initial identification of stakeholders is made from two sources. First, interviewing the project manager of VCBL & Telemedicine who is responsible for the overall implementation of the project. Next to the project manager of the owner organization, the project director of the implementing stakeholder is selected as a key informant. The key stakeholders refer to their action. According to Clarkso (1995), if these critical stakeholders withdraw or become dissatisfied with the system, the activity of the project would be severely damaged or unstable to continue. Then using the snowballing technique, initially identified stakeholders also been asked to identify further the stakeholders who are working with them. Accordingly, the stakeholders were identified are listed in table 4.2. Further identification and classification of the stakeholders were made and supported based on the available project documentation to support the evidence from the interview. Source stakeholders' identification interviews ten interviewees and documents 3 (Project sub-award contract document (2)), Annual Publication(1).

Category	***Stakeholders***	***Number of Participants Identified***
Beneficiaries	1. Patients 2. Health worker/clinician/professional 3. Training facilitator 4. Hospitals & Health Facilities	5
National Central government	5. Federal Ministry of Health (FMOH) 6. Ministry of Innovation and Technology (MinT) 7. National telecom provider (Ethiotelecom) 8. Ministry of Education (MoE) 9. INSA	8
Owner of the Project	10. ALERT Training Center & Hospital	6
Departmental	11. FMOH Health Information Technology Team - HIT 12. ALERT Management board of directors 13. National TB Program	3
Regional	14. Regional Health Bureau (Addis Ababa, Oromiya, and Amhara)	8

	15. Regional ICT Bureau	
Zonal & Woreda	16. WoredaNet (ICT) office, video conferencing facility.	7
Project	17. Heal TB 18. Challenge TB 19. TB Reach	4
Project implementer – NGO	20. Management Science for Health Inc (MSH)	5
Funders	21. USAID 22. FMOH / Grand Challenge - AHRI	4
Technology vendor	23. POLYCOM 24. ZTE 25. Huawei	2
Individuals	26. Individual Consultant	2
Other	27. In-Service Training Center (IST)	2

Table 4. 2 List of Stakeholder identified

To identify, the participants were asked the following questions with follow up questions.

> *"Who are your stakeholders that you and your organization are working in particular to VCBL & Telemedicine Project with their respective categorize level (central government, regional, departmental, community, the project itself, international, project implementer, etc., ...)? Alternatively, you can label them as Key and secondary. etc..*

The study initially identified ten (10) stakeholders with the initial interview and supporting secondary source is used. Later the more referred key informant is used by using a snowballing technique and an iteratively validating with what the previous stakeholders have identified. As a result, after ten interviewees and key informants are involved in the process, the study finally identified twenty-seven stakeholders. Table 4.3 shows a summary description of stakeholder responsibilities and the role played in VCBL & Telemedicine Project.

Category	Stakeholders	Description
Beneficiaries	1. Patients	The ultimate beneficiary of any health care service.
	2. Health worker/clinician/professional	They are benefited from quality training and telemedicine consultation. They obtain knowledge and skills through consultation and training.
	3. Training facilitator and Trainer	Conduct Blended TB Training to remote health professionals via video conferencing and actual face to face. Expert physician in ALERT also participates in providing and conducting telemedicine patients' case consultation.
	4. Hospitals & Health Facilities	To provide quality health care for patients by having competent and skillful health professionals.
National Central government	5. Federal Ministry of Health (FMOH)	Directing, decision, and controlling government bodies of the health sector.
	6. Ministry of Innovation and Technology (MinT)	Owner of the WoredaNet connectivity. Infrastructure. Providing ongoing support for the infrastructure whenever there is a service interruption, coordinate, and connect multiple WoredaNet sites whenever there is multiple site connection.
	7. National telecom provider (Ethiotelecom)	Providing internet and WoredaNet connectivity infrastructure to WoredaNet facilities
	8. Ministry of Education (MoE)	Directing, decision making, and controlling government bodies of the education sector.
	9. Information Network Security Agency (INSA)	INSA also provides clearance on the device security permission.
Owner of the Project	10. ALERT Training Center & Hospital	The host and the owner of the project. It is responsible for providing in-service training for health care workers in a different modality such as face-to-face modality and blended type.
Departmental	11. FMOH-Health Information Technology Team - HIT	Support the technology acceptance and adoption of Health Information Technology in the country.
	12. ALERT Management board of directors / Leadership	ALERT leadership also has a role in political dimension by creating a better picture and advocacy for the clear benefit of the society and alignment with the national objectives
	13. National TB Program (NTP)	FMOH-NTP, it could be on the TB health care area, it could be on health worker capacity building so at the National Level.

Regional	14. Regional Health Bureau (Addis Ababa, Oromiya, and Amhara)	Coordinate, facilitate, sensitize regional activities of the training.
	15. Regional ICT Bureau	Coordinate regional level video conferencing and ICT activities.
	16. Zonal / WoredaNet (ICT), video conferencing facility.	Coordinate Zonal/Woreda level of video conferencing and ICT activities.
Project	17. HealTB	HealTB Initially stated the initiation of the project to ensure the sustainability of blended eLearning of Comprehensive TB training in Ethiopia in a fixed obligation grant award.
	18. Challenge TB	Challenge TB project also takes over the project continuation from HealTB.
	19. TB Reach	Expand the project service to Private Health Workers.
Project implementer - NGO	20. Management Science for Health Inc (MSH)	The implementing non – governmental organization
Funders	21. USAID	The Primary Funding agency for the project.
	22. FMOH / Grand Challenge – AHRI	Finance the telemedicine of TB/HIV and Tele-Dermatology via seeding funding.
Technology vendor	23. POLYCOM	Video Conferencing Device international vendor.
	24. ZTE	The WoredaNet connectivity network support providers who are contracted and works with MinT.
	25. Huawei	The WoredaNet connectivity network support providers who are contracted and works with MinT.
Individuals	26. Individual Consultants	They are involved in providing consultancy services to the project in ensuring the sustainability of the service.
Other	27. In-Service Training Center (IST)	Inservice Training Center (IST) is working on the capacity building of health professionals.

Table 4. 3 Summary of the stakeholders of the VCBL & Telemedicine project.

4.5.Stakeholders engagement indictor

Concerning the measurable performance of stakeholders' attributes that is essential to consider and description with the stakeholders' attribute measurable indicator. According to the thematic analysis, below is the summary of stakeholders' performance indicators in Table 4.4.

> *What measurable the performance of stakeholders' attributes is essential to consider and describe the nature of each indicator identified (financial and non-financial vs. qualitative and quantitative) suggest other if any additional performance indicator to be measured?*

Stakeholders engagement Performance indicator	**Description of stakeholders' engagement performance themes**	**Total Sources**	**Total Reference**
Financial	-The Stakeholders Contribution of financial support or allocation to meet the stated objective.	6	8
Satisfaction level	-For Funding Agencies, the Government is the extent to which the stakeholder meet their goals and objective. -For Beneficiaries is the extent to which the services are available without displacing from their work. -The project owner is the degree to which the institution is willing to take the project ownership considering the future benefit. -The degree to which other stakeholders are willing to adopt the project approach in their system.	3	3
Internal process	-The ability of organizational structure, technical performance level to assist and support the project objective. -Integration of internal management process and technique sustainability in their plan, monitor, evaluate, and control throughout the lifecycle of the project.	6	9
Innovation and Learning	-Selecting, adoption, installation, and utilizing innovative technology to meet future demand.	4	5

Table 4. 4 Summary of Stakeholders engagement indictor

4.6.Stakeholders Mapping

Renken and Heeks (2013) underlined the approach to stakeholders that was well illustrated by Bailur as "the most appropriate method to classify stakeholders in the development field. The view of categorizing helps to segregate and put demarcation between "stakeholders" with that of "importance versus influence." Under this imperative, the importance refers to "priority of the intervention is needed for those stakeholders whose problems, needs, and interests are critical for the ICT4D sustainability of the project" and influence refers to "the extent to which the stakeholders put power on the project sustainability" Bailure (2006). Accordingly, here is the summary of mapping the stakeholders from the frequency of identification of stakeholders. The stakeholder influence map in Figure 4.5 indicates the difference in influence/power and importance/interest among the identified stakeholders of the project.

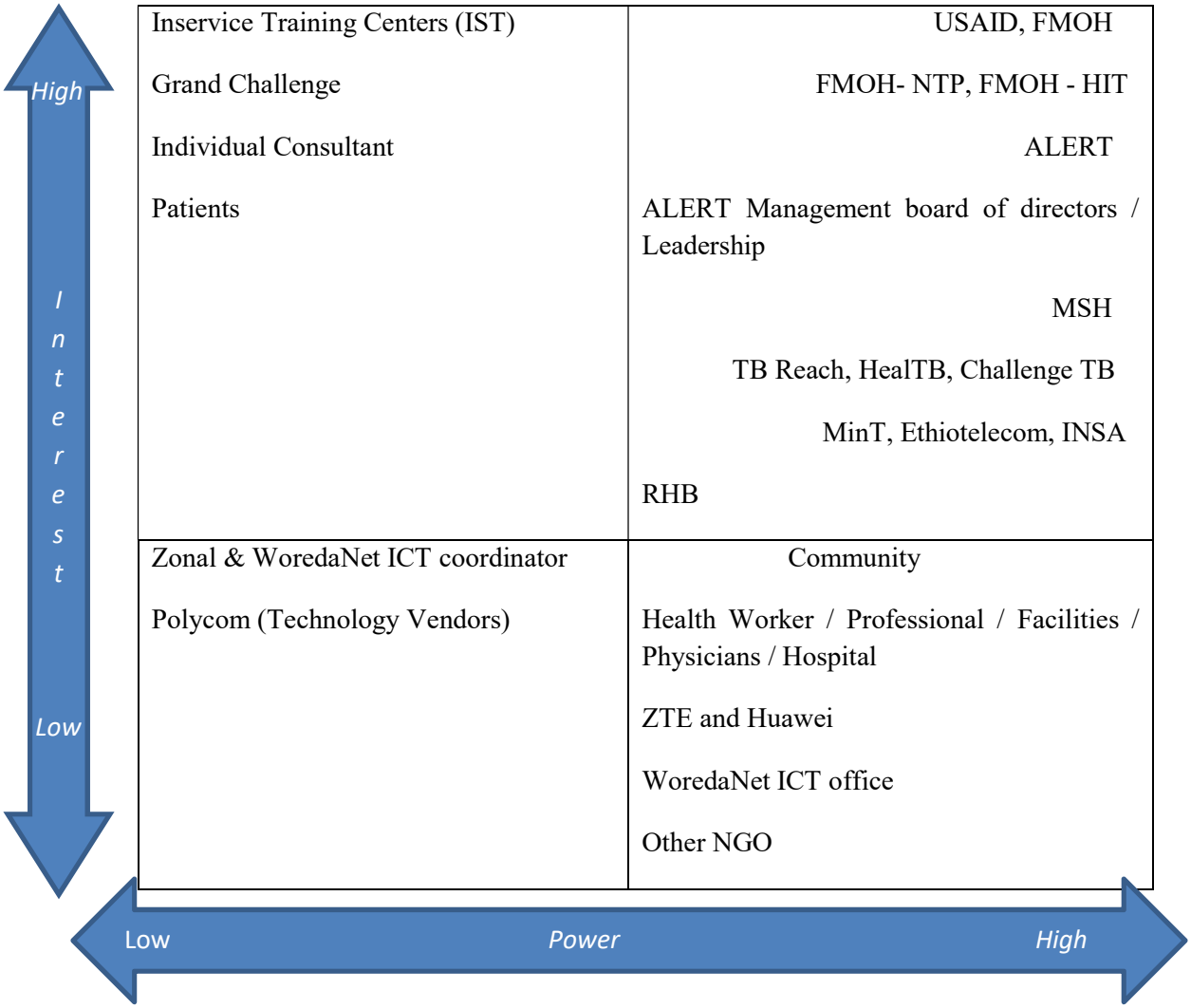


Figure 4. 5 Stakeholders Mapping

Nearly the all the key informant participants agreed and mentioned that the Federal Ministry of Health (FMOH), The funding agency, United States Aid for International Development (USAID), ALERT center and Management Science for Health Inc.(MSH) are important and influential as instructional ultimately came up with the consensus that the project benefit towards the national objective. (FMOH, 2015). Besides, the vision of MSH aligns with the strategic objective of FMOH.

"Ministry of Health as the overall directing organization. USAID is our funder…" Participant 3.

"When we refer to ALERT center, it is not detached with the FMOH since it is under the umbrella of FMOH internal process" …Participant 2.

"The contribution of this project concerning the impact is to an equitable training service will be addressed, and delivering a quality of health care service" Participant 4.

"My previous organization (MSH), the primary motto is to save lives…" Participant 3.

Hence ALERT center is under the umbrella of FMOH hosting the project. As a result, the ownership is taken by ALERT, considering the future benefit to society.

> *"When we see first depending on the level of engagement, ALERT the first one to take ownership considering the future benefit of the service to the beneficiaries." Participant 2*

The other ranked stakeholder has high power and a high-interest project that are HealTB, Challenge TB, and TB Reach project for which The VCBL & Telemedicine project at ALERT was supported by their technical and program support. Coming to the regional health bureaus (RHB) and the Ministry of Innovation (MinT) are also relatively high power and high interest. However, the latter was not involved in the planning of the project. WoredaNet is locally owned by MinT and was already in place before the inception of the project.

> *"Since MinT has High power in the infrastructure was engaged in a partnership with the ALERT center in defined the providing permission to join WoredaNet VPN and scope in setting the bandwidth allocation" …Participant 7,8,9.*

The next identified low power and highly interested are Grand Challenge Ethiopia (GCE). In essence, AHRI, as it is an innovative approach for conducting training by using information technology, GCE financed the continuation and adoption of the project service to telemedicine (on areas of TB/HIV and Dermatology) with seeding money from the funding sources available from FMOH.

"The third out of this project is directly related to AHRI under the Grand Challenge TB related Tele-dermatology and HIV/AIDS Telemedicine." Participant 1.

Besides, the contribution of the individual consultant who participated in the project has less power, but their professional consultancy service as the most significant contribution to the sustainability of the project.

"One of which is the consultancy service I have rendered for ALERT training center to ensure the sustainability of VCBL & Telemedicine Project as sustainability Consultant. besides, I have participated in several projects in integrating the concept of sustainability to the project design." Participant 10.

Concerning the high power and low interest, stakeholders are Ethiotelecom. For instance, initially, the national telecom provider has high power initial to the primary backbone connectivity and installation of the infrastructure. However, once the service is started, their interest seems to decline.

"Initially, Ethiotelecom was involved in the initial phase is considerably high but has in the middle-low in major area…." Participant 1 and "Ethiotelecom also engaged in providing maintenance service on network connectivity issues." Participant 2.

The other identified stakeholders in this regard are the community, health worker (i.e., professional, nurses, physicians) health facility (clinics, hospital) since they are beneficiary and their contribution influence that project output. Nevertheless, due to other engagement, their interest becomes decline. Similarly, ZTE and Huawei are also the most powerful in giving the backbone connectivity support for WoredaNet contracted by MinT.The last stakeholders mapped as low power and low interest are regional/zonal ICT, WoredaNet ICT coordinator, Polycom (technology vendors).

4.7.Stakeholder Behavior Analysis

Federal Ministry of Health (FMOH) and the United State Aid for International Development (USAID)

They are ranked as powerful/influential and highly important/interested stakeholders in VCBL and Telemedicine Project. FMOH is responsible for directing and controlling government bodies for setting policy and direction towards the implementation of technology projects to maximize the quality of health care. The FMOH was initially fully engaged in setting the direction and involved in all the processes of the initial project planning phase. Initially, they have to know everything from scratch. Among the divisions that are responsible for the issues about the VCBL Project are The National TB program and the health Information Directorate Director (HIT). Besides, USAID is a funding agency that finance projects that support meeting the strategic objective set by the Federal Ministry of Health.

Their continued role in running of the projects. VCLBL & Telemedicine Project as they saw it as part of their social responsiveness ambitions. This cooperative behavior was important in attaining set-out objectives. Their continued role was important for the successful implementation of the project concerning scope definition and objective setting. They are also the key actor in defining the resource and resource mobilization to sustain the project. Hence by aligning the project objective, the project owner, implementers, and other stakeholders should work in closer tight with them.

> *"Ministry of Health as the overall directing the organization, the USAID it was our funder…" Participant 2.*

> *"There are different organizations as stakeholders the Mother (The main one) that is the government part Federal Ministry of health "…Participant 1.*

ALERT

ALERT is the key stakeholder in taking the initiative of project ownership and setting up the project organization for the successful provision of the VCBL & Telemedicine Project. During the initial phase of the project, ALERT involved in the preparation with the MSH in designing the project. The objective was to meet the objective of reducing the cost and time spent on traditional training. During the execution phase, ALRET involved relevant stakeholders that are important for technology adoption and assigning project team. ALERT Management board of directors / Leadership is also engaged in the project. ALERT, in collaboration with MSH, defines the task and responsibility. Mobilizing internal resources was one of the essential tasks in the development of technology. This includes renovating the local library room for the state-of-the-art video conferencing room. During this phase, ALERT has also worked with MinT and Ethiotelecom in acquiring permission to join the WoredaNet VPN and install network infrastructure connectivity that has a bandwidth of 5MB.

All in all, the service provided by the project enable remote training participant to access quality training from ALERT Training center by connecting multiple sites of WoredaNet video conferencing centers. Regional health bureaus, zonal, and woreda level health and ICT offices are involved in selecting the training participant were working in partnership to meet the objective. Furthermore, telemedicine enables ALERT to be a hub for accessing expertise. The area of consultation is for dermatology to treat remote patients and also replicate the telemedicine consultation on the area of MDR TB and TB/HIV.

To run the project, ALERT uses already allocated financial resources with a fixed-obligation grant; as a result, ALERT has limited power to put sanction and reward employees. What has been done as a part of project implementation and in meeting the national objective, the information will be shared and documented to relevant stakeholders.

> *"When ALRET has provided sufficient ALERT center has generally had high power. But some constraining limiting factor for the is the strong internal financial control system as a challenge. ALERT set object and scope; there is an internal obstacle process of finance system again that inhibits the power. Because of the financial process, the problem becomes critical for project activity. We usually spend an already remarked because when the funding comes, it is obligated for this activity. We can share the information and knowledge we acquire. ALERT has a powerful role in defining tasks and responsibilities. We have limited power to reward and put sanctions."…Participant 1.*

Concerning the interest, ALERT has high interest and ranked as important, being the owners those who are initially are not involved. Since ALERT has high interest whenever there are a problem and issues in the project, they look for the immediate solution since the risk associated with the project uncertainties harms the beneficiaries. Active searching for funding alternatives and smooth relationships to address issues with the stakeholders is the attribute for their interest so that others will have a sense of ownership and to raise interest. Besides, ALERT uses effective communication to increase the interest of other stakeholders.

> *"ALERT has a high interest. When there was a problem of a funding shortage, for example, when the projects are changing from USAID / HealTB to Challenge TB, from Challenge TB to TB Reach, and finally, when TB Reach Stop, there was no external funding support. We cover from the internal"…and …."We made a review meeting, based on our through available communication media such as phone calls, letters we will communicate and brigs down the issues and problem to resolve it and request their concerned assistance stakeholder. Since the benefit is for the health sector and has shared responsibility to have a higher impact…" Participant 1.*

Management Science for Health Inc. (MSH)

MSH is also highly ranked and plays a pivotal role in the implementation of the project being an international Non – governmental organization whose mission is to save a life. The focus of MSH is in addressing poverty-related diseases in resource-limited settings using a resource through the ownership of the local stakeholders. MSH was working from the initial phase of the project by involving the FMOH, ALERT, and RHB's, especially at the piloting. The way MSH engaged in the

project was to start from the very beginning by designing the project; for example, for the project, MSH contributed a significant role in providing financial and technical support. The necessary technology device was imported from abroad and all the necessary. The funding comes from USAID via Challenge TB. MSH also seconded a technical advisor for ALERT Center to provide technical assistance and transfer knowledge.

> *"…., for example, from if you are talking about the technical aspect we (MSH) have, financial we also have high power overall, we have high power. We have power in defining scope action, We have power on setting the objective is set through the census process it is done from just one side …. depending on the priority (we allocate resources) …. We do not alone. We do it through consulting. They (ALERT) define it defines the task and responsibility, and we concur and customize…." Participant 2*

When establishing a contract agreement with ALERT to implement VCBL & Telemedicine project, it is based on a fixed obligation award. The scope of the project is already defined, and accordingly, each year, the necessary resources will be allocated by MSH. MSH is also responsible for setting the project objective. There is also local and international-based information and knowledge sharing platform. Rewarding, providing recognition, and sanction based on the direction set by USAID and the grant owner the FMOH – ALERT.

Concerning the interest, MSH has a high interest in any issue concerning the project since it significantly affects the funding objective, its mission, and the national strategic objective set by the FHOH. MSH uses documentation of the result and sharing and disseminates through the popular media and different media to increase the insert of other stakeholders.

