



Information and Communication Technology Skills Dynamics in Mozambique

A dissertation

by

Ammar Canani

(CNNAMM001)

Supervised by: Gwamaka Mwalemba

Submitted to the

Department of Information Systems, Faculty of Commerce, University of Cape Town

In partial fulfilment of the requirements for a Master's Degree in Information Systems

The copyright of this thesis vests in the author. No quotation from it or information derived from it is to be published without full acknowledgement of the source. The thesis is to be used for private study or non-commercial research purposes only.

Published by the University of Cape Town (UCT) in terms of the non-exclusive license granted to UCT by the author.

Plagiarism Declaration

1. I know that plagiarism is wrong. Plagiarism is to use another's work and pretend that it is one's own.
2. I have used the APA convention for citation and referencing. Each contribution to, and quotation in, this thesis, "Information and Communication Technology Skills Dynamics in Mozambique", from the work(s) of other people has been attributed and has been cited and referenced.
3. This thesis, "Information and Communication Technology Skills Dynamics in Mozambique", is my own work.
4. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his or her own work.
5. I acknowledge that copying someone else's assignment or essay, or part of it, is wrong, and declare that this is my own work.
6. I have not falsified or manufactured any data and declare that all data was ethically collected.

Signed, 01/02/2024:

Signed by candidate

Ammar Canani – CNNAMM001

Table of Contents

Abstract	VII
Dedication	VIII
Acknowledgements.....	X
Chapter 1: Introduction	1
Chapter 2: Literature Review	3
2.1. Skills.....	4
2.2. Soft skills and Hard skills	4
2.3. 21 st Century Skills	5
2.3.1. The Partnership for 21 st Century Skills.....	5
2.3.2. Assessment and Teaching of 21st Century Skills	5
2.3.3. Organisation for Economic Co-operation and Development approach	6
2.3.4. 21 st Century Digital Skills.....	6
2.4. ICT Skills.....	7
2.5. ICT Skills Stakeholders.....	8
2.5.1. Government	8
2.5.2. Educational Institutions	9
2.5.3. Businesses – Private Sector.....	9
2.5.4. Organizations – Non-Profit	9
2.5.5. Individuals	10
2.5.6. External Stakeholders	10
2.6. ICT Skills Channels.....	10
2.7. ICT Skills Dynamics	11
2.7.1. Quality of Education.....	11
2.7.2. Incomplete skillset and High expectations for entry-level jobs.....	12
2.7.3. Role of Educational Institutions.....	12
2.7.4. Upskilling and Training.....	12
2.7.5. Language and Cultural Barriers.....	13
2.7.6. Infrastructure	13
2.7.7. External Influences.....	13
2.8. Literature Summary	13

Chapter 3: Theoretical Framework	16
3.1. Grounded Theory Methodology	16
3.1.1. Coding Paradigm	16
3.2. System Dynamics – Casual Loops Diagram	17
3.3. Ecosystems.....	18
Chapter 4: Research Methodology.....	19
4.1. Research Question and Objectives	19
4.2. Methodology.....	19
4.2.1. Philosophical Considerations	19
4.2.2. Purpose	21
4.2.3. Approach to Theory	22
4.3. Research Strategy	23
4.3.1. Case Study.....	23
4.3.2. Grounded Theory Methodology	24
4.3.3. Justifying CS-GTM	25
4.3.4. CS-GTM Roadmap	26
4.4. Timeframe.....	27
4.5. Data Collection.....	27
4.5.1. Research Instruments	27
4.5.2. Sampling.....	27
4.5.3. Participants	28
4.6. Data Analysis.....	28
4.7. CS-GTM in Practice.....	30
4.8. Quality of Research	33
4.9. Ethics, Privacy, Access, Confidentiality and Data Management	34
Chapter 5: Case - State of ICT Skills in Mozambique.....	35
Chapter 6: Results	37
6.1. Findings	37
6.1.1. Causal Conditions.....	37
6.1.2. Context.....	38
6.1.3. Intervening Conditions.....	39
6.1.4. Strategies	40

6.1.5. Consequences	41
6.2. Discussion.....	43
6.2.1. ICT Skills Ecosystem.....	43
6.2.2. Dynamics of ICT Skills.....	44
6.2.3. ICT Skills Dynamics Model.....	46
6.2.4. Engaging ICT Skills Dynamics Model with Literature	48
6.2.5. Contribution	49
Chapter 7: Conclusion.....	51
References.....	53
Appendix A: Literature Summary	63
Appendix B: Case Study Protocol	66
Appendix C: Interview Guide.....	68
Appendix D: Data Management Plan	70
Appendix E: Consent Letter for Participants	77

List of Tables

Table 1: Participants of the study.....	28
Table 2: Quality of Research	34
Table 3: Causal Conditions.....	38
Table 4: Context.....	39
Table 5: Intervening Conditions	40
Table 6: Strategies.....	41
Table 7: Consequences	42

List of Figures

Figure 1: Case Study-Grounded Theory Methodology	26
Figure 2: Steps of Coding	33
Figure 3: Coding Paradigm Summary of ICT skills concepts in Mozambique.....	43
Figure 4: Orchestrating Actor Ecosystem.....	44
Figure 5: ICT Skills Dynamics Model.....	47

Abstract

The current state of Information and Communication Technology (ICT) in Mozambique is inadequate regarding education, skills, infrastructure, government support, language, and culture. Poor education is available at all levels, and basic ICT skills are lacking countrywide. Language and cultural differences constitute barriers to ICT due to English not being commonly spoken. The country's infrastructure remains inadequate to reap the potential of ICT fully. As there is insufficient literature on an integrated view of the ICT skills ecosystem as a field in Mozambique, this study lays some groundwork by inductively exploring the dynamics around the supply and demand of ICT skills as perceived by local actors. The study was guided by a Case Study-Grounded Theory Methodology (CS-GTM), with data collected through in-depth interviews with various local stakeholders implicated in the ICT skills ecosystems. The results show a never-ending cycle of scarce ICT opportunities (jobs, education, and training) to acquire ICT skills on the one hand, and a shortage of skills to meet the demand for ICT in the nation as a result of unfavourable growth conditions for ICT, which is made worse by insufficient government support, on the other hand.. Some of the dynamics raised were the centralisation and reliance on the capital city, the hierarchy of the country's different regions, and the heavy reliance on foreign companies and talent. From a big-picture view, the government holds the power in the ICT ecosystem but provides little support, leading to stakeholders adapting to the situation. However, due to insufficient support, the supply of ICT skills remains inadequate, leading to inadequate demand and creating a never-ending loop of ICT skills that are not improving in the ecosystem. In terms of literature, this study presents a broad perspective on the dynamics of ICT skills. It offers a starting point for examining similar aspects in countries with comparable development indicators. In practical terms, the highlighted dynamics in the study provide a foundation for developing a roadmap to navigate the persistent challenges in this field.

