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FOSTERING INCLUSIVE INNOVATION BY USING ICT TO EMPOWER GRASSROOTS ENTREPRENEURS IN EAST AFRICA

Emma Nkonoki



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*To my father Professor Simon Nkonoki,
My mother Elizabeth Nkonoki
and my children Elina and Eliud*

UNIVERSITY OF TURKU

Faculty of technology

Department of computing

Computer Science

EMMA NKONOKI: Fostering Inclusive Innovations by Using ICT to Empower Grassroots Entrepreneurs in East Africa.

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ABSTRACT

In the digital transformation era, inclusive innovations have become increasingly crucial with their exclusive role in bridging the socioeconomic gaps in emerging economies. This research study examines the role of Information and Communication Technology (ICT) in empowering grassroots entrepreneurs as one way to contribute to fostering inclusive innovations. Through qualitative methods, the study conducts a deep analysis of case studies and interviews first with entrepreneurs and supporting actors from the institutional level of the Tanzanian innovation ecosystem in order to understand the growth journeys of startups and the role of actors in promoting innovation. The study continues with interviews with grassroots entrepreneurs who utilize ICT to overcome barriers in access to information and market reach. Firstly, the findings of this study revealed an integrated innovation model which includes a series of processes done by higher education institutions in promoting creativity, innovation and entrepreneurship including successes and challenges. Secondly, through activities and processes organized by innovation hubs to promote inclusive innovation the study revealed that a clear understanding of inclusive innovation is needed. Thirdly, the study identified some factors that positively influence the growth of technology startups and support organizations that are the most active in contributing to their growth and success. Lastly, the study also demonstrated how ICT plays a critical role as an enabler, providing access to resources, enhancing skill development and expanding market opportunities for entrepreneurs. The implications established by the study show the need for more community level innovation hubs to address local challenges, a need to contextualize institutional level approaches, the necessary for an expansion of inclusivity through community centered- campaigns, and a promotion of participatory policy design.

KEYWORDS: Inclusive innovation, ICT, grassroots, entrepreneurship, Tanzania

TURUN YLIOPISTO

Tekniikan tiedekunta

Tietojenkäsittelyn laitos

Tietojenkäsittelyntiede

EMMA NKONOKI: Inklusiivisen innovoinnin edistäminen tieto- ja viestintäteknikan avulla ruohonjuuritason yrittäjien voimaannuttamiseksi Itä- Afrikassa

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TIIVISTELMÄ

Digitaalisen muutoksen aikakaudella inklusiivisen innovaation merkitys on kasvanut, sillä sen ainutlaatuinen rooli auttaa kaventamaan sosioekonomisia kuiluja kehittyvissä talouksissa. Tämä tutkimus tarkastelee tieto- ja viestintäteknikan (ICT) roolia ruohonjuuritason yrittäjien voimaannuttamisessa, mikä osaltaan edistää inklusiivista innovaatiota. Laadullisia menetelmiä hyödyntämällä tutkimus tekee syvällisen analyysin tapaustutkimuksista ja haastatteluista, ensin yrittäjien ja tukitoimijoiden kanssa Tansanian innovaatioekosysteemin institutionaalisella tasolla toimivien startupien kasvupolkujen ja innovaatiota edistävien toimijoiden roolin ymmärtämiseksi. Tutkimus jatkuu haastatteleamalla ruohonjuuritason yrittäjiä, jotka hyödyntävät ICTä voittaakseen tiedonsaannin ja markkinoille pääsyn esteet. Ensinnäkin, tutkimuksen tuloksena syntyi integroitu innovaatiomalli, joka sisältää korkea-asteen oppilaitosten prosessit, joilla edistetään luovuutta, innovaatiota ja yrittäjyyttä, mukaan lukien saavutukset ja haasteet. Toiseksi, inklusiivista innovaatiota edistävien innovaatiokeskusten toiminnan ja prosessien kautta tutkimus paljasti, että laajempi ja selkeämpi ymmärrys inklusiivisesta innovaatiosta on tarpeen. Kolmanneksi, tutkimus tunnisti tekijöitä, jotka vaikuttavat myönteisesti teknologiastartupien kasvuun sekä tukiorganisaatioihin, jotka eniten tukevat niiden kasvua ja menestystä. Lopuksi tutkimus osoitti, kuinka ICT toimii keskeisenä mahdollistajana tarjoten pääsyn resursseihin, parantaen taitojen kehittämistä ja laajentaen yrittäjien markkinamahdollisuuksia. Tutkimuksen tuloksista voidaan tehdä seuraavia johtopäätöksiä: tarvitaan lisää yhteisötason innovaatiokeskuksia paikallisten haasteiden ratkaisemiseksi, institutionaalisten lähestymistapojen kontekstualisointia, inklusiivisuuden laajentamista yhteisökeskeisten kampanjoiden kautta sekä osallistavan politiikka-suunnittelun edistämistä.

ASIASANAT: Osallistava innovaatio, ICT, ruohonjuuritaso, yrittäjyys, Tansania

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Abbreviations

SDG	Sustainable Development Goals
ICT	Information and Communication Technology
HEIs	Higher Education Institutions
RQ	Research Question
IST	Innovation Systems Theory
RBV	Resource-Based View
MCT	Motorcycle Taxi
GRI	Grassroots Innovation
LS	Local Solution
NC	Networking Capabilities
GI	Grassroots Innovators
Y4C	Youth For Children
SSA	Sub-Saharan Africa
UDSM	University of Dar es Salaam
TUDARCo	Tumaini University Dar es Salaam
SJUIT	St. Joseph University Dar es Salaam
DIT	Dar es Salaam Institute of Technology
UDOM	University of Dodoma
NM-AIST	Nelson Mandela University of Science and Technology
UoI	University of Iringa
SUA	Sokoine University of Agriculture
DTBi	Dar Teknohama Business Incubator
dLab	Tanzania Data Lab
TANZICT	The Information Society and ICT Sector Development Project in Tanzania
Rlabs	Reconstructed Living Labs

List of Original Publications

This dissertation is based on the following original publications, which are referred to in the text by P (Publications):

- P1 Nkonoki, E., Kateule, R., Machuve, J & Leppänen, V. Advancing innovation through higher education institutions: case studies and best practices. **Under Journal Review**
- P2 Hooli, L., Nkonoki, E., & Leppänen, V. Inclusive innovation processes in Tanzania: from national policies to local practices in innovation hubs. *African Journal of Innovation, Science, Technology and Development*, 2024; 1-13.
- P3 Nkonoki, E., Makundi, H., & Leppänen, V. Exploring the growth of innovative software startups in the emerging technology district of Dar es Salaam. **Under Journal Review**
- P4 Nkonoki, E., Kateule, R., & Leppänen, V. Exploring the role of ICT in empowering grassroots innovation and entrepreneurship: A cross-sectional study of Iringa region in Tanzania. *The African Journal of Information Systems (Accepted for publication)*
- P5 Nkonoki, E., & Hamza, V. A qualitative assessment of the role of mobile phone technology in enhancing motorcycle taxi services in Dar es Salaam. *Transportation planning and Technology*. 2024. 1-17,

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Declaration of Contribution in Articles

Article: Nkonoki, E., Kateule, R., Machuve, J., & Leppänen, V. (x). Advancing innovation through higher education institutions: case studies and key practices. **Under Journal Review. My contribution:** Conceptualization, designing the research and making the research plan with the support of the supervisor. Collecting all relevant research data concerning HEIs in Tanzania, analyzing data together with the contributing authors, writing, finalization of the article, preparing it for submission and handling final revisions.

Article: Hooli, L., Nkonoki, E., & Leppänen, V. (2024). Inclusive innovation processes in Tanzania: From national policies to local practices in innovation hubs. *African Journal of Innovation, Science, Technology and Development*, 1-13. <https://doi.org/10.1080/20421338.2024.2398835>. **My contribution:** Designing the research and making the research plan with the support of the supervisor. Collecting all the research data concerning innovation hubs and the Tanzania innovation ecosystem. Analyzing research data together with the contributing authors. Contributing to the overall content of the research and seeking additional data concerning the research topic. Contributing to the finalization of the research paper and preparing it for submission. Contributing to the revision of the paper.

Article: Nkonoki, E., Makundi, H., & Leppänen, V. (x) Exploring the growth of innovative software startups in the emerging technology districts of Dar es Salaam. **Under Journal Review. My contribution:** Conceptualization, designing the research and making the research plan with the support of the supervisor. Collecting all research data concerning startups particularly software startups in Tanzania, analyzing data together with the contributing authors, writing, finalization of the article, preparing it for submission and handling the final revisions.

Article: Nkonoki, E., Kateule, R., & Leppänen, V. (2025) Exploring the Role of ICT in Empowering Grassroots Innovation and Entrepreneurship: A Cross-Sectional Study of Iringa Region in Tanzania. *The African Journal of Information Systems*. **Accepted for Publication. My contribution:** Conceptualization, designing the research and making the research plan with the support of the supervisor. Collecting all research data concerning grassroots innovators and the innovation ecosystem in Iringa, analyzing data together with the contributing authors, finalization of the article, preparing it for submission and handling the final revisions.

Article: Nkonoki, E., & Hamza, V. (2024). A qualitative assessment of the role of mobile phone technology in enhancing motorcycle taxi services in Dar es Salaam, Tanzania. *Transportation Planning and Technology*, 1-17. <https://doi.org/10.1080/03081060.2024.2384530>. **My contribution:** Conceptualization,

designing the research and making the research plan with the support of the supervisor. Collecting research data concerning motorcycle taxis and the transport industry in Tanzania, analyzing data together with the contributing authors, writing the original draft together with the contributing author, finalization of the article, preparing it for submission and handling final revisions.

1 Introduction

1.1 Background and Context

There is a relationship between technology, innovation and entrepreneurship, since technology accelerates innovation, which can then be followed by entrepreneurship. This is especially true in the context of developing countries where most people in grassroots communities find themselves engaging in “need-based entrepreneurship”. Technology encourages creative thinking, which in turn triggers innovation. Despite being branded as the engine for economic development, innovations also contribute to economic and social inequalities, especially in developing countries (Schillo & Robinson, 2017).

Innovation plays a crucial role in driving economic growth, fostering competitiveness, and addressing societal challenges. In East Africa, particularly in Tanzania, where the innovation landscape is rapidly evolving, with Information and Communication Technology (ICT) emerging as a key enabler for entrepreneurs and innovators. However, despite the increasing focus on innovation, grassroots entrepreneurs often face barriers in accessing resources, markets, and networks that are essential for scaling their ventures. Higher Education Institutions (HEIs) are positioned as vital actors in fostering innovation through research, capacity building, and partnerships. Additionally, innovation hubs have gained prominence as spaces that provide mentorship, funding, and networking opportunities to startups. While national policies in Tanzania highlight the importance of innovation, it remains critical to assess how these policies promote inclusive innovation, ensuring that marginalized and underrepresented groups benefit from technological advancements. Understanding the transformative role of ICT in supporting entrepreneurs, particularly in emerging technology districts, can provide insights into how digital solutions contribute to business growth and economic transformation

For several years researchers and practitioners have been studying and emphasizing Sustainable development goals (SDGs) (Robert et al., 2005) and SDGs in relation to inclusive innovations (Iizuka and Hane, 2021) as well as conceptual understanding of social innovations and inclusive innovations (Patino-Valencia et al., 2022). The SDGs in the 2030 Agenda stressed the importance of not leaving

anyone behind, meaning more efforts should be geared towards inclusivity of the most vulnerable groups in society. In relation to this dissertation, some of the most related studies conducted were comprised of the following topics:

- Inclusivity for development (Tandon & Arunesh, 2009; Gupta & Pouw, 2017)
- Innovation for development (Fagerberg, 2010; Jauhiainen and Hooli, 2019)
- Technology for development (Unwin, 2009; Thioune, 2003; Akinlo, 2023)
- Entrepreneurship for development (Leibenstein, 1968; Hessels and Naude, 2019).

In recent years, the topic of inclusive innovation has been given closer attention, this is partly due to the challenges that started to arise which resulted in branding innovation as being one way that could result in discrimination in society (Pasquale and Cintron, 2014). This arose because of challenges to the accessibility of technological devices and the necessary skills to be able to use the devices. A study by Foster and Heeks (2015) defines Inclusive innovation as “*the means by which new goods and services are developed for and by marginal groups (the poor, women, the disabled, ethnic minorities etc.)*”.

In relation to emerging markets, inclusive innovation is crucial for fostering economic growth, reducing inequality, and improving the quality of life of marginalized communities. By innovatively designing affordable, accessible and scalable solutions, inclusive innovation enables the marginalized population to participate in and benefit from technological advancements. Inclusive innovation drives job creation, as well as enhancing productivity and promoting social equity by addressing local challenges. Embracing inclusive innovation has the potential to unlock new markets, ensuring sustainable development and bridging the digital gap and economic divide.

1.2 Problem Statement

Despite the revolution in technology and the fast spread of such technology around the globe, the world is still witnessing many people being left out of this revolution (Lipton, 1977; Tosun, 2000). The emergence of technology districts especially in developing countries has helped people to see the growing inequalities (Bramann, 2017; Nawrot, Juma & Donald, 2018). The situation has raised an interest among scholars to study these areas to find ways to improve the situation. The idea being to

reduce the gap between those having accessibility to technology and those who are most often left behind due to a number of reasons.