HealTB, Challenge TB and TB Reach projects

MSH was a key implementer of three projects funded through USAID and UNOPS. These are HealTB, Challenge TB, and TB Reach. So the projects have inherited the power and interest role set and customized by the project implementer (MSH). Initial HealTB was the first project to support the VCBL & Telemedicine project in the pilot phase. The Challenge TB takes over when HealTB phase-out. HealTB and Challenge TB were using the VCBL & Telemedicine project to train government health professionals. Following TB Reach uses the project to train remote private health professionals in the Amhara region.

MinT, Ethiotelecom, and INSA

Ministry of Innovation Technology (MinT) and Ethiotelecom are both government bodies responsible for WoredaNet infrastructure connectivity. Initially, and throughout the project, both have high power. Particularly the MinT has significant power in providing permission to allow ALERT to join the WoredaNet. MinT works in closer collaboration with Ethiotelecom from local government, with ZTE & Huawei and Regional & Zonal ICT office for successful service delivery of WoredaNet. MinT has significant power in defining the suitable, sustainable, adaptable technology considering the future benefit for the country. Both ministries have a high interest in the infrastructure. The primary role of Ethiotelecom was to install the infrastructure connectivity, provide maintenance, and to troubleshoot the connectivity issues. As far as their power and interest are concerned, although MinT is the owner of WoredaNet and has significant relativity influence in defining the bandwidth, scope of connectivity, service, and facility resource utilization. Once the infrastructure connectivity was avail by both ministries; subsequently, INSA has also had a high power in allowing the security permission clearance for ALERT to finalize the import process and customs clearance.

> *"The level of MinT responsibility was initially… when FMOH officially requests WoredaNet service - ALERT center first, the request was approved, and the permission is given to ALERT to join WoredaNet then MinT sent a letter to Ethiotelecom with local IP. The Ethiotelecom installed the infrastructure with a 5MB bandwidth of upon the request that has data and internet connectivity. MinT was providing ongoing support for the infrastructure whenever there is a service interruption, coordinate and connect multiple WoredaNet sites whenever there is multiple site connection…." Participant 6,7,8.*

> *"From the perspective of providing permission of security clearance and technology device import and acquisition, the Ministry of Innovation and INSA also provide clearance on the device security permission..." Participant 2.*

> *"Ministry of Innovation in selecting a technologically sustainable ICT that is reliable, adaptable ...This project, for example, the contribution it should be in the small,... but when it is initially thought it should be thought in the bigger vision of the country plan to adopt sustainable technology and should be worked out with MinT as it is a responsible government body for selecting and adopting sustainable ICT in Ethiopia." Participant 10.*

RHB

Regional Heal Bureau (RHB) is responsible for Coordinate, facilitate, sensitize Regional activities of the training. Communicate Zonal to coordinate training activity. Concerning Power RHB is labeled as high Power even though the power is decentralized o regional, zonal and woreda level. RHB is aware of the initiation phase of the project, but due to the limited engagement seamlessly, their inters become relatively declining although they have high interest. Conducting sensitization to zonal and woreda levels is a crucial activity identified to increases the interest of other stakeholders.

> *"The RHB has high Power in general but initially was involved on a limited basis. RHB has a relatively middle-high interest. The RHB does not define the scope but has the power to comment to scaleup to self-paced learning, do not set the authority, does not allocate the resource, ALERT has the power to set roles and responsibility. RHB has no power to reward and put sanctions. We as RHB have the engagement role in sustainability by facilitating and participating in the expansion." Participant 4.*

Health Worker (Physician, Health Professional, Clinicians) and Patients

These are the stakeholders has high power and low interest, for example, their engagement in this project is by as a project beneficiary they are the one whose capacity and skill needs to be developed to provide the quality health care. Most of the project beneficiary health worker are from various regions where there is a limited resource setting is available.

The other role the health worker notably played at an expert level is by providing training for remote health professionals and by conducting telemedicine consultation. They are the trainer and training facilitators. Hence, they have high power but low interest due to they are working at Load of Effort (LoE) scheme for the project.

The final target of this project is that patients who are the beneficiaries of the improved impact contributed to the health sector. Particularly for the telemedicine service, it allows them to access equitable health care where ever they are.

> *"…the second output having training health professional ….the health workers are remote health workers who are far-reaching to access training facility we trained 326 from the government health facility, 96 for the first time from private health facility on TB case identification and telemedicine consultation on Tele-dermatology and TB/HIV 50, Teledermatology - Mizan Aman hospital, South Omo, Chencha, Keffa Agaro, Fiche for HIV Case 24 case Agaro and Fiche, MDR (7 cases), from different*

area BG Oromia, SNNPR region, Plastic surgery(3 cases) from Sweden hospital…."…Participant 1.

Community

These are also stakeholders that are mapped as high power, and low-interest associations are one of the community members that are engaged.

Individual consultant and Inservice Training Provider (IST) Providers

Inservice Training center and Individual consultants are labeled as low power, and high inters for the sustainability of the project service. The played a pivotal role in the sustainability of the project service. Even though they are lesser power but has significant contribution due to the high interest they have and important.

> *"IST Providers, Individual consultant, we involve them in consulting them on how we can proceed and improve the services……" and "the Other satisfied stakeholders I can consider are the IST who are very eager to adopt such an innovative approach" …Participant 2.*

> *"one of which is the consultancy service I have rendered for ALERT training center to ensure the sustainability of VCBL & Telemedicine Project as sustainability Consultant. besides, I have participated in several projects in integrating the concept of sustainability to the project design." Participant 10.*

Zonal and Woreda ICT Coordinator

These stakeholders are ranked as low power and low inters. The way they are engaged in the project is they will be informed whenever there is a video conference session. They will make the facility ready for video conferencing, identify the closest WoredaNet site, check and test the connectivity, and coordinate the technology utilization by the training participant. They are working by the direct supervision of MinT to avail of the WoredaNet service. Their ICT competency needs to be upgraded in order to improve the performance of the project.

> *"…To coordinate the video conferencing session with woreda ICT coordinators. The government installed the WoredaNet video conferencing centers for public and political meeting purposes. There is 540 woreda among this. We will select the sites where there is a high TB burden to train the participant…" Participant 5.*

4.8. Management of stakeholder engagement

The high interest and high-power stakeholders such as FMOH, USAID, ALERT, MSH, Challenge TB, HealTB Project, and TB Reach. They were engaged by involvement in decision making, in general, to involve them in controlling the project activities from the very beginning to the closeout phase. Although MinT and Ethiotelecom are initially high power and high interest. The next ranked high power and high-interest stakeholders' community, RHB (High power, relatively little high interest), association, health worker, other NGOs such as Ethiopian Medical Association, who are directly involved and engaged in the partnership. The other thing of high interest but high low power are Inservice Training (IST) providers, the individual consultant we involve them in consulting them on how we can proceed and improve the services. The last thing is for the low power, and low interest is a health facility, regional ICT, Woreda ICT. They are kept them. Table 4.5 shows the summary of the management of stakeholders' engagement.

4.9. Conflict

In this study, the participant identified that there were no apparent conflicts between the stakeholders. The minor disagreements were concerning the hidden conflict or minor conflict of interest were identified. In such a case, an open discussion was used to understand the cause and came up with an agreement.

> *"There is always a kind of hidden conflict, the kind of conflict is interest conflict and .... again, this is we the same consultative approach we usually base our project implementation to the interest of government anything against it we bring in to table we discuss it."...Participant 3.*

One possible conflict source of internal conflict has happened when the seconded ICT advisor is assigned. To resolve conflict, a clear demarcation of role and responsibility was set to delineate the overlapping conflict of interest.

> *"Conflict is natural to happen; the was a hidden conflict; for example, there was in deploying the ICT professional from outside that will be seconded by the implementing partner MSH. initially, there was conflict as there was no clear ....., but we solved it by clearly identifying and defining the roles and responsibilities." ...Participant 2.*

Level of engagement Phase of the Project	Inform	Consult	Partnership	Control
Identification / analysis	Regional / Zonal / Woreda ICT	Individual consultant and Inservice Training Provider (IST) Providers	Community Health Worker / Professional / Facilities / Physicians / Hospital	USAID, FMOH NTP, FMOH - HIT ALERT, ALERT Management board of directors / Leadership MSH HealTB RHB
Planning	Regional / Zonal / Woreda ICT	Individual consultant and Inservice Training Provider (IST) Providers	Community Health Worker / Professional / Facilities / Physicians / Hospital	USAID, FMOH NTP, FMOH - HIT ALERT ALERT Management board of directors / Leadership MSH HealTB , MinT, Ethiotelecom, INSA RHB

Cost Budget and Activity (CBA) and Resource allocation	Regional / Zonal / Woreda ICT	Individual consultant and Inservice Training Provider (IST) Providers	Community Health Worker / Professional / Facilities / Physicians / Hospital	USAID, FMOH NTP, FMOH - HIT ALERT ALERT Management board of directors / Leadership MSH HealTB, RHB
Implementation	Regional / Zonal ICT Woreda ICT coordinator	Individual consultant and Inservice Training Provider (IST) Providers	Community Health Worker / Professional / Facilities / Physicians / Hospital	USAID, FMOH NTP, FMOH - HIT ALERT ALERT Management board of directors / Leadership MSH HealTB , Challenge TB , TB Reach MinT, Ethiotelecom, INSA RHB
Monitoring and evaluation	Regional / Zonal ICT Woreda ICT coordinator	Individual consultant and Inservice Training Provider (IST) Providers	Community Health Worker / Professional / Facilities / Physicians / Hospital R	USAID, FMOH NTP, FMOH - HIT ALERT ALERT Management board of directors / Leadership MSH HealTB , Challenge TB , TB Reach RHB

Table 4. 5 summaries of the management of stakeholders' engagement

4.10. Sustainability

Few executive level key informant stakeholders identified that sustainability is a broad topic to define, and it is a burning agenda for developing countries.

> *"Well, sustainability is the key question that needs to be addressed well, especially for developing countries. For instance, we can say that a sustainable ICT4D is when the use of ICT contributes and brings sustainable benefits for society, and this will be achieved through the improved performance of the sector." ...Participant 2.*

Besides, sustainability has its objective by nature. Regarding the understanding of ICT4D sustainability, the following themes were analyzed and summarized from the qualitative data. Participants pointed out that ICT4D sustainability is based on the analysis of the highly ranked understanding of the ICT4D project sustainability themes are coded as "continuous ICT service utilization," "performance change," "contribution to impact," and "sustaining impact at scale."

> *"Sustainability should not be thought at the end of the project, ICT4D sustainability can be understood as the utilization of continuous and uninterrupted ICT service that results in a performance change in the sector to produce or contribute impact on an individual and society. The impact also should be sustainable at scale." ...Participant 10.*

4.10.1. VCBL & Telemedicine Project Sustainability

This section explores the suitability dimension that determines the sustainability of the VCBL & Telemedicine Project at ALERT. I explore the following factors affecting sustainability: Financial sustainability, institutional, technological, Social, and Political. Other dimension Leadership and Behavioral sustainability.

4.10.1.1. Financial Sustainability

The participants identified the following are the sources of financial support for the project.

i. Award grant from USAID.
ii. Local funding sources from FMOH through Grand Challenge.
iii. An internal and external source of local budget and source.
iv. Use the facility for revenue and income generation.

"USAID, it was our funder for his project…." Participant 3.

"FMOH (in the financial and concerning the internal process of like structure, not in all of the project but for some of the project example The Grand Challenge we measure FMOH by Structure and Internal process)" Participant 1.

"When the projects are changing from, for example during from USAID / HealTB to Challenge TB, from Challenge TB to TB Reach, When TB Reach Stop no external funding support we cover from the internal. FMOH is contacted to acquire funding to use the facility for the Teleradiology program because they initially know it. We made a smooth transition." Participant 1.

"For instance, ALERT can ensure financial sustainability by integrating other partners, to engage the service for generating income by providing service to the society" Participant 4.

Funding source as fixed obligation grants from USAID was one of the primary sources of the project. The financial support goes through the implementer MSH as a part of the HealTB and Challenge TB initiative to improve the quality of TB care by ensuring the sustainability of Blended eLearning of TB training in Ethiopia. Following since the new approach of conducting the training is an innovation, other FMOH financed through Grand Challenge Ethiopia for seeing innovation in health care. The third source of financing is from an internal and external source when the project is changing. The last source of money to support and ensure the sustainability is to use the facility as revenue and income-generating mechanism to cover internal cost and expenses.

4.10.1.2. Institutional Sustainability

The second most prominently identified sustainability dimension for the VCBL project is next to financial sustainability is the organizational or institutional sustainability. The factor that determines the sustainability of this dimension is that the initiative and commitment that ALERT has taken the full ownership of the service of the project considering the future benefit that will provide for health workers and patients.

"The other is that ALERT took the initial sense of ownership as an institution by view in the project benefit, not a one-time benefit. For example, the best effort that was done by ALERT was taking institutional ownership from the perspective of national benefit." ...participant 2.

"When the ownership is taken, ALERT should use all available local infrastructure, mobilize resources, and or should search other sources of funding. As long as sustainability is important for the nation as a whole, full ownership should be accompanied by such mentioned efforts." ...Participant 1.

The other essential themes identified by the participants is to develop the competent institutional capability in terms of internal process and knowledge base organizational system to ensure the utilization and transfer of technical skill.

"The other one is institutional sustainability. It can go with the technical sustainability that addresses the issue of "Do we have strong enough institutions who might have capable, knowledgeable enough to take over the project and run technically?"...Participant 10.

"The FMOH should support our (ALERT) internal process, and their role is important to enhance the implementation of the VCBL & Telemedicine Project for our organizational system by implementing the supportive and conducive internal system".... Participant 1.

4.10.1.3. Technological Sustainability

The identified themes concerning technological sustainability are the use of locally available technology infrastructure, such as WoredaNet data and internet infrastructure owned by MinT. ALERT as got permission from MinT to connect WoredaNet video conferencing sites via dedicated VPN. The WoredaNet network connectivity is not a shared connection like an internet network. The data network is dependable and reliable, even if there is no internet service. Since the video connectivity works by data service through WoredaNet.

"technological sustainability by integrating the locally available infrastructure…" Participant 3.

"The Service quality that WoredaNet infrastructure provides as it is local and government-owned and is separate from the usual publicly shared internet infrastructure it provides reliable data and video connectivity even though there is no internet service…"Participant 7,8,9.

The other factor that describes technology sustainability is that it is maintainable, easy to use, deliver quality training, and telemedicine service.

"The other dimensions are the technology part in my understanding the technology sustainability considered here in this project is it provides quality service with the

provision of uninterrupted service, and it is maintainable when the technology provides easy service to end-users or beneficiaries…" Participant 5.

The last factor mentioned as a technological sustainable is that the existing technology infrastructure will meet the current and update itself for future demand by the beneficiaries.

"The exiting technology infrastructure should address the current service demand and absorb, adaptable for future changes in technology advancement the knowledge concerning the advancement should be available and developed well…." Participant 10.

4.10.1.4. Social Sustainability

It refers to the active participation of the community towards the maximum utilization of the service to the beneficiary. It also refers to the inclusion of the social part as an integral part of the project service.

"The other sustainability I consider is the social dimension part where the social and community are focused on the umbrella of project service that they are considered as integral parts." ...Participant 5.

4.10.1.5. Political sustainability

It refers to the engagement of the ALERT and FMOH management and leadership to advocate and to publicize technology utilization. Besides, it also refers to the alignment with the current digitalizing the health service strategy set by the government.

"The ALERT leadership also has a role in political dimension by creating a better picture and advocacy for the clear benefit for the society and alignment with the national objectives" Participant 2.

"This day, the current political advocacy is toward using the digital platform to automate the previous manual system, I can associate the political dimension of the strategic direction and move towards the digitalizing the system." Participant 10.

4.10.1.6. Others (Knowledge Sustainability and Behavioral Sustainability)

Knowledge sustainability is the availability of a sustainable knowledge management system to create, store, use, and transfers the knowledge of ICT and Behavioral sustainability refers to the attitude of

the user (Patients and health worker) to towards the benefit of digitalization or using ICT in their day to day activity.

> *"To conclude what makes most project sustainable is the knowledge management they have, it is not the building or other infrastructure. Knowledge makes a difference in making the project sustainability by learning a lesson from other project success and failure. KM enables the project will learn from failure lessons and correct the practice and adopt it." and "for example, while digitalizing the health information system the health worker how to change their behavior to capture and record the patents record in the digital platform" Participant 10.*

Sustainability performance indicator	**Description of the indicator**	**Total Source**	**Total Reference**
Financial	Allocate financial support from internal and external or from an alternative source.	6	14
	Use the facility as an income or revenue-generating mechanism to ensure sustainability.		
Institutional	Take full ownership of the project with all the commitments.	5	15
	Should Develop a capable knowledge base organizational system to ensure the utilization and transfer of technical skills.		
Technology	The use of locally available and government-owned technology infrastructure.	5	7
	Provision of quality and uninterrupted service The technology should be reliable, easy to use, user-friendly, and maintainable system.	5	4
	The technology should meet the need of future demand.	2	2
Social	Active participation increased awareness and eagerness of the community to consider it as an integral part of the project.	2	2
Political	Strategic direction and move towards the digitalizing the system.	2	3
Others Knowledge Sustainability	Availability of a sustainable knowledge management system to create, store, use, and transfer the knowledge of ICT.	2	9
Behavioral sustainability	The attitude of the user towards the benefit of digitalization.	1	2

Table 4. 6 Summary of Sustainability dimension themes

Table The most prominent was the frequent mention themes of sustainability pillar indicator identified for VCBL and Telemedicine Project by six respondents is Financial sustainability, the following most crucial part of as being identified by 5 participants. Social and political sustainability is also an important pillar identified for VCBL and Telemedicine Project.

4.10.2. Output

4.10.2.1. Output indicator

Concerning the output, the participant identified the following themes, which are highly coded is the development of technology infrastructure and adoption of the technology to initiate the project service. The second theme that is identified by the participants in the use of this technology to training remote health workers at woreda level health facility. The third coded and identified themes by the participant is the adoption of video conferencing technology to Telemedicine to assist knowledge and skill sharing to treat remote patients.

> *"One of the output or result was initially the development and adoption of the infrastructure or to lay down the technology." Participant 1, and "we adopt the use of such technology for telemedicine where ALERT becomes a hub for access expertise consultation in the fields of dermatology to treat remote patients, and we also replicate the telemedicine consultation on the area of MDR TB and TB/HIV." Participant 2.*

> *"The second output has trained health professional ....the health workers are remote health worker who is far-reaching to access training facility we trained 326 from the government health facility, 96 for the first time from private health facility on TB case identification and telemedicine consultation on Tele-dermatology and TB/HIV 50, Teledermatology - Mizan Aman hospital, south Omomo, Chencha, Keffa Agaro, Fiche for HIV Case 24 case Agaro fiche, MDR (7 cases), from different area BG Oromia, SNNPR region. Finally, Telemedicine of Plastic surgery (3 cases) from Sweden hospital."Participant 1.*

4.10.2.2. Identification of Stakeholder role for Sustainability

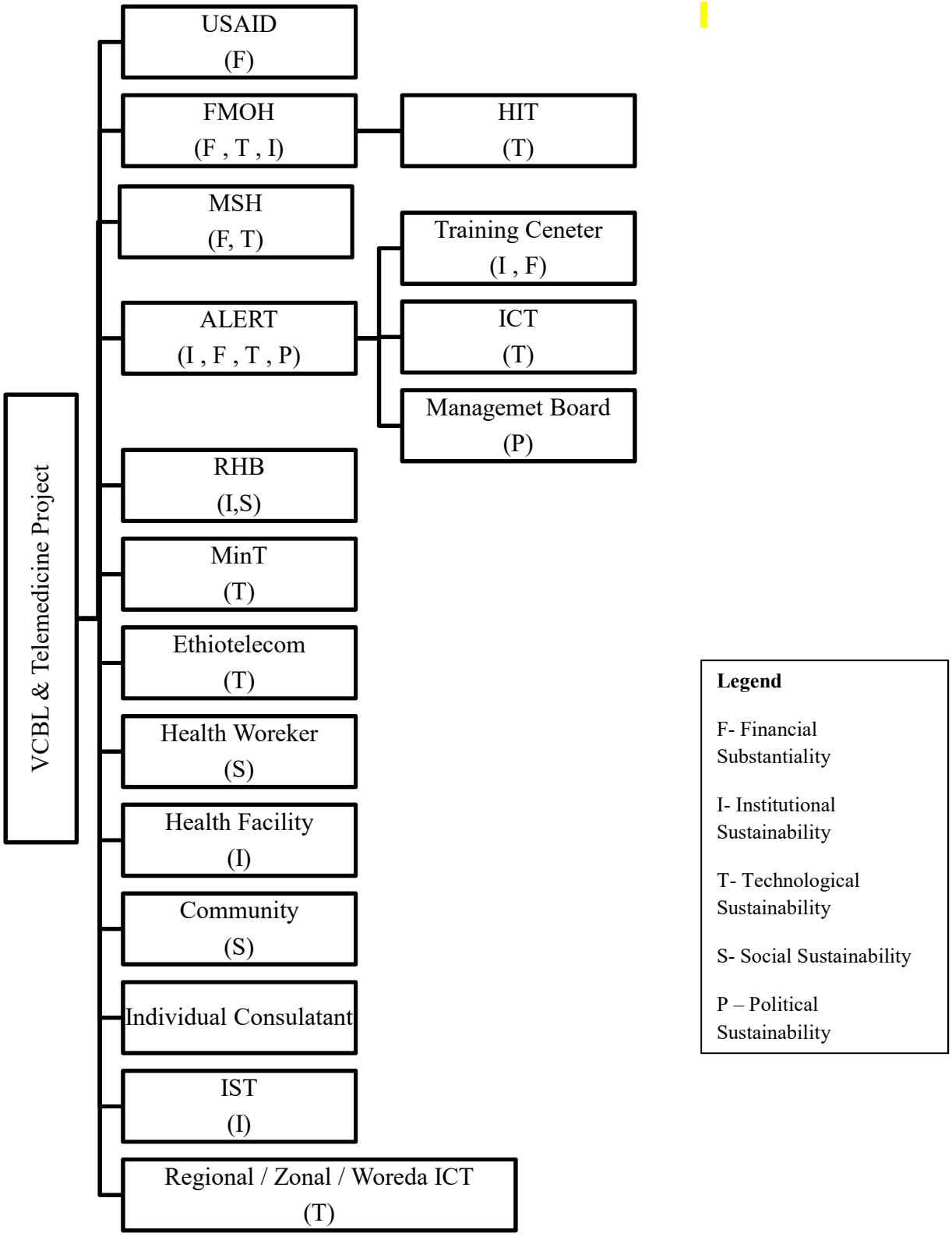


Figure 4. 6 Stakeholder role Identification (bottom-up) Approach

Output	Description of the indicator	Total Source	Total Reference
System Use	Development and adoption of the video conferencing center with all the necessary ICT infrastructure.	6	8
	Initiate and Pilot the use of technology to train health workers.		
Users' satisfaction	By using the technology train remote health worker at the woreda health facility level.	5	10
	Adopt the video conferencing technology to telemedicine.		