Keywords: ICT, skills, Mozambique, ICT skills, digital skills

Dedication

بِسْمِ اللَّهِ الرَّحْمَنِ الرَّحِيمِ

الْحَمْدُ لِلَّهِ رَبِّ الْعَالَمِينَ

اللَّهُمَّ صَلِّ عَلَى مُحَمَّدٍ وَآلِ مُحَمَّدٍ

While this thesis shows as one person's submission, many behind the scenes contributed in many ways. This day always seemed like it was never coming; when it felt near, it was the farthest, and when it felt the most distant, it was near.

First and foremost, from day 0, the big boss upstairs has helped me during ups and downs. This thesis felt like an impossible task when it all began; it seemed like it would never finish, but the Almighty (swt) was there through it all. As the verse in the Holy Quran goes: “God does not burden any soul with more than it can bear” [2:286]. I am thankful for this opportunity to reach this point – somewhere I almost never made it.

The Holy Prophet Muhammad (saww) has said: “Whoever is not grateful to the people is not grateful to Allah (SWT)”. It would not be just to forget and thank everyone who has supported me on my path so far. After all, it takes a village!

At the top of the list are the people who brought me here – my parents. None of this would have been possible without their support, motivation, brainstorming sessions, push to keep going, and much more, where my writing would not do justice. And, of course, I can't forget my sister, who sat with me more than once to check if all my references in the text had been added to the reference list. She also helped proofread this so if something is wrong...

You may have noticed another name mentioned at the start of this thesis. The mere fact that his name is there says a lot about the role played by my supervisor. In his case, he was not just a supervisor but played a multi-faceted role depending on the day. He took the “wearing different hats” lesson in class to a new level. From being a teacher to a mentor to a guide and a friend who provided support, help, advice, guidance and all other synonyms, this thesis came to the end of the road partly thanks to him. At times, it seemed like he was piling more work on me, but at the end, it would always end with, “Well, that helped a lot, thanks!”. It makes a big difference when you have a supervisor like Prof G!

This brings me to the final appreciation section – thanking everyone who directly or indirectly helped me along my journey. It goes without saying; I am unsure if I can name them, but they are members of WhatsApp groups called Divide by Five, SCAM, and House Stellenberg – from the coffees to the waffles to the steaks and much venting along the way! These friends are the ride to die, and they helped me get to the end of the line. At the same time, from Prof Pitso, the GTM ChatGPT, to Prof Elsje, my UCT mother, to Tendani, now Doc Tendani, another casualty of the thesis life, to Grant, also in the same boat, to Prof Kyobe for keeping it real, to my lecturers who paved the path and finally ending with my fellow Masters peers who made our online vibes happen. Lastly, I can't forget the tutor groups that always kept it entertaining – my UCT family helped along the way! The Writing Centre team for dragging me to the finish line and Blessing being a Blessing for my thesis's second read!

I generally don't write lengthy essays (case in point: how long this thesis took 😊), but for the efforts it took to complete this thesis, the above people deserve a special shoutout for being there along the way! One thing that car racing turned action franchise got right is “I don't have friends. I've got family”. As Imam Ali (as) has said about family: “Honor your family, for they are the wings with which you fly, and the hands with which you fight; they are the home that you always will return to.”

Thank you to everyone who helped from day 0!

Acknowledgements

This thesis is a culmination of various assignments submitted for the Master's Degree. The following list of assignments contributed to several sections of this thesis:

1. High-level Thesis Overview
2. Literature Review
3. Research Proposal
4. Research Design
5. Management Assignment
6. Systems Thinking Assignment

Additionally, this thesis was published as a research-in-progress paper in the Proceedings of the 14th Annual AIS SIG GlobDev Pre-ICIS Workshop held in Copenhagen, Denmark, on 10th December 2022. The paper may be viewed here: <https://aisel.aisnet.org/globdev2022/11/>.

The feedback received from the above helped me realise this thesis.

Chapter 1 Introduction

Information and Communication Technology (ICT) is believed to be the foundation for innovation, especially in the current phase, where means of production, commerce, service delivery, and almost all other aspects of life are deeply integrated with technology (Alhassan & Adam, 2021; Van Laar et al., 2017). If appropriately utilised, ICT can play a key role in addressing some of the most persisting economic and social challenges, including those in the areas of health, education, agriculture, and commerce (Alhassan & Adam, 2021; Park & Yoo, 2022; Qureshi, 2015; Walsham, 2012). However, despite its potential, ICT is not a silver bullet. Realising its potential is not entirely straightforward and can exacerbate some negative aspects of society (Karunaratne et al., 2018).

Developing countries face several challenges to realise the potential of ICT. Among other aspects, inadequate infrastructure and lack of suitable policies affect how ICTs are managed, poor education levels cause skills gaps, and language and cultural barriers create difficulty in adopting technologies (Afawubo & Noglo, 2022; Cha et al., 2020; Kang & Park, 2017; Kasparova, 2019; Kumar & Singh, 2019). These challenges affect the skills available to grow the ICT industry in these countries.

Mozambique has poor education levels, with only 8% of people finishing secondary education (World Bank, 2019). People lack basic ICT skills due to insufficient ICT training (Mothobi et al., 2018). There is a lack of access to funding as the country has not invested in its digital economy, and continuing corruption has made accessing investment difficult (World Bank, 2019). Language and cultural barriers within and between countries pose a barrier to ICT access as most Mozambicans speaking African languages can't speak Portuguese – the official language (Chimbutane, 2017). Lack of policy reform, poor infrastructure and 70% of the population use basic phones with around 10% of internet penetration (Gillwald et al., 2019; Mothobi, 2021), adds to making Mozambique one of the many developing countries yet to sufficiently realise the potential of ICT (Gillwald et al., 2019; Mothobi et al., 2018; World Bank, 2019). ICT in Mozambique is still in its infancy, both from an industry perspective and an ICT research discourse perspective (Ribeiro Ribeiras, 2018).

Even compared to other countries in the region, there is relatively limited research on the state of the Mozambican ICT industry and requires further study (Ribeiro Ribeiras, 2018). This

exploratory study aims to explore the influence of the dynamics affecting the supply and demand of ICT skills in the current state of the ICT industry.

The research question in this regard is: *What is the state of ICT skills dynamics (supply and demand) in Mozambique?* By answering this question, the study will contribute to the discourse on ICT skills in developing countries and the role of ICT skills in shaping the state of national ICT industries.

This thesis begins by reviewing extant literature (Chapter 2). Subsequently, an overview of the theoretical framework that influenced the study (Chapter 3), followed by the methodology used, is discussed (Chapter 4). The state of ICT skills in Mozambique is highlighted next (Chapter 5). The results section (Chapter 6) then discusses the findings, showing the different elements affecting the dynamics of ICT skills. This is followed by a discussion on the link between the current state of ICT skills and the effect this has on the dynamics of ICT skills and the ICT skills dynamics model and ecosystem. Finally, the conclusion is presented (Chapter 7).