Several challenges hinder the full participation of grassroots entrepreneurs in Tanzania. Many technology startups struggle with sustainability due to limited financial support, weak policy implementation, and inadequate access to technological solutions, market access and innovation ecosystems. Innovation ecosystems are defined as the “collaborative arrangements through which firms combine their individual offerings into a coherent, customer-facing solution” (Adner, 2006, p.2).

While HEIs and innovation hubs are recognized as key players in fostering innovation, their exact role in promoting inclusive innovation and addressing inequalities remains underexplored. Moreover, although innovation-related policies in Tanzania emphasize economic development, it is unclear how effectively they are at integrating inclusive innovation principles. Likewise, while ICT is widely acknowledged as a transformative tool, a deeper understanding of its impact on the growth of innovators and entrepreneurs is needed. Given these gaps, this study aims to investigate the role of HEIs, innovation hubs, and ICT in fostering inclusive innovation in Tanzania’s emerging innovation ecosystem.

1.3 Research Objectives

The aim of this dissertation is to understand the activities and processes of some actors of the Tanzanian innovation ecosystem and learn how they support ideas so that they come to fruition, and create new businesses. The goal being to learn from the practices of this institutional level and use the knowledge to develop the grassroots ecosystem further with the main purpose being to foster inclusive innovations. The increasing gap between the institutional and grassroots level motivated me into doing the study. I felt the need to contribute to the understanding of what is happening within the gap to try and connect the two sides through cooperation. I wanted to contribute to reducing the gap by using technology to empower grassroots entrepreneurs so they too can be active stakeholders in the innovation ecosystem. To be able to do this, it was important for me to explore and understand innovation processes at the institutional and grassroots level. Moreover, I saw the need for growth and sustainability of grassroots entrepreneurship for inclusive innovation. In this dissertation the role of ICT as an enabler in empowering entrepreneurs is given the most attention. The comprehensive goal is to contribute to the understanding of ICT as the enabler and thus provide one solution to offering inclusive innovation (Moldovan, 2022).

This study seeks to:

1. Examine the role of **Higher Education Institutions** in promoting innovation in East Africa.
2. Analyze how **inclusive innovations** are addressed in the main innovation-related policies in Tanzania.
3. Investigate how **inclusive innovations** are implemented through **innovation hubs** in Tanzania.
4. Identify the key factors influencing the **growth of technology startups** in emerging technology districts.
5. Explore the transformative role of ICT in the growth of innovators and entrepreneurs in Tanzania.

The foundation of this dissertation has four research questions (RQs):

- RQ1: What is the role of Higher Education Institutions in promoting innovation in East Africa?
- RQ2: a) How inclusive innovations are addressed in the main innovation-related policies in Tanzania? b) How inclusive innovations are implemented through innovation hubs in Tanzania?
- RQ3: What factors have the most influence on the growth of tech-startups in emerging technology districts?
- RQ4: How can the transformative role of ICTs be understood on the growth of innovators and entrepreneurs in Tanzania?

The above questions have been answered through five scientific articles that are summarized and presented in Chapter 4. The results and contribution of the dissertation are synthesized and presented in Chapter 5.

These research questions respond to the role of support organizations in promoting innovation in general and inclusive innovation in particular (RQ1 and RQ2). The questions also seek to reveal the factors that most influence the growth of startups in an emerging technology district (RQ3); the results help as a guide to be followed by current and future innovators and in this case especially the grassroots entrepreneurs. Even though the settings are different, the roles and factors can be contextualized to be incorporated in the grassroots settings and to be accomplished by community level actors in order to serve the purpose. Lastly, (RQ4) is essential as it reveals how ICT as the enabler can be used to empower grassroots entrepreneurs. When combined together the four research questions present a meaningful argument on how actors' actions, incorporated with ICT as the catalyst, can result in successful growth of startups.

Based on the above, the themes for this dissertation are:

- T1) Higher Education Institutions
- T2) Inclusive innovation
- T3) Innovation hubs
- T4) Startup growth
- T5) ICT
- T6) Entrepreneurs and innovators

The foundation of these themes is the Quadruple helix model of innovation, whereby Government, Industry, Academia and Society are the four components of the innovation system. These four have dynamic and multi-layered interactions. This model is very useful for interactions that are working towards the needs of society (Schütz, Heidingsfelder and Schraudner 2019). Innovation systems emphasize that the flow of technology and information among people, enterprises and institutions is key to innovative processes, this means the interaction between actors is a necessity in turning ideas into processes, products and services and later becoming commercialized (Feinson, 2003; Edquist, 2010).

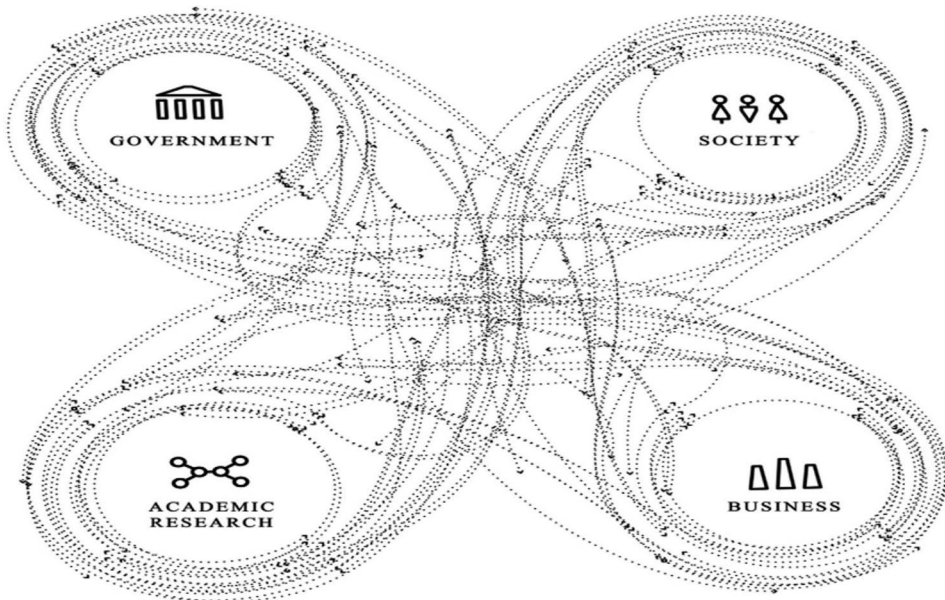


Figure 1. The Quadruple Helix Model adapted by Fraunhofer (2016), originally developed by Carayannis and Campbell (2009). Copyright © 2015 Fraunhofer. (Adopted from Schütz, Heidingsfelder, Schraudner, 2019)

In relation to my research questions, these five themes are the most relevant because: The **Higher education system (Academia)** is at the heart of National innovation ecosystems (Schaeffer et al., 2018; Rosli and Cacciolatti, 2022). Efforts and resources are invested to enhance the capacity of institutions to become strong entrepreneurial Universities. Higher education institutions produce knowledge and research which are the drivers of the economy, especially as regards the innovation economy. Starting the conversation on promoting innovation for any country or region, the role of these institutions in the process must be explored. **Innovation hubs (Business)** are the drivers of incubation and acceleration of ideas for businesses. Some of them started and are embedded in higher education institutions. Hence, it was important to not overlook them when talking about fostering inclusive innovations especially in an emerging economy like Tanzania. Their role cannot be overemphasized (Chirchietti, 2017; Jimenez and Zheng, 2018). The next two themes concern the **entrepreneurs and innovators (society)** that are the result of the processes of promoting innovation in general and inclusive innovation in particular. The activities are done by the people and are for the people. It would not make sense to involve the actors and leave out their activities because these are the actual and most important parts of the processes. The last theme is **ICT**, which is steering the whole research. It is the main enabler that has been empowering entrepreneurs for years (Hashim et al., 2011; West, 2012; Tunio, 2020). This theme is important as the research aims at emphasizing the use of ICT to empower grassroots entrepreneurs and hence entrepreneurship in resource-scarce settings. The actions and interactions between the above actors contribute to **startup growth** and when strategic efforts are made to involve all members of the society into the process then **inclusive innovation** is promoted. The close knit relationship between the research questions and the above themes, is scientifically fit to support this study.

1.4 Significance and Contributions of the Research

This study is significant in several ways:

- **Academic Contribution:** It adds to the body of knowledge on inclusive innovation, particularly in the African context, and highlights the role of HEIs and innovation hubs in supporting startups.
- **Policy Implications:** Findings from this research can inform policymakers on how to design inclusive innovation policies that support grassroots entrepreneurs.
- **Practical Relevance:** Entrepreneurs, investors, and innovation hub managers can use insights from this study to strengthen innovation ecosystems in Tanzania and beyond.

This study contributes to entrepreneurship by shedding light on how higher education institutions and innovation hubs facilitate inclusive innovation and also empowers startups and grassroots entrepreneurs. By identifying the key support mechanisms, for example mentorship, funding and collaborative networks, this study highlights pathways for fostering sustainable and scalable startups. Improved innovation ecosystems have the ability to enhance grassroots entrepreneurs' access to resources, reduce barriers to market entry and promote startup business growth; the result of which can drive economic development by creating jobs, increasing productivity and fostering a more inclusive and dynamic entrepreneurial landscape in Tanzania and beyond.

1.5 Scope and Limitations

This study focuses on Tanzania as a case study within East Africa's innovation landscape. It examines the role of HEIs, innovation hubs, policies, and ICT in fostering inclusive innovation. The research primarily investigates the experiences of technology startups in emerging technology districts, experiences of innovation hubs in incubation processes with a particular focus on how innovation policies are implemented and lastly, the study investigates the role of ICT in grassroots entrepreneurship. However, the limitations include potential constraints in data availability and access to relevant stakeholders.

1.6 Definition of key concepts

Higher Education Institution (HEI): are post-secondary institutions that offer learning and research opportunities. HEIs provide degrees and other qualifications that are recognized in the national educational framework (OECD,2008).

Inclusive Innovation: According to Heeks et al., 2013 and Foster and Heeks (2015), inclusive innovation is the means by which new goods and services are developed for and by the most excluded members of the development mainstream.

Innovation Hubs: are physical or virtual spaces whereby knowledge-intensive activities occur. To drive technological and economic advancement, these activities leverage human capital and digital infrastructure (Carayannis & Campbell, 2012).

Startups Growth: is the dynamic process of acquiring and utilising resources, implementing strategies and developing capabilities that result in the expansion of startup's operations, market reach and value creation (Slevin and Kovin, 1990). With the evolving entrepreneurial ecosystem in East Africa, the definition by Slevin and Kovin fits best for this study. Startup growth is different from traditional business

growth in terms of scalability, speed, and venture capital financing, which enable startups to expand rapidly compared to small businesses that grow organically (Eisenmann et al., 2013).

ICT : *According to Subba -Rao (2004, pp.261) “ICTs can be broadly defined as the set of activities that facilitate the capture, storage, processing, transmission and display of information by electronic means. ICTs offer remarkable opportunities for the alleviation of poverty and employment generation. ICTs enhance the opportunities of rural communities by: Improving their access to market information and lower transaction costs (for poor farmers and traders); increasing efficiency, competitiveness and market access for firms in developing countries; Enhancing the ability of developing countries to participate in the global economy and to exploit their comparative advantage in factor costs (particularly skilled labor); .health; and education”. In the context of this study, ICT and the accessibility to information and knowledge it can offer, has been taken into consideration when researching and evaluating how ICT has empowered entrepreneurs in general and how it can be used to empower grassroots entrepreneurs in particular.*

Entrepreneurs: are individuals who discover, evaluate and exploit opportunities to create and grow a business, linking them to innovation and market dynamics (Shane and Venkataraman, 2000).

Innovators: are individuals or entities that are first to adopt new ideas and technologies (Rogers, 2003).

1.7 Research process

This sub-section outlines the research process, and the five studies that form this dissertation. The table below summarizes the process and the connection between the research questions, empirical work and the studies. A detailed account of the data and methods is presented in Chapter 3.

Table 1: The connection between the research questions, empirical work and publications (P).

RQ1: What is the role of Higher Education Institutions in promoting innovation in East-Africa?	RQ2: a) How inclusive innovations are addressed in the main innovation-related policies in Tanzania? b) How inclusive innovations are implemented through innovation hubs in Tanzania?	RQ3: What factors have the most influence on the growth of tech-startups in emerging technology districts?	RQ4: How can the transformative role of ICTs be understood on the growth of innovators and entrepreneurs in Tanzania?
Empirical work: Study of 8 higher education institutions in Tanzania.	Empirical work: Study of 10 innovation hubs in Tanzania.	Empirical work: Study of 8 software startups in Tanzania.	Empirical work: a) Study of four grassroots entrepreneurs in Iringa, Tanzania b) Study of 35 motorbike users and service providers
P1: Advancing Innovation through Higher Education Institutions: Case Studies and Key Practices	P2: Inclusive Innovation Processes in Tanzania: From National Policies to Local Practices in Innovation Hubs	P3: Exploring the Growth of Innovative Software Startups in Emerging Technology District of Dar es Salaam	P4: Exploring the Role of ICT in Empowering Grassroots Innovation and Entrepreneurship: A Cross-Sectional Study of Iringa Region in.., Tanzania. P5: A qualitative assessment of the role of mobile phone technology in enhancing motorcycle taxi services in Dar es Salaam, Tanzania

Publication P1 explored the role of higher education institutions in promoting innovation. Higher education institutions are at the heart of an innovation ecosystem. This is where knowledge is prepared, thus an important ecosystem actor to start with. The study is a case of eight universities that offer education programmes in Tanzania and are active in carrying out innovation activities. This study is guided by the Innovation Systems Theory (IST) by (Freeman, 1987). The analysis of data showed that almost all institutions had a special unit for incubation acceleration of ideas, some had a research and development unit. Students were exposed to entrepreneurial courses and were incubated under expert supervision. The study came up with an integrated innovation model.