Table 4. 7 Summary of VCBL & Telemedicine Project Output indicator

4.10.2.3. Role of stakeholder to improve the result

In relation to the role played to leverage the output, the participant identified the following the scale-up and expansion of the project service to other regions is one of the most prominent coded themes to maximize the result. Accordingly, the key informant identified the following Table 7.8 role the stakeholder should play.

Table 4. 8 Summaries of stakeholders role for better output

Role	Description Role played to leverage the output	Stakeholders	Source	Reference
Policy and Guideline formulation	Engage in policy and guideline formulation at the national level for the is of ICT in health care training and HR Capacity building. Mobilize resources to scale up.	FMOH	1	3
Ownership to scale up	Continue ownership and show Leadership commitment in Scale-up and expanding the service.	ALERT	3	8
Continuous funding	Continue funding as part of scale-up and Sustainability.	USAID	1	1
Technical Guidance	Engaged search for additional and alternative financial support, grants, and show technical guidance. Besides, the implementers should be engaged in building the local capacity.	MSH	2	3
Active Participation	Increase their engagement and active participation of the local community.	Community	1	1
Awareness creation	Active role in creating awareness and sensitization to use the technology at the regional, zonal, and woreda levels.	RHB	2	2
Benchmarking	Benchmarking shows eagerness and increases its influence to adopt the technology in its existing platform to become the Center of Excellence.	IST	1	1
Strategic Guidance	Provide Strategic guidance on the future direction of the existing Plan of MinT System upgrade plan. Increase engagement in coordination Regional offices, Zonal, and Woreda ICT's.	MinT	2	3
Ongoing support and coordination	Ensure going support for the infrastructure whenever there is a service interruption, coordinate, and connect multiple WoredaNet sites whenever there is multiple site connection.	MinT and Ethiotelecom	2	3

Reliable power	Avail a dedicated Power generator in case of power interruption.	WoredaNet ICT office	1	1

4.11. Outcome

4.11.1. Indicator of Outcome

The participant identified the key outcome or performance improvement is the existing health sector by the VCBL & Telemedicine projects is towards the improvement in knowledge and clinical skill by the health professional. According to … FMOH 2015 improved HR development is one of the key contributors to the improved quality of clinical service and health care. Concerning the project objective, the other performance indictor, or the outcome achieved by the project, are summarized below in Table 4.9.

> *"Blended Training improves the knowledge of Health workers to provide better clinical treatment" ....and ..." concerning teleconsultation, we enhance the knowledge sharing mechanism as to how remotely knowledge constrained health professionals to acquire better clinical practice from our specialist based in ALERT." Participant 1.*
>
> *"Thus, this project enables producing high-quality health professionals to remote resources constrained health facility by enabling easy access to quality training where ever they are from accredited training providers" ...Participant 4.*
>
> *"concerning providing training to remote health professionals, the approach is easy and cost-effective" Participant 2.*
>
> *"The improvement, reduction cost ..." Participant 3, "WoredaNet video conferencing service is used to minimize travel time, allowance fee..." , "..the client can make their video conferencing for without displacing from their workplace." Participant 6,7,8. And "One of the keys outcomes is of this project was that we could cut the health work displacement time spend on training by 50%" ...Participant 3.*
>
> *"We also increase the number of concurrent sites connected and simultaneously trained at their site." Participant 4. "This project can connect training site from one to five at a time (Simultaneously)" .... Participant 5.*

Outcome	Description of the indicator	Total Source	Total Reference
HR - Development	Fostering the knowledge of remote health worker by through the use of innovative approach training modality and knowledge sharing by telemedicine Patients case consultation	6	8
	Increased number of competent health professionals to remote resources constrained health facility by enabling easy access to quality training where ever they are from accredited training providers.		
Clinical Service	improved clinical skill practice by improving the knowledge of the health profession.	2	4
Other Training Cost	Reduce the training cost such as travel cost, peridium, and lodging than the traditional (Classroom) training modality by 50%.	7	11
Workplace displacement	Minimize workplace displacement by 47-50% than the traditional training Modality spent by travel.	5	11
Multiple site training delivery	Increase training delivery for multiple sites from one site to five sites at a time.	2	2

Table 4. 9 Summary of VCBL & Telemedicine Outcome indicator

4.11.2. Role of Stakeholder to increase the performance of the project

The key informant has identified the following code as the stakeholder's role to improved the performance outcome indicator. Accordingly, the most prominent role mentioned in the development and use of locally/publicly owned eHealth technology infrastructure, an effort towards resource mobilization, the use of knowledge base or system, Competency level, effort towards Center of Excellence, upgrading existing National ICT backbone connectivity and service and engaged in research to improve the project efficiency. Table 4.10 shows the summaries of role.

Description of Stakeholders Role	Responsible Stakeholder	Source.	Reference
Create a sense of ownership, expand and enhance the development, and the use of local or publicly available eHealth technology infrastructure.	Project Owner and Implementer ALERT and MSH	5	10
Mobilize available resources such as material, financial, and human resources to ensure the continuity of the service.	FMOH and ALERT	5	8
Develop a knowledge management system that will capture to improve the efficiency of the system.	ALERT , MinT	5	6

Develop and Hire qualified ICT proficient technology person at WoredaNet site level to narrow the knowledge gap with the central technology person	Regional / Zonal and Woreda ICT office	3	5
Adopt and Use the exiting innovative ICT in the training and health care system as a part of the stewardship to Center for Excellence to develop competent and skillful health professionals.	IST	2	4
Install and upgrade existing national ICT infrastructure and backbone connectivity and core service to accommodate the enhanced and new application.	MinT & Ethiotelecom	3	5
Link and link the project service with research activity to further develop, innovate, and improve the efficiency of the service.	Owner and implementer	2	2

Table 4. 10 Summary Stakeholders role in improving the outcome

4.12. Impact

4.12.1. Indictor of Impact

The key informant has identified the following coded themes for the impact of the VCBL & Telemedicine project. Like any other ICT project on health, the majority of the key informant has identified the main contribution ifs towards the improved quality of health that will lead to a reduction in mortality due to TB infection. The other contribution of the project service the distribution of quality health care services to patients that are in remote and resource-constrained settings. The patients can benefit and get access to quality health care in an equitable way like any other patents that are being treated at ALERT hospital. Technology bridges the gap between expert physicians and remote patients.

Impact Indicator	Description of the indicator	Source	Reference
Quality of health	Improved the quality of life by provision of quality TB care treatment	5	6
Mortality	Reduce the patients' Death due to TB infection	2	2
Equitable Distribution	Equal access to quality health care services in TB, TB/HIV and dermatology, and Plastic Surgery.	2	2

Table 4. 11 Summary of VCBL & Telemedicine project impact indictor

4.12.2. Stakeholder Role for sustainable impact

Concerning the role of stakeholder to ensure the sustainability of the project impact the key informant identified that the important role that should be played by the key stakeholder is during the initial phase to consider the sustainability as an integral part rather than to think the issue of sustainability at the end of the ICT4D project. In that case, project sustainability will not be in question.

> *"So when you initially design the project, sustainability should be an integral component to have improved impact. That means like the Project has its objective similarly, Sustainability has its objective. …." Participant 10.*

The other identified themes are to scale up the project throughout the country in other regions to sustain the impact at the desired scale.

> *"This is still small scale funded it has not been expanded .it has not been expanded to all over the country. to have a more impact, we expand it and scale it up. "…. Participant 3*

The creation of a separate legal entity that will take ownership of a sense of suitability and be responsible for ensuring the sustainability of the ICT4D project by monitoring, evaluating, and controlling the projects is also important for improved sustainable project impact on society. The government bodies will govern this institution; however, funding agencies should also finance the institution to meet sustainability objectives.

> *"There is an organization that is responsible for managing the sustainability of the project for a better and improved impact on society. This is by itself, it is an institution that has a separate legal identity, but the money comes from the project funders. Funding and donor agencies should also invest or allocate initially for addressing the issue of ICT4D project sustainability." and "This institute will also monitor, evaluate and control the sustainability indicators at every stage of the project life cycle" Participant 10.*

The Development of Knowledge management (KM) culture by all stakeholders should also be a critical consideration for sustaining the impact of ICT4D projects.

> *"Knowledge makes a difference in making the project sustainability by learning a lesson from other project success and failure. KM enables the project will learn from failure lessons and correct the practice and adopt it….."Participant 10.*

Creating a redundancy of technology services such as redundant data center development is also one of the most contribution roles that should be played by a government responsible body such as MinT.

Besides MinT engagement in selecting the resilient technology that will fit the current and future service demand for the country is also a contributing factor for sustainable ICT4D impact.

> *"MinT will have redundant data center backup to ensure the sustainability of the service…" and..." We, as a MinT, also measure our engagement by taking the lesson and learning from the competitive environment and adopt the new and innovative technology to fit the future countries demand…" Participant 6,7,8.*

Strategic alignment with the countries vision to select and adopt ICT should be worked out with MinT as part of aligning the project objective to the strategic vision of the country is also another identified role that should be played by stakeholders especially for the project owner (MSH) and Owner (ALERT).

> *"when it is initially thought it should be thought in the bigger vision of the country plan to adopt suitable technology and should be worked out with MinT as it a responsible government body for selecting and adopting sustainable ICT in Ethiopia." Participant 10.*

The last identified role that should be played by stakeholders is to engage in research activity to investigate and understand the reason for ICT4D project failures. This will be done by post mortem evaluation of failed ICT4D project. The lesson learned from the failed ICT4D project will provide a better insight into how to tackle the issue to sustain the impact.

> *"I also suggest conducting post-mortal research, investigation, or study to understand and learn a lesson on the failed project to avoid malpractice of project management issues…" Participant 10.*

4.13. Chapter Summary

Based on the data analysis, the stakeholders' role is significant and usually reasons one of the reasons why the project would succeed. This means that the sustainability of ICT4D initiative could also be seen from the perspective of stakeholders' engagement. The analysis was started by initially identifying measurable indicators of stakeholders' level of engagement. One the identification of performance indicator stakeholders in the ICT4D project is pointed out the nested analysis done was understanding their role form towards the sustainable implementation of ICT4D project on a particular case of eHealth (Digital health) Project. Once their level of engagement was identified and described. The next level of stakeholder role identification is the role of the maximizing the project output. As part of ensuring the sustainability ICT4D project, the analysis was done on the

stakeholder's role towards improving the performance of project out com and achieving an improved and sustainable impact on individuals and society. Table 5.11 shows identified themes summaries stakeholders' role for impact .

Description of the Role	Stakeholder(s)	Source	Reference
Integrate sustainability at the project's initial design phase instead of thinking about sustainability during the project phase-out.	Funding agency, Government, Project Implementers, owners.	2	6
Scale up the project to other regions of the countries to replicate the impact level to other regions and continue the service at the desired target level.	Funding agency, Government, Project Implementers, owners.	2	3
There should be a separate institution that will take sustainability as ownership and dedicated for monitoring, evaluating, and controlling the sustainability indicator at every stage of project Lifecycle.	Central Government	3	10
Develop the culture of the use of the knowledge management system to ensure the sustainability of knowledge and technical skill transfer.	ALERT, MinT	2	6
Develop redundant backup data centers (at national and regional level) to ensure the sustainability of core wordnet services.	MinT	3	3
Selection of self-resilient technologies to meet current and future demand.	MinT	4	5
The selection of technology by stakeholders should be planned and align with the strategic vision of the technology sustainability responsible government bodies.	Stakeholders	1	1
Conduct post-mortal research to investigate and understand to lesson on the failed project to avoid malpractice of failed ICT4D project practice and management and issues.	ALL Stakeholders	1	1

Table 4. 12 Summary of Stakeholders role for sustainable ICT4D project impact

CHAPTER FIVE

DISCUSSION

In this section discourses the research findings of the study, that helps answer the research questions. The discussion begins by presenting what has been identified as a critical finding. Following this chapter present the highlight of what this study contributed towards the theoretical framework development. Since the purpose of the study is to develop a theoretical framework to better understand the role of ICT4D stakeholders in developing countries such as Ethiopia. Furthermore, assess the extent of its sustainability impact on ICT4D. By selecting the particular case of the VCBL & Telemedicine Project at ALERT Center. The study analyzed a case of the selected project as being potentially sustainable ICT4D project in the health sector toward answering the first research question "How the role of stakeholder should look like in towards ICT4D project sustainability". The study is concerned with the stakeholder role investigation as it has been the most researchable agenda and still luck literature, theoretical framework, model, and knowledge Hatakka (2018). The study went beyond examining factors affecting sustainability but examined but tried to develop a theoretical framework on answering the second research question "How does the role of stakeholder be managed in improving the impact on individual & societal capability by sustaining ICT4D?".

5.1. Thematic discussion on the findings

Using the case of the VCBL and Telemedicine project at ALERT, the study highlighted the stakeholders' role and the sustainability aspect of the project throughout the life each stage of ICT4D project. Bailure (2007) emphasized the need to examine the position of stakeholders and to have a temple to evaluate what has been achieved for stakeholders on an ICT4D project and to use it as an analytical tool to identify who stakeholders are, their actions and how they are handled are relevant for the success of the ICT4D project. To examine the role of stakeholders in the VCBL and Telemedicine project, I examined the different stakeholders' roles at each life cycle of the ICT4D project. The findings on stakeholder engagement in all stages of the project resulted in the sustainability of the project service. The participation of stakeholders in the project plays a significant

role in the progress of ICT4D initiatives (Bailur 2006; Neville and Menguc 2006; Pade-Khene et al. 2013; Proches and Bodhanya 2015).

The study tried to answer the following leading questions to provide the answer to leading questions. The central themes of the research agenda are coded following the leading question themes.

(Q1): understand and identify what aspects of stakeholders' measurable attributes are essential to consider in ICT4D projects?

(Q2): Understand what role of stakeholder is important and identify how it affects the sustainability of ICT4D projects?

(Q3): Understand what aspects and features of ICT4D sustainability are important to consider in ensuring the sustainability of ICT4D projects?

(Q4): Identifies the output of ICT4D project outcome and what role of stakeholder should be important to maximize the output of a sustainable ICT4D project?

(Q5): Aspect of ICT4D impact and outcome performance factor needs to be considered and measured by the stakeholders to improve the impact of a sustainable ICT4D project and stakeholders' role?

The emerging themes from the study out of these leading questions are discussed in more details in the following subsections.

5.2. Initial Stakeholders Identification.

I used the stakeholder theory instrumental perspective to identify VCBL and Telemedicine Project stakeholders and to understand how they were managed. The stakeholders in this study were categorized as either primary or secondary. The importance and influence are taken into consideration when managing the identified stakeholders. Gavin and Pinder (1998) created a participation matrix and was later modified by Bailur (2007). The primary and secondary stakeholders were identified utilizing semi-structured interviews with the VCBL and Telemedicine Project Manager and MSH Regional Director Manager. One of the primary or Key stakeholders was Federal Mistry of Health, USAID, MSH, ALERT, RHB, Challenge TB, and HealTB. They were part of the project in the planning phase. Stakeholders such as MinT and Ethiotelecom that were classified as highly important and influential were involved in the initial phase of the implementation stage. Their level of engagement seems to decline since they are the influential stakeholder in selecting the

technology, infrastructure connectivity permission, and installation of WoredaNet initially. The stakeholders that had high influence yet low importance like Community and Health Worker. The rest of the stakeholders were easily using the referred stakeholder key informant identified in the process of the interview using a snowballing technique.

Mengesha and Garfield (2013) identified that the stakeholders who are involved in the telemedicine program on the project are the government, Ministry of Health, Patients, Student, Resident physician, institution and Black Lion hospital college, implementer, and Funding agency (PEPFAR). Evidence from Lessa (2015) also suggested that stakeholders who are involved in WoredaNet are district level: WoredaNet video conferencing facility, the top management district, zonal ICT unit, Woreda ICT coordinator, civil servant, MCIT and regional ICT agency.

Concerning the use of eLearning, Wagner at al. (2008), identifies the stakeholders' students, instructors, educational intuition, and technology & content providers. Honest (2007) also identified that stakeholders who are engaged in health projects are Software Agency, Ministry of Health (MoH), Donors (International Monetary Fund), Bilateral donors for the provision of the fund, Health districts, and Provincial Health Directorate, Ministry of Health in Mozambique, Primary Health Care (PHC) Health unit. Three management levels (district, province, and national), Clients or Citizens, Office of cooperation and International projects office, and Patients are also identified in Honest (2007) study.

5.3.Stakeholders engagement indictor

The stakeholder engagement is measured by the Financial contribution stakeholder made to meet the stated objective (Cooper, 2007; Lukviarman, 2008). Satisfaction level, especially Funding agencies, Government is the extent to which the stakeholder meets their goals and objective and for beneficiaries getting the service meeting (Lukviarman, 2008). In relation to the other stakeholder indictor, the internal institutional process also identified as one of indictor to measure their engagement. The internal process is described as the ability of organizational structure, technical performance level to assist and support the project objective (Lukviarman, 2008). Lastly, innovation and lesson learning from the perspective of selecting and adopting new technology innovation (Eccles Pyburn,1992; Kaplan and Norton,1992; Atkinson and Epstein, 2000: p.28).

5.4.Stakeholder Management

The high power and the high-interest stakeholder such as FMOH, USAID, ALERT, MSH and from Projects HealTB and Challenge TB they were not only informed and consulted instead they were working as a key stakeholder in decision directing and controlling stakeholders. They were involved starting from the project initiation to closure (Newcomb,2003; Ouma, 2017: p4). Stakeholders such as Community, Health workers, Health facility, and Other NGOs who are labeled as high power and low-interest works in partnership and effort should is made to increase their interest. Providing incentives and conducting the consultative meeting and by sharing information to keep them satisfied (Zimmermann and Maennling, 2007; Eden and Ackermann,1998; Newcomb,2003; Leala et al., 2013, Chib et al., 2013: p133). The other stakeholders, such as the In-Service training Center, Individual consultant, and Grand Challenge Ethiopia has high interest and low power due to the power distance; however, their engagement is essential for the sustainability service. They are consulted for improving service quality; they are the potential supporter of the project. (Zimmermann and Maennling, 2007; Eden and Ackermann,1998; Newcomb,2003; Leala et al. 2013). The other last labeled low-power and low-interest stakeholders require minimal effort on the part of the project implementation to monitoring. They are informed with available media to engage them.