Chapter 2 Literature Review

ICT can be defined in three broad perspectives: the usage (how it is used as a driver, commodity or an enabler), domain impacts (substituting existing means, proliferating and creating new social structures) and the contextual view (as a tool to do a task, the value added, a dynamic network in a social context and capabilities of ICT) (Twinomurinzi et al., 2017).

Using ICTs as mediums, information is disseminated using complementary tools that provide information for better human development (Alderete, 2017). Societies that utilise ICTs effectively gain economic and social advantages, have competitive markets, and introduce innovations for improvement (Ziemba, 2017). Due to globalisation, ICTs have helped increase competitiveness and effectiveness by increasing profitability in different fields while tackling complexities in business processes (Dubey & Tiwari, 2020). ICTs enable inclusive growth whereby an entire population may benefit and prosper monetarily and non-monetarily (Manda & Backhouse, 2017). Prior to ICTs, employment was location-fixed; as ICT use has increased, digital workers have emerged (Graham et al., 2017). Outsourcing of work has made it more affordable and increased the talent pool (Mothobi et al., 2018). ICTs have enabled digital platforms that allow the exchange of products and services by increasing interactions between suppliers and consumers (Badran, 2021). In general, ICTs enable development by providing access to new markets, increasing access to knowledge, and increasing competitiveness when applied to challenges and problems faced in a specific context (Alderete, 2017). ICTs are found in many fields, such as health, education, politics, and infrastructure, among others (Dubey & Tiwari, 2020).

However, ICTs are not the answer to all problems as there are several challenges to utilising them effectively, such as lack of funding, skills and interest from stakeholders (Karunaratne et al., 2018). Some government policies are insufficient or outdated (Kang & Park, 2017; Manda & Backhouse, 2017; Manda & Ben Dhaou, 2019). The quality of education available and the gaps in the existing skills available affect the effectiveness of ICT (Kasparova, 2019; Schelenz & Schopp, 2018). Differences in languages and cultures pose barriers to ICT usage (Kumar & Singh, 2019; Schelenz & Schopp, 2018). Imported technologies are challenging to use (Schopp et al., 2019). Poor infrastructure, lack of investments and contextual challenges such as the digital divide affect access to ICTs (Ben et al., 2017; Canani & Seymour, 2021).

There are possible adverse effects of ICT. With suitable policies, ICTs ensure resources are available to face the opportunities and challenges of using ICTs (Kang & Park, 2017; Manda & Backhouse, 2017; Manda & Ben Dhaou, 2019). Poor quality of education creates poor digital skills, leading to graduates having poor skills, causing a skills gap, which could result in financial losses due to inefficiencies and data loss in businesses (Kasparova, 2019; Schelenz & Schopp, 2018). Language and cultural barriers disrupt the flow of knowledge and technology due to differences in spoken languages (Kumar & Singh, 2019). Imported technologies often unavailable in local languages risk enabling technological barriers (Schopp et al., 2019). Poor infrastructure and lack of investments decrease accessibility to new markets while increasing gaps in disadvantaged areas (Ben et al., 2017). Context-specific challenges such as the digital divide affect access to ICTs, resulting in the use of ICTs not being realised to its full potential (Canani & Seymour, 2021). The following section explores skills, including their various types and the frameworks used to classify them, providing context for the skills examined in this study.

2.1. Skills

Skills refer to the capability to perform a task (Patacsil & Tablatin, 2017). It is a learned capacity to do a predetermined task with minimal time and energy (Twinomurinzi et al., 2017). Skills are acquired in a structured or an intentional manner such as non-formal learning and informally such as with friends or using the internet and formally through schooling (Fonseca et al., 2017).

2.2. Soft skills and Hard skills

Nontechnical skills are ‘soft’ skills while technical skills are ‘hard’ skills (Patacsil & Tablatin, 2017). Soft skills are not precise and are challenging to quantify or measure (Van Laar et al., 2017). Soft skills are vast and sometimes referred to as emotional, employability, and people skills, among others (Dubey & Tiwari, 2020). Examples of soft skills include but are not limited to problem-solving, communication, teamwork, and leadership skills (Dubey & Tiwari, 2020; Patacsil & Tablatin, 2017). On the other hand, hard skills complement soft skills as they are specific to a field or profession (Nazron et al., 2017). Examples of hard skills include but are not limited to knowledge of programming languages, hardware, and software. Soft and hard skills are essential for innovation (Hendarman & Cantner, 2017). The importance of having soft skills increases with the complexity of a task at hand (Dubey & Tiwari, 2020). Several

authors have prioritised soft skills, which have a wider gap than hard skills (Dubey & Tiwari, 2020). A systematic literature review on the core skills in ICT industries resulted in the most missing and critical skills being soft skills, with communication being the most mentioned in the literature (Klimas & Wójcik, 2018).

2.3. 21st Century Skills

21st Century Skills are needed for the current economic climate (Van Laar et al., 2020). They are vital for people to be influential citizens in societies (Geisinger, 2016). Examples of 21st Century Skills include but are not limited to digital literacy, creativity, critical thinking and problem solving (Van Laar et al., 2017). 21st Century Skills allow people to develop themselves in an uncertain society (Liesa-Orús et al., 2020). Discussed below are several frameworks that define 21st Century Skills.

2.3.1. The Partnership for 21st Century Skills

A collaboration between The National Council of Social Studies based in Maryland, USA and the Partnership for 21st Century Skills resulted in the development of The Partnership for 21st Century Skills (P21) (Van Laar et al., 2020; Yell & Box, 2008). The aim was to create an education system where every child had the skills to succeed in the 21st century (Alismail & McGuire, 2015; Yell & Box, 2008). P21 focuses on three skills (Van Laar et al., 2020; Yell & Box, 2008):

- **Learning skills:** innovation, creativity, critical thinking, collaboration, problem-solving and communication.
- **Literacy skills:** ICT literacy, information literacy and media literacy.
- **Life skills:** adaptability, initiative, self-direction, flexibility, accountability, responsibility, leadership, productivity, social and cultural skills.

2.3.2. Assessment and Teaching of 21st Century Skills

Due to a shift in workplace requirements, three corporations (Microsoft, Cisco and Intel) recognised the need to concentrate on 21st Century Skills (Griffin & Care, 2015). Along with six governments (Finland, Singapore, Costa Rica, Australia, Netherlands and the United States of America), they funded a project to target teaching with an emphasis on 21st Century Skills

(Griffin & Care, 2015) called Assessment and Teaching of 21st Century Skills (ATC21S). ATC21S focuses on four categories (Van Laar et al., 2020):

- **Ways of thinking:** critical thinking, creativity, innovation, decision-making, problem-solving, metacognition and learning to learn.
- **Ways of working:** collaboration and communication.
- **Tools for working:** ICT literacy and information literacy.
- **Living in the world:** social responsibility, citizenship, personal responsibility, life and career skills.