In publication P2 analyzed inclusive innovation processes in innovation hubs. Innovation hubs are the centers /focal points/ nucleus for innovations, even the units studied under HEIs fall under the same group. Empirical data was collected from 10 innovation hubs and centers. The foundation for this study was a refined analytical framework by Heeks and colleagues (Heeks et al., 2013; Foster and Heeks, 2014), where they delineated inclusive innovation into six levels of inclusion. The analysis showed that most innovation hubs have inclusive innovation as part of their strategy but the actual understanding and effective implementation of it is inadequate or at times missing. Innovation policy was not properly executed to support the process.

Publication P3 explored the factors that most influence the growth of technology startups. The study looked at the forces within and outside the startups and ecosystems that contribute to success. The study presents the factors for growth which is a common question for all innovations under each paper and research question. Innovations are done with the aim of seeing them grow. Eight successful software startups journeys were studied from the start of the innovative idea to commercialization of products and services. The study was guided by three theories namely the innovation ecosystem theory by Ping Wang (2009), the resource-based view (RBV) of the firm by Douglas Miller (2019) and the social network theory by Lukáš Durda and Aleksandr Ključnikov (2019). The analysis showed that different factors such as the innovators' background, education, exposure and external support organizations including funding, all contribute to the success of startups.

Publication P4 analyzes the role of ICT in growth and expansion of grassroots innovations (GRI). The study aimed at understanding entrepreneurship in resource-scarce settings and looking at ways to improve it through empowering entrepreneurs in those settings. Empirical data came mainly from four grassroots entrepreneurs, the study focused on how entrepreneurs make use of available resources. The study was guided by the diffusion of innovation theory (Everett Rodgers, 1962), entrepreneurship ecosystem theory (Daniel Isenberg, 2010) and the technology acceptance model (Davis & Granic, 2024). The analysis showed that ICT can be used to empower grassroots entrepreneurs. They can gain knowledge which would support them in resource allocation and utilization, and also communication which would support their networking and collaboration.

Publication P5 studies mobile phone technology and the role it has on enhancing motorcycle taxi business. It explores grassroots entrepreneurs in urban environments. This business is characterized by having drivers who are surrounded by resource scarcity from inadequate education, lack of sufficient capital, poor or non-existing English and digital skills. Empirical data was collected from 35 people including providers (drivers) and customers of this business. This study was guided by the diffusion of innovation theory by Everett Rogers 1962 (adopted from Rogers, Singhal and Quinlan, 2014). The analysis showed that the power of ICT in revolutionizing the motorcycle taxi (MCT) business is obvious. Mobile phone technology has enabled efficiency and convenience into this service business. Despite poor digital skills among drivers, ICT plays a key role in the motorcycle taxi service, connecting passengers to riders.

While this dissertation looks at innovation as a means to a developed economy (Publications P1, P2, P3). It is important to understand the potential for growth and expansion of grassroots entrepreneurship especially when ICT is reflected as a catalyst for change (Publications P4, P5). The first two articles explore how innovation is promoted under support organizations at the institutional level of the

Tanzanian innovation and entrepreneurial ecosystem i.e. Higher education institutions and innovation hubs. The third article explores successful software startups in an emerging technology district in emerging economies, giving a specific look at the factors influencing growth of successful technology startups. The fourth and the fifth articles look at the role of ICT in the growth and expansion of businesses among grassroots entrepreneurs in resource constrained settings.

Overall, these articles provide two perspectives on innovations and entrepreneurship in two different settings. They also show how actors and doers from the two settings are connected through the processes. Taken together, the articles provide a holistic understanding on the role of ICT in promoting inclusive innovation. The studies contribute to the existing knowledge on inclusive innovation and grassroots entrepreneurship.

1.8 Structure of the Thesis

This thesis carries five (5) chapters:

- **Chapter 1: Introduction** – Provides background, problem statement, research objectives, significance of the study, scope and limitations, definition of concepts, research process and structure of the thesis
- **Chapter 2: Theoretical Background** – Introduces the theoretical perspectives, conceptual framework and presents the connection to the dissertation.
- **Chapter 3: Materials and Methods** – Describes the research approach, data collection methods, and analytical framework.
- **Chapter 4: Findings** – Presents key findings (5 articles) on the role of HEIs, innovation hubs, innovation policies, ICT, and factors influencing the growth of technology startups.
- **Chapter 5: Conclusion** – Summarizes the findings, contribution of this study, discusses policy implications, limitations and suggests recommendations for future research.

2 Theoretical Background

This chapter presents the theoretical framework for my dissertation; the focus is on inclusive innovation literature. The choice of literature is driven by its relevance in examining how innovation fosters entrepreneurship and economic development in East Africa. Since ICT is known to be the most accessible and widespread technological tool in developing countries, (Waverman, Meschi and Fuss, 2005; Baguma and Eilu, 2014; James, 2015), this assures accessibility by large numbers and hence a reason to review literature under the subtopic. ICT serves as a crucial catalyst and enabler of innovation. Higher education institutions play a key role in equipping individuals with skills and knowledge that drive innovation, while innovation hubs provide essential infrastructure, mentorship, and networks that support entrepreneurial ventures. By reviewing scientifically recognized articles in this domain, the study builds a strong theoretical foundation to explore the interplay between inclusive innovation, entrepreneurship, ICT, and the East African context.

2.1 Inclusive Innovation and Entrepreneurship

Inclusive innovation ensures that individuals from all backgrounds, regardless of their social or economic status, have the opportunity to participate in innovation processes. It emphasizes creating opportunities for marginalized populations to engage in innovation, thereby fostering economic advancement through equal access to resources and technologies. By enabling entrepreneurs to address local challenges, inclusive innovation drives social impact and promotes economic growth (Vickery, 2011; Bergek et al., 2013). As a crucial aspect of entrepreneurship, inclusive innovation facilitates the development of affordable and accessible solutions tailored to the needs of underserved communities. Entrepreneurs leverage this approach to create innovative solutions that not only address societal challenges but also generate business opportunities for themselves and others. By empowering individuals to enter and operate in traditionally inaccessible markets, inclusive innovation contributes to inclusive economic growth and ensures that the benefits of innovation are more evenly distributed across society (Prahalad, 2005).

2.2 Inclusive Innovation and ICT

ICT in general and mobile phone technology in particular is a catalyst of inclusive innovation in grassroots entrepreneurship. A study by Singh et al. (2018) presents ICT as a moderator of economic benefits. The results revealed that ICT enhances the relationship between new learning practices and economic benefits (partially moderated); local solutions and economic benefits (partially moderated); networking capabilities and economic benefits (fully moderated). The full moderation suggests that stronger ICT usage yields greater success in entrepreneurship. Another study by Karakara & Osabuohien (2020) gives evidence on ICT adoption and entrepreneurial growth in Africa. The study shows that ICT tools like mobile phones, emails, and websites significantly enhance innovation in informal businesses in West Africa. Similarly, Asongu (2020) examined mobile phone technology across 49 Sub-Saharan African countries, finding that mobile phones contribute to knowledge creation, diffusion, and inclusive human development—even in varying economic and political conditions. Mobile phones are the most accessible ICT tools in grassroots settings, they play a vital role in enhancing learning and knowledge sharing for entrepreneurs, improving market access and business expansion through digital marketing and stimulating creativity and human development, promoting sustainable and inclusive growth. Promoting the use of ICT among grassroots entrepreneurs reduces the digital divide and hence promote an inclusive innovation ecosystem. Previous studies have revealed mobile phones and the enabling technology (ICT) as a factor that adds value and success to communities when they make good use of these tools (Furuholt and Matotay, 2011; Nyangarika and Ngassa, 2020). When grassroots entrepreneurs obtain access to ICT and relevant skills they will do well with their innovations and business, and in turn they will be able to contribute to economic development (Smith, Fressoli and Thomas, 2014; Hanna, 2010).

2.3 Inclusive Innovation in East Africa

Inclusive innovation plays an important role in addressing socio-economic challenges in East Africa (Trojer, Rydhagen and Kjellqvist, 2014). Through different initiatives inclusive innovation ensures that marginalized communities have access to affordable and sustainable solutions. With a growing entrepreneurial ecosystem, the region has witnessed innovations in a number of sectors. East African ecosystem actors are leveraging technology and local expertise to create affordable and accessible innovative solutions that empower grassroots populations and drive economic growth (Adesida, 2023). However, inclusion is still a challenge and most people especially from rural communities are left behind. Previous studies have proven that grassroots innovations have a very important contribution to

development (Gupta, 2020). However, their contribution in a country like Tanzania is very limited (Goldman and Little, 2015) and access to technology is what increases the gap between the institutional and grassroots level. Thus, it is important to understand the impact that ICT might have on innovations and entrepreneurship and what supporting organizations can do to promote the use of ICT. To ensure sustainable development, inclusive innovation must be granted enough attention and priority in East Africa. By using ICT to foster inclusive innovation in East Africa, the region will have equitable development and social impact.

2.4 Theoretical Framework of this dissertation

The following sub-section presents the relationship between Higher education institutions, inclusive innovation, innovation hubs, startup growth, ICT, entrepreneurs and innovators in the context of East Africa in general and Tanzania in particular. It will provide a unifying structure that ties together the research themes and key theoretical perspectives guiding and connecting the 5 studies in this thesis. It draws on several conceptual frameworks such as innovation systems, inclusive innovation, entrepreneurship ecosystems, a resource-based view of the firm and diffusion of innovation.

2.4.1 Theoretical Framework

The research draws on a number of theoretical perspectives, each addressing a distinct part of the research themes:

Innovation Systems Theory (Christopher Freeman, 1987): This theory focuses on the networks of institutions and policies that facilitate innovation. Freeman argues that innovation is not an isolated process but rather a systemic and dynamic interaction between knowledge producers for such as HEIs, users such as industries and policy makers. It will be applied to understand how HEIs, innovation hubs, and technology districts act as nodes within an innovation system in Tanzania, fostering innovation.

Inclusive Innovation (Heeks et al., 2013): This framework represents six levels of inclusion in innovation processes i.e. intention, consumption, impact, process, structure and post-structure. It places a strong emphasis on engagement of marginalized groups at all stages of the innovation process. It will guide the analysis of Tanzania's innovation policies and their focus on inclusivity.

Entrepreneurship Ecosystems (Daniel Isenberg, 2010): The theory puts a strong emphasis on the interconnectedness nature of factors that influence entrepreneurship

positively. It is helpful in examining how ICTs interact with other components in the entrepreneurial environment to drive socio-economic development in developing countries. The theory helps to understand ICT as an enabler which must operate as a part of an ecosystem to foster entrepreneurial growth. Here, 2 other theories will be used (1) **The innovation ecosystem theory** which is considered as part of the broader entrepreneurship ecosystem theory (Ping Wang, 2009) it focuses on the interplay of ecosystem actors (2) **Social network theory (Lukáš Durda and Aleksandr Ključnikov, 2019)** which is part of the innovation ecosystem theory as it helps to explain how relations and interactions within an innovation ecosystem influence innovation performance. It explores the role of relationships and social connections in shaping entrepreneurial behavior and outcomes. In general, the entrepreneurship ecosystem theory will be used to analyze the factors that influence the growth of technology startups and entrepreneurship within the emerging technology districts, and it will also be used to understand the role of ICT in empowering grassroots innovators and entrepreneurs.

Resource-Based View (RBV) of the firm (Douglas Miller, 2019): RBV emphasizes the importance of firm-specific resources and capabilities in achieving sustainable competitive advantage. It provides a complementary perspective by explaining how firms within the ecosystem leverage resources to succeed. It will help to analyse the factors influencing growth of technology startups within the emerging technology district, from the point of view of firm resources.

Diffusion of Innovation Theory (Everett M. Rodgers, 1962): DOI framework serves as a foundation for exploring the relationship between ICT adoption and entrepreneurial growth. It gives a structured approach to the evaluation of how technology innovations diffuse within grassroots communities, which in turn influences their potential for economic transformation. It can be applied to explore how new technologies (like mobile phones) are diffused within specific communities and industries, such as the motorcycle taxi service.

2.5 Conceptual Framework

Below is a conceptual framework structure representing the relationship between the key concepts in my research. The figure shows how key elements interact to foster inclusive innovation and entrepreneurial growth in Tanzania.