5.5.Stakeholder Role for VCBL & Telemedicine Project

The Role of Stakeholder for VCBL and Telemedicine project is complex and has a multi-level. It has different forms and happens at different levels among the stakeholders. The highly ranked stakeholder influential and important stakeholder FMOH is responsible for the overall project initiative, activities, coordinating, and initially fully engaged in setting the direction and involved in all the processes starting from the initial project planning phase (Honest et al.,2006: p5, FMOH, 2015). Initially, they have to know everything from scratch (Honest et al., 2006). USAID is responsible for financiering the projects to support in meeting the strategic objective set by the Federal Ministry of Health. Their continued role is important in running of the projects. (Honest,2006, p8) donors play a key role in sustaining the changes achieved in the long run since donors have funds, expertise, and experience. The study identified that their continued role was necessary for the successful implementation of the project concerning the scope definition and objective setting (Ouma, 2017: p4). They are also the key actor in defining the resource and resource mobilization to sustain the project.

The other highly ranked influential and important stakeholder identified next is ALERT as a key stakeholder in taking the initiative of project ownership and setting up the project organization for the successful provision of the VCBL & Telemedicine Project. Various literature highlighted that Taking ownership by the local party is one of the critical success factors in the ICT4D project and emphasizes that it must be given for local parties (Maepa,2003; UNDP,2001; Kora,2002).ALERT, in collaboration with MSH, define the task and responsibility, mobilizing internal resources was one of the important tasks. (Honest,2006, p8) also reiterated that decentralize the decision making to allow for user participation to participate in the mobilization of resources for long-term IT support Integrate processes is one of the important roles of user organizations that host the project (ITU, 2015: p28)

Management Science for Health Inc. is also the other high power and highly interested is project implementers. It is an international non-governmental organization whose mission is saving lives. Management Sciences for Health (MSH), under the guidance of the NTP and in partnership with the All-Africa Leprosy, Tuberculosis and Rehabilitation Training Center (ALERT), pioneered the technical and financial BLVC & Telemedicine project service approach for TB training in Ethiopia. MSH also channels the funding from USAID through the work was supported through two successive (HEAL TB and Challenge TB [CTB]) projects, and ALERT was a partner in both projects. (McKee, 2018). MSH being a project implementing unit, their role is significant in providing financial and technical support. The Project Implementation Unit office designated as a PIU usually performs a significant number of technical tasks such as detailed design, procurement, construction supervision, monitoring, and other tasks such as supervision of training (ADB, 2005: p1).

Ministry of Innovation and Ethiotelecom were categorized as high power and high interest due to their initial role of MinT is responsible for defining the suitable, sustainable, adaptable technology considering the future benefit for the country. Both ministries have a high interest in the infrastructure. The main role of Ethiotelecom was to install the infrastructure connectivity, provide maintenance, and to troubleshoot the connectivity issues (MinT, 2016).

Regional Health Bureau is the next highest power and high-interest stakeholders responsible for coordinating Coordinate, facilitate, sensitize Regional activities of the training. Communicate Zonal and woreda level and ICT to coordinate activity (Kaur & Ashir, 2019: p6). According to the hierarchical structure, the Health service unit is decentralized in three sub-district levels. (Honest, 2006). Regional, Zonal, and Woreda level. RHB is aware of the initiation phase of the project, but due to the limited engagement seamlessly, their inters become relatively declining although they have

high interest. ICT office at each level hierarchical office is responsible for facilitating and providing support related to ICT activity. (Lessa, 2015, p103).

The Project Beneficiaries are Health Worker (Physician, Health Professional, Clinicians), Health Facilities, and Patients, who are the beneficiaries that need to be worked at the partnership level. (May-Ann Lim et al.,2013). They are the health care service provider In-Service Training Center, and Individual consultants that are labeled as high interest and low influence have significant contributions in the continuity of the innovative approach. Their effort to adapt towards moving to the center of excellence makes the government pay attention to the importance of innovative technology (Ntagwirumugara et al., 2016; Kaur, 2019: p7). On the other hand, the role of Individual consultants in providing consultancy service in the development of a sustainability plan, as well as their participation in the development of the material, were significant.

ZTE and Huawei are highly essential and seemingly less interested in relation VCBL Project. However, they have a strong relationship with MinT as a core partner that provides back end ongoing support on WoredaNet infrastructure. Even though they are identified at the last snowballing and interview session and papers invisible on the initial identification, they are critical for the sustainability of WoredaNet service. Especially on the focus group discussion with the MinT key informant, it was understood that the contract agreement with the ZTE and Huawei is about to terminate, and back bonne connectivity support on the WoredaNet will be in question. Bailure (2006), on his study on Sustainability of ICT4D project, suggested by referencing the literature of Freeman (1984) that, what is called the "snail darter fallacy." In 1977, the snail darter—a small fish—was seen as an endangered species and delayed the building of a dam in Tennessee.

However, other habitats of the fish were found, and in 1984 its endangered status was downlisted, meaning that although they are not being identified as in the initial phase as influential and important, the termination of the contract service will undermine the sustainability of the WoredaNet service. The something for the effort of IST and Individual consultants, although they are labeled as low powered/influential stakeholders.

5.6.Sustainability

5.6.1. Understanding of sustainability

Sustainability agenda is a key issue for developing countries and pointed out that it should be answered for developing nations. Harris et al. (2003) also justified that sustainability is by far the most common challenge for many of the ICT4D projects in developing nations, which continue to be donors funded for a finite period. The concept of sustainability of ICT4D projects is a broad and challenging agenda for developing countries. It was understood that the long run ICT service continuity without interruption of utilization (Reynolds and Stinson, 1993; Honest, 2007) resulted in improvement in the performance of the application sector to contribute a sustainable impact on individual and societal development. (Sen, 1999; Chambers & Conway,1992; Hatakka & Lagsten, 2012). By utilizing the technology to address human and social needs is the issue of development, which is at the heart of ICT4D (Mario,2015). The impact should not be limited to one stage to have a sustainable development impact, and the impact should be sustained at scale (Jill et al. ,2019).

5.6.2. VCBL & Telemedicine Project Sustainability

The sustainability dimension identified for the project is financial sustainability as the most important pillar of the sustainability dimension. Particularly funding source from USAID in the form of a grant from FMOH, local, and external source of budget (Harris et al., 2003; Tino,2003). And the last description of the final dimension is the use of the video conferencing facility and service as revenue and income generation mechanism to support running costs (Proenza, 2001).

The second identified sustainability dimension is institutional sustainability. It refers to the ability of the user organization to take full ownership of the project (Maepa,2003; UNDP,2001; Kora,2002). The factor that determines the sustainability of this dimension are internal organizational effort, and the commitment to take full ownership (Fanta & Pretorius,2018; Lluch, 2011; Aziati et al., 2014).

The other essential themes identified by the participants is to develop the competent institutional capability in terms of internal process, resource mobilization, and knowledge base organizational system to ensure the utilization and transfer of technical skill. (Aqil, et al., 2009, Fanta & Pretorius,2018)

Regarding the technological sustainability system, quality of the use of locally available technology infrastructure such as WoredaNet data and internet infrastructure owned by MinT is the most factor

that determines technological sustainability. (Gorla et al., 2010, DeLone & McLean, 2003, Kiggundu,1989 and Fanta & Pretorius, 2018, Lessa 2015). Meaning the video data network connectivity is reliable even though there is no internet connection Since the WoredaNet is a separate VPN than a shared public network. WoredaNet infrastructure service use is also very relevant for the relevance of training purposes to train remote level health workers, and its relevance is linked to information quality (Aziati et al., 2014; Fanta & Pretorius,2018).

The other factor that describes technology sustainability is service quality. It refers to video conferencing technology adoption for training, and telemedicine is maintainable, easy to use, deliver quality service (Aziati et al., 2014; Fanta & Pretorius,2018). The up-to-date characteristics of the current technology device also one of the factors mentioned as a technological sustainable to meet the current and future demand.

The active participation of the community for maximum utilization of the service is also described as the social sustainability perspective of the project. That means it refers to the inclusion of the social part as an integral part of the project service (Gómez and Casadiego, 2002; Harris et al., 2003; Stoll and Menou, 2003; Delgadillo, 2004; Fanta & Pretorius,2018).

The political dimension of the sustainability of VCBL & Telemedicine is the political sustainability (Kuriyan et al. , 2006 and Avgerou,2000) as that ALERT and FMOH management and leadership to advocate and to publicize the technology utilization. Besides, it also refers to the alignment with the current digitalizing the health service strategy set by the government. One of the critical success factors for ICT projects is that political context must be analyzed and considered (James, 2004; UNDP,2001; Conradie, 2003; Kora,2002; Kumar, 2003).

The other last-mentioned sustainability dimensions are Knowledge and Behavioral sustainability. Usually, there is knowledge, and behavioral suitability dimensions are research projects (Zwickle and Keith Jones, 2018). Nevertheless, it has been given in the body of an analysis of most sustainability agenda that has to be made to sustain skill transfer is knowledge sustainability. Behavioral sustainability also refers to the attitude of the patients and health professionals to use digital technology to automate their daily activities.

Summary of sustainability of VCBL & Telemedicine and Stakeholders role

Sustainability Dimension	Status	Role identification of Stakeholders
Financial	Yes	USAID, MSH, FMOH, and ALERT
Institutional	Yes	ALERT, FMOH, IST
Technological	Yes	MinT, Ethiotelecom, MSH, and ALERT – ICT, FMOH -ICT
Social	Yes	RHB and Community
Political	Yes	FMOH and ALERT Management Board
Knowledge and behavioral	Yes	ALERT and MSH

Table 5. 1 Summary of Stakeholder Role Identification for Sustainability.

5.7.VCBL & Telemedicine Project output

5.7.1. Output indictor

Because of the project initiative as an eHealth project the output the participant identified the development of technology infrastructure and adoption of the technology to initiate the project service referred to as the actual system use (FMOH, 2015; Chen, Y. 2011; Mutingi & Matope, 2013; Fanta & Pretorius, 2018).

Users' satisfaction that is identified by the participants in the use of this technology to training remote health workers at woreda level health facility and the adoption of video conferencing technology to Telemedicine to assist knowledge and skill sharing to treat remote patients (Fanta & Pretorius, 2018).

5.7.2. Stakeholders Role for better output

Concerning the role played to leverage the output, the participant identified the following the role had been identified as the scaleup, and expansion of the project service to other regions is one of the most prominent coded themes to maximize the result. Accordingly, the key informant identified the following role the stakeholder should play. Table 5.2 summarized the relevant and related literature sources for the findings.

Role	Description Role played to leverage the output	Stakeholders	Literature source
Policy and Guideline formulation	Engage in policy and guideline formulation at the national level for the is of ICT in health care training and HR Capacity building. Mobilize resources to scale up.	High Power & High Interest Government Ministry	FMOH ,2015; Bardelli-Danieli, 2011; Heeks, 2015.
Ownership effort to scale up	Continue ownership and show leadership commitment in Scale-up and expanding the service. Exert the level of effort to convert existing other manual in-service training modules to an electronic-based learning/training platform.	High Power & High Interest Project Owner	Bourne L.,2009; Maepa ,2003; UNDP ,2001; Kora,2002.
Continuous funding	Continue funding as part of scale-up and Sustainability.	High Power & High Interest Funding Agency	Honest et al.,2006: p8
Technical Guidance and Serch for other grants	Engaged in searching for additional and alternative financial support, grants, and show technical guidance. Besides, the implementers should be engaged in building the local capacity.	High Power and High Interest Project Implementers	ADB 2005, p1
Active Participation	Increase their engagement and active participation of the local community.	High-power and Low Interest Community	Dijkers et al., 2018; Heeks,2007: p17 ; Heeks ,2015: p33;Krauss,2016; Mursu et al,2013; Krauss,2016; Sandep et al,2015.
Awareness creation	Active role in creating awareness and sensitization to use the technology at the regional, zonal, and woreda levels.	High Power and High Interest Regional Government	Lessa, 2015; Dzhusupova et al. ,2011.
Benchmarking best practice	Benchmarking, Show eagerness and interest, and Effort should be made to	High Power and High Interest	Avgerou, 2003; Femmer et al., 2013: p 74;Ntagwirumugara et al., 2016

	increase their influence to adopt the technology in their existing platform to become the Center of Excellence.	Local Training Providers IST	
Strategic Guidance	Provide Strategic guidance on the future direction of the existing Plan of MinT System upgrade plan. Increase engagement in coordination Regional ICT.	High Power and High Interest Government technology ministry MinT	Lelea et al.,2014; Newcomb,2003; Lessa, 2015, p103.
Ongoing support and coordination	Ensure going support for the infrastructure whenever there is a service interruption, coordinate, and connect multiple WoredaNet sites whenever there is multiple site connection.	High Power and High Interest Government technology Ministry & National Telecom	ITU, 2015: p28; Lessa, 2015: p103, ITU, 2015: p28
Reliable power	Avail a dedicated Power generator in case of power interruption.	WoredaNet ICT office	Ikwaba et al., 2012

Table 5. 2 Summary of Stakeholder role to increase the output.

5.7.3. The outcome of VCBL & Telemedicine

5.7.3.1. Indictor for outcome

Outcome performance indicator identified are improvement is the existing health sector by the VCBL & Telemedicine projects. These measurement indicators are towards the improved knowledge and clinical skill by the health professional. According to FMOH (2015), improved human resource development is one vital contribution to the improved quality of clinical service and health care.

The other outcome identified by the project is the reduction in training costs than traditional training modality (McKee et al., 2018). Reduction in Workplace displacement by health workers is also a critical performance indicator of the outcome achieved by the project (McKee et al., 2018). Multiple site training delivers rather than providing only one classroom. The video conferencing multiple site connection features enables us to accommodate up to 5 WoredaNet sites simultaneously. (Liu, Sandy & Molyneaux, Heather & Matthews, Brad. 2008). As a result, it is possible to training from twenty to sixty health professionals simultaneously. McKee (2018) justified that it is possible to engage 50 to 60 participants at a time, compared with the traditional classroom capacity of 15 to 20. An average of three working days of displacement was minimized with this approach, and the cost of training was reduced by 50%.

5.7.3.2. Role of Stakeholder to increase the performance

The key informant has identified the following code as the stakeholder's role to improved the performance outcome indicator. Accordingly, the most prominent role mentioned in the development and use of locally/publicly owned eHealth technology infrastructure, the effort towards resource mobilization, the use of knowledge base or system, Competency level, effort towards Center of excellence, upgrading existing National ICT backbone connectivity and service and engaged in research to improve the project efficiency. Table 5.3 shows a summary of the literature summary for findings.

Stakeholder Role	Description of Stakeholders Role	Responsible Stakeholder	Literature Source
Development of Local infrastructure	Create a sense of ownership, expand and enhance the development, and the use of local or publicly available eHealth technology infrastructure.	High Power and High Interest Project Owner and Implementer	Bourne L.,2009; Maepa ,2003;UNDP ,2001; Kora,2002 Maepa ,2003;UNDP ,2001; Conradie, 2003;Kora ,2002; Kumar, 2003;ITU, 2015: p13.
Resource mobilization	Mobilize available resources such as material, financial, and human resources to ensure the continuity of the service.	High Power and High Interest Health Ministry and Project Owner	Honest et al.,2006: p8
Use of Knowledgebase	Develop a knowledge management system that will capture to improve the efficiency of the system.	High Power & High Interest Project Owner and Implementers Technology Ministry	Bourne, L.,2009; ITU, 2015: p29.
Skill, competency and training	Hire and Develop skillful ICT coordinator and the trained person at WoredaNet site level to narrow the knowledge gap with the central technology person.	Low Power and Low Interest District and Woreda ICT Coordinator	James, 2004; Maepa ,2003; UNDP ,2001; Conradie ,2003; Kora ,2002; Kumar, 2003.
Center of Excellence	Adopt and use the exiting innovative ICT in the training and health care system as a part of the stewardship to Center for Excellence to develop competent and skillful health professionals.	Low Power and High Interest Local Training Centers	FMOH, 2015; Ntagwirumugara et al. , 2016
Upgrade existing National ICT infrastructure and connectivity	Install and upgrade existing national ICT infrastructure and backbone connectivity and core service to accommodate the enhanced and new application.	High power and High Interest Technology Ministry and national telecom Provider	UN-ESCAPE, 2016, p13
Research	Link and link the project service with research activity to further develop, innovate, and improve the efficiency of the service.	High Power and High Interest Project Owner and implementer	ITU, 2015: p28 Chib et al., 2013: p133

Table 5. 3 Summary Related Literature of the role of Stakeholder to improve the outcome

5.8. Impact of VCBL & Telemedicine Project

5.8.1. Impact indicator

The project contributes to the impact is considering the individual and social development (Deneulin, 2006) and Grunfeld (2007) evidenced that the values inferred from a development perspective (e.g., being healthy, educated, happy, etc.). Moreover, it is identified that the potential contribution to the quality of life improved by the quality of health by the provision of quality TB care treatment. The second identified is a potential contribution to mortality by reducing the patient's death due to TB infection and Equitable Distribution by the provision of equal access to quality health care services in TB, TB/HIV, and dermatology, and Plastic Surgery. (Elbert et al., 2014; Fanta & Pretorius, 2018; FMOH, 2015).

5.8.2. Stakeholder Role for sustainable impact

Below is the summary of related literature evidence concerning the role of stakeholders in improving the sustainable impact presented in Table 5.4.

Role	Description of the Role	Stakeholder	Literature Source
Begin with the end minds	Integrate sustainability at the project's initial design phase instead of thinking about sustainability during the project phase-out.	High Power and High Interest Key Stakeholder	Carvalho, Soniya & Perkins, Gillian & Reid, Gary,2015.
Sustain impact at scale	Scale up the project to other regions of the countries to replicate the impact level to other regions and continue the service at the desired target level.	High Power and High Interest Key stakeholders (community leaders, government officials, potential beneficiaries)	Kickul, Jill & Gundry, Lisa & Mitra, Paulami & Berçot, Lívia,2018.
Institutionalize Sustainability	Create an institution that will take management of project sustainability and dedicated to monitoring, evaluating, and controlling the sustainability indicator at every stage of the project lifecycle.	High Power and High Interest Key stakeholders	Gachie & Wanjiru, 2019.
Use of Knowledge Management	Develop the culture of the use of a knowledge management system to ensure the sustainability of knowledge and technical skill transfer.	Key stakeholder (Project Owner and Technology and Innovation Minister	ITU, 2015: p29; Gachie & Wanjiru, 2019.
Redundancy & Selection resilient technology	Develop redundant backup data centers (at national and regional level) to ensure the sustainability of core wordnet services and Selection of self-resilient technologies that will meet currents and future demand.	High Power and High Interest Technology and infrastructure responsible	UN-ESCAPE,2016, p24.
Strategic Alignment	The selection of technology by stakeholders should be planned and align with the strategic vision of the technology sustainability responsible government bodies.	High Power and High Interest Implementers and project owners	Honest et al. ,2006, p8;Post et al. ,2002;Eden and Ackermann,1998: 121-5, 344-6;ITU, 2015: p13.
Conduct post-mortem ICT4D Research.	Conduct post-mortal research to investigate and understand the reason for the failed project to avoid malpractice of ICT4D project management practice.	ALL Stakeholders	Gaikema et al., 2019:p1

Table 5. 4 Summary Related Literature of the role of Stakeholder to improve the outcome

CHAPTER SIX

FINDINGS AND REVISED CONUPTUAL FRAMEWORK & PROPOSTION DEVELOPMENT

In the previous two chapters, I tried to discuss what has been analyzed, and following the discussion is made to relate how the finding is related to the existing literature. As a part of the research output, this section will present the summary of the finding and theoretical framework development based on the proposed conceptual research framework development based on the sustainable ICT4D (e.g., eHealth) Project. This ultimately leads to the development of a theoretical framework for sustainable ICT4D (Particularly for eHealth) Project.

6.1. Findings

The finding in this section is consolidated from what has been analyzed and discussed in the previous chapters. Accordingly, to answer the research question first, we need to answer the leading questions.

Section 2: level of project understanding, stakeholder identification in projects, and what aspects of stakeholders' measurable attributes are essential to consider in the projects.

The level of project understanding by the participant is good enough to define the most recent definition of Sustainability, particularly when it comes to sustaining the impact at scale impact. It was evidenced by the most recent literature (Jill et al., 2019). The understanding is that the long run ICT service utilization resulted in improving the performance of the sector to contribute a sustainable impact on individual and societal development. The impact should not be limited to one stage to have sustainable development, and the impact should be sustained at scale (Jill et al. ,2019).

The Financial indicator is the right measurement that is highly weighted, and it measures the level of stakeholder engagement. Especially most eHealth projects are donor-funded, and efforts should be made by the project owner to sustain towards meeting the project objective. The next strongly emphasized indicator is the internal process. The other mentioned performance indicators are the level of satisfaction (from the perspective of the donor, implementor, funding agency, and beneficiary. The last one is the magnitude of innovation and Learning rate.

Section 3: Understanding and know how about VCBL & Telemedicine Project and the service provided by the project now and suggest service to be included in the future.