2.3.3. Organisation for Economic Co-operation and Development approach

The Organisation for Economic Co-operation and Development (OECD) approach organises 21st Century Skills into three dimensions (Ananiadou & Claro, 2009; Geisinger, 2016; Van Laar et al., 2020):

- **Information:** research, problem-solving, dimensions relating to using the information as a source and product.
- **Communication:** effective communication, virtual interaction and collaboration.
- **Ethics and Social Impact:** globalisation, multiculturalism and social responsibility.

In 2015, the OECD introduced the ‘Skills for a Digital World’ framework, highlighting several needed skills (Raitskaya & Tikhonova, 2019). Technical and professional skills, ICT specialist skills for experts, ICT generic skills for citizens and ICT complementary ‘soft skills’ such as communication, leadership and teamwork (OECD, 2016). The framework prioritised skills policy changes to enable learning of basic ICT skills in early education, better anticipation from educational institutions for learner outcomes, skills needed for a digital economy to be used by employees and employers and lastly, employers and employees should be ready to up-skill or re-skill as demand changes (Raitskaya & Tikhonova, 2019).

2.3.4. 21st Century Digital Skills

Digital skills refer to having abilities to access the internet and online tools and skills that allow understanding online content (Van Laar et al., 2020). Based on the systematic literature review conducted by Van Laar et al. (2017), the paper argued that the digital component is missing in

21st Century Skills as these skills only circle information searching (Van Laar et al., 2020). However, the systematic literature review highlighted that when digital skills were studied, papers did not incorporate skills found in 21st Century Skills (Van Laar et al., 2017, 2020). The 21st Century Digital Skills framework consists of information digital skills, communication digital skills, collaboration digital skills, critical thinking digital skills, creative digital skills and problem-solving digital skills (Van Laar et al., 2017, 2020). The digital component for each 21st Century Skill is listed below (Van Laar et al., 2020):

- **Information digital skills:** being able to utilise the information retrieved.
- **Communication digital skills:** being able to communicate using tools available effectively.
- **Collaboration digital skills:** using and managing work using collaborative tools available, such as working on documents online.
- **Critical thinking digital skills:** critically accessing online material by understanding the source and nature.
- **Creative digital skills:** using creative tools to produce and share content to assess designs and concepts.
- **Problem-solving digital skills:** consolidating online information to formulate solutions to problems.

2.4. ICT Skills

Skills relating to ICT are found in all 21st Century Skills frameworks making ICT skills a 21st Century Skill (Van Laar et al., 2020). Defining ICT skills is challenging; ICT is embedded in almost every task across several domains, making it difficult to set a boundary to box ICT skills (Twinomurinzi et al., 2017). Tyagi et al. (2020) define ICT skills as having the technical capacity to use ICT and being able to apply the skills by using ICT for a specific purpose – the definition used by this study too. Van Laar et al. (2020) support the definition mentioned previously but use the term ‘digital skills’ to refer to the concept as their findings showed ICT skills to be focusing on information finding (technical) and not using the result of the information found (application). On the other hand, ICT skills are ‘hard’ skills (Hendarman & Cantner, 2017). Since hard skills are specific to a field or profession (Nazron et al., 2017), this perspective shows ICT skills to be specialised. This study refers to ICT skills as the former definition where ICT skills refers to having the technical capacity and the application of the

skill to perform a task (Nazron et al., 2017) or what is referred to as ‘digital skills’ by Van Laar et al. (2020). Firstly, soft skills are prioritised more (Dubey & Tiwari, 2020), and hard skills complement soft skills (Nazron et al., 2017). Secondly, the OECD states that ICT generic skills and ICT complementary ‘soft’ skills are needed for an ICT-enabled environment in a digital world (OECD, 2016), which reflects the importance of both ‘soft’ and hard skills. Lastly, as ICT crosses into several domains, it is challenging to define what ICT skills are as new forms of ICT are created (Twinomurinzi et al., 2017). Therefore, ICT-related skills include soft and hard skills to use ICT effectively. Regardless of how ICT skills are defined, they allow performing a pre-determined ICT result or fixed ICT outputs (Twinomurinzi et al., 2017). The next section discusses stakeholders of ICT skills exploring their roles in shaping the dynamics of ICT skills.

2.5. ICT Skills Stakeholders

The term ‘stakeholders’ refers to any individual or group who can influence or be affected by the objectives of an organisation (Savga et al., 2018). The term includes those who consider themselves interested but may not be recognised by the organisation (Savga et al., 2018). In this context, ICT skills stakeholders are individuals or groups interested in ICT skills. These stakeholders may supply ICT skills or consume ICT skills or, in some cases, serve as both suppliers and consumers of ICT skills.

2.5.1. Government

Governments introduce essential policies to ensure resources and measures are in place to respond to the opportunities and problems that happen with digital transformation (Cha et al., 2020; Manda & Backhouse, 2017; Manda & Ben Dhaou, 2019). Policies touch on skills, regulation, funding, and investment in infrastructure, among other aspects, to create a thriving environment (Manda & Ben Dhaou, 2019). There are several ways a government may influence ICT skills, such as tax exemptions on ICTs, infrastructure improvement by increasing spending, provision of training, promoting the distribution of intellectual rights, introducing changes to educational curriculums, and changing immigration laws, among others (Afawubo & Noglo, 2022; Beerli et al., 2017; Nazron et al., 2017; Sakil, 2017). Governments use ICT skills by utilising ICT to improve governmental services, improve decision-making, and increase transparency (Ziemba, 2017). ICT may be used to promote the digital maturity of e-governments and launch e-government projects to improve citizen’s lifestyles (Muzafar &

Jhanjhi, 2020). Therefore, governments are key stakeholders and act as suppliers and consumers of ICT skills (Alderete, 2017; Twinomurinzi et al., 2017).

2.5.2. Educational Institutions

Educational institutions produce and disseminate knowledge, creating highly educated individuals (Badat, 2010). They introduce ICT as part of the curriculum to ensure people acquire ICT skills (Raitskaya & Tikhonova, 2019). They try to fill in gaps in skills by attempting to meet the demand for skills (Mwalemba, 2019). Additionally, they must anticipate skills that may be needed and prepare students accordingly (Raitskaya & Tikhonova, 2019). They equip people with soft and hard skills to be literate in ICT (Dubey & Tiwari, 2020). From a demand point of view, educational institutions use ICTs to improve educational services and remain resilient when faced with unexpected events (Canani & Seymour, 2021). Therefore, educational institutions are key stakeholders and act as suppliers and consumers of ICT skills (Alderete, 2017; Twinomurinzi et al., 2017).