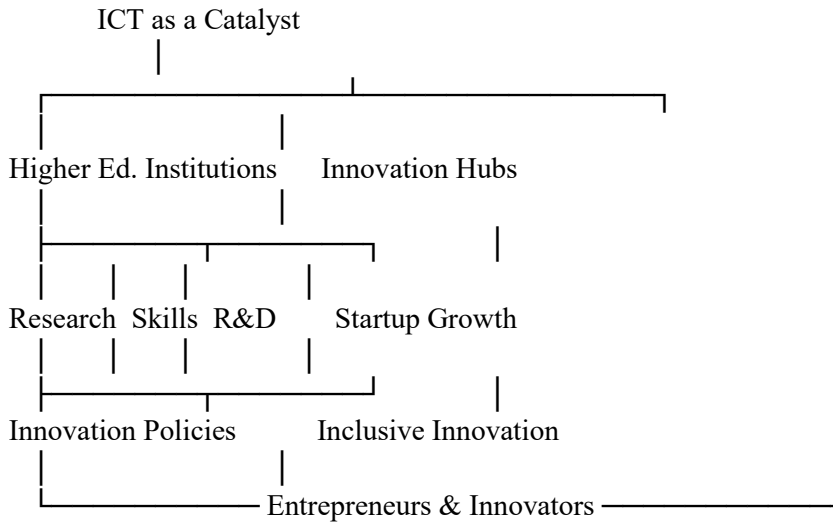


Figure 2: The relationship between the key components of the study.

Figure 2 visualizes the relationship between the key components of the study. The framework illustrates how ICT acts as a unifying force, integrating HEIs, innovation hubs and policies to foster entrepreneurship, innovation and inclusive economic development. It shows how **ICT as a catalyst** is the central element of the framework. Through research, skills and R&D, the core components of the framework i.e. **Higher Education Institutions and Innovation hubs** contribute to **startup growth**, in the process these components are influenced by innovation policies. The outcome of these processes is **inclusive innovation**, which is the outcome of the connections and integrations of other components. Startup growth and inclusive innovation contribute positively to empowering **entrepreneurs and innovators** through a supportive ecosystem. Technological solutions (ICT/mobile phones) can be used as catalysts or enablers to empower grassroots communities in different capacities but especially in gaining knowledge and by facilitating smooth and convenient communication between customers and entrepreneurs. The actors, the actions, the processes with ICT as the catalyst lead to inclusive innovation.

2.6 Link to the Research Papers

By exploring different elements that contribute to ICT-driven innovation and entrepreneurship, this subsection presents the connection between the research articles and the conceptual framework.

P1-HEIs and innovation: This relates to the framework through HEIs, which contribute to Research, skills development and R&D, ultimately driving innovation and entrepreneurship.

P2-Innovation hubs and policies: Are linked to innovation hubs and innovation policies, as they both facilitate inclusive innovation and startup growth.

P3-Factors driving startup growth: These are directly linked to startup growth, that emerges from innovation hubs and is influenced by innovation policies.

P4-The impact of ICT on entrepreneurship and innovation: This aligns with the role of ICT as a catalyst, impacting multiple components including entrepreneurs and innovators.

P5-(ICT and the growth of entrepreneurs): This reinforces the role of ICT in enhancing the capabilities of entrepreneurs and innovators, linking back to innovation hubs, policies and startup growth.

The 5 studies provide a comprehensive understanding of inclusive innovation in Tanzania by examining key drivers such as ICT, higher education institutions, innovation hubs, and policies that shape entrepreneurship and technological advancement. They highlight how HEIs contribute through research, skills development, and R&D, while innovation hubs and policies support startup growth and inclusive innovation. Additionally, they explore the role of ICT as a catalyst, demonstrating its impact on entrepreneurship, innovation, and the overall economic landscape. By linking these elements, the research offers insights into how Tanzania can leverage digital transformation, institutional support, and policy frameworks to create a more inclusive and sustainable innovation ecosystem.

This theoretical and conceptual framework provide the foundation for the research by offering structured perspectives to analyze and understand key relationships among variables. The theoretical framework draws from established theories such as innovation systems, inclusive innovation, entrepreneurship ecosystem, and diffusion of innovation to explain how factors like higher education institutions, innovation hubs, and policies influence inclusive innovation. Meanwhile, the conceptual framework visually maps out these relationships, illustrating ICT as a catalyst that connects HEIs, research, skills development, R&D, and innovation hubs to drive startup growth, entrepreneurship, and inclusive innovation. Together, these frameworks ensure a systematic approach, guiding data collection, analysis, and interpretation while aligning the research with broader academic and policy discussions.

2.7 Research gaps

Previous literature has explored different aspects of ICT, innovation, and entrepreneurship, but despite this a number of critical gaps remain:

The role of ICT in fostering grassroots innovation: Most studies on inclusive innovation in East Africa focus on urban and peri-urban areas (Trojer, Rydhagen and Kjellqvist, 2014; Iizuka and Hane, 2021; Alemu et al., 2024) while rural grassroots

settings remain understudied. Research on digital financial inclusion is relatively extensive (Lotto, 2022; Risola, 2023; Ochen and Bulime, 2023) but tends to focus on specific industries for example agriculture and the food sector, rather than broader grassroots entrepreneurship. There is inadequacy of research on how ICT, as the most widespread technological tool, can foster inclusive innovation beyond financial services.

The role of support organizations in ICT promotion: The role of HEIs and innovation hubs in driving inclusive innovation has been studied extensively (Muchungi et al., 2023; Hooli, Nkonoki, Lepänen, 2024) but how these actors specifically support grassroots entrepreneurs in leveraging ICT remains unclear. There is a need for research studies on how support organizations and contextualize ICT interventions to suit the unique needs of grassroots innovators. While some level of support exists, it is often not aligned with local needs, thus creating a mismatch between available resources and the actual challenges.

Measuring ICT impact on grassroots entrepreneurship: There is limited research that measures the before and after effects of ICT adoption among grassroots entrepreneurs especially in East Africa (Wickramasinghe and Ahmad, 2014; Noor, Hashim and Jamin, 2020). Success metrics for ICT-enabled entrepreneurship in Tanzania remains underdeveloped (Cunningham, Cunningham and Eckenberg, 2015; 2016) making it difficult to assess impact. There is also little discussion on how entrepreneurs can overcome barriers such as language, lack of digital skills and the high costs of internet connectivity.

This study aims to examine how ICT can foster grassroots innovation and entrepreneurship in resource-constrained settings, analyze the role of support organizations in promoting ICT adoption among grassroots entrepreneurs, identify barriers and enablers of ICT-driven inclusive innovation and propose contextualized solutions for improving ICT access and utilization in grassroots settings. By addressing these gaps, this study contributes to the broader discourse on technology-enabled inclusive innovation and provides actionable insights for policymakers, support organizations and entrepreneurs in Tanzania and beyond.

3 Materials and Methods

This chapter describes how data was collected and analyzed. The main methodology for this research study was a case study approach. The original target was to include Kenya and Uganda as part of a study covering East Africa. I had the opportunity to visit Kenya through my work and spent some time with innovation ecosystem actors and beneficiaries. Through interviews, observations and attending innovation and technology events I learned a considerable amount but, in the end, it was not enough to be incorporated in my study. Due to a lack of sufficient funds and the effect of Covid19 the focus of the study had to be limited. The final case studies were all from Tanzania, however, some of them were firstly studied while the innovators visited Finland for Slush events. A follow-up was done when the research officially started. Slush is an annual startup and technology event in Helsinki, Finland that aims to build a worldwide startup community. The event facilitates meetings between founders and investors, and organizes side events for matchmaking and pitching competitions.

Tanzania was selected for a few/ several reasons, first it was the location where I have a deep and thorough understanding of the environment, culture and relevant connections to support the study. Secondly, a revolution of innovation and technology ecosystem in Tanzania, which was largely influenced by the support from a Finnish project “The Information Society and ICT Sector Development Project in Tanzania” (TANZICT), increased my curiosity to use it as a study region. In addition, at the time at which this research study started, there was a rapid growth of institutional level innovation and technology ecosystems in Tanzania; however, the grassroots ecosystem was proceeding at a very slow pace or in some cases such communities were being completely left behind. As the gap between the two levels was still evident and increasingly obvious, it drew my interest in doing this research and contributing to a solution in minimizing if not filling the gap by fostering inclusive innovations in the country.

For all RQs an empirical research based on qualitative and an explorative research approach was used, this method employs different techniques including structured interviews and observations (Palmer and Bolderston, 2006; Denny and Weckesser, 2022). A qualitative and explorative empirical approach is suitable for

this study because it allows the researcher to explore complex, multifaceted phenomena in their natural settings (Ponelis, 2015; Lim, 2024). Since the research questions address the roles, processes, and factors influencing innovation, startup growth, and ICT in East Africa, a qualitative approach is ideal for understanding nuanced insights, perceptions, and behaviours that cannot be captured through quantitative methods on their own. The approach allows for flexibility in data collection and for deep exploration of the social and economic contexts. The approach is explorative since it investigates under-researched areas, for example, inclusive innovation and startup growth in East Africa. The area is likely to be diverse but still evolving. This research method is qualitative since the aim is to understand the meaning and context behind institutional roles, innovation policies, and the experiences of innovators and entrepreneurs.

All the studies adopted a case study approach which allows researchers to gather comprehensive and detailed information over an extended period (Baxter and Jack, 2008; Feagin, Orum and Sjoberg, 2016; Thomas, 2021). The case study approach is suitable since it allows for contextualized, and in-depth investigation of specific cases like innovation hubs, higher education institutions, emerging technology districts and factors affecting startup growth, while allowing for the comparison of findings across different settings in Tanzania. The approach helps in focusing on real world settings where inclusive innovation and ICT are implemented. The case study approach is well-suited for understanding local contexts and the dynamic nature of innovation in East Africa. It facilitates understanding of how policies, ICT interventions, and innovation hubs interact. A potential limitation could be generalizability to the broader region. However, case studies offer rich contextual insights that can be applied to similar settings.

The following part details each research question and the method used respectively to respond to it. The five publications that are an outcome of the data collected in this study are interlinked and that allowed me to work on the respective research questions in a systematic manner.

RQ1: I used a qualitative research design and adopted a case study approach. The process consisted of semi-structured interviews with key informants to uncover the present state of innovation in HEIs. The aim was to highlight the existing innovation practices, successes and challenges within the institutions; in addition, the observation methods used were useful in gathering background information on innovation practices.

RQ2: I used a qualitative research design and adopted a case study approach. Observations included multiple visits to 12 innovation hubs during which interactions were held with the relevant actors. These hubs provide a comprehensive overview of the Tanzanian innovation activities in practice. Additionally, official semi-structured interviews were conducted with key actors in the Tanzanian

innovation ecosystem to gain a comprehensive understanding of inclusive innovation processes in innovation hubs in Tanzania.

RQ3: I used a qualitative research design and adopted a case study approach, exploring the experiences of eight successful software startups. The analysis followed a thematic analysis process. Research data was first collected by observation through different interactions with relevant stakeholders within the innovation ecosystem. Moreover, during the fieldwork I interacted and engaged with CEOs and other employees of the companies. Finally, I conducted semi-structured interviews with CEOs to gain a comprehensive understanding of their entrepreneurship journeys.

RQ4 : I used a qualitative research design and adopted a case study method, An interview-based qualitative survey was followed, where I explored the experiences of four grassroots entrepreneurs. The second study included in this question was done through semi-structured interviews of service providers and users and the role of technology was assessed.

Empirical research for this dissertation included 2 main field visits each lasting 3-4 weeks. The field visits align with all the studies that led to the publications from P1 to P4. (see Table 2). Data collection included both primary and secondary data. The primary data was collected using: semi-structured interviews, short interviews, observations, email correspondence, free face to face discussions, WhatsApp chats, telephone discussions, photos and videos from the archives. According to Ryan and Ogilvie (2011) photographs can be useful in enhancing the research process especially in situations where in-depth clarity of the meaning of respondents' statements is needed; it helps to enhance phenomenological analysis. Photos can also increase credibility and trustworthiness of qualitative research, as they can add to the validity of the process. Secondary data used in this study included annual reports, press releases, articles and other data covering topics relevant to the study.

Table 2: Data sources.

Paper	List of case studies	Description of case studies
Publication P1 Advancing Innovation through Higher Education Institutions: Case Studies and Best Practices	University of Dar es Salaam (UDSM) Tumaini University Dar es Salaam (TUDArco) St. Joseph University Dar es Salaam (SJUIT) Dar es Salaam Institute of Technology (DIT) University of Dodoma (UDOM) Nelson Mandela University of Science and Technology (NM-AIST) University of Iringa (UoI) Sokoine University of Agriculture (SUA)	Higher education institutions in different regions of Tanzania.
Publication P2 Inclusive innovation processes in Tanzania: From national policies to local practices in innovation hubs	Buni Hub Dar Teknohama Business Incubator (DTBi) Sahara Accelerator Data Lab (dLab) Smart Lab Ndoto Hub Seedspace Dar es Salaam UDSM ICT incubator Safe Space Y4C Innovation Hub RLabs Iringa Kiota hub	Innovation hubs, some going by the name incubator, accelerator and lab. These hubs are situated in Dar es Salaam and Iringa.
Publication P3 Exploring the Growth of Innovative Software Startups in Emerging Technology Districts	Magilitech Shule Direct Zaidi App Smart Darasa Niajiri Platform Weledi Africa IPF Softwares TanzMED	Examples of successful stories of technology startups originating and incubated in the main technology district in Dar es Salaam.
Publication P4 Exploring the role of ICT in Empowering Grassroots Innovation and Entrepreneurship: A case study of Iringa	Envibrigh Y-Tek Brianna Bridal and Beauty Salon Eden enterprises company	Grassroots entrepreneurs who obtained their first self-awareness and entrepreneurship courses at RLabs Iringa.
Publication P5 A qualitative assessment of the role of mobile phone technology in enhancing motorcycle taxi services in Dar es Salaam, Tanzania	A combination of 30 service users and providers	Motorcycle taxi customers and drivers.