The service provided by the VCBL & Telemedicine Project is technology-based blended TB related training to remote health professionals where there is limited access to resources. The other service provided by the project is video conferencing-based telemedicine to treat remote patients and transfer knowledge for far-reaching health facilities where there is limited access to expert consultation.

The following services are suggested to improve the project performance: upgrade the delivery of the training modality from the group level to an individual or self-paced eLearning platform (Jumoke et al. 2012). Scale-up the project service to reach to other remote sites, enhance the use of knowledge base systems to capture the recoding not only for missing training section but also as part of knowledge management, expand modernizing the existing approved manual training on other health field and enhance linking the project with research activity.

Section 3: Understanding what aspect and features of ICT4D sustainability are important and need to consider in ensuring the sustainability of ICT4D projects?

Again, the financial aspect is the most important that is equally weighted as institutional sustainability. The third one is that the dimension of technology sustainability is also essential for VCBL Project. Social sustainability and political sustainability are the last mentioned but not least. In relation, other sustainability dimensions the least mentioned, but the highly emphasized dimension of project sustainability is knowledge sustainability and behavioral sustainability.

Further identification of stakeholders' role concerning the sustainability pillar was made using a bottom-up approach as it provides an in-depth investigation of the department that is invisible to other dimensions of sustainability. The bottom-up analysis is efficient and down-to-earth, i.e., with the interviews and lots of input. This approach actively includes employees (Femmer et al., 2013). Accordingly, for example, the unit analysis level suggested that FMOH -HIT and ALERT – ICT are also crucial for technology sustainability. However, MinT, Ethiopielecom, and MSH have a role in the sustainability of technology. Although ALERT has a role in institutional, finical and technical sustainability, it was identified that the Training center department has a role in institutional and Financial sustainability, ICT Directorate – for technology Sustainability and the management board of directors have a role on Political sustainability.

Section 4: Understanding of what role of stakeholder is important to consider the sustainability of ICT4D and identify how and why it affects the sustainability of ICT4D projects services?

The Analysis of the stakeholders' role revealed that the high power and highly interested stakeholders are most of the key stakeholders. They are funding agency (USAID), governing controlling body (FMOH), the project owner (ALERT), project implementer (MSH), technical support project initiative (HealTB & Challenge TB), and RHB. The technology & infrastructure strategic control government units (MinT and Ethiotelecom were initially informed, engaged, and consulted. All the key stakeholders were engaged at every stage of the project when their role is needed. Besides, MSH has a role in providing financial assistance through these projects as well.

The high influential stakeholder such as MinT and Ethiotelecom, INSA are initially the right hand and are involved in decision making in providing permission, selection, and installing infrastructure. They are not frequently consulted and actively engaged in the day to day training. They are high power and high interest labeled stakeholders. Their level of engagement once the infrastructure and technology will be limited to provide support on connectivity and troubleshoot whenever there is a problem (ITU, 2015: p28).In similar terms, although RHB is labeled as high power and high-interest stakeholders, the level of engagement in planning is limited. Hence, effort should be made to increase their level of interest.

The other stakeholder, In-Service training centers and individual consultants are labeled a low influential and high interest; however, they have to increase eagerness for adopting innovation on their training platform to scale-up and expand the project service to other regions (Kaur and Ashir, 2019: p7). Evidence from the selected case revealed that the role of individual consult towards the sustainability of project service is critical for continuity and survival of the service. Keep them consulted in major decision areas as their input is critical for the success of the project and engage them in a low-risk area.

A community such as the medical association, health facility, and health professionals have high power but their profession input to convert the project service into output and significant consideration in formulating the policy. Nevertheless, due to other engagement, their interest seems to low. They are engaged in the project with the partnership to increase the level of engagement.

The use of information sharing, exchange, and sharing through available communication media will increase the interest of stakeholders (Chib et al., 2013: p133). As such, there was no apparent conflict that was observed, although there is hidden interest conflict since there is a clear definition of roles and responsibilities. However, whenever there is hidden conflict of interest happen a clear consultative meeting and discussion will be made to resolve the issues (Kaur and Ashir, 2019: p6). The Zonal and WordaNet ICT offices are labeled as high power and low interest due to the power distance and link between the project. It requires minimal effort for them to engage. Most instruction about ICT service support provision is channeled through MinT and Regional ICT. Provision of incentive payments such as top-up fees on their day-to-day ICT support is made to increase their interest and level of engagement.

Section 5: Identification of the output of the project and outcome and what role of stakeholder should be important to maximize the output of a sustainable ICT4D project?

Technology Development and adoption for the first use is the first of the result of the project service. The other output of the project service is the use of training to remote health professionals in both public and private health facilities. The third output of the VCBL & Telemedicine Project is the number of Telemedicine Patients case consulted and treated.

The role of stakeholders to maximize the project output is summarized below.

Stakeholder Role	**Stakeholder category**	**Role Play / Description of engagement**
High Power and High Interest	Central Government	Strategy, policy and guideline formulation
		Mobilize resources to scale up
		Human Resources Capacity building
		Provide ongoing support and coordination with regional
	Project Owner	Scale up the service
		Ownership and leadership commitment
		Increase Adoption to other disciplines
	Funding Agency	Continuous funding
	Implementers	Search for further grants
		Technical guidance.
		building the local capacity
	Regional Government	Awareness creation

		Coordination and facilitation activities
High Power and Low Interest	Community	Active Participation
Low Power and High Interest	Local Training and Individual consultant	Increase in Technology adoption
Low Power and Low Interest	Zonal and Woreda ICT	Support and Coordinate ICT activities
		Provision of Reliable power backup generator

Section 6: What aspect of project impact and outcome or performance factor needs to be considered and measured by the stakeholders to improve the impact of a sustainable ICT4D project and stakeholders' role?

The Project contributes to the impact is the improved quality of life and reduction in mortality. The other identified contribution of the project to improved impact is the equitable distribution of health care due to Telemedicine.

The vital outcome indicator of the project service has improved the development of remote health workers' capacity in terms of knowledge and skill in a cost-effective way without displacing from their workplace.

Stakeholder Role	**Stakeholder category**	**Role Play / Description of engagement for improved outcome**
High Power and High Interest	Central Government	Mobilize resources
		Provide ongoing support and coordination with regional
	Project Owner	Localization of ICT infrastructure
		Resource Mobilization
		Use of Knowledgebase
		Research
	Funding Agency	Continuous funding
	Implementers	Research
		Technical guidance.
		building the local capacity
	Regional Government	Skill, competency and training development
		Coordination and facilitation activities

High Power and Low Interest	Community	Active Participation
Low Power and High Interest	Local Training and Individual consultant	Center of Excellence
Low Power and Low Interest	Zonal and Woreda ICT	Avail power backup

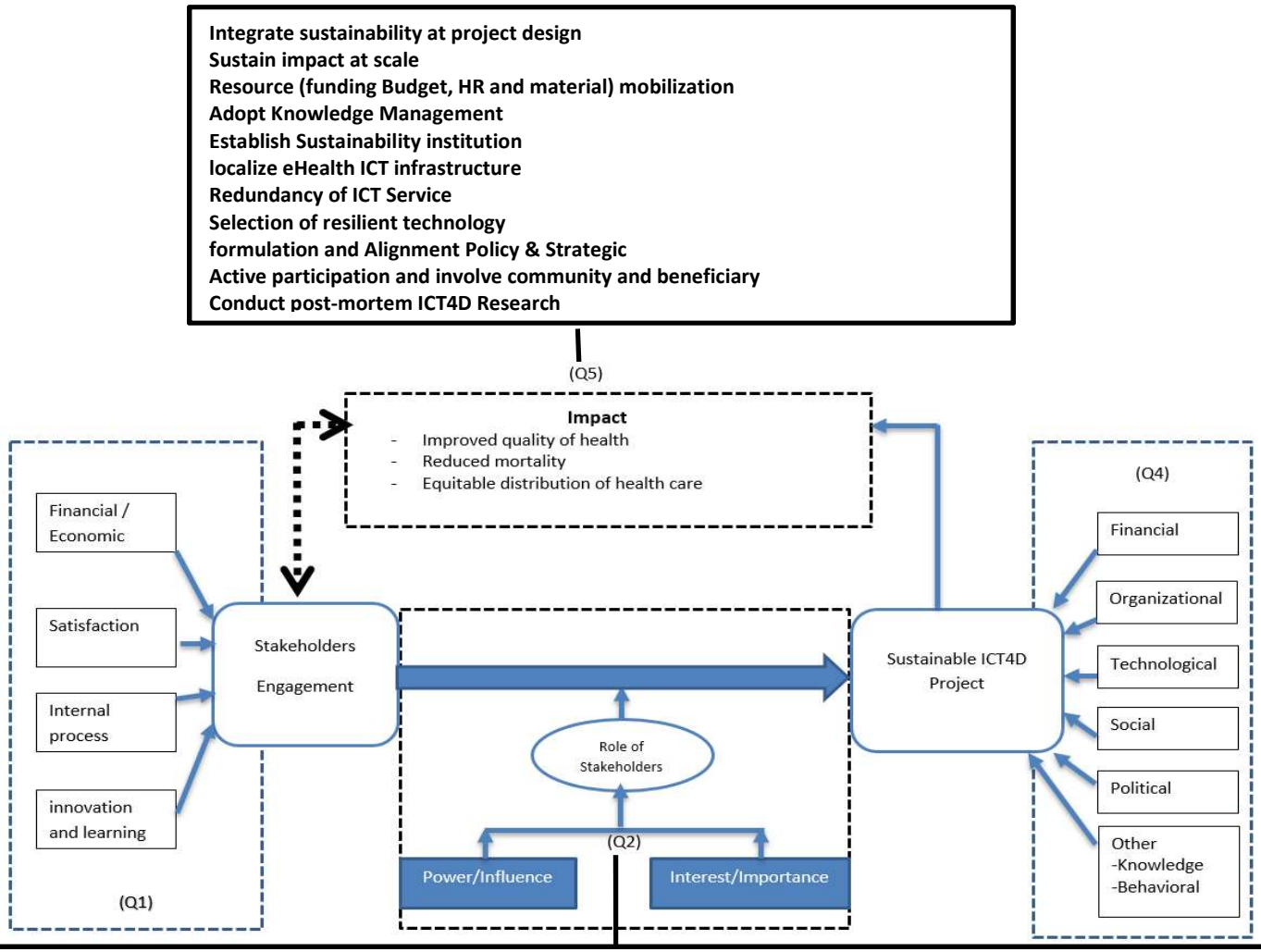
Concerning the training delivery, it is possible to train multiple sites simultaneously. The other outcome achieved is the reduction in patients' referral rate due to telemedicine to treat and consult patients' cases remotely. Telemedicine consultation also fosters the knowledge and skill transfer to remote health professionals.

Stakeholder Role	Stakeholder category	Role Play / Description of engagement for sustainable impact
High Power and High Interest	Key Stakeholders Central & Regional Government Funding Agency Project Owner Project Implementers	Begin with the end in minds
		Sustain impact at scale
		Knowledge Management
		Institutionalize Sustainability
		Redundancy & Selection resilient technology
		Strategic and Policy formulation and Alignment
		Conduct post-mortem ICT4D Research.
		Active participation and involvement of community and beneficiary.
		Resource (fund, budget, material, HR, etc.) allocation and mobilization.
		Create a sense of ICT4D project ownership and localize eHealth ICT infrastructure.

6.2. Revised Conceptual Framework

Figure 6.1 shows revised conceptual framework. Bailure (2007) framework is adopted to consolidate and simplify the initially proposed conceptual framework.

Figure 6. 1 Revised Conceptual framework (Adopted & Modified from Bailure (2007) and Fanta & Pretorius (2018))



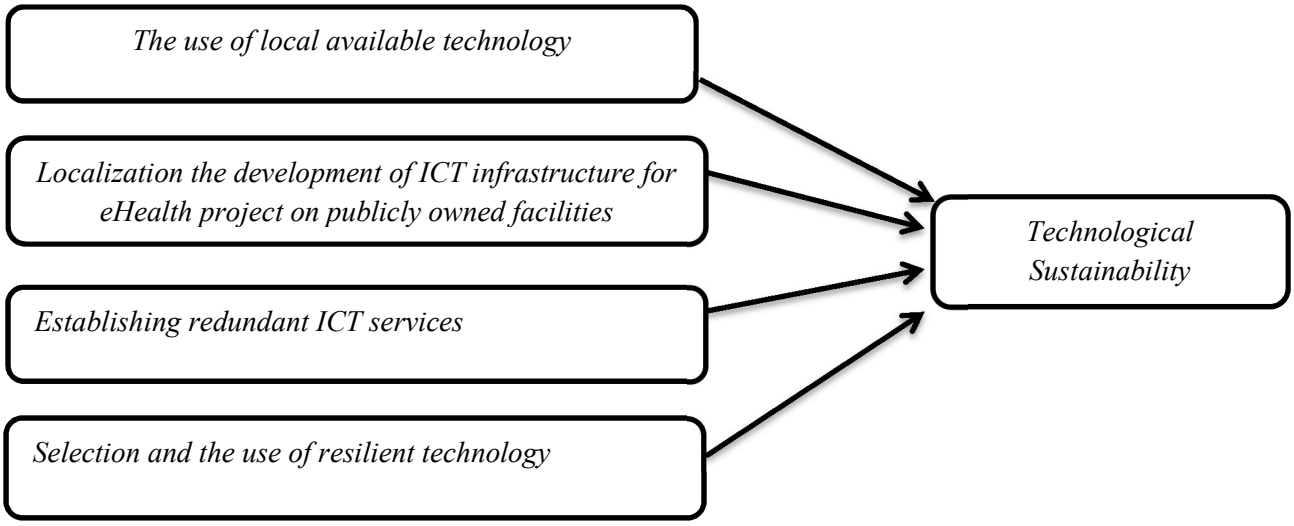
High Power & High Interest	High Power and Low Interest	Low Power Low High Interest	Low Power and Low Interest
-Strategy & policy formulation	- Consider in policy formulation	-Engage in low risk area	- Exert Minimal effort
-Governing, controlling and decision making	-engage in interest area	-Supporter and Ambassador	- Provide financial incentive
-Technology Selection	-Work in partnership	-Consult major decision area	- Inform
-Resource mobilization	-Increase their effort	- Inform and Consult	-Upgrade ICT Competency
-Project ownership			
- Capacity building			

6.3. Proposition Development

Based on the revised conceptual and theoretical framework, discussions and findings presented in the previous chapters of the empirical work, possible propositions are made among the stakeholders' engagement and sustainability of eHealth project. This is aimed to produce improved and sustainable impact via sustainable ICT4D project in particular selected eHealth ground case. Building proposition on the relationship between the level of stakeholders' engagement and ICT4D sustainability evaluation dimensions is emerged out of considering the insights obtained from the case study work by relating with the review of literature.

Proposition #1: The use of local available technology, localization of ICT infrastructure for eHealth project on publicly owned facilities, establishing redundant ICT services, selection and the use of resilient technology enhance technological sustainability.

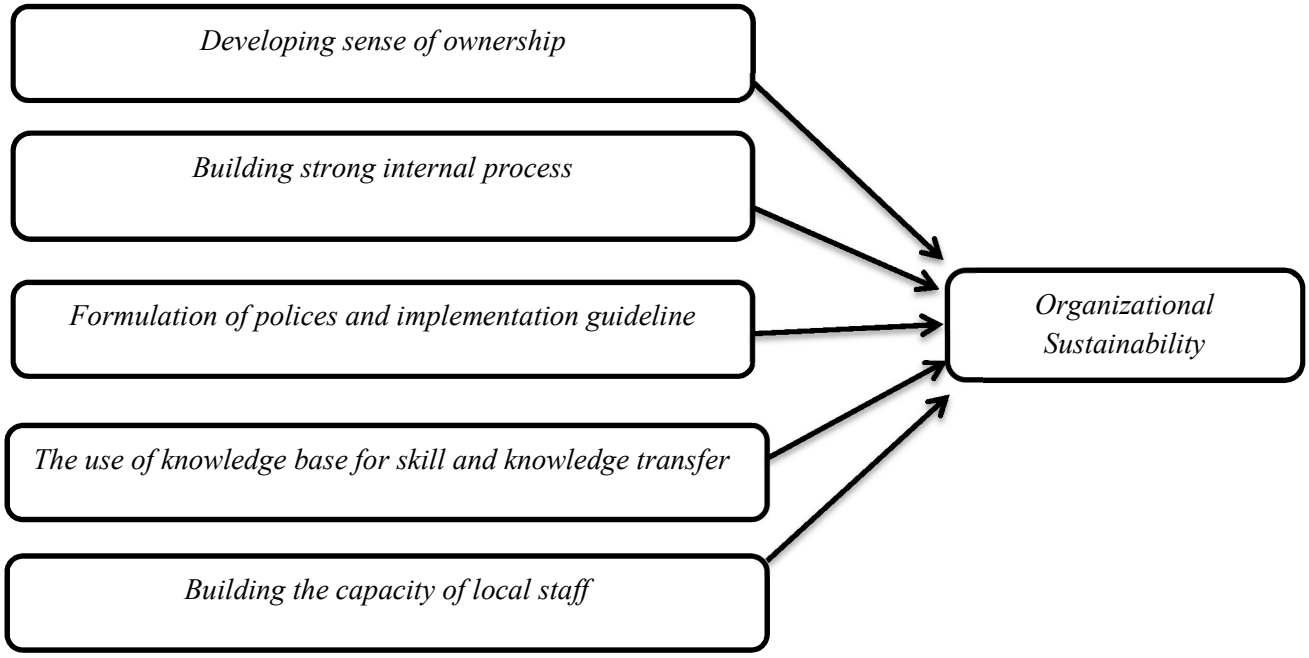
Regarding the technological sustainability system quality which refers to the use of locally available technology infrastructure such as WoredaNet data and internet infrastructure owned by MinT is the most factor that determines technological sustainability. Meaning the video data network connectivity is reliable even though there is no internet connection since the WoredaNet is a separate VPN than a shared internet network. If the ICT infrastructure for eHealth is built and developed on privately rented facility the infostructure will be dismantled by the time the project is phase out however if the infrastructure is built in publicly owned and project owners premises the owner and other partner will take use the infrastructure to ensure the sustainability of project. Developing a redundant backup data centers (at national and regional level) to ensure the sustainability of core wordnet ICT services and selection of self-resilient technologies that will meet currents and future demand are also important for technology perspective of eHealth sustainability.



Proposition #2: Developing sense of ownership, building strong internal process, formulation of polices and implementation guideline. the use of knowledge system for skill and knowledge transfer and building the capacity of local staff positively affect organizational sustainability ICT4D projects.

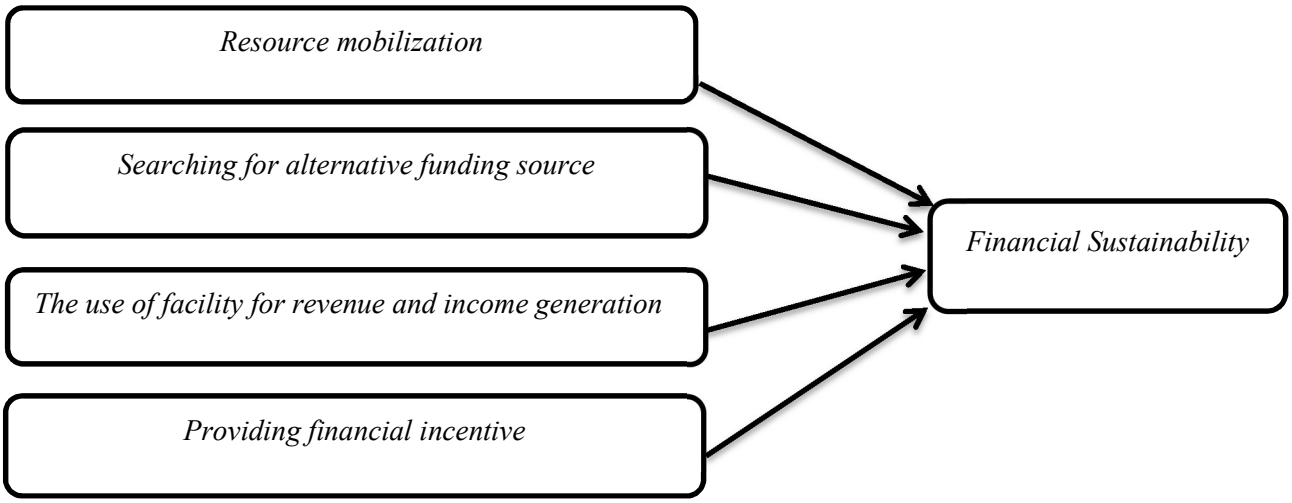
Stakeholders such as project owner should be willing to take the project ownership considering the future benefit for the society at national level. The ability of organizational structure, technical performance level to assist and support the project objective. Integration of internal management process and technique sustainability in their plan, monitor, evaluate, and control throughout the lifecycle of the project. Building and implementing strong internal organizational process that is tailored ICT4D project sustainability management in planning, execution, monitoring & evaluation, and controlling throughout the lifecycle of the project is also important level of engagement

Stakeholders especially the project implementer, in collaboration with the project owner, central and regional government, should be engaged in capacity building district level ICT staff. Also, when the regional and district office hires and assigns ICT professionals, they should select the right qualified ICT personnel for the position and especially in developing sustainable human resource skills and capacity building. Developing and use of capable knowledge base organizational system to ensure the utilization and transfer of technical skills. This will help to ensure the continuity of the ICT4D project service keep running when the project staff left.