2.5.3. Businesses – Private Sector

Using ICT, businesses may transform their operations for growth and improved productivity, among other benefits (Ziemba, 2017). Businesses provide employee training to improve their skills (Fonseca et al., 2017). Lastly, businesses offer employment and demand ICT skills (Fajčíková et al., 2018). Therefore, businesses are key stakeholders that supply and demand ICT skills (Alderete, 2017; Twinomurinzi et al., 2017).

2.5.4. Organizations – Non-Profit

Organisations are stakeholders of ICT skills by providing development programs (Dubey & Tiwari, 2020). Some collaborate with other stakeholders to improve current standards, such as working with the government to improve educational standards (Griffin & Care, 2015). Some of the 21st Century Skills have been developed by public organisations (Van Laar et al., 2017, 2020). Some organisations head up ICT projects for sustainability and development, promoting education, access and learning opportunities (Tyagi et al., 2020). Therefore, organisations supply and demand ICT skills depending on their context.

2.5.5. Individuals

Individuals require ICT skills to be part of the digital space, as having these skills is no longer about the 'have' or 'have not' but about competence (Erstad, 2010). Illiteracy may cause inefficiencies and potential business loss (Kasparova, 2019). ICT skills are important because individuals can gain employment and personal growth while remaining digitally included (Bejaković & Mrnjavac, 2020). Using ICT, individuals can learn anywhere and upskill at any time (Fonseca et al., 2017). Therefore, individuals are stakeholders of ICT skills (Alderete, 2017).

2.5.6. External Stakeholders

The above stakeholders are within the same ecosystem, in this case, a country. Other stakeholders may have interests but are not present in the same region. Foreign organisations may develop initiatives to promote programmes, developmental organisations may fund research, and foreign institutions may advise on policy reform (Gillwald et al., 2019; Mwalemba, 2019; World Bank, 2019). The next section lists the channels used by stakeholders to supply and demand ICT skills.

2.6. ICT Skills Channels

There are various channels for how ICT skills are supplied:

- **Education Institutions:** skills are taught in educational institutions (Patacsil & Tablatin, 2017).
- **On-the-job training (OJT):** Training at work provides practical skills (Patacsil & Tablatin, 2017).
- **Internship Programmes:** provide an opportunity to gain practical skills in the industry (Patacsil & Tablatin, 2017).
- **Immigration:** changes in immigration may attract foreign talent (Beerli et al., 2017).
- **Internet:** Learning online may help you obtain ICT skills (Fonseca et al., 2017).
- **Training and Development Initiatives/Workshops:** training programmes that aim at providing skills to upskill individuals (Dubey & Tiwari, 2020; Fajčíková et al., 2018).
- **Graduate Programmes:** industry-ready programmes or training individuals to equip them with skills they lack (Kang & Park, 2017; Nazron et al., 2017).

There are various channels to show demand for ICT skills:

- **Internet:** advertising on social media or websites for job listings (Fajčíková et al., 2018).
- **Advertisement and Presentations at Educational Institutions:** sponsoring programmes, putting up fliers or organising events to advertise and present job listings (Fajčíková et al., 2018; Gogolova et al., 2015).
- **Career Fairs:** attending career fairs to advertise to prospective talent for recruitment (Fajčíková et al., 2018; Gogolova et al., 2015).
- **Agencies:** using agency workers to find prospective talent (Fajčíková et al., 2018; Gogolova et al., 2015).
- **Workshops:** hosting workshops and advertising to attract talent (Fajčíková et al., 2018; Gogolova et al., 2015).
- **Conferences:** sponsoring or presenting at conferences to attract talent (Fajčíková et al., 2018; Gogolova et al., 2015).
- **Direct Recruitment:** recruiting potential talent among interns (Gogolova et al., 2015).

2.7. ICT Skills Dynamics

Vilfredo Pareto proposed that society is a system of interrelated parts that are changing at surface level but maintain a state of equilibrium, and any changes to the equilibrium result in modifications to counter the effects to restore equilibrium (Caulfield & Maj, 2001). Applying the concept to the ICT skills environment means that any changes from a stakeholder's actions result in either a shift to or from equilibrium, creating the dynamics being explored in the study. To understand the dynamics at hand, the ICT skills environment must be studied to gain awareness about the fundamentals (Caulfield & Maj, 2001). The following section explores several dynamics may involve different stakeholders that positively or negatively affect the supply and demand of ICT skills.

2.7.1. Quality of Education

The quality of education determines the skills available in the ICT skills environment as gaps in skills emerge with poor education (Nazron et al., 2017; Patacsil & Tablatin, 2017). Even though sub-Saharan African countries, such as Mozambique, rank low on access to ICTs when compared to developed countries, the youth that have access lack the literacy skills to access

them (Metu et al., 2019). Notably, children in developed countries have access to ICTs at a very young age (Canani & Seymour, 2021).

2.7.2. Incomplete skillset and High expectations for entry-level jobs

In the Philippines, a developing country, graduates lack the skills to find a job in the workplace; high school graduates take around three years to find a job, while university graduates take about a year (Patacsil & Tablatin, 2017). In Malaysia, another developing country, graduates lacked the soft skills required and needed additional training to be ready for the workplace (Nazron et al., 2017). On the other hand, businesses expect graduates to have a complete skill set and prefer not to spend time training graduates (Twinomurinzi et al., 2017). Therefore, while graduates possess some skills, they lack a complete skillset to be ready for employment.

2.7.3. Role of Educational Institutions

Educational institutions and businesses disagree on who is responsible for the lack of skills in graduates (Badat, 2010; Twinomurinzi et al., 2017). Educational institutions argue that it is not their role to prepare ‘workers’ for the industry but rather to foster knowledge and create educated individuals who can learn (Badat, 2010; Twinomurinzi et al., 2017). On the other hand, businesses claim that educational institutions are responsible for aligning with the demands of industries to produce industry-ready graduates (Twinomurinzi et al., 2017). Meanwhile, educational institutions are already underfunded and have limited time to equip graduates with all the skills required (Twinomurinzi et al., 2017). However, there have been positive results when businesses and educational institutions work together to create curricula to reduce graduate gaps (Patacsil & Tablatin, 2017).

2.7.4. Upskilling and Training

ICTs are quickly transforming the working environment through innovations and digitisation, requiring workers to be upskilled or re-trained (Tyagi et al., 2020). The G20, an intergovernmental forum consisting of 19 countries, the European Union and African Union sets the direction for structuring and maintaining of the world economy (Pogge, 2023), recognised the need to upskill and better use the skills of the G20 countries (Chetty et al., 2018).

2.7.5. Language and Cultural Barriers

Language barriers have been the major challenge in digitising Africa (Schelenz & Schopp, 2018). English is the primary language used online and is essential to facilitating and enabling ICTs (Bukht & Heeks, 2018; Schopp et al., 2019). Imported ICTs are usually unavailable in local languages and tend to prioritise Western content in English in African nations, leading to technological barriers (Schelenz & Schopp, 2018; Schopp et al., 2019).