The stakeholders involved in this study fell under/ can be classified under all parts of a quadruple helix of innovation which includes higher education institutions, industry, society and government. The selected cases fell under/can be classified under 3 parts of the helix but the government was a direct partner of all parties involved through regulations and at times providing training and financial support.

3.1 Field settings

This dissertation uses a grounded theory approach (Strauss and Corbin, 1994 ; Jorgensen, 2001). It includes data from case studies which is a method commonly used in grounded theory (Locke, 2002). According to Hamel, Dufour and Fortin, (1993) “A Case study approach strives to highlight the features or attributes of social life”. The main reason for case studies is to produce reports of experiences and offer evidence in order to avoid generalization (Stenhouse 1978 (as cited by Bassey (1999))).

Since the main task of this dissertation was to respond to the research questions, the first and most important step was to identify the cases to be studied. To ensure reliability and credibility of results and to be able to gain more insights, each paper covers a number of cases. In order to identify the most relevant cases that would allow maximum response to my research questions a theoretical sampling method was used (Coyne, 1997; Glaser & Strauss, 2017). Since my data collection started during the corona pandemic, it was challenging and thus very important to make sure that the cases were accessible. This affected, to a certain extent, the selection criteria.

In both fields visits I was responsible for organizing and conducting the field research. Each field visit will be described below including the data collection methods. It is important to note that there was a pre-field visit period where I personally visited the targeted ecosystem several times for work related purposes. Since my work was always focusing on innovation and research, the result was that I started to explore, collect and observe data for my planned doctoral research.

3.1.1 Pre-field visits (preparatory missions)

Through my work experience as a student in? academic institutions, visiting the institutional level innovation ecosystem in Tanzania was very common so I knew it well. Conducting interviews, facilitating workshops and observations were part of my work. Through this work I also used my time to observe and reflect on my potential research interest and at the same time I built relationships with relevant ecosystem actors. This opportunity helped me to gain very important background information which made me more curious and that is how I developed this research proposal. I decided to include my work-related trips as part of the knowledge that

accelerated the start and continuation of this journey, this part I call "pre-field visits preparatory missions".

Since moving to Finland, I have been on more than 20 visits to Tanzania, most were work related and some for visiting family. To me each of these visits has contributed directly or indirectly to my study interest and added flesh to the skeleton that I started with. During the visits that were not officially part of my studies I had opportunities to have talks with innovation experts and other stakeholders of the innovation ecosystem from different parts of the country; this gave me a better picture of the situation in my respective topic of interest. However, my understanding of the topic was influenced even deeper by all the trips I made to Tanzania since I started to be involved in the research and innovation world in January 2014.

I started writing my research proposal in 2016 and continued to develop it over time and as more knowledge on the topic was gained. I used the proposal to apply for a number of graduate schools and finally succeeded in officially starting my doctoral research journey in Autumn, 2019. It should be noted that this came after having worked for almost 6 years as a research assistance and project management in higher learning institutions in Finland. The tasks that were included in the development cooperation involved close cooperation with innovation hubs and higher education institutions in Tanzania, which was one reason as to why I chose both these as my support organizations as the focus of my study. Having visited the field and worked with stakeholders several times made it easier to start conversations and gain relevant informants when my research studies officially started. I can say that I already had the background information that I needed for my research studies when I embarked on this journey. I consider all the interactions prior and during the early stages of my research as part of the field visits but in the form of preparatory missions.

The development cooperation work between Finland and Tanzania which included exchange visits among experts supported my data collection journey to a great extent. Several innovation ecosystem stakeholders from Sub-Saharan Africa have travelled to Finland for work related trips including events like Slush. Being well connected in Finland and East Africa worked to my advantage since it gave me a chance to meet African guests quite often among whom there were many innovators, hub managers, University faculty and government representatives. Through these visits I would organize formal and informal talks or interviews at separate times in Helsinki or Turku with a number of participants to obtain a deeper understanding of the African innovation ecosystems' processes, opportunities and challenges. I was fortunate enough to meet most of them again while traveling in East Africa, and I would re-interview them to gain important updates.

3.1.2 Field visit 1

With regard to grassroots settings I was only familiar with environments like slums where I have observed the urban poor several times during my work but specifically for my study I went to Iringa. I chose the Iringa region in Tanzania since RLabs is actively operating there and to my understanding and experience the model used by this organization is the most inclusive of all those I have seen in the country. This was later proven through scientific research. Grassroots settings are present in this dissertation through the small entrepreneurs incubated at RLabs Iringa. First the entrepreneurs were interviewed over the telephone and later when the pandemic restrictions were relaxed a field visit was conducted. The visit included observation of the old and new premises of the organization, interviews with some key informants and beneficiaries and lastly visiting the entrepreneurs I had interviewed over the telephone; this was important to be able to observe their business settings and discuss matters further in order to validate and update my data. During the same field visit I conducted interviews at the Kiota hub at the University of Iringa as part of preparations to respond to another research question on the role of innovation hubs in promoting inclusive innovation.



Image 1: Preparatory mission in Dar es Salaam and field visit in Iringa.

3.1.3 Field visit 2

My second field visit was in Dar es Salaam which is the business capital of the country. It is a city that I grew up in and therefore I know it very well. Moreover, I

had traveled several times on work related trips from Finland to Dar es Salaam. This is the town where I attended several innovation and technology related events throughout the years, and it is where I started to notice the gap between the institutional and grassroots level within Tanzanian society. The idea of innovation and technology automatically creating segregation in the society was very evident. However, it was a city that I thought the rest of the country could learn a considerable amount from as it boasted the first emerging technology district in the country. Innovation was booming and curious youths were mingling around the area on a daily bases. One reason was because the area is surrounded by higher education institutions and high end, elite surroundings where you will not notice? a foreigner in a cafe or a supermarket. The area branded “Silicon Dar” was attracting at that time a number of relevant stakeholders for innovation and technology. I did face to face interviews with key informants from higher education institutions and programs focusing on promoting innovation in higher education institutions. To use my time effectively, I also did extra interviews with other relevant stakeholders to validate data and also some observations to support my other research questions; the data for which had already been collected either through telephone interviews or through informal discussions during informants visits in Finland. The aim was to gain more information and especially from different perspectives.



Image 2: Field visit in Dar es Salaam.

3.2 Data collection methods

Prior to field trips, and in order to acquire a background understanding of the cases, secondary data were collected from reports, press releases and other archival studies. Secondary data also helped in confirming the relevance of the cases. In the fieldwork, primary data was collected through semi-structured interviews, informal interviews, observations of premises and activities, participation in innovation related events and workshops. In both field-visits the key areas of study were activities, innovation practices plus the role of technology (ICT). I was interested in understanding events and processes from a very practical level. There were a number of cases where I joined the interviewees in their activities that were relevant to my study. Occasionally, I was also able to try the practices by myself while continuing with the discussions. According to Kusenbach (2018) this qualitative research tool is known as go-along, the article talks about it as one aspect of data collection which includes observation of on-going practices and short interviews. It was very useful that I as the principal researcher immersed myself in the field, this helps in data analysis and identification of key findings (Halme et al., 2012; Khavul et al., 2013).

Apart from a few challenges like the long bus trip from Dar es Salaam to Iringa which were not very comfortable and a little dangerous due to the high speeds, generally the data collection process was enjoyable. Even though the data collection was well planned and executed, it is worth noting that not all data that was collected was used in this study, this is due to the fact that some was later found not to be sufficiently relevant information - due to this reason some cases were dropped.

Being originally from Tanzania, I was familiar and well aware of the culture and environment in the field where all my primary data and some secondary data was collected. I started making field visit plans with partners at least 3 months before each visit to describe my research and make sure that I was connected to the most relevant stakeholders for interviews. Access to all sites and interviewees was facilitated by the existing networks that I already had. With some of the informants I had to book an appointment before meeting them but since the culture of appointment is not so common in Tanzania, sometimes I only had to inform them that I am in the country and I will visit for the interview. It was sometimes challenging as I when I arrived at the meetings the informants were busy, and I had to wait and at times they were not available at all. This meant that I had to go again the next day. Sometimes I had to share interview questions beforehand through email or WhatsApp, and in some situations, I had to call and explain briefly the study plan. I am very glad that I had a chance to visit some of these businesses, hubs and factories. The visits were enlightening and it increased my understanding of the scenario, which was an important contribution to my data.

When entrepreneurs and other stakeholders knew that I was actually originally from Tanzania and I speak Swahili it made the process much easier. They were

active, and opened up freely, however the interview process involved them also posing questions to me, most of which were about my personal life, studies and future plans. Even though my background made the process easier, there were also risks involved. Since I could consider myself as an insider there were a lot of pre-assumptions of the field, and also the responses from locals to locals might be affected by assumptions that I should know some of the things thus they do not need to go into details in responding to my questions. Also, the fact that we used Swahili for interviews, it is obvious that some points were lost in translation. I used different approaches to informants from the institutional level and grassroots level due to the different in their knowledge and understanding of different things, plus respondents from the institutional level tend to use English more even if the questions would be asked in Swahili or would be explained in detail in Swahili. Apart from interviews I was fortunate to have been given good tours of the businesses and factories of the informants. One factory had an indoor and outdoor space where innovators were working, surrounded by machines and unfinished products e.g. doors and windows. I took a number of photos from this place and also wrote some notes. At the end of each day, I typed my notes on to a computer and in some cases I had to translate the information first from Swahili to English. Organizing my notes, photos and digitizing the information including reflection from observations was done every evening after the working day. Doing this I was certain to retain the information while it was still fresh in my mind and to not leave any of it out. I always organized the days so that I would spend 4 to 6 hours on the site and return to my hotel, take some rest and spend 2 to 3 hours in the evening writing. As already mentioned earlier, working in these settings was not something new, but this time I went as a Doctoral researcher, and that is what made the difference and everything else remained the same except of course for the responses I received and the focus of my observations. Apart from interviewing innovators and other actors in the ecosystem, I also had an opportunity to do ad-hoc talks with some users of the innovations. This was useful as it provided more background information, increased my understanding of the context and widened my perspective. I am very glad that I managed to spend as much time as possible with key informants and Swahili language helped us to connect and bond very well which made interviews much smoother and more comfortable.

3.2.1 Observations

Field visits included visits to innovation hubs, university premises, startups, government offices and other sites. I spent time in the relevant locations and took photos and memos. Every opportunity was a data collection moment, I also often made observations, especially when seated during breaks and at informal gatherings

with partners. Recording videos was not possible as most people have become very sensitive especially in towns, this is due to the spread of the internet and use of social media.

3.2.2 Interviews

I mostly conducted semi-structured interviews, but these were supplemented with short ad-hoc interviews. Longer interviews were planned and well organized. In a number of situations, the key informants directed me to other people who could provide even more information to some of my questions thus I often had more informants than I had planned or expected. All interviews were done in the offices of informants or the hubs and premises where they did their daily activities.

Almost all interviewees were familiar with interviews and this made it easier for me; however, a small challenge was with the grassroots entrepreneurs with whom I had to elaborate on questions and sometimes use easier or simpler language in order to obtain answers. All questions had to be translated into Swahili and I did all the translations myself. Since all the interviewees knew I was originally from Tanzania there were situations where even those who spoke English would mix their response and add some information in Swahili; this was fine with me as I was then given more and deeper information. The only setback was that I needed more time in the end to make further translations into English as my notes were mixed with English and Swahili.



Image 3: Field visit in Dar es Salaam and Iringa.

3.2.3 Assessment of data collection

The data collection process had strengths and weaknesses. In terms of strengths, the process was flexible, the qualitative method that I employed allowed me to explore nuances of innovation processes, policies and the experiences of innovators and entrepreneurs. I was able to gain rich data, collecting it from diverse sources, this ensured comprehensive insights. Despite the positive side of the process, weaknesses were identified. The process can be subject to research bias, however as researcher I maintained consistency and used triangulation, in order to mitigate the challenge. The proves / the verification? was time-consuming, gathering qualitative data takes time, especially when I was dealing with multiple case studies and interviews. With the Covid19 pandemic, data collection took more time than I had anticipated.