Proposition #3: Resource mobilization, searching for alternative funding source, the use of facility for revenue and income generation, and providing financial incentive enhance ICT4D project sustainability.

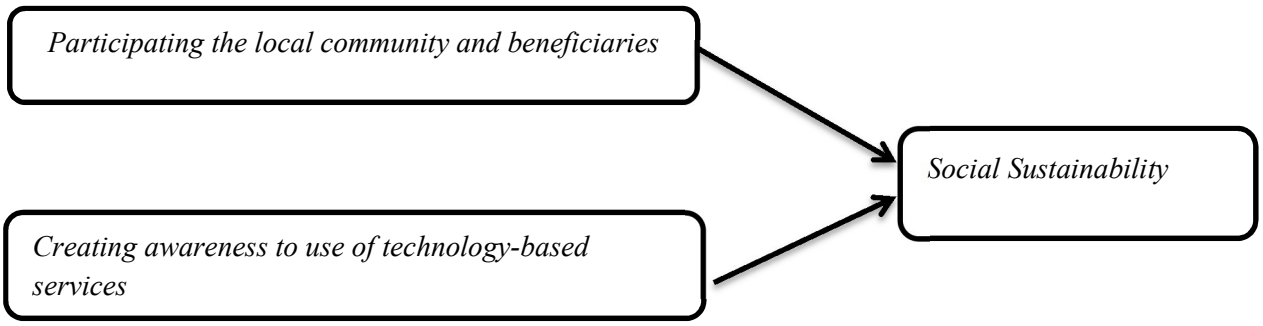
Mobilizing available resources such as material, financial, and human resources to ensure the continuity of the service especially with increasing pressure for domestic project needs will create new and cost-effective solutions is explored, For instance in this project case ,ALERT uses already allocated financial resources with a fixed-obligation grant, the use of all resources such as renovating local faciality to avoid resource duplication, Mobilize budget from internal, and searching other sources of funding from FMOH- Grand Challenge and UNOPS – TB Reach were the means to ensure the continuity of financial needs. Besides the state-of-the-art video conferencing facility was used to generate income by providing service to clients that demands the video conferencing facility for conducting training, meeting and conference with remote participant. Providing financial incentive to WoredaNet ICT coordinators also a means to encourage and engage during the project activity.



Proposition #4: Actively participating the local community and beneficiaries and Creating awareness to use of technology-based services ensure social sustainability.

This study identified that participating the community such as professional association in standardization of activities to meet the demands of project beneficiaries was also a means to ensure the social sustainability dimension. This was achieved through active participation of beneficiaries and community engagement considering the fact that they are the integral part of ICT4D project. Besides RHB was engaged in sensation technology use for local community. This will increase the

understanding and awareness in relation to the use of technology in their day-to-day activity in order to produce impact.



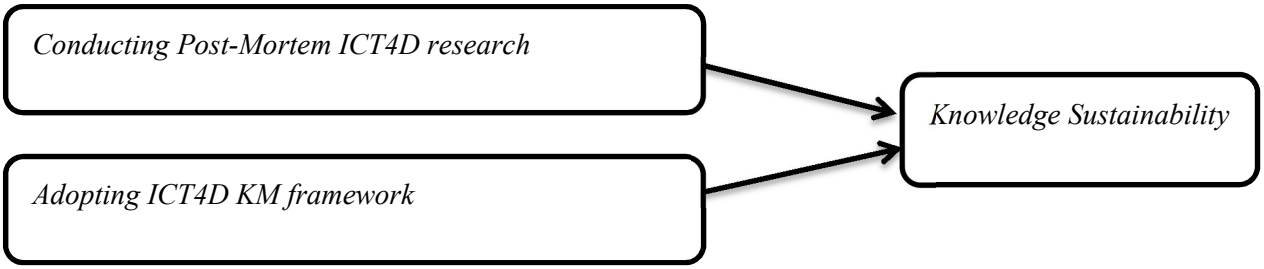
Proposition #5: Active commitment of Leadership and management in advocating the national diction of digitizing result political sustainability.

In this study it was indicated that ALERT management board of directors and leadership have played a pivotal role publicizing and advocacy for the clear benefit of the society and alignment with the alignment of project service with national strategic direction. It was also inferred that the engagement of FMOH management and leadership to advocate the alignment of the project activity with the current digitalizing direction set by central government.

Proposition #6. Conducting Post-Mortem ICT4D research and Adopting ICT4D KM framework contributes to knowledge sustainability.

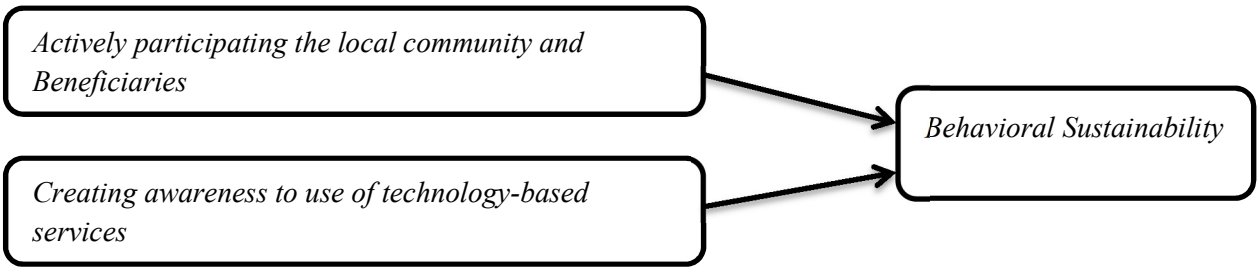
The research also investigated that knowledge management (KM) issue is the most overlooked dimension of the sustainability of ICT4D project. Adopting knowledge management life cycle as creation, storing, sharing and application for ICT4D project significantly contribute the knowledge sustainability. Knowledge makes a difference in making the project sustainability by learning a lesson from other project success and failure. Besides KM enables the project to learn from failure lessons and correct the mal-practice and adopt the bench mark practice. One possible way that a stakeholder

should do is to engage themselves in conducting post-mortem ICT4D research as a tool to a acquire a very good insight about the causes for failed project.



Proposition #7 Actively participating the local community and beneficiaries and Creating awareness to use of technology-based services positively affect behavioral sustainability.

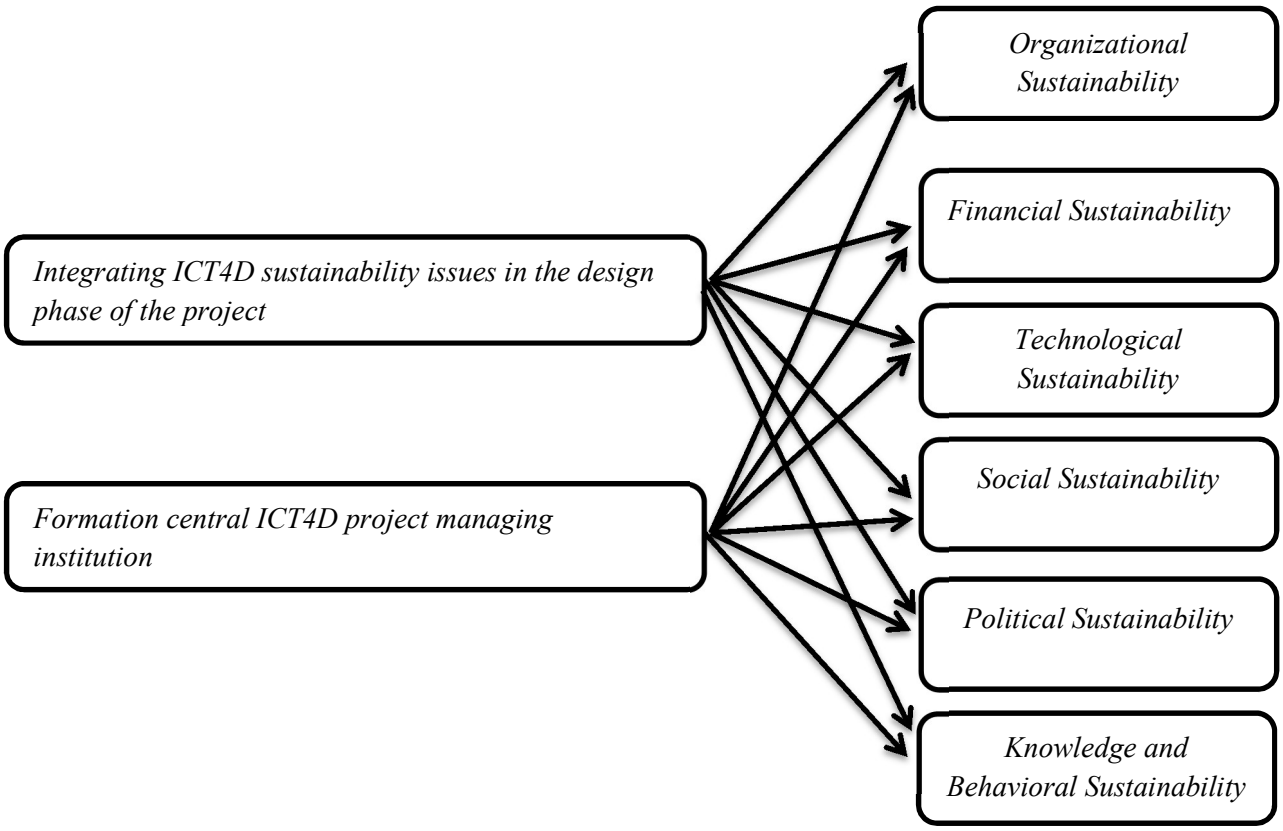
The study also pointed out that the attitude of the patients and health worker towards the benefit and the use of digital technology can be improved by creating awareness. Hence stakeholders should engage themselves in sensitization of technology use to enhance the perception of the user (Patients and health worker) to towards the benefit of digitalization of health care and training services. In this study it was also identified that project owner, implementers and regional bodes were involved in creating awareness.



Proposition #8. Integrating ICT4D sustainability issues in the design phase of the project and formation ICT4D project managing institution ensure overall sustainability.

If sustainability issues of ICT4D project are addressed at the end of project or are not initially integrated in the design phase the sustainability will not be achieved. In this regard the study identified that the concern of sustainability was initially incorporated in the project design phase. If the issues of sustainability are integrated in the design phase the indicator for sustainability can be measured, evaluated, and controlled trough out the ICT4D project lifecycle. Like any project have objective that is monitored and evaluated, sustainability has its own objective and performance indicators that can

also be monitored and evaluated. And hence incorporating sustainability agenda at project initiation will avoid the adverse and unintended project impact. Beside the formation of central organization which is responsible for managing ICT4D project is a good mechanism to synergize and centralize the effort of stakeholders' engagement in one umbrella. The organization will be accountable for the continuity of the service despite the fact that the project input or resource are disconnected. These two areas of stakeholders' engagements are important to ensure the over all ICT4D project sustainability.



CHAPTER SEVEN

CONCLUSIONS AND RECOMMEDATION

The objective of this research is to develop a theoretical framework that will provide an answer to the stated research question based on the qualitative study. The previous discussion section demonstrated how the finding is related to the literature of domain knowledge of ICT4D project sustainability and its improved and sustainable impact. This section will try to conclude the work by answering the research questions and outline a recommends. Finally, it summarizes the limitations of the research and proposes a research agenda as an opportunity for future research.

7.1.Conclusion

The purpose of this study is first and foremost to propose a conceptual research framework and based on the proposed conceptual research framework to develop a theoretical framework on the role of stakeholders to foster the sustainability of ICT4D projects. A particular sustainable case of the eHealth Project is selected to meet the study objective. The previous three chapters provide the analysis, the discussion, and the finding, as well as the theoretical framework developed. This last chapter briefly presents the conclusion contributions of the study. Finally, it summarizes the limitations of the research and proposes a research agenda as an opportunity for future research.

It was highlighted in the introductory part that sustainability could be accomplished from the different viewpoints for ICT development projects. A recent study has shown that sustainability is not well researched concerning stakeholder position and engagement. Being Ethiopia is one of the developing countries, and most of the ICT projects in the health sector are donor-funded. The role of stakeholders, in this case, should be further explored. In this regard, there are two fundamental research questions raised in this study to arrive at the full deliverables.

The literature section discussed the two theoretical dimensions and lenses to understand the role of stakeholders objectively, how they are handled, and assess the impact of sustainability of ICT4D initiatives. Such theories are the theory of stakeholders and the approach to capability. Accordingly, the literature examined and suggested that current ICT4D stakeholder interactions and roles need more refinement of theories/models/frames to understand better how stakeholder roles are handled and advocate the need for a new theoretical dimension in understanding their interactions better. In order to meet the research agenda, a sustainable eHealth implementation framework of Fanta and Pretorius (2018) was selected to develop the conceptual research framework as a blueprint to conduct the study.

The methodology section depicted the research strategy component: a single case study that intended to identify and formulate the proposed theoretical proposition for stakeholders' role towards ICT4D sustainability. Following the thematic analysis was employed to develop a theoretical framework.

The last chapter tried to answer the leading five questions that will enable us to answer the final two research questions. In the subsequent section, the consolidated version of the leading question will be presented and provides profound understandings, the main research questions from the perspective of the primary deliverables of the case study.

- *How do stakeholders the role of stakeholders look like concerning the sustainability of ICT4D projects?*

Evidence from the most literature showed that many factors affect the sustainability of ICT4D projects. Among the several factors that convert the input to the impact of sustainable ICT4D Project is stakeholder engagement (Bass et al. ,2013; Fanta & Pretorius 2018). Based on the sustainable eHealth implementation framework by Fanta & Pretorius (2018) and the proposed research framework in section 2.8 that, it starts with answering the question one. Besides section 2.18 discussed that in-development projects, to map and manage stakeholders' roles by categorizing into power and interest or influence vs. importance. The first themes suggested that the stakeholder engagement measured financial, non-financial, level of stakeholders' satisfaction, internal organizational process, and learning & innovation rate.

The study showed that the essential factor for VCBL & Telemedicine project 's stakeholder engagement measurement is a financial/economic indicator. Equally mentioned, but that should not be detached with financial indicators, is the institutional internal process quality indicator. Taking full ownership of the project, particularly as endorsed by the project owner, is the critical indicator description that measures the level of engagement. The stakeholder satisfaction indicator should also be measured from the perspective of government, funders, project implementers, and beneficiary view. The innovation and learning rate are also the vital measurement of stakeholders, especially the lesson learning capability is critical for knowledge management.

The study also revealed that the high power and high-interest stakeholder played a significant role in terms of the funding commitment to ensure the continuity of the service. The project owner played a

pivotal role in resource mobilization, ownership accompanied by leadership & management commitment, and internal process effectiveness. The government and funding agencies were also informed, consulted initially from the inception of project initiation through each phase. Appropriate technology selection and adoption by these stakeholders are also essential stakeholders' roles together with the deployment of the knowledge management system to improve the performance of the project service.

Stakeholders whose interest is relatively low but has significant power are critical for the day-to-day activity of the project. They are working on a partnership basis, and they are involved in their interest area, and excellent communication increases their level of interest in order to produce a better output. The zonal and woreda level ICT offices should be equipped with a power backup generator to ensure service continuity without interruption.

What makes the project initiative sustainable and being considered in the eyes of the government and funding agency is the role of high inters and low power mapped stakeholders. Notably, local In-Service Training and Individual consultant level of engagement, their increased eagerness to adopt the innovative approach towards the center of excellence creates attention by government and funding agency.

One of the key challenges mentioned in from the participant of MinT is the knowledge gap between Central ICT professionals at the National Data Center of MinT, Regional, zonal, and WoredaNet facilities. Zonal and Woreda level ICT coordinator should also increase their level of ICT knowledge since it will narrow the knowledge gap between project participants at MinT and National/Regional Data Center. To this end, the project implementer, in collaboration with the central and regional government, should be engaged in capacity building district level ICT staff. Also, when the regional and district office hires and assigns ICT professionals, they should select the right qualified personnel for the position.

Providing financial incentives also increases their level of motivation. This one of the project implementation approach to provide top-up payment as an incentive for the ICT support service they provide. Also evidence from Lessa (2015) justified that the provision of incentives for ICT personnel as part of the workplace assessment program and in relation to their performance and institutional acknowledgment of ICT will help to increase their career engagement. This will increase their level of engagement and interest as they are mapped in low interest and low power.

The study also showed that financial sustainability and organization sustainability dimension is the important dimension of the project service sustainability dimension when it comes to the ICT4D project in the eHealth application area. The funding contribution, allocation, and mobilization are the critical factors that determine the economic sustainability dimension. The key stakeholder, such as Government bodies (FMOH), Funding agency (USAID), and implementer (MSH), the project owner (ALERT), played an important role in taking financial sustainability by allocating and mobilizing internal budget when external funding sources are disconnected. The other identified dimension of financial sustainability is the use of the facility as revenue and income generation to support running expenses. Organization sustainability is also the next most important sustainability dimension for the project service once the financial sustainability pillar is maintained.

- *How can stakeholders' role influence and managed for improved and sustainable impact through a sustainable ICT4D project?*

An improved and sustainable impact of the ICT4D project will be achieved if the existing effort is scaled up. Various literature showed that the best way to understand the role of stakeholders towards a sustainable impact on individuals and society. The level of stakeholder engagement should be investigated on each lifecycle of IS through output, outcome, and impact stage. The selected case project case is believed to be potentially sustainable. The study identified stakeholders' role at each stage, particularly from inception, implementation, result, outcome, and impact.

Hence, once we have answered the research question one, the next thing is to understand the role of stakeholders to maximize the result of the project service. Accordingly, it is critical to identify the initial output of the project that is the first use of technology. In the second place to it is essential to identify actual measurable results such as the number of a health professional trained and the number of patients treated and case consulted by the project. To this end, stakeholders of the highly influential and interest such as government bodies (FMOH) should formulate strategy, policy, and guidelines, mobilize resources, build their human resources capacity and provide ongoing support and coordination with regional to leverage the output. Project owners (ALERT) should play a pivotal role in scale-up and expand the project service, increase the project sense of ownership with leadership commitment, and increase the adoption to other disciplines. The project implementer (MSH) is also crucial in providing continuous financial support, technical guidance, and capacity-building support. Concerning the project implementer, in collaboration with funders, should work on searching alternative and additional grants to maximize the output. Regional bodies (RHB, Zonal, and

WoredaNet Offices) should also play a significant role in coordination, facilitation, and availing of a power backup generator for project activities. Lastly, the effort and eagerness of local In-service training centers towards working in twinning with the ALERT Training center to adopt the technology service as part of project initiatives can also be seen as a means to maximize the project output.

The strategic objective of the eHealth or digital health project service contributes to the impact set by the strategic objective of FMOH. One of the contributions of the project to impact is the improved quality of life, reduction in mortality, and equitable distribution of health care and services. Various literature evidenced that the sustainable impact of ICT4D project service contribution is achieved through the improved performance outcome measured in the sector. Accordingly, the case study showed that improved quality of TB clinical service is the primary outcome of the project through the development of skillful health professionals. The reduction in workplace displacement and the cost of training are also an important outcome indicator to be measured. These two performances outcomes avoid disruption in health service and increase cost saving. Equitable distribution of health care and service is also the other performance measure of outcome achieved. These are achieved through the provision of telemedicine services.

In this regard, in order to increase the performance of project outcomes, key stakeholders should continue what they have played in improving the result of the project output. Besides, they have played a role in mobilizing resources that provide ongoing support and coordination with regional bodies. Above all, stakeholders should ensure ownership and localization of eHealth ICT infrastructure, the use of knowledge base, and linking the project with research activity. The roles mentioned above should be the typical role of the project owner (ALERT) to improve the project outcome and enhance project performance. Regional bureaus should also engage in sensitizing technology utilization by health professionals as part of improving the health care service.

This study discovered that the lion share of the role is expected from the primary stakeholders who are high power and high interest. First and foremost, sustainability issues should be thought at the initial design phase of the ICT4D project and should be an integral part of the project. The Key stakeholders should begin ICT4D project sustainability with the end in their minds. Like the project has its objective. Sustainability has its objective that should be measured, monitored, evaluated, and controlled at each phase of the project. In order to bring improved impact, sustainability should not be thought of when the project is approaching to phase out. In line with the effort to sustain the

improved ICT4D project impact key, stakeholders should play a pivotal role in sustaining the impact indicator at scale on other social and community settings.