2.7.6. Infrastructure

Infrastructure allows stakeholders with ICT skills to connect to the Internet (World Bank, 2019). The infrastructure is described by the usage and connectivity of the Internet, penetration of mobile services, speed and pricing of the Internet and growth of companies and employment (Ben et al., 2017). The infrastructure is essential for a country to reach critical mass to fully reap the benefits of ICT (Mothobi, 2021).

2.7.7. External Influences

Initiatives undertaken by foreign organisations and nations, such as the ESEFA Initiative, an organization that aims to address the shortage of Enterprise Systems skills, affect the availability of resources that affect the supply of ICT skills (Mwalemba, 2019). International developmental centres fund research relating to ICT that targets specific countries, in this case. International developmental centres fund research relating to ICT that targets specific countries, providing knowledge on the status of ICT skills and recommendations for improving these (Gillwald et al., 2019). Foreign institutions that fund governments play an advisory role, giving suggestions on ways forward (World Bank, 2019). Foreign donors may provide systems for governments to utilise, develop using foreign consultants, and never update, even though they experience issues (World Bank, 2019).

2.8. Literature Summary

ICT gives access to new markets, knowledge and skills, increases competitiveness and is vital for innovation (Alderete, 2017; Ziemba, 2017). Several barriers prevent the realisation of the potential of ICTs: poor education levels, infrastructure, language and cultural differences, lack of funding, insufficient policies and contextual challenges such as the digital divide (Ben et al.,

2017; Karunaratne et al., 2018; Manda & Backhouse, 2017). Therefore, understanding the barriers to ICT adoption in developing countries such as Mozambique help provide context for the current ICT landscape.

Skills are the capacity to perform a task (Patacsil & Tablatin, 2017). Soft skills are non-technical skills that are difficult to measure, and hard skills are technical skills specific to a field (Dubey & Tiwari, 2020; Nazron et al., 2017). 21st Century Skills refers to skills needed to be influential citizens in a society (Geisinger, 2016). Several frameworks describe 21st-century skills, such as P21, ATC21S, the OECD approach, and 21st-century digital skills.

Skills relating to ICT are part of all 21st Century Skills frameworks (Van Laar et al., 2020). ICT skills refer to having the technical capacity and the ability to perform a task (Tyagi et al., 2020). ICT skills have crossed into several domains, allowing the performance of a pre-determined ICT result (Twinomurizi et al., 2017). Classifying skills help to uncover where the gaps in skills are in the ICT industry.

There are several stakeholders of ICT skills; governments are policymakers, educational institutions create and spread knowledge by filling in gaps in the demands for skills, businesses use ICT skills for growth and productivity, organisations provide development programs, individuals use ICT skills for employment and growth and external stakeholders influence policies and funding (Dubey & Tiwari, 2020; Manda & Backhouse, 2017; Ziemba, 2017). Exploring different roles of stakeholders helps to understand the interconnectedness and complexity of relationships between stakeholders that influence the demand and supply of ICT skills.

There are several channels for ICT skills to be supplied and consumed. Educational institutions, on-the-job training, internship programmes, immigration, the internet, training and development workshops and graduate programmes supply ICT skills (Dubey & Tiwari, 2020; Fonseca et al., 2017; Patacsil & Tablatin, 2017). Regarding demand, channels include using the Internet, advertisement at institutions, career fairs, employment agencies, workshops, conferences and direct recruitment (Fajčíková et al., 2018; Gogolova et al., 2015). Knowing different channels used for ICT skills helps to see how they function in the context of Mozambique.

In terms of dynamics, the quality of education, incomplete skillset, high entry-level skills requirements, roles of educational institutions, upskilling and training, language and cultural barriers, government policies, infrastructure and external influences affect the supply and demand of ICT skills (Patacsil & Tablatin, 2017; Schelenz & Schopp, 2018; Twinomurinzi et al., 2017; World Bank, 2019). As the context varies, these dynamics provide a starting point to begin addressing different actions at play by stakeholders in the context of Mozambique. While literature highlights the nature of dynamics, understanding how they function in the context of Mozambique may result in uncovering findings at a deeper level.

Several studies reviewed by this study focused on skills gaps, such as the skills gap mentioned by Dubey and Tiwari (2020). Some were quantitative, while others were specific to a context, such as aligning industry with educational institutions in Malaysia by Nazron et al. (2017). There are concerns about data quality as most data is procured from newspapers or whitepapers (Kirlidog et al., 2016). In the context of Mozambique which is discussed later (Chapter 5), literature around ICT is emerging and requires further study (Ribeiro Ribeiras, 2018). Appendix A: Literature Summary illustrates the summary of the literature reviewed.

Chapter 3 Theoretical Framework

This section discusses the different influences that formed the study's theoretical framework. The study used Grounded Theory Methodology (GTM) to map relationships from the data gathered using the coding paradigm. System Dynamics (SD) helped shape dynamics uncovered and portrayed using causal loops. Ultimately, in order to illustrate the dynamics, an ecosystem was employed to present the overall findings following the completion of analysis.

3.1. Grounded Theory Methodology

GTM is used when little is known and aims to generate a theory to explain the subject (Chun Tie et al., 2019). The goal was to generate theory from data to understand the social context (Halaweh et al., 2008). GTM as an interpretive approach has become common as it develops a contextualised, process-oriented explanation of a subject at hand (Hughes & Jones, 2003). For this study, Mozambique is the context, and little is known about the dynamics affecting ICT skills, specifically in Mozambique (Ribeiro Ribeiras, 2018). There were concerns about data quality as there are insufficient academic studies on ICT skills (Kirlidog et al., 2016). GTM techniques allowed for a rigorous research process, enabling the data to generate concepts, eventually leading to a theory contextualised to the topic. An analytical tool called the coding paradigm was used to guide the coding and define the relationships between the concepts found (Seidel & Urquhart, 2013).

3.1.1. Coding Paradigm

The coding paradigm provided a starting point for understanding concepts, relationships and categories emerging from the data provided. While the coding paradigm has been criticised as forcing data by linking relationships and categories, it has been noted that it plays a role in providing a starting point for making sense of the data collected (Seidel & Urquhart, 2013). The paper used the coding paradigm with the same intention – a tool that allowed understanding the relationships between concepts while remaining alert to different emerging themes (Seidel & Urquhart, 2013). The coding paradigm has five (5) items (Seidel & Urquhart, 2013):

- Causal Conditions – events that lead to the phenomenon.
- Intervening conditions – structural conditions affecting the strategies taken relating to the phenomenon.

- Context – properties of where the phenomenon is occurring.
- Strategies – responses to the phenomenon.
- Consequences – results of the strategies taken.

Once the coding paradigm was developed, it required an element of dynamism in the themes which emerged from the data – SD.