3.3 Data analysis

All the studies that comprise this dissertation are qualitative and empirical. The data analysis process involved: **Data Preparation:** I began with transcribing interviews, categorizing documents (e.g., policy reports), and organizing photographs or field notes. **Coding Process:** I started by using open coding in order to identify significant themes, the next step was axial coding and selective coding which were used to group and refine the themes based on patterns. **Thematic Analysis:** when the codes were developed, I used a thematic analysis approach to group the codes into broader themes. This allowed me to answer each research question related to higher education's role, inclusive innovation, ICT impact, and technology startup growth. The analysis followed inductive thematic research principles where one starts by making observations or gathering data, followed by taking a broad view of the data, finding patterns, themes and making conclusion (Hodkinson, 2008; Douglas, 2003). This was inspired by grounded theory (Locke, 2002). The aim of the approach is to find insights into phenomenon from the perspective of the life experiences of those participating (Corley, 2015). The thematic analysis approach was used to identify patterns in interviews, policy documents and case studies related to innovation policies, ICT integration, inclusive innovation and startup growth. Data was analyzed inductively, using codes and themes to capture emerging trends. With this analysis, the results were rich in description, providing insights into how policies and practices influence innovation and entrepreneurship. They offered recommendations for policymakers, higher education institutions, and entrepreneurs in East Africa.

The themes for the study were identified using the 6 steps of thematic analysis developed by Braun and Clarke (2006). This framework is widely used in qualitative research due to its flexibility and systematic approach. Below are the six steps and the descriptions of actions at each step: **Familiarization with data:** it involved

reading through transcripts, reports, and photos. I spent considerable time with the data, this gave me an overview of the material and its relevance. Photos helped by adding to the understanding of the environment and people through activities and processes that I was studying, they also assisted in reminding me of the field work and that brought memories and in some cases interviewers' responses made much more sense. I needed to focus and understand the notes, reports and case studies in order to organize data into structures and categories and later find key messages. **Generating initial codes:** here I began identifying and systematically coding interesting key words and concepts from the data, I focused on those that directly addressed my research, such as "inclusive innovation," "higher education," or "ICT impact." **Searching for themes:** at this stage, I grouped related codes into categories or potential themes. For example, "innovation policies" and "inclusive innovation" could form one category, while "startup growth" could form another. **Reviewing themes :** I refined themes to ensure coherence, clarity and relevance to my data set. **Defining and naming themes:** I described each theme and how it contributed in understanding the data. **Producing the report:** I wrote the analysis, providing evidence such as quotes, and explaining findings in relation to the research question.

3.3.1 Assessment of data analysis

The data analysis process had strengths and weaknesses. In terms of strengths, the thematic analysis allowed me to identify patterns across my data, which was ideal for my broad research questions. Using an iterative process of coding and refining themes I ensured that the analysis remained flexible and responsive to emerging insights. In terms of weaknesses, there was a risk that the thematic analysis could oversimplify the complexity of my data. To address the challenge, I remained reflective throughout the process and I constantly returned to the data to ensure its complexity is preserved. During coding there was potential for bias, this is due to the fact that thematic analysis can introduce researcher bias if categories are prematurely assumed. To address this challenge, my data analysis processes involved other researchers, and this helped to maintain objectivity and consistency in the analysis process.

3.4 Quality of the data

Trustworthiness of the research process is of utmost importance (Harrison, McGibbon and Morton, 2001). Before starting the process, I had to understand the phenomenon even on a general level. Alvesson and Sandberg (2022) defines pre-understanding as the extent to which the researcher is familiar with the empirical phenomenon. Being originally from the same country, assumptions were very

minimal as I understood things deeply, especially the culture. This gave me a strong understanding of the phenomenon. As a researcher, I looked the same as my informants and thus I did not need to put much effort to stay at the same level with them and be equal. One thing I have always remembered especially when visiting the grassroots settings is to not take along my computer or expose my other mobile devices too often, this would normally affect peoples' concentration in the interview. In order to obtain authentic information, I used qualitative methods. I engaged in trust and atmosphere building through small talk which was meant to break the ice and open interactions with informants. Further integrated information was gathered from observations, which was a bonus to the data.

In assessing the authenticity and trustworthiness of the data, it is important to ensure that the research maintains its credibility, transferability, dependability and confirmability (Hayre, 2021). **Credibility:** I ensured participant engagement and double-checking by sharing preliminary findings with participants or experts to verify the accuracy of interpretations. This enhanced the internal validity of my findings. **Transferability:** I provided rich descriptions of the contexts, thus allowing others to assess if the findings can be applied to similar settings, such as other East African countries. **Dependability:** I maintained consistency in the process, by keeping detailed records of how data was collected, coded, and analyzed, so that others can follow the process. **Confirmability:** I ensured objectivity by keeping a detailed log to document my decision-making processes. I triangulated data sources (e.g., interviews, policy documents, and case studies) to confirm the findings.

4 Findings

This chapter summarizes the findings from the five articles as part of this dissertation. The summaries consist of an introduction which discusses the motivation for including the articles as part of my dissertation and it also introduces the topics of the articles using literature. This is followed by the methodology of how the research was conducted and, finally, the findings are highlighted as well as the contribution of the study.

4.1 Publication P1: Advancing innovation through higher education institutions: case studies and key practices

This paper is included as part of my dissertation as it responds to RQ1, RQ2 and RQ3. HEIs in the developed world have contributed greatly to the current levels of innovations. However, in order for higher education to deliver future generations with the right set of skills and knowledge; an imperative question has to be asked regarding how HEIs in the developing world, particularly East Africa would be affected by the current new emerging innovations in the developed world and how the delivery of education should be transformed (Altbach, 2007).

The study used a case-study methodology to answer the research question. The study aims to explore the current state of innovation by compiling a comprehensive collection of case studies and key practices from higher learning institutions in Tanzania. This paper explored the current state of innovation through a collection of case studies and key practices from higher education institutions in Tanzania to highlight innovation initiatives and provide insights into effective strategies for advancing innovation. A total of 8 institutions participated in this study.

The results of the study revealed that most institutions use innovation intermediaries in the form of hubs and incubators with different incubation and acceleration processes to promote innovation. This involves a process from recruiting innovators to assisting innovators in the establishment of their startups and strengthening the linkage between industries and higher education institutions. All the 8 HEIs included in this study are actively promoting innovation and creativity as a central part of their curriculum. The HEIs involved in this research vary in their

ownership and operational frameworks. All of the 8 universities work closely in partnership with the government, private sector, academic institutions and most have international partnerships through which they build networks with faculty members, promote knowledge exchange, and research and innovation. The findings of the study reveal different activities and approaches which encourage or promote innovation in general and inclusive innovation in particular. In the context of my research region, higher education institutions are seen as a complete opposite of the grassroots communities. However, this paper confirms that through the transmission of knowledge and sharing, the two can be connected by finding innovative solutions to societal challenges.

These findings contribute to the response to the research questions by revealing the activities done by these institutions and the units within them in the process of promoting creativity, innovation and entrepreneurship.

All HEIs involved in this study have hubs and centers that are working tirelessly in collaboration with management, faculties, students and other external partners to promote innovation not only in the most obvious schools of business and technology but in entire respective HEIs systems. Referring to one of the main outcomes of P1 which is an integrated innovation model, it is important to note that the entire flow in the process has not always been smooth. Despite the positive efforts we identified a number of challenges from the recruitment to incubation and commercialization stage. These challenges need to be addressed for more improvement. In order to implement and promote innovation effectively leadership should be given priority. HEIs need to consider having a steering team which is headed by the head of the HEI. This will help in promoting innovation leadership which is inadequate in most studied HEIs except for SUA, UoI and NM-AIST where the practice is actively promoted through the Innoversity Africa project.

4.2 Publication P2: Inclusive innovation processes in Tanzania: From national policies to local practices in innovation hubs

This paper is included as part of my dissertation as it responds to RQ1, RQ2 and RQ3 by looking at the role of innovation hubs in promoting innovation in general and inclusive innovation processes in particular. The study began by looking at who is involved and what are the outputs of these innovative processes. The findings of this study are important for my dissertation as they give more evidence that can be used for the analysis of the role of innovation hubs in promoting inclusive innovation. Innovation has emerged as a key driver of global development, and it is increasingly difficult to envision any major spatial development strategy or humanitarian intervention without considering its role (Krause, 2013). The ninth Sustainable

Development Goal in the 2030 Agenda for Sustainable Development, adopted by all United Nations Member countries in 2015, emphasizes the promotion of inclusive and sustainable industrialization and fostering innovation (United Nations, 2015). Furthermore, there has been a recent shift in innovation research towards transformative innovation policies, which aim to address global grand challenges related to environmental and social issues, going beyond mere economic growth (Haddad et al., 2022). In order to align innovation policies with the specific development needs of Sub-Saharan Africa, it is important to tailor the general concept of innovation to better respond to the circumstances of local communities. This requires a shift towards inclusive, participatory, and transformative innovation processes that actively engage local communities (Chataway, Hanlin, and Kaplinsky 2014).

The methodology for this study includes empirical material collected through observations and qualitative triangulation of diverse research materials. Observations were conducted between 2020 and 2023 among various stakeholders in the Tanzanian innovation system, primarily in Dar es Salaam and Iringa. The observations for this research included multiple visits to 12 innovation hubs (10 in Dar es Salaam and 2 in Iringa). These 12 innovation hubs provide a comprehensive overview of the Tanzanian innovation activities in practice. During these observations, interactions were held with coordinators, hub managers, and users. Additionally, 10 official semi-structured interviews were conducted with key actors in the Tanzanian innovation ecosystem.

Our findings reveal that the definition and significance of inclusive innovation within the policies are well understood. However, implementation programs are currently modest and scattered. With a few exceptions, innovation hubs have inadequate understanding and limited resources for implementing inclusive innovations in practice. This research contributes by underscoring the need for comprehensive strategies, capacity-building initiatives, and collaborative efforts to fully leverage inclusive innovation for sustainable development in the region. Among the 12 innovation hubs included in this study, only five hubs explicitly prioritize inclusive innovation activities as a central part of their curriculum. These hubs, namely Ndoto Hub, Y4C, dLab, UDSM ICT Incubation, and RLabs Iringa. The RLabs Iringa stands out as the most impactful innovation hub examined in this research. Located in a small town in the southern highlands, RLabs Iringa has successfully adopted and franchised the inclusive innovation model pioneered by RLabs South Africa, which is widely recognized globally as one of the most successful inclusive innovation hub models (Wills, Parker, and Wills 2015).

The findings of this study contribute to responding to the research questions by revealing the activities accomplished during the processes of inclusive innovation within innovation hubs. The findings help to identify who is involved in the processes, what these actors do and the outcomes of these processes.

As highlighted by Heeks, Foster, and Nugroho (2014), achieving inclusion in innovation activities encompasses distinct levels, extending beyond the mere development of new technological products for the underserved. It necessitates the establishment of inclusive structures and post-structures that empower communities and facilitate their active participation in their own social and economic development.

4.3 Publication P3: Exploring the Growth of Innovative Software Startups in the Emerging Technology District of Dar es Salaam

This paper is included as part of my dissertation as it responds to all the four RQs. The study involved 8 successful software startups. The findings of the study reveal the factors affecting growth of innovative startups and these factors touch each theme of this study with the goal of seeing innovative entrepreneurial growth and in turn inclusive innovation. In Tanzania the creation of the DTBI and the TANZICT Project in early 2010s triggered a rapid evolution of similar initiatives to support SME through cluster initiatives, Incubation centers, technology hubs, competitive innovation funds and similar startup support systems. Innovation ecosystems are dynamic networks comprising of industry, investors, higher education institutions, and governments that facilitate innovation through knowledge flow, collaboration and infrastructure support (Autio and Thomas, 2014). There is evidence that effective cooperation within these ecosystems fosters knowledge exchange, resource sharing that are essential for startup success (Thomas *et al.*, 2019). Institutional and financial support are critical enablers in the growth phase of startups (Skawińska and Zalewski, 2020). The country has witnessed a revolution in innovation and technology. Many young people have embarked on entrepreneurship journeys by creating startups inspired by personal ideas, creativity and with their self-interests in mind. These interests have mostly been triggered by societal challenges surrounding them, coupled by a growing scarcity of employment opportunities (Msigwa and Kipesha, 2013).

The purpose of this paper is to explore the factors influencing the growth of software startups within an emerging technology district in an East African city. The article focuses on eight cases and in examining the process from the start to the current status of the respective technology startups. The research will look at the internal and external drivers from the technology district and how they influence the growth and expansion of the hosted case study startups. The methodology used in this study is qualitative exploring the experiences of 8 software startups from Dar es Salaam. The participant observer approach was used, and the analysis followed a thematic analysis process. Research data was first collected by observation through

different interactions with different stakeholders within the innovation ecosystem, during the fieldwork CEOs and other employees of the case companies interacted and engaged with the lead researcher. The platforms used for data collection included: the largest innovation and entrepreneurship events in Tanzania, Sahara Sparks, Tanzanian innovation week and also Slush Finland.

The study identified some factors that positively influence the growth of successful technology startups. Factors like Education, English language, International exposure, Networking, Partnerships and collaboration, Early-stage financial prize, and Training were the most common among the successful startups studied. Support organizations that were most active in contributing to the success were: innovation hubs, NGOs, Bilateral cooperation projects, funders/donors, international development organizations and educational institutions.

The findings contribute to the research questions by revealing the factors affecting the growth of technology startups. Understanding these factors is of utmost importance in the context of the entire study where growth and expansion of innovative ideas to businesses cannot be overemphasized. This study contributes to the body of knowledge on innovation, entrepreneurship and scaling of technology startups in the developing East African economy.