The other key role identified in this study concerning improved and sustainable impact is the engagement towards the sustainability of knowledge. Stakeholders should advocate and enhance the culture of the Knowledge Management System (KM) system. Employing an appropriate KM lifecycle as creating, storing, using, transfer, and sharing will significantly contribute to the sustainability of knowledge and skill in the ICT4D project area. Not only is KM important for the organization to sustain the service, but also KM enables the organization to learn lessons from failed ICT4D and develop action plans on how to correct the mal-practice.

Concerning role towards knowledge management, conducting post-mortem ICT4D Research will capitalize on the sustainability of the improved impact of ICT4D project by investigating the reasons, understand, and learn a lesson on the failed project to avoid malpractice of project management issues. The research output can also be one of the roles as part of the knowledge sustainability role.

Establishing a redundant ICT service and selecting resilient technology by the MinT is also a significant role in sustaining the improved impact of the sustainable ICT4D project. In line with stakeholders such as Project owners, implementers, and other stakeholders should align with the strategic vision set by MinT for the successful and sustainable adoption of technology. This project, for example, the contribution of this project can be but when it is initially thought it should be thought in the bigger vision of the country plan to adopt suitable technology and should be worked out with MinT as it a responsible government body for selecting and adopting sustainable ICT in Ethiopia. FMOH is also should work in a closer-tight with MinT in from the technology perspective. Implementers (MSH) and project owners (ALERT) should also be engaged in content development that can go with technology.

Beyond taking project ownership concept towards the organizational /institutional sustainability, engagement towards institutionalizing, Sustainability is also important that should be at the heart of the stakeholder role. Benchmarked the best practice of other countries who have a sustainable project, These countries established an organization that is responsible for managing the sustainability of the project for a better and improved impact on society. This organization of project sustainability is by itself is an institution that has a separate legal entity responsible for ICT4D project sustainability. The money required to run sustainability activity comes from the project funders. It means funding and

donor agencies should also invest initially to address the issue of ICT4D project sustainability. The donors and funding agencies should work with government agencies in setting up an institution the is primarily responsible for the sustainability of the projects. This also holds not only for the ICT4D project but also for other development-oriented projects. This institute will also monitor, evaluate, and control the sustainability indicators at every stage of the project life cycle to ensure the improved and sustainable outcome of the project.

If we leave the issue of sustainability for the project implementers, they might window dress the sustainability issue as will practically be sustainable. This is because an inconsistent data and indicators presented in the closeout report will only reflect the aspect of project success. The question of sustainability should not be left only for one stakeholder, The question from this perspective should be given for independent and separate institute for monitoring and evaluation, controlling and ensuring organization in Ethiopia?". To conclude, sustainability should be the concern of All stakeholders, be it funding agencies, implementers, project owners, ministries, regional health bureaus, etc...). If sustainability issues of ICT4D project are addressed later or are not initially monitored, evaluated, and controlled, then there will be a significant waste or loss of resources. As a result, the project can have an adverse and unintended impact.

7.2.Contribution of the study

Initially, the study was based on the work of Bailure (2007) and Fanta and Pretorius (2018) on a sustainable ICT4D project lifecycle to develop a conceptual research framework on how to understand the role of stakeholders. As guided by the proposed conceptual research framework, this research qualitatively identified the role of stakeholders on each stage because stakeholder engagement is one of the process factors that converts the input to a sustainable individual and societal impact. The second contribution of the study used a stakeholder theory as a lens to investigate the role of stakeholder and capability approach to see the impact of sustainable ICT4D projects on individuals and society and proposed and developed theoretical framework.

The third contribution of the study is beyond the generic and iterative identification of stakeholders, and this study employs a snowballing technique for identifying stakeholders as key informants in the study. The fourth one is, once the sustainability dimension of the project service is well explored, further identification of the role of stakeholder for sustainability using the bottom-up approach is employed to identify the subunits of stakeholders concerning the sustainability pillar. Sustaining ICT4D projects should not only be seen from the perspective of surviving the project but also the stakeholder role should also be viewed from the perspective of exerting effort to maximize the impact and ensure sustaining the improved impact.

7.3. Future Works

- The study further developed and proposed a theoretical framework that will show how the stakeholders' role looks like for the ICT4D project and how the stakeholders influence and engage themselves in attaining a sustainable impact. Accordingly, a further quantitative study needs to be performed in order to test empirically understand the relationship and the magnitude of the correlation between the stakeholders' role and stages of the ICT4D project lifecycle on another study setting.
- The study employed a single-stage to know the first-hand, correct terminology, and meaning of the underlying phenomena on the role of stakeholders. Further two stages or employing multiple cases can be used to see variations, differences, and the correlations between scenarios. Furthermore, multiple-cases design can be used to predict contradictory results for anticipated purposes or to predict similar findings in studies, further exploration, and comparison role of stakeholders.
- In-depth exploration of how stakeholders affect the sustainability of an ICT4D initiative can be studied in the future considering the stages of the “ICT4D life cycle” and the “role” as a unit analysis. Especially more focus should be given on the impact stage to match with the context of attaining improved sustainable impact through ICT4D projects.
- A further qualitative study can be done to identify the enablers and disablers of the stakeholders' role in each lifecycle of the ICT4D project life cycle.

7.4. Limitations of the study

- The study scope of the study is limited on the eHealth project, which is potentially sustainable at the ALERT center using a single-stage case study setting that employs the eHealth practice in conjunction with health professional capacity building that needs scale up.
- Due to time constraints, an empirical study is not employed to complete the full picture and understand the magnitude of stakeholder's roles as a justification for the qualitative evidence.
- The usability of the proposed conceptual research framework and theoretical framework is applicable in the context of developing countries like Ethiopia. The proposed framework can also be used by researchers as a tool to understand the role of stakeholders in projects at project initiation, execution, and post-project closeout stages. In addition, they can use the framework as an initial working theoretical theme to evaluate the influence of stakeholders' role on the long-term sustainability of ICT4D projects that result in benefits for individuals and society.

7.5. Recommendation

In order to ensure the sustainability of ICT4D project from the perspective of digital health or eHealth application, we need to question that how stakeholders should "create the sense of ICT4D project ownership and localize eHealth ICT infrastructure"," formulate strategy, policy and guideline ", "produce and build good internal organizational process", "Scale-up exiting project service and sustain the impact at scale", 'mobilize resources such as financial, material, and human", "active participation of beneficiary and community," "build local leadership commitment", "knowledge and skill are managed and sustained," "research activity is linked with the project", "to align with the country's ICT strategic vision," and "centralize their effort towards establishing a project suitability controlling organization" in order to influence an improved and sustainable ICT4D project's service impact.

Hence, stakeholders should have a sense of team building and committed their leadership towards sustainability. Sustainability is the primary concern of our country; as a result, stakeholders should have a sense of nationality who works for the benefit of society. Although stakeholders have a different role, they should work for the same goal. In this particular case central government, project implementers, funding agency, project owner, technology and innovation ministry, regional government, projects, vendors, In-service training centers, community, WoredaNet ICT offices,

individuals, beneficiaries and ALL should work for the country to harness the power of ICT to promote development.

The role of stakeholders should be analyzed and managed using the lenses of stakeholders' theory and project stakeholder's management techniques so that it will produce a better and sustainable impact. Stakeholders should form a high performing team to sustain the impact. Teaming effort should include the five stages of forming, storming, norming, performing, and adjourning (Galan et al., 2008). The fact that stakeholders have a different and variable role, stakeholders should work for the same goal. If we leave the issue of sustainability for the project implementers, they might window dress the sustainability issue as will practically be sustainable. This is because an inconsistent data and indicators presented in the closeout report will only reflect the aspect of project success. The question of sustainability should not be left only for one stakeholder, the question from this perspective should be given for independent and separate institute for monitoring and evaluation, controlling and ensuring organization in Ethiopia?". To conclude, sustainability should be the concern of All stakeholders, be it funding agencies, implementers, project owners, ministries, regional health bureaus, etc...). If sustainability issues of ICT4D project are addressed later or are not initially monitored, evaluated, and controlled, then there will be a significant waste or loss of resources. As a result, the project can have an adverse and unintended impact.

7.6. Publication Emerged out of this Research

- Andualem Aklilu, Lemma Lessa, and Solomon Negash (2020) "Understanding the Role of Stakeholders in Fostering Sustainability of ICT4D Projects: Towards a Conceptual Framework," *Twenty-sixth Americas Conference on Information Systems (AMCIS2020)*. (Accepted for publication).

Note: This is a conceptual research-in-progress paper that was submitted to the Americas Conference on Information Systems (AMCIS 2020) in the "*Emergent Research Forum (ERF) Paper*" category. It was submitted to the conference in the middle of this thesis research (*prior to the actual data collection*). The acceptance letter from AMCIS 2020 is attached as Appendix VI.

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APPENDICES

Appendix I – List of literature evidence on the stakeholders' Roles in the sustainability of ICT4D project

Role of Stakeholder in ICT4D Sustainability	Research Title and Source	Identified Stakeholders
"Ongoing active participation needs all stakeholders to be interested."	ICT4D 2016: New Priorities for ICT4D Policy, Practice, and WSIS in a Post-2015 World. Source: (Heeks,2007: p17) & Heeks (2015: p33).	International or national NGOs, UN agencies, New Actors (Private firm, Partnership (such as private-government, local-international, etc.), Virtual organizations.
"Needs a shared understanding of goals, viewpoints, aspects of importance, and advantages to be included with all stakeholders."	Sustainability Framework For E-Government Success: Case of WoredaNet Services in Ethiopia Source: (Rowley, 2011; Lessa, 2015: p 30)	ALL Stakeholders
"actively involved in scope identification and in initiation. (World Bank 2010) -	Role of Stakeholders' Involvement in Sustainability of Constituency Development Fund Projects in Kenya Case of Nakuru Town East Constituency. Source: (Ouma, 2017: p4)	Project managers (the agents) Decision-making authority Principal Project Management Committee Beneficiary community's

"Consider the ICT infrastructure as part of the integral component and as long-term city planning." "Search a new use for a public-owned facility or simply proposing changes in planning or design."	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders' engagement in smart, sustainable cities Source: (ITU, 2015: p13)	Planning Unit
"Avail the ICT infrastructure to support and integrate SSC services. It has to be standard, compatible, and scalable." "Research and innovate to provide better technical solutions." "Develop innovative and financially sustainable business models."	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders' engagement in smart, sustainable cities. Source: (ITU, 2015: p28)	ICT companies (e.g., telecom operators, start-ups, software companies)
"Develop a science of cities, to study them as the complex systems they are " "Participate in SSC standardization activities." "Drive research and innovation in fields related." "They have to include the social aspects of the debate." "Assist managers and policymakers with the transition to the new model regarding measuring methods, baseline definition."	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders' engagement in smart, sustainable cities Source: (ITU, 2015: p28)	Academia, research organizations, and specialized bodies

“Design and formulate the framework.” “Identify standardization gaps.”	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders’ engagement in smart, sustainable cities Source: (ITU, 2015: p31)	Standards Developing Organizations (SDOs)
“Define legal frameworks and policies “ ” managing and promoting the implementation of "smart regions." “To facilitate ICT technology competition and development.”	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders’ engagement in smart, sustainable cities Source: (ITU, 2015: p26)	National and regional governments
“Provide funds.” “Provide technical assistance and documentation.” “Develop knowledge exchange platforms.”	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders’ engagement in smart, sustainable cities Source: (ITU, 2015: p29)	International, Regional and Multilateral Organizations
“Provide their expertise to collaborate with municipalities and ICT companies to develop integrated collaborative models.” “Change towards "smart" and "KPI-based" city service models.”	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders’ engagement in smart, sustainable cities. Source: (ITU, 2015: p27)	City services companies

"In some cases: create a new service that covers a new or an uncovered urban need."		
"Bring the SSC issues to the table for debate." "Build spaces for discussion." "Facilitate financing options for the development of SSC."	ITU-T Focus Group on Smart Sustainable Cities Setting the stage for stakeholders' engagement in smart, sustainable cities. Source: (ITU, 2015: p29)	Industry Association
"The alignment of resources, interests, and responsibilities is crucial to avoid duplication of effort in addressing the health and management problems." "The actors involved in one way or another with the HIS have roles to play either technically, financially or operationally and their joint actions can be reflected in the sustainable development of an IT system." "The interests and resources of all involved actors must be aligned." "Developing a sustainable IT is a process whereby the involved stakeholders succeed by translating their interests into the development and use of IT" (Avgerou, 2003). "Exert effort to institutionalize the effort."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique. Source: Honest et al. (2006, p8)	Software Agency Ministry of Health (MoH) Donors International Monetary Fund, and Bilateral donors for the provision of fund Health districts and provincial Health directorate (ALL Actors)
- "MoH was given responsibility for the overall coordination of all activities relating to the HMIS, including	The challenges of sustainability of health information systems in developing	MoH

the training of health workers, and monitoring and evaluation of the nation-wide implementation." - "Build Human capacity."	countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Tanzania Case) Source: (Honest et al.,2006: p5)	
"Consequently, clients or citizens are themselves unclear about who is responsible for what."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Mozambique Case) Source: (Honest et al.,2006: p6)	Clients or Citizens
"management and administration of health services."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Mozambique Case) Source: (Honest et al.,2006: p5)	MISAU3 is the national authority (Ministry of Health of Mozambique)
"engaged in SIS administration tasks related to data."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Mozambique Case) Source: (Honest et al.,2006: p5)	clinical work, health staff

"donors could play a long-term role to assist user organizations in coping with changing demands and needs appropriately." Formulate "Long-term funding policy." Devise "Long-term strategies to ensure institutionalization of processes fully." A bottom-up strategy involving top-level managers. Engage in "Local human capacity building through expertise, experience sharing, and training."	The challenges of sustainability of health information systems in developing countries: Source: (Honest et al.,2006: p8)	Donor
"Develop both strategic and operational organizational needs." "Create reliable data sources and infrastructural resources." "Cultivate a habit of information dependence and use." "Plan for the institutionalization of IT processes through organizational change." "Build skills and local capacity to adapt to the new organizational changes." "Decentralize the decision making to allow for user participation to Participate in the mobilization of resources for long-term IT support Integrate processes and needs to avoid duplication of efforts and resources." "Conduct regular evaluation and assessment of IT."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both Case) Source:(Honest et al.,2006: p8)	User Organization

"The (HIS) system must be 'needs' and 'local people' driven and appropriate for sustained use and its evolution over time" (Misund and Hoiberg 2003).	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both case Case) Source: (Honest et al.,2006: p8)	ICT System Developer
-A collaboration between the local organizations and donors plays a key role to sustain the changes achieved in the long run since donors have funds, expertise, and experience -A donor should not bypass a local organization	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both case Case) Source: (Honest et al.,2006: p8)	Donor & Local Actors
The local organization needs to have control over the software development process to shape it to their particular needs	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both Case) Source: (Honest et al.,2006: p8)	Local Organization
"User participation from the inception of ideas of such systems, their initiation, design, development, and implementation are also required to develop gradual changes in user's understanding and to enable IT to become a normal way of doing the thing."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both case Case)	System Users

	Source: (Honest et al.,2006: p8)	
"The major factor that we found to contribute to the development of unsustainable HIS is the misalignment of the interests, roles, and responsibilities of the actors involved in the process (the donors, developers, and MoH). Effective collaboration between these actors is fundamental to sustain the changes achieved in the long run."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both case) Source: (Honest et al.,2006: p8)	Donor, Developer, and MoH
"Managers need to upgrade their skills for better management of information flows and planning. To build and retain human capacity, there is a need to build a conducive working environment not only for organizational but also for group and individual benefits."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both case Case) Source: (Honest et al.,2006: p8)	Managers
"user skills should be viewed as a continuous process to allow users to learn from their experience and to change course when required." "conducive environment implies better workers' benefits, incentives, and work procedures created by the involved actors in response to performing their attached responsibilities."	The challenges of sustainability of health information systems in developing countries: comparative case studies of Mozambique and Tanzania (HIS) & Mozambique (Both case Case) Source: (Honest et al.,2006: p8)	MoH, in collaboration with donors,
Effective collaboration between these actors is fundamental to sustain the changes achieved in the long run.	The challenges of sustainability of health information systems in developing countries: comparative case studies of	Donors, Developers, and MoH

	Mozambique and Tanzania (HIS) & Mozambique (Both case Case) Source: (Honest et al.,2006: p9)	
- "Established trust and support among the local community." - "Introduced the project team to the community, which established a dialogue between the team and community members." - "Delegate staff to bridge between SVM and Project team to the community." Avoid delays in the payment and finance process. Formalize the agreement and define roles & responsibilities.	Unpacking Actor Interactions in ICT4D Ecosystem Reet Kaur & Ashir Ahmed 2019 Case: IT for social impact Project-India site Source: (Kaur, 2019: p5)	SVM - Local partner
"Conducting short meetings and direct conversations among the team and with delegated actors from SVM helps overcome some bottlenecks like language barrier and eases volatility."	Unpacking Actor Interactions in ICT4D Ecosystem Reet Kaur & Ashir Ahmed 2019 Case: IT for social impact Project-India site Source: (Kaur and Ashir, 2019: p6)	Foreign expert
Through the introduction of new innovations, they play a role in inscribing and fostering other actors 'interest.."	Unpacking Actor Interactions in ICT4D Ecosystem (Kaur & Ahmed, 2019) Case of: IT for social impact Project-India site	Project Director

	Autor: (Kaur and, 2019: p7)	
"In their position as community officials, local leaders, planner and public servants have integrated aspects of sustainability into the vision of a project that conforms to the SD general discourse (Partridge, 2005; Hansson, 2010)"	Stakeholders' Views on ICT And Sustainable Development: Case of In An Urban Development Project1 Autor: (Malin, 2014)	Local Politician
" ….often requires a number of stakeholders to engage themselves in the planning process and achieve the goal of social sustainability.."	Stakeholders' Views on ICT And Sustainable Development in An Urban Development Project Autor: (Malin, 2014) The Urb@n Case	Architect and planning unit
-Establish and map the stakeholder level's communication pathway aimed at linking Practice-Research-Policy. To achieve this, all stakeholders should play a significant role in establishing a communication platform at a different level: Management-Level Stakeholders, Operations-Level Stakeholders, and Beneficiary -level stakeholders.	Multi-stakeholder Perspectives influencing Policy-Research-Practice Source:(Chib et al., 2013: p133)	Funding Agencies and Implementers
A PIU-designated project office usually conducts a large number of technical tasks including comprehensive design, and monitoring and reporting to ADB and other duties such as training management.	The Role of Project Implementation Units, ADB (2005, p1)	Project implementing Unit (PIU)
"Assessment of Sustainability Knowledge (ASK) and the Sustainability Attitudes Scale (SAS) an important diverse	Knowledge and Behavioral sustainability Adam Zwickle and Keith Jones (2018)	Research Project Stakeholders

set of hypotheses and push the field to create cutting edge, sustainability-oriented theories.”		
-Given the above-mentioned dependency on ICT for vital transactions, the resilience of ICT backbones, networks, and systems should be considered as the priority in network and infrastructure development.” - Therefore, it is important to ensure that enhancements and improvements to satisfy the demand of users, while redundancy is to be considered not just for the usual management of network traffic but also for ICT resilience efforts. - To expand e-resilience needs to be taken care of in early development and planning of telecommunications infrastructures, in particular backbones and access networks in order to meet people impacted by disasters on a wide scale and to take advantage of the evolving technologies. Networks to enable disaster-resilient applications and systems must be designed from the beginning. Improved networking in backbone infrastructure, including concepts of peering and redundancy through meshed networks,	Enhancing E-resilience of ICT Infrastructure: Gaps and Opportunities in Disaster Management Technical Brief by the Information and Communications Technology and Disaster Risk Reduction Division Autor: Atsuko Okuda, Chief, Matthew Perkins, and Seung Yeon Kwak	UN-ESCAPE (2016, p13) UN-ESCAPE (2016, p14) UN-ESCAPE (2016, p24)

would dramatically enhance the ability of such infrastructure to enhance disaster management.		
"to improve the prospects of achieving sustainable outcomes by addressing specific questions from the very start of project design, or, in other words, by beginning with the end in mind."	Beginning with the end in mind: implications for project design. Journal of Development Effectiveness. Carvalho, Soniya & Perkins, Gillian & Reid, Gary. (2015, p1).	Key Stakeholders (Funders, Implementers, Government, …)
Developing and implementing more effective solutions requires specific behaviors and innovative approaches to small-scale / pilot projects. 1) continuous and substantial involvement by stakeholders has affected the design and implementation significantly. 2) multi-sector project is dynamic, and consistency is difficult in the initiatives, 3) projects that address a sharply felt need experience substantial pressure for scale-up, even before their effectiveness is established. Implicit in this paper is the recommendation that other projects would also benefit from applying a scale-up perspective from the outset.	Beginning with a sustainable scale-up in mind: (Laura et al., 2014)	Key Stakeholders

"We are further promoting a wider conceptual framework that we define as four major social company education topics, namely creativity, impact, sustainability, and scale." "The iterative aspect of design thinking allows the need to scale broad and deep so that students are able to use continuous input from the piloting processes to launch new ideas that support social projects and apply them to other societies and contexts in the immediate community."	Designing with purpose: Advocating Innovation, Impact, Sustainability. Jill et al. (2018).	This involves interviewing and engaging key stakeholders (community leaders, government officials, potential beneficiaries, other social enterprises, etc.)
"The need to incorporate sustainability in order to achieve organizational strategy and to meet stakeholder needs over the entire project life cycle. It can also be done with a professional sustainability project management team. "The research showed that the institution was considered the most important factor for taking concrete action in the constructive management of all the three pillars of sustainability through a good institutional facilitator."	Project sustainability management: Risks, problems, and perspective. Gachie, Wanjiru. (2019, p1).	key stakeholder
Recognizing the international post-mortem lessons learned could increase awareness of the application of the international project resolution benchmark in the early phase of IT projects.	Increase the success of Governmental IT-projects (Gaikema et al., 2019, p1)	Key Stakeholders (Government, IT Project owners, implementers, etc.)