3.2. System Dynamics – Casual Loops Diagram

SD, a systems thinking approach, is an approach to think and simulate conditions by picturing how different elements fit together, interact, and change over time (Morecroft, 2010). As we live in an interconnected world, we must see systems instead of parts to make sense of relationships and connections (Komives et al., 2005). SD sees behaviour as non-linear, as the dynamism arrives from feedback loops and delays (Morecroft, 2010). SD illustrates how dynamic behaviour is affected by feedback loops and acknowledges that improvements occur as an ongoing process to achieve a goal (Morecroft, 2010). SD helps capture different points of view to understand the big picture, including the consequences and knock-on effects that may occur (Morecroft, 2010).

As this study explores the dynamics affecting ICT skills, any action taken by a stakeholder may affect the dynamics positively or negatively towards equilibrium, affecting other stakeholders and effectively changing the dynamics at play. The study may be illustrated using an SD model by creating a Causal Loop Diagram (CLD). CLD allows for creating a map based on available data showing the influence elements have in the model (Šviráková & Bianchi, 2018). By offering the dynamics using SD, the study captures different views, painting the big picture while considering the context (Morecroft, 2010).

This study followed the manner of Šviráková and Bianchi (2018) to illustrate the findings whereby GTM was used for data collection and analysis – including the coding steps to show the findings using a CLD. As the study concluded, the CLD had captured the dynamism needed after the coding paradigm. However, it still needed to be to portray the big picture of how dynamism comes into play in an environment – Ecosystems.

3.3. Ecosystems

To understand the dynamics, it is beneficial to show the ICT Skills ecosystem as it enables understanding the interactions and interdependencies of actors in the ecosystem (Ritala et al., 2013). Ecosystems provide an overview of the whole system (Guggenberger et al., 2020). Ecosystems comprise a population, purpose, relationship structure, system configuration and system dynamics. The population is central to any ecosystem as they form the community (Guggenberger et al., 2020). Every ecosystem has a purpose or a value proposition for the community (Guggenberger et al., 2020). The population has interaction and social systems in place, forming the relationship structures and providing the social layer to an ecosystem (Guggenberger et al., 2020). Ecosystems have a static structure, such as rules, structuredness in operating, and reactions to external stimuli providing the system configuration. Lastly, the behaviour creating the dynamism in an environment creates the system dynamics.

Dynamics occurred in an environment simultaneously between different community members in the study. The concepts emerging and relationships uncovered in the coding paradigm had dynamism introduced using casual loops. While the casual loops provided an overview of the dynamics, it demonstrated a disconnect between them and the environment where the dynamics occurred. Post-analysis, interest emerged in using ecosystems as they showcased dynamics in a system (ICT ecosystem) where members of the population already had existing social structures and system configurations interacting simultaneously. As the casual loops provided a deeper understanding of the dynamics explored, the ecosystems allowed for a further birds-eye view of the dynamics of ICT skills as part of a system.

Chapter 4 Research Methodology

4.1. Research Question and Objectives

The research question for this study was: *What is the state of ICT skills dynamics (supply and demand) in Mozambique?* The research objectives were to understand the dynamics that influence the supply and demand of ICT skills and to study the relation between and among the stakeholders and the channels used to supply and demand ICT skills. Ultimately, these objectives helped understand the dynamics affecting the supply and demand of ICT skills in Mozambique.

4.2. Methodology

This section shows the research plan for the study. The plan had a clear structure, ensuring the objectives set out by this study answered the research question. It is shown using the ‘Research Onion’ – a way to present the stages of research in layers (Cussen & Cooney, 2017; Saunders et al., 2019).

4.2.1. Philosophical Considerations

Research philosophy refers to the assumptions and beliefs about how knowledge is developed (Saunders et al., 2019). When researching, it is good practice to articulate the basis of claiming what we know (O’Gorman & MacIntosh, 2014). Two research assumptions differentiate philosophies – ontology and epistemology (Saunders et al., 2019).

4.2.1.1. Ontology

Ontology refers to assumptions about the nature of being and reality (O’Gorman & MacIntosh, 2014; Orlikowski & Baroudi, 1991; Saunders et al., 2019). It outlines how research objects are seen and studied (Saunders et al., 2019). There are two views on how the world is seen – objectively or subjectively (O’Gorman & MacIntosh, 2014). From an objectivist point of view, physical and social objects are independent of the opinions of an individual (Saunders et al., 2019). Reality is made of solid objects that can be measured and tested (O’Gorman & MacIntosh, 2014). On the other hand, a subjectivist perceives reality as made up of interactions with living subjects (O’Gorman & MacIntosh, 2014). Reality is a consequence of the actions of actors (Saunders et al., 2019)

This study aimed to explore the influence of the dynamics affecting the supply and demand of ICT skills. To understand the dynamics at hand, the ICT skills environment must be studied to understand its makeup and gain awareness about the fundamentals (Caulfield & Maj, 2001). Studying parts of the ICT skills ecosystem may result in a lack of understanding of its essentials (Caulfield & Maj, 2001). Vilfredo Pareto proposed that society is a system of interrelated parts that are continuously moving and are in a state of equilibrium, and any changes to the equilibrium result in modifications to counter the effects to restore equilibrium (Caulfield & Maj, 2001). Applying the concept to the ICT skills environment means that any changes from a stakeholder's actions result in either a shift to or from equilibrium, creating the dynamics being explored in the study. To understand these dynamics, the study sought to understand how the participants give meaning to the interactions and participation in the ICT skills environment (Orlikowski & Baroudi, 1991). As there are several stakeholders, each stakeholder holds a view of reality and understands reality from their point of view. Thus, the study was interested in exploring the different realities of the various stakeholders (Saunders et al., 2019). For example, an individual trying to gain ICT skills may have another point of view on a government regulation encouraging hiring local talent to a business that depends on foreign talent. The study aimed to understand the influence of the dynamics affecting the supply and demand of ICT skills. It is built on the assumption that reality is subjective as it depends on the subject's perspective, such as an individual or a business being affected by a government policy. Each stakeholder perceives reality based on their perspective. Therefore, a subjectivist point of view is being adopted as it supports the way the study perceives the way reality is perceived.

4.2.1.2. Epistemology

Epistemology refers to the assumptions of how knowledge is obtained, validated and communicated (O'Gorman & MacIntosh, 2014; Orlikowski & Baroudi, 1991; Saunders et al., 2019). There are more than five viewpoints, although these are the core ones – postmodernism, pragmatism, realism, interpretivism and positivism (O'Gorman & MacIntosh, 2014; Saunders et al., 2019).