4.4 **Publication P4: Exploring the Role of ICT in Empowering Grassroots Innovation and Entrepreneurship: A Case Study of Iringa**

This paper is included as part of my dissertation as it responds to RQ3 and RQ4. This study explores the journeys of grassroots innovative entrepreneurs and how ICT impacts the growth of their business through day-to-day routines. According to Trojer et al. (2014), grassroots innovations can be described as creativity or inventions that respond to people's social needs in resource scarcity. In this case, resource scarcity can be in the form of materials, technology, knowledge etc. The majority of the population in most developing countries are found in rural areas and many of them are poor. These settings are identified as grassroots. The objective of the study is to assess the influence of ICT on the development and expansion of grassroots innovation and entrepreneurship in resource-constrained settings, with a specific focus on its role in idea generation, establishment and growth of grassroots innovative startups, and the challenges associated with its utilization, including marketing and advertising strategies, among grassroots entrepreneurs in Iringa, Tanzania.

This research follows a case study methodology which was chosen as it allows for holistic investigation of both the entrepreneurship journey to when the ideas would later turn into a startup, grow and become a profitable business that can help

to sustain the entrepreneur, solve societal challenges and at times even provide employment to others. This paper presents an interview-based qualitative survey exploring the experiences of four grassroots entrepreneurs from Tanzania, the startups being Envibright, Ytek, Brianna Bridal and Beauty Salon and Eden Enterprises Company. Action research-oriented research approach was used. Data used in this work are process data which was collected through face to face and telephone interviews and also observation and interactions with different stakeholders within the Tanzanian innovation ecosystem. Examples of the events where data was collected are both the Sahara Sparks and the Tanzanian innovation weeks 2017-2022. The data was supplemented by a number of sources such as desk research from internet sources, news articles, other relevant case studies, emails and telephone discussions with relevant stakeholders in the ecosystem.

The findings of the study revealed how all the case businesses went through a program at RLabs in the beginning of their journeys. They went through a program that commences with empowerment of trainees. They received training on self-awareness, goals and entrepreneurship courses. Each business had an average of 1 to 5 employees, except for one which before Covid had 20 employees. Through access to computers at the lab and mobile phones, new knowledge was acquired. The knowledge included basic computer skills and social media, speaking English, programming etc. ICT solutions used that fostered growth included YouTube, WhatsApp, Email, Instagram, Facebook and Google Sheets. ICT has helped in different capacities including networking physically but also through social networks, marketing and communication.

The findings contribute a response to the research questions by highlighting themes that emerge as the indicators of the role of ICT in the growth and expansion of grassroots innovation and entrepreneurship i.e. access to information and knowledge, resource assembly, allocation and utilization, collaborative and networked ecosystems. The findings of the study reveal several ways by which ICT can be an enabler used to empower grassroots entrepreneurs from self-awareness, to creative thinking and finally to successful entrepreneurs; hence inclusive innovation which is the main goal of this study is encouraged.

4.5 Publication P5: A qualitative assessment of the role of mobile phone technology in enhancing motorcycle taxi services in Dar es Salaam

This paper is included as part of my dissertation as it responds to RQ3 and RQ4. Motorcycle taxis (MCT) are a means of transport and a source of employment for drivers. At the same time, the owners, who are often not drivers, receive an income to run their lives. With so many motorcycles and three-wheelers, mobile phones have

been instrumental for this transport service's drivers and customers. While customers have been using phones to access MCT services, the drivers have been using their mobile phones to receive new customers and retain old ones. The findings of the study reveal the ways in which mobile phone technology as a form of ICT eases and adds value to the motorcycle taxi business especially on the interaction between the driver and the customer. The drivers in this case might be owners but they are mostly employees from grassroots backgrounds with resource scarcity including lack of formal education, lack of ICT skills etc. Motorcycle taxis (MCT) are widely used in urban and rural transport in Asia and Africa. The reasons for the preference for this mode of transportation include unreliable urban public transport traffic congestion and rapid urban population growth (Appelhans and Magina 2020), and affordability compared to other conventional motor vehicle taxis. With specific reference to sub-Saharan Africa, the MCT sector has boomed in the past three decades because it has been not only a mode of transport but also a source of employment for a large segment of rural and urban youths. The mismatch between the rapidly growing youthful population and slow, formal employment creation has made informal sectors, including the MCT, essential to development. In East Africa, MCTs are popularly known as *bodaboda*.

This study's objective was to explore the role of mobile phone technology in enhancing motorcycle taxi service (popularly known as *bodaboda*) in Dar es Salaam. The study analyzed the practices, successes and challenges in using information and communication technology in mobile phone devices to navigate the motorcycle taxi service for customers and as an income-generating business to drivers and owners. The paper proposes recommendations on how ICT can be used to improve service efficiency.

This study used a qualitative research methodology. In this approach, a researcher studies some issue in a natural setting trying to interpret the phenomena of the meanings given by the people to this issue. The data is represented in interviews, photographs, conversations and other memos (Denzin and Lincoln, 2011). In this study data was collected in Dar es Salaam specifically in the Kinondoni municipality through individual in-depth interviews (IDI) with 35 recruited motorcycle operators and service users in Dar es Salaam. The pool of interviewees included talks/discussion with 10 drivers and observations.

This study revealed how mobile phones were used in different scenarios to facilitate smooth and convenient service between motorbike customers and service providers. Most customers were more satisfied with the service request and other communication to do with the service due to the use of mobile phone technology. They saw efficiency, convenience, cost-saving and time saving as added values that have been enabled by technology. Despite challenges, some of which are serious and life threatening, most people would not imagine life without motorcycle taxis in a

city like Dar es Salaam. After analysis of the data a number of recommendations arose as solutions to improving the service, especially on safety and efficiency.

The findings contribute to answering the research questions by revealing the impact of ICT where it empowers grassroots people in this case the drivers and contributes to growth and expansion of entrepreneurship. The connection between motorcycle taxi business in East Africa and the grassroots communities cannot be overemphasized. The business is surrounded by grassroots people who are either working with the taxis due to poverty and inadequate choices in their lives and the users who choose the service due to affordability and convenience.

5 Conclusion

This chapter summarizes and discusses the key findings and contributions of the dissertation. It also presents a synthesis of the key findings. The aim of this thesis is to study how ICT can empower grassroots entrepreneurs and foster inclusive innovation. This aim was achieved by posing four research questions that were answered in five articles. The four research questions were:

- RQ1: What is the role of Higher Education Institutions in promoting innovation in East Africa?
- RQ2: a) How are inclusive innovations addressed in the main innovation-related policies in Tanzania? And b) How are inclusive innovations implemented through innovation hubs in Tanzania?
- RQ3: What factors most influence the growth of tech-startups in emerging technology districts?
- RQ4: How can the transformative role of ICTs be understood on the growth of innovators and entrepreneurs in Tanzania?

The results were presented as follows: Higher education institutions as actors promoting innovation, innovation hubs as actors promoting innovation and innovation policies that influence innovation processes (P1 and P2), Factors influencing startup growth (P3) and the role of ICT in the growth of grassroots businesses (P4 and P5). The study takes place mostly in Tanzania, despite being a lower middle-income country, the majority of the population live in grassroots settings.

5.1 Key findings and Theoretical contributions

In this sub-section I will synthesize the key findings in relation to the purpose of this dissertation. Through five individual publications this study revealed key findings as listed below:

- 1) Identified the activities done by most HEIs and their units in the process of promoting creativity, innovation and entrepreneurship. While there may be certain unique aspects in how innovation is carried out and nurtured, HEIs share common practices from the moment where the innovators are recruited to the establishment of their startups.
- 2) Revealed the activities and processes done in innovation hubs in promoting inclusive innovation. They revealed with a few exceptions, innovation hubs have inadequate understanding and limited resources for implementing inclusive innovations in practice.
- 3) Identified some factors that positively influence the growth of successful technology startups and support organizations that were most active in contributing to the growth and success of startups.
- 4) Revealed how ICT solutions have helped in empowering grassroots entrepreneurs in different capacities but especially in gaining knowledge that led to increased self-awareness, and exposure to relevant information that contributed positively to the growth of businesses.
- 5) Revealed how mobile phones were used in different scenarios to facilitate smooth and convenient service between motorbike customers and service providers.

This PhD research advances theoretical and empirical knowledge on innovation studies, focusing on the role of Higher Education Institutions (HEIs), innovation hubs, and ICT in fostering inclusive innovation and entrepreneurship in East Africa, particularly Tanzania. It provides insights into how policies and institutional frameworks support or hinder innovation, offering recommendations for more effective and inclusive policies.

By analyzing Tanzanian innovation policies and their real-world application, the study identifies best practices, challenges, and gaps in/when fostering inclusivity. It highlights the role of innovation hubs in supporting startups and the determinants influencing the growth of technology enterprises in emerging tech districts. The findings contribute to refining entrepreneurship models specific to the East African startup ecosystem, distinguishing them from Western models.

The research also explores how Tanzanian HEIs facilitate innovation, from recruitment to startup establishment, contributing to literature on academic entrepreneurship and university-led innovation ecosystems. Additionally, it examines the role of ICT, particularly mobile solutions, in empowering grassroots entrepreneurs, enhancing digital transformation, and supporting the informal economy.

By bridging the gap between policy, practice, and theory, this study provides evidence-based recommendations for managers and policymakers, innovation hubs, and HEIs to strengthen innovation support systems. It enriches academic discourse on inclusive innovation, digital transformation, and startup growth in emerging economies, laying a foundation for further research in these areas. With empirical evidence, this study contributes by presenting the importance of a strong support networks in the ecosystem and the influence it has on startup growth. It also reveals the impact of interactions of organizations at different levels of a society.

This study contributes to the inclusive innovation and grassroots entrepreneurship literature. The context of grassroots entrepreneurs and the role of ICT in their businesses is limited in literature, especially in the East Africa region in general and Tanzania in particular. Most of the previous literature focuses on the Silicon Valley model of entrepreneurship characterized by high tech cluster formation and growth (Welter et al., 2017; Etzkowitz, 2019). This dissertation addresses the shortcoming by contributing to the area in the developing country context. The study contributes by showing the role of HEIs as ecosystem actors in promoting innovation (P1) the role of innovation hubs in promoting inclusive innovation and the influence of innovation policies to innovation related processes (P2) Factors influencing growth (P3) The role ICT in growth and expansion of grassroots entrepreneurship (P4 and P5).

In terms of contributing to scholarly discussion the study improves the understanding a number of topics including: Promoting innovation and entrepreneurship, ICT for inclusive innovation, Growth of innovative startups and ICT in grassroots entrepreneurship. Below I will discuss ICT for inclusive innovation and ICT in grassroots innovation and entrepreneurship

5.1.1 ICT for inclusive innovation

The topic of ICT for inclusive innovation has been discussed by several researchers. According to Goyal (2015) who did a study in the context of India, innovation by using the internet and ICT benefits inclusion and supports inclusive growth. The author suggests that the adoption and adaptation of technology supports economic incentives. Gaur and Avison (2015) conducted a study on women and their ICT enabled well-being in rural India. This study revealed that upon exposure to ICT, innovation had a positive impact on the livelihoods of the women in a process of improvement and effective use of resources. A study by Paunov and Rollo (2016) revealed that the use of the internet positively affects the average firm's productivity through knowledge access. Ofori et al. (2022), studied the interaction between ICT and financial development in 42 Sub Saharan Africa (SSA) countries, the study explored how the interaction influences inclusive growth. The results revealed that

ICT skills, access and usage induce inclusive growth in SSA. Using case studies of inclusive innovation processes in the Tanzanian innovation ecosystem where inclusion contributed to growth, the findings of my study complement the results of studies by (Goyal, 2015; Gaur and Avison, 2015; Paunov and Rollo, 2016; Ofori et al. 2022), on the interaction between ICT and inclusive innovation. In this dissertation, I show that ICT can empower grassroots entrepreneurs through access to information and thus knowledge and it can facilitate resource allocation and utilization. I also show that ICT promotes inclusive innovation by providing a platform for developing innovations. It also provides access to services for the entire range of society without excluding anyone. This dissertation contributes to advancing literature by revealing the role of ICT on self-awareness which in turn empowers grassroots youth and allows them to be open minded and enjoy the fruits of access to knowledge. I show that there is a need for more awareness campaigns on inclusive innovation among innovation ecosystem players especially innovation hubs.

5.1.2 ICT in grassroots entrepreneurship

A previous study by Singh et al. (2018), revealed that the use of ICT can partially moderate the relationship between new learning practices, local solution and networking capabilities to economic benefits. The higher the use of ICT the stronger the relationships. From an entrepreneurial opportunity perspective, a case study by Leong et al. (2016), explored digitally enabled grassroots entrepreneurship, some of the study findings revealed how business, knowledge and institutional as dimensions of entrepreneurship are involved in entrepreneurship development. It revealed the role of ICT in driving grassroots entrepreneurship for self-driven development, the study also presented the development stages through opportunity exploitation and exploration of business, knowledge and institutional entrepreneurship. These facts are backed by the results of this dissertation. However, in this study the role of ICT is not discussed from the perspective of a self-driven development but rather from the role of the innovation hubs in stimulating the minds of youths. The findings of this research study revealed how through access to computers and mobile phones, new knowledge was acquired. The knowledge included basic computer skills and social media, English language and programming. Apart from learning ICT has helped in different capacities including networking physically but also through social networks, marketing and communication. This research contributes to theory by putting a strong emphasis on a more enabled environment, including access to ICT and relevant skills for grassroots entrepreneurs to gain from the technology through self-awareness, to creative thinking and to successful entrepreneurship. ICT helps grassroots entrepreneurs in resource allocation and utilization to collaborative

networking which helps to create an enabling environment for adopting technology use. Through knowledge grassroots innovation and entrepreneurship will expand and in turn there will be an increase in inclusive innovation in the region.