Students are relaxed and comfortable in an ICT environment, and the combination of this with self-paced student-centered learning along with traditional classroom learning will help enhance learning, thus improving the academic performance of students as a whole.	Soyemi, Jumoke & O.I., Ogunyinka & Soyemi O.B, Jide Soyemi. (2012). Integrating Self-Paced e-learning with Conventional Classroom Learning in Nigeria Educational System. Mediterranean Journal of Social Sciences.. 3. 127-133.	Project implementers, owners, Schools, Training centers, government

Appendix II – Consent Form

Consent Form

Dear Study Participant,

My name is Andualem Aklilu, and I am a postgraduate student at Addis Ababa University, School of Information Systems. Mob.: +251911628955, email: andualem.aklilu@gmail.com, I am conducting a research on the area ICT4D Sustainability area.

This consent form contains details of the purpose of research, a description of the involvement required from you & your rights as a participant, and the interview question. The research focuses on one of the existing ICT4D projects (eHealth), i.e., Video conferencing based blended e-learning/Training and telemedicine (VCBL & Telemedicine) at the ALERT center. The project is selected as a sustainable ICT4D project in the eHealth application area. The interview will take 30 minutes, depending on the level of clarification and back & for questions.

The purpose of this study is:

- To understand how the role of stakeholder in fostering the sustainability of ICT4D Project look like and how it should be managed in improving the long-term the project impact.

The benefit of this research is to provide a general recommendation that will give an excellent insight into how the stakeholders' role and interaction should be viewed in sustaining ICT4D projects that are driven towards development. Besides, the finding of this study benefits stakeholders on how to strategically position themselves toward aligning their interests, power, strategies, and objectives among themselves to ensure the long term successful sustainable ICT4D projects.

The methods that will be used to meet this purpose include:

- One-on-one interviews

The interview has seven sections.

  - *Section 1: General and demographic question*
  - *Section 2: Level of project understanding, stakeholder identification in projects and what aspects of stakeholders' measurable attributes are essential to consider in the projects*
  - *Section 3: Understanding what aspect and features of ICT4D sustainability are essential to consider in ensuring the sustainability of ICT4D projects?*
  - *Section 4: Understanding of what role of stakeholder is important and identify how it affects the sustainability of ICT4D projects?*
  - *Section 5: Identification of the output of the project and outcome and what role of stakeholder should be important to maximize the output of sustainable ICT4D projects?*

- *Section 6: questions related to the aspect of project impact and outcome or performance factor need to be considered and measured by the stakeholders to improve the impact of a sustainable ICT4D project?*

You are welcome to request feedback or to show concern about the essence of the research and the methods I use at all times. Contact me at any time at the email as mentioned above or mobile number.

Our discussion will be recorded so that I can understand your insights in your own words accurately. In this study, I'll hear only the recorded tapes and read the transcribed speech. The text of the transcript will be forwarded to you to confirm that your speech is accurate and contentful.

You also have the right at all times to withdraw from the study. For situations where you want to withdraw from the survey, I will delete all the details (including recorded) and will not appear for the final research report.

Ideas and concepts gathered by you and other participants will be used in writing a qualitative research report, which will be read by my research advisor and presented to the research defense. By direct quoting of your speech and transcribed text may be used in the paper. Your identification, such as name and other identifying information, will be kept anonymous and doesn't appear on the nay of the research report.

Before the analysis is done, the transcribed vision of the interview will be flagged for your review and approved for the constancy and bias-free content.

AAU letter of research approval and permission of ALERT center to conduct the study are also attached to this questioner and consent form for proof of evidence?

By signing this consent form, I certify that I _____ agree to

(Print full name here)

the terms of this agreement:

- I agree to participate in this study that I understand will be submitted in partial fulfillment of the requirements for the degree of Masters in Information System from Addis Ababa University.
- I understand that my participation is voluntary.
- I understand that all data collected will be limited to this use.
- I understand that I will not be identified by name in the research report.
- I am aware that all records will be kept confidential in the secure possession of the researcher.
- I understand that I may withdraw from the study at any of them with no adverse repercussions.

_____ _____

(Signature) (Date)

Appendix III – Interview Questions

Interview Questions

Section 1: General and demographic question

- Can you tell me your background (sex, age, the highest level of university academic level, and field of study)?
- Could you please tell me the background and objectives of your organization you are working on?
- How long have you been working in the organization and department and position in your organization?
- Could you please explain your position role, responsibility, and in what sort of project you are involved, especially in the ICT4D project area?

Section 2: level of project understanding, stakeholder identification in projects, and what aspects of stakeholders' measurable attributes are essential to consider in the projects.

- Tell me what you understand and know about VCBL & Telemedicine Project and the service provided by the project now and suggest service to be included in the future?
- Tell me your engagements and responsibility at each stage of the VCBL & Telemedicine Project?
- Who are the key stakeholders that you and your organization are working in particular to VCBL & Telemedicine Project with their respective categorize levels (central government, regional, departmental, community, the project itself, international, Project implementer, etc.…?)
- What measurable the performance of stakeholders' attributes is essential to consider and describe the nature of each indicator identified (financial and non-financial vs. qualitative and quantitative) suggest other if any additional performance indicator to be measured?

Section 3: Understanding what aspect and features of ICT4D sustainability are important and need to consider in ensuring the sustainability of ICT4D projects?

- Tell me your level of understanding about ICT4D project sustainability, and why do you need sustainability for this project?
- Tell me what aspect of VCBL & Telemedicine project sustainability is important and state the measurable dimensions or state the description of the factors of the suitability feature.
- Tell me by identifying the specific perspective or pillar sustainability of VCBL project that you or organization is role is important and, if possible, try to mention or decompose the department or unit or individual who is important for specific sustainability pillar you mentioned?

Section 4: Understanding of what role of stakeholder is important to consider the sustainability of ICT4D and identify how and why it affects the sustainability of ICT4D projects services?

- What is the current stage of the project, and how do you involve and engage your stakeholders at different project lifecycle stages use (frame Project Life cycle vs. (inform, consult, partnership, control)?
- What is your role power/influence in the project (High or Low)? Detail how do you engage yourself in relation to your power (Use leading sub-questions)?
  .1. How do you influence/influenced the scope of action?
  .2. What is your authority in terms of Setting objectives and norms?
  .3. Are you allocating or denying resources to other actors?
  .4. Are you defining others' tasks and responsibilities?
  .5. Are you controlling access to knowledge/information?
  .6. Are you allocating rewards/recognition/sanctions?
- What is your degree or level of role in relation to interest (High or Low) about the issue/problem of the project? How do you engage yourself in relation to interest (Use Leading sub-questions)?
  .1. What prior experience engagement you have on the problem/issue to be addressed?
  .2. What potential benefits and risks arise for you or your organization if the issue is addressed/the problem is solved?
  .3. What options exist to increase the other stakeholder interest and engagement, or to dismantle obstacles?
- Have you ever observed conflict in stakeholders, explain the nature of the conflict, and suggest what could be done to manage and resolve conflict in stakeholders?

Section 5: Identification of the output of the project and outcome and what role of stakeholder should be important to maximize the output of a sustainable ICT4D project?

- Please describe the output/result of the VCBL & Telemedicine project and describe the nature of project output?
- What is your organization's role in leveraging the output, or how do you affect the output?

Section 6: What aspect of project outcome or performance factor needs to be considered and measured by the stakeholders to improve the impact of a sustainable ICT4D project?

- What aspect of project impact you think is achieved and essential by the project and describe the nature of the impact indicator?
- What is the outcome of the project, and How do you measure the outcome to evaluate the performance of the project in achieving the impact of sustainability-related targets from the stakeholder's perspective?
- What do you and other stakeholders do to influence on improving the Project Performance so that the project has a better impact?

Appendix IV – Letter of study approval from AAU and Organization

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ADDIS ABABA UNIVERSITY
College of Natural Science
School of Information Science

Date: January 21, 2020
Ref No. SIS/33/2020/2012

To whom it may Concern

Subject:- Student Andualem Aklilu

Dear Sir /Madam,

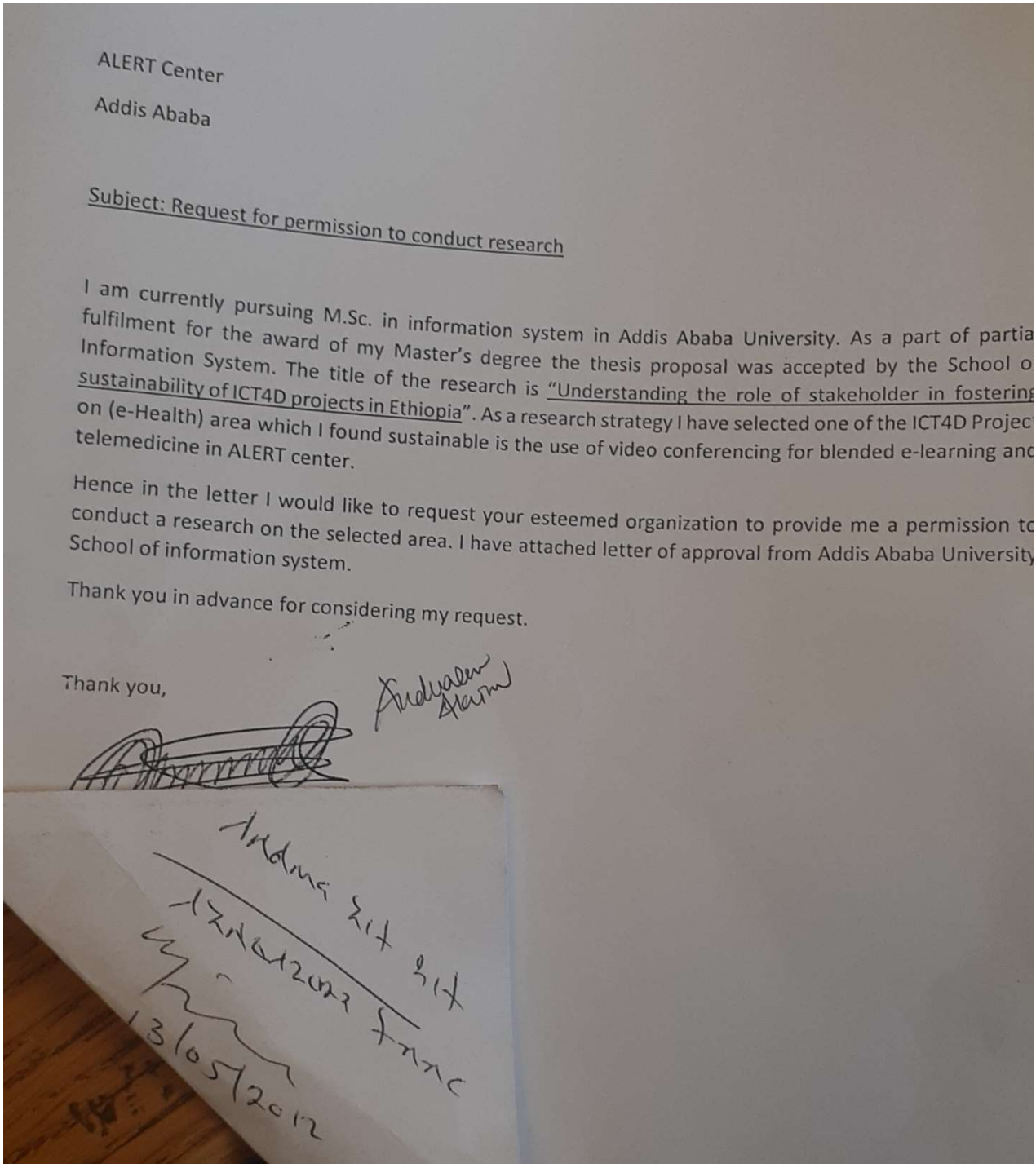
Student Andualem Aklilu (ID.No GSE/8130/10) is graduate student at the School of Information System, Addis Ababa University. He is currently conducting a MSc. Thesis research under the title "Undertsatnding the Role of Stakeholder in Fostering Sustainabilty of ICT4D Project".

I would like to thank you in advanced for all the assistance that you would provide to the student.

With Regards

Tibebe Beshah (PhD)
Head, School of Information Science

✉: 1176 Email: information_cci_cns@aau.edu.et ☎: +251-(11)-122-91-91



ALERT Center

Addis Ababa

Subject: Request for permission to conduct research

I am currently pursuing M.Sc. in information system in Addis Ababa University. As a part of partia fulfilment for the award of my Master's degree the thesis proposal was accepted by the School o Information System. The title of the research is "Understanding the role of stakeholder in fosterin sustainability of ICT4D projects in Ethiopia". As a research strategy I have selected one of the ICT4D Projec on (e-Health) area which I found sustainable is the use of video conferencing for blended e-learning and telemedicine in ALERT center.

Hence in the letter I would like to request your esteemed organization to provide me a permission to conduct a research on the selected area. I have attached letter of approval from Addis Ababa University School of information system.

Thank you in advance for considering my request.

Thank you,

Andualem Alemu

ALERT Center Training Division
P. O. Box 165, Addis Ababa, Ethiopia
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Ref. No. Ref/026723/00124/20

Date: 22/1/2020

To whom it may concern

Re: Permission to conduct research

As per the letter of request dated on Jan 21, 2020, I hereby confirm that Mr. Andualem Aklilu is allowed to research one of ICT4D projects (eHealth) in our center. The study will focus on the use of video conferencing for blended eLearning/training and telemedicine project. The title of the study is "Understanding the role of stakeholder in fostering sustainability of ICT4D projects in Ethiopia."

Therefor I would like to thank you in advance for all the assistance you provide him.

With kind regards

Martha Fekadu
Training Division Directorate
Director

CC:
- CEO

ALERT

Appendix V – Revised Theoretical Framework

Role of Stakeholders for ICT4D Project	Description of the role of Stakeholder for ICT4D Project
High Power and High Interest	They are the key player of stakeholders and are Involved in strategy formulation governance, decision making bodies, and constantly needs to be consulted as a part of communication. The extent to which stakeholders' alignment of resources, interests, and responsibilities to avoid duplication of effort. Selection of appropriate technology, provision of ongoing technical, and infrastructure coordination and support. Engage them in the capacity building of local staff. Create a sense of ownership for the project, resource mobilization.
High Power and Low interest	These are stakeholders that need to be meet their needs, and their level of satisfaction should also be maintained. Moreover, they need to be engaged in their interest area of the project to engage them in partnership. Upgrade and develop their ICT and competency. Efforts should be exerted to increase their interest, such as incentive fees. Consider when formulating a project strategy.
Low Power and High Interest	These are stakeholders that show consideration for the project and need to be engaged in a low-risk area. They need to be informed and consulted in their interest area. They should play a vital role as a potential supported and goodwill ambassador for the project. We need to be kept fully informed of the area of the major decision. Establish and maintain good relationships as part of communication.
Low power and low interest.	These are stakeholders who are least important for the project and exert minimal effort on the project. They need to be communicated via a general communication platform. Efforts need to be exerted to increase their interest, such as financial incentives.

	Will require minimal effort on the part of the monitor and control.

Sustainability performance indicator	**Description of the indicator**
Financial	Allocate financial support from internal and external or from an alternative source.
	Use the facility as an income or revenue-generating mechanism to ensure sustainability.
Institutional	Take full ownership of the project with all the management and Leadership commitments.
	Develop a capable knowledge base organizational system to ensure the utilization and transfer of technical skills.
Technology	The use of locally available and government-owned technology infrastructure.
	Provision of quality and uninterrupted service.
	The technology should be reliable, easy to use, user-friendly, and maintainable system.
	The technology should meet the need of future demand.
Social	Active participation increased awareness and eagerness of the community to consider it as an integral part of the project.
Political	Strategic direction and move towards the digitalizing the system.
Others Knowledge Sustainability	Availability of a sustainable knowledge management system to create, store, use, and transfer the knowledge of ICT.
Behavioral sustainability	The attitude of the users towards the benefit and the use of digital technology.

Output	**Description of the output indicator**
System Use	Development and adoption of the video conferencing center with all the necessary ICT infrastructure.
	Initiate and Pilot the use of technology to train health workers.
Users' satisfaction	By using the technology train remote health worker at the woreda health facility level.
	Adopt the video conferencing technology to telemedicine.

Stakeholder Role to Leverage the outcome	**Stakeholder category**	**Role Play / Description of engagement**

High Power and High Interest	Central Government	Strategy, policy and guideline formulation
		Mobilize resources to scale up
		Human Resources capacity building
		Provide ongoing support and coordination with regional
	Project Owner	Scale up the service
		Ownership and leadership commitment
		Increase Adoption to other disciplines
	Funding Agency	Continuous funding
	Implementers	Search for further grants
		Technical guidance.
		Building the local capacity
	Regional Government	Awareness creation
		Coordination and facilitation activities
High Power and Low Interest	Community	Active participation
Low Power and High Interest	Local Training and Individual consultant	Increase in technology adoption
Low Power and Low Interest	Zonal and Woreda ICT	Support and coordinate ICT activities
		Provision of reliable power backup generator

Outcome	Description of the indicator
HR - Development	Fostering the knowledge of remote health workers through the use of innovative approach training modality.
	Knowledge sharing via telemedicine patients' case consultation.
	Increased number of competent health professionals to remote resources constrained health facility by enabling easy access to quality training.
Clinical Service	improved clinical skill practice by improving the knowledge of the health profession.
Other Training cost	Reduce the training cost such as travel cost, peridium, and lodging than the traditional (classroom) training modality.
Workplace displacement	Minimize workplace displacement than the traditional training modality spent by travel.
Multiple site training delivery	Increase training delivery for multiple.

Stakeholder Role	Stakeholder category	Role Play / Description of engagement for improved outcome
High Power and High Interest	Central Government	Mobilize resources
		Provide ongoing support and coordination with regional
	Project Owner	Localization of ICT infrastructure
		Resource Mobilization
		Use of Knowledgebase
		Conduct research to improve efficiency
	Funding Agency	Continuous funding
	Implementers	Conduct research to improve efficiency
		Technical guidance.
		building the local capacity
	Regional Government	Skill, competency and training development
		Coordination and facilitation activities
High Power and Low Interest	Community	Active Participation
Low Power and High Interest	Local Training and Individual consultant	Center of Excellence
Low Power and Low Interest	Zonal and Woreda ICT	Ensure power backup Build staff competency

Impact Indicator	Description of the indicator
Quality of health	Improved the quality of life by provision of quality health care
Mortality	Reduce the patients' Death
Equitable Distribution	Equal access to quality health care services.

Stakeholder Role	Stakeholder category	Role Play / Description of engagement area for improved sustainable impact
High Power and High Interest	Key Stakeholders Central & Regional Government Funding	Begin with the end in minds
		Sustain impact at scale

	Agency Project Owner	Knowledge Management
		Institutionalize Sustainability
		Redundancy & Selection resilient technology
		Strategic Alignment
		Conduct post-mortem ICT4D Research.

Appendix VI – AMCIS 2020 Publication Acceptance Letter

ASSOCIATION FOR INFORMATION SYSTEMS
AIS Offices • P.O. Box 2712 • Atlanta, GA 30301-2712, USA

20 May 2020

Professor Lemma Lessa Ferede:

We are pleased to let you know that the following ERF (emergent research form) paper has been accepted for AMCIS 2020, originally scheduled for Salt Lake City, Utah USA and now to be held virtually this August. Your ERF paper will appear in the AMCIS Proceedings in the AIS eLibrary and you will have an opportunity to present the research during a synchronous session during the conference.

Paper Title: *Understanding the Role of Stakeholders in Fostering Sustainability of ICT4D Projects: Towards a Conceptual Framework*
Paper ID: *1649*

Thank you for submitting your work to AMCIS. We look forward to your participation in the conference in August.

Warm regards,
Sue Brown, Kathy Chudoba, and Kelly Fadel
AMCIS 2020 Program Co-Chairs
amcis2020.program@gmail.com