The findings of this research study also revealed how mobile phones were used in different scenarios to facilitate smooth and convenient services between motorbike customers and service providers. Most customers were more satisfied with the service request and other communication to do with the service due to the use of mobile phone technology. They saw efficiency, convenience, cost-saving and time saving as added values that have been enabled by technology. With an in-depth study, this dissertation contributes to literature by showing the impact of ICT in grassroots people in this case the drivers and how it influences growth and expansion of entrepreneurship. The study puts an emphasis on how ICT solutions have facilitated smooth and convenient service between motorbike customers and service providers.

Moreover/ Furthermore, the study confirmed how ICT helps in empowering grassroots entrepreneurs especially in gaining knowledge that led to increased self-awareness, exposure to relevant information that contributed positively to businesses. Despite the creative minds of individuals, this study demonstrated the important role played by support organizations to grassroots communities especially to the youth. Previous studies have looked at how organizations supported individuals who have already developed innovations through entrepreneurial training (Karami and Agahi, 2018; Cote, 2020). This study looked at organizations that supported individuals before they became entrepreneurs and developed innovations. The approach to support grassroots entrepreneurs and innovators as demonstrated in previous studies (Wierenga, 2020) is different from the practice of training individuals with little or no consideration to them becoming entrepreneurs. This dissertation contributes by highlighting that support in the form of pre-entrepreneurship training is necessary as demonstrated by the results of the work of R Labs in empowering the youth. Wierenga (2020) talked about the importance of training low-income entrepreneurs at different levels, from individual levels to organizational levels. Training them on an individual level impacts their own capabilities and opens up or increases possibilities. This empowers them to become entrepreneurs. This dissertation confirmed this fact through a thorough and detailed study of grassroots entrepreneurs in Iringa, the study revealed significant changes in growth post-training in terms of self-awareness, income generation and job creation.

This dissertation focused on the necessity of driven grassroots entrepreneurs, who according to Wierenga (2020) are individuals who develop, commercialize and scale innovations that they have developed. The study contributes to literature on grassroots communities as entrepreneurs and innovators (Sarkar, 2018), it also shows that grassroots entrepreneurs can also innovate despite resource scarcity. The

innovativeness of these entrepreneurs is in processes, product, services and business models. In this dissertation, I show that grassroots entrepreneurs stem from access to information and knowledge, resource allocation and utilization, and also collaborative and networked ecosystems. This dissertation provides a new dimension to the current understanding of grassroots entrepreneurs who can be self-empowered first before they can even think of becoming entrepreneurs.

5.2 Implications

Based on this research, it is possible to provide implications in the field of inclusive innovation to all innovation ecosystem stakeholders and especially policy makers. This study has demonstrated the transformative potential of ICT in empowering entrepreneurs and fostering inclusive innovations. By enabling access to information, markets and resources ICT plays a role of a powerful tool for enabling grassroots entrepreneurs operating in resource scarcity surroundings. Digital tools like a mobile phone have the ability to provide accessibility, affordability and scalability that can allow these entrepreneurs to operate and see progress despite the poor infrastructure, lack of capitals and lack of education that restricts them in their daily lives. Our findings reveal that ICT is not only an enabler to economic activities but also a catalyst for social change. By promoting grassroots innovation ICT enables entrepreneurs to create and scale different solutions to social challenges. Through the empowerment, local communities develop a culture of creativity and problem-solving which fosters self-sustaining and resilient communities that in turn contribute to sustainable development.

Despite the positive effects of ICT, this research study highlighted some areas where interventions are needed. Obstacles such as digital literacy gaps, unreliable internet connectivity, internet costs and inadequate policy support remain the greatest setbacks to the maximization of ICT impact among grassroots entrepreneurs. Tackling these challenges needs a multi-stakeholder approach involving all ecosystem actors to create a conducive environment for inclusive innovation. The actors include industry, academia, government and non-governmental organizations. An enabling environment at the grassroots level needs to be strengthened and maintained. For example, it is of the utmost importance to create more community level innovation hubs in order to increase empowerment and nurture innovation and entrepreneurship. There are many desperate youths at the grassroots level especially in emerging economies like Tanzania, where not only resource scarcity is a challenge, but self-empowerment is a great obstacle. There are support organizations and some are working with grassroots communities, but their approach does not always suit the context. There is a need to take positive learning from the institutional level and contextualize them to fit into the grassroots level. In order to expand the

inclusivity, the approach described in publication P4 should be imitated into all other grassroots levels of the country. More campaigns for empowering grassroots youth and promoting sustainability of their businesses are needed. Policy makers need to understand inclusive innovation further through concrete cases and taking forward lessons learned to obtain a full picture of the ecosystem. When planning and designing policies the grassroots communities need to be involved in order to avoid top-down approaches.

5.3 Limitations of the study

Despite all the findings and contributions in the area of inclusive innovation, this study has limitations. First, all data from the case studies was collected in Tanzania only, thus the results do not reflect the realities of a large geographical region. Given the population of Africa, a study on the entire East African region would give results from a broader perspective, which would make the conclusions stronger. Secondly, in part of the study, the research involves a limited number of case studies, some may argue that more cases would be useful in producing/ generating stronger conclusions and contributions. Thirdly, this study explored other ecosystem stakeholders i.e. Industry, Higher education institutions and Society but it did not present an in depth study on the government as one important actor of the ecosystem. This is a limitation since everything that happens within the ecosystem is regulated by the government. A deeper understanding of the role of the government would help to make better plans and solutions for weaknesses facing the rest of the ecosystem. Fourthly, the study focused on the empowerment of grassroots entrepreneurs where it investigated them from the rural and urban contexts; however, the actual definition of a grassroots person with regard to resource scarcity is unclear, as some previous studies suggest that people have the ability to combine and recombine what they have and use it as a resource. A study with a narrower focus and only a rural context would make the contribution a bit more specific.

In addition, traditional knowledge is in some cases counted as a resource which can be used by grassroots people to make changes into their lives. In this study, the definition of grassroots people has been generalized which might have influenced the results to some extent. On the other hand, the number of grassroots interviewees involved in the study is less compared to interviewees from the institutional level. Since the focus was on fostering inclusive innovations by promoting the use of ICT among grassroots entrepreneurs, it would have been better if the number of grassroots informants had exceeded those from the institutional level. The number of ecosystem actors from rural areas, for example, higher education institutions, innovation hubs should have been given more attention. Although looking at the institutional level actors helped as a guide for what should be contextualized and

applied at the grassroots level, a deeper study of the grassroots level including the actors at the community level would make more sense as the starting point. Subsequently, future studies could continue by looking at examples from the institutional level.

Lastly, this research was limited to a large extent and in a number of ways by Covid19, which for example limited field visits for almost three years and even during some research countries and cities had to be omitted or the actual plan had to be narrowed or minimized for it to work. The pandemic also saw many businesses, especially startups, failing and some even closing. Some of the information I collected during the interviews occurred in the past, this might have caused some bias, but I minimized the effect by including other sources of data and at times re-interviewing the same participants later, to try and gain new knowledge. In the absence of Covid19 pandemic, most of the limitations of this study can be minimized and some completely avoided. For example more areas, regions and countries can be involved in the study and make the empirical results more rich, and allows for a comparison analysis. The results of that analysis will contribute more extensively. Also, going to more regions could give access to more grassroots level entrepreneurs and innovators hence more empirical data and more evidence to support conclusions.

5.4 Future research

Future research should focus on deepening the understanding of how ICT can be tailored to the specific needs of grassroots communities. Studies could explore the integration of emerging technologies, such as artificial intelligence, into innovation and entrepreneurial activities in resource-constrained grassroots settings.

While this research considered both male and female entrepreneurs, future studies should delve deeper into the experiences of women entrepreneurs, particularly in geographical contexts where they remain underrepresented in technology adoption. Research should investigate focused and intentional approaches to entrepreneurial training for women in emerging economies and the impact of such training on the success of their startups. Additionally, studies should explore how to design education models for women who may not have had access to formal education.

Future research should examine the challenges faced by women living with disabilities in the context of innovation and entrepreneurship in emerging economies. This group remains significantly underrepresented, particularly in developing countries. A broader understanding of their barriers and opportunities could provide valuable insights into ICT-enabled grassroots innovation, fostering greater social inclusion and inclusive innovation.

Most existing research on ICT for inclusive innovation focuses on organizations, leaving a gap in understanding grassroots perspectives, particularly among young people. Research should explore the need for self-awareness and psychological empowerment before entrepreneurial training in emerging economies, such as Tanzania. Investigating this area could lead to improved programs that strengthen entrepreneurial mindsets and promote inclusive innovation.

Future studies should explore innovative approaches to accelerate the absorption of ICT skills in grassroots communities. Understanding how technology influences grassroots innovation ecosystems in emerging economies is crucial for closing the gap between institutional and grassroots innovation levels. Research should prioritize studying grassroots innovation ecosystems as they currently exist before drawing lessons from institutional models. Additionally, inter-regional cooperation between grassroots ecosystems should be examined to enhance collaborative development.

Many innovation and entrepreneurship activities thrive under internationally funded projects but struggle to sustain themselves post-project. Future research should investigate strategies to improve the sustainability of donor-funded initiatives after the funding cycle ends.

This study identified some challenges associated with the government's role in the innovation ecosystem but did not explore them in depth. Future research should examine the role of government institutions in promoting grassroots innovation and entrepreneurship in developing countries. Case studies of relevant government agencies could help identify areas for policy improvement and intervention. By addressing these research areas, future studies will contribute to advancing sustainable and inclusive innovation, fostering stronger grassroots entrepreneurship, and bridging the gap between technology and underrepresented communities.

5.5 Concluding Reflections

This thesis studied the promotion of innovation and entrepreneurship in emerging economies, with a focus on ICT as an enabler to empowering grassroots entrepreneurs. This study was motivated by my desire to contribute to closing the gap between the institutional and grassroots level in the East African innovation ecosystem. I felt the need to study the role of two actors at the institutional level and how they promote innovation, I also studied the role of ICT in promoting innovation and entrepreneurship at the grassroots level. The common factor is the entrepreneurial journey from the idea to commercialization through which all startups should - despite their background and operational settings. This motivated me to study the factors influencing growth of successful technology startups, with

the aim of taking the results as lessons and contextualize those into the grassroots context.

Despite several realizations and insights on a personal level, I wish to conclude by reflecting on the insights gained through the data collection. The majority of data in this thesis was from my native socio-cultural environment. In one way it made it easier for me as I speak the local language and interacting with research participants was not a huge challenge. However, living and working in Europe for more than 20 years does not make it easier for me as a researcher in my country of origin. Research participants' perspective of me was different, they do not consider me to be equal with them or the same as they are; this is something which I do agree with, at least to some extent, and being a woman is also another issue. Even though I did my best to be flexible in many ways and fit into each participant's level comfortability, I am still not very sure how much these issues affect the response I received and to what extent. This is from an anthropological point of view.

Another reflection is on the role of grassroots communities to the inclusive innovation processes. The participatory approach cannot be overemphasized. I have come to realize the importance of including grassroots communities and all relevant actors in the process of planning and designing interventions that concerns them, in order to ensure sustainable inclusive innovation. This is not yet done as properly/appropriately /accurately and as extensively as it should. It has to start from the grass root level, and the approach should find suitable ways to maximize the involvement of the communities. As regards technology and grassroots communities, most researchers collaborate more closely and research different topics at the institutional level, however, as time has gone by, we now also have more researchers looking at the grassroots level. Nevertheless, connecting technology and the grassroot level is something that in many situations leads to limited data and thus discourages some studies. This is especially true with regard to emerging economies where despite the spread of technology the majority of the people cannot yet use the technology productively to maximize its potential in fostering change. Even though many people even in rural areas might have mobile phones, their poor digital skills, language barriers and infrastructure including accessibility to digital devices and affordable and reliable internet connections remain the challenges. This calls for more research and actions. I must acknowledge how much this study has contributed to a massive growth within me both academically and intellectually.

Fostering inclusive innovations by using ICT to empower grassroots entrepreneurs is not only the road to economic inclusion but it is also a vital step towards achieving sustainable growth and development. By harnessing the power of technology to empower grassroots entrepreneurs we create a pathway towards a society where no one is left behind. This means that opportunities and possibilities for economic expansion will be accessible to all despite their socio-economic status,

geographical location or level of education. This thesis contributes to the understanding of this domain and serves as a call to action for further research, policy innovation, and investment in ICT solutions that empower entrepreneurs at all levels.

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