This study adopted interpretivism. An interpretive belief assumes that reality may not be understood without all the social actors being present – including the researcher (Orlikowski & Baroudi, 1991). Human action is integral to an interpretive belief (Bevir & Kedar, 2008). The researcher is driven to reveal the social construct that is reality (Walsham, 1995). Since

participants have different backgrounds and circumstances, they give different meanings to reality and experience and create other realities (Saunders et al., 2019). Using an interpretive approach, the researcher understands the entrenched subjective meaning in social life (Orlikowski & Baroudi, 1991). The approach gives an insight into the experiences from the actor's point of view (Diaz Andrade, 2009). Consequently, the researcher can understand the participant's point of view (Cussen & Cooney, 2017). Therefore, by conducting interpretive research, the researcher can create a social world based on the experiences relating to the interactions with participants to interpret the meaning of different realities experienced (Diaz Andrade, 2009).

This study used an interpretive approach built on the assumption of reality being subjective. Since reality is subjective, the researcher must create a social world to interpret and create meaning based on interactions with various stakeholders such as individuals or businesses. As the study was based on the context of Mozambique, understanding the context required the researcher to be part of the study to understand the different viewpoints. Therefore, to understand the different dynamics occurring, human activity plays a vital role in shifting to and from equilibrium; by assuming that reality is subjective, an interpretive approach became integral to understanding how each stakeholder was creating meaning in the ICT skills ecosystem.

4.2.2. Purpose

This study aimed to explore the influence of the dynamics affecting the supply and demand of ICT skills in Mozambique. An exploratory study is conducted when little is known or when a researcher is motivated to believe there are elements worth exploring (Bhattacharjee, 2012; Stebbins, 2001). It aims to unveil propositions allowing researchers to use their insights, imagination, and experiences to understand and interpret reality (Reiter, 2013). The purpose of exploration is to generate ideas that form theory emerging from data, and thus, exploration ends when the researcher feels no significant ideas are being developed (Stebbins, 2001). In the context of this study, the researcher gathered data from participants that provided insights into the dynamics of ICT skills and attempted to generate a theory to help answer the research question. The researcher did not explore without preconceived ideas; they had an existing meaning or perception of reality in mind (Reiter, 2013). For example, when you buy a car of a specific brand, you notice other cars of the same brand on the road. For this study, the

researcher used the personal experience of being in Mozambique and the literature gathered to understand the topic. For an exploratory research to be rigorous, it must be transparent, with all assumptions clearly stated (Reiter, 2013). Lastly, early weaknesses in research validity, sampling and generalizability get corrected as exploratory studies progress (Stebbins, 2001).

There is currently little information about ICT as it is an emerging topic with a scarce bibliography nationally in Mozambique, requiring further research (Ribeiro Ribeiras, 2018). Therefore, an exploratory study was adopted for this study. The researcher generated ideas to form a theory emerging from the data collected by interpreting meaning based on their constructed world or perception of reality to understand the different dynamics affecting ICT skills in Mozambique.

4.2.3. Approach to Theory

There are several approaches to theory – deductive, inductive and abductive (Saunders et al., 2019). The deductive approach refers to verifying or falsifying a theory; when the premises are true, the conclusion will be true (Saunders et al., 2019). It is known as the theory-testing approach (Bhattacharjee, 2012). The inductive approach refers to building and generating theory using premises to generate conclusions (Saunders et al., 2019). It is known as the theory-building approach (Bhattacharjee, 2012).

Since this study adopted a subjective ontology and an interpretive epistemology, it aimed to give meaning to the social world from the point of view of the person experiencing it – in this case, a stakeholder of ICT skills. Interpretive research focuses on the context of a study and readily accepts emerging issues and concepts (Halaweh, 2012) – in this case, the context of Mozambique. As this was an exploratory study, it assumed that the theory would emerge from the data being gathered (Stebbins, 2001). Furthermore, an inductive approach helps understand complex data by developing them into summary themes or categories as interpreted by the researcher (Thomas, 2003). It further allowed data analysis without structured methodologies such as experiments (Thomas, 2003), allowing for flexibility for this study – an explorative study. Therefore, an inductive approach for this exploratory study allowed theory to emerge based on the data while considering the context and different experiences, in line with the previous assumptions.

4.3. Research Strategy

The research objectives guide the choice of a research strategy and help answer the research question (Saunders et al., 2009). For this study, a Case Study-Grounded Theory Methodology (CS-GTM) was used (Figure 1). The CS-GTM strategy is a methodology defined as identifying the research question, selecting a research strategy and formulating findings and results based on philosophical assumptions (Al-Adwan, 2017). Therefore, when combining two methods, which are defined as techniques used for data collection and analysis (Al-Adwan, 2017), it is vital to ensure the assumptions are the same (Halaweh, 2012).

4.3.1. Case Study

A case study approach is helpful to gain a rich understanding of the context and is often used in an exploratory study (Saunders et al., 2009). It allows the use of multiple sources, which provides more insights than other strategies (Rowley, 2002). It will enable the researcher to obtain deeper insights and understand the participants' perspectives to help answer the research question (Denscombe, 2010). Additionally, a case study approach is appropriate when the scope is unclear, and the researcher has little to no control over the events being studied (Al-Adwan, 2017). This was the case for this study; defining the scope of ICT was difficult as it is entrenched in several domains (Twinomurinzi et al., 2017), and the researcher had little to no influence on the dynamics affecting ICT skills. Another reason for using a case study approach was that it allowed for collecting data from a natural setting to generate theory from practice (Halaweh, 2012), in this case, the context of Mozambique. Lastly, it allowed studying areas with fewer studies conducted (Halaweh, 2012), as with ICT-related studies in Mozambique (Ribeiro Ribeiras, 2018). Case studies may be used in positivist and interpretive studies; for this study, the approach was interpretive, as the researcher was involved with the study by interpreting concepts with the participants (Halaweh, 2012). The researcher eventually used the interpretations to generate a theory (Halaweh, 2012). Therefore, a case study approach was part of the methodology used with the same philosophical assumptions of the study.

However, case study research has its limitations. It lacks a systematic way of analysing the large amount of data gathered (Halaweh et al., 2008). In a single case study, generalisation is a challenge. However, a single case study aims to generalise theoretical propositions and not to be representative of a sample (Halaweh, 2012). Lastly, generalisation from case studies aims

to add to theory by generating theories and understanding specific implications from the case (Walsham, 1995).

For this study, a single case study was employed. A single case study refers to studying a phenomenon many have not studied (Saunders et al., 2009) – as was the case with this study (Ribeiro Ribieras, 2018). It further allowed for an in-depth topic investigation, providing rich descriptions (Walsham, 1995). For this study, the unit of analysis was the ICT sector of Mozambique. Since ICT is embedded across several domains (Twinomurinzi et al., 2017), a sector is defined as “a set of activities which some related product groups unify for a given or emerging demand and which share some basic knowledge” (Kruss et al., 2015, p. 96).

4.3.2. Grounded Theory Methodology

GTM is common in Information Systems research (Halaweh, 2012; Halaweh et al., 2008). GTM may focus on a context to understand stakeholders' processual elements and actions (Hughes & Jones, 2003). It is better suited and appropriate for interpretive studies (Hughes & Jones, 2003). For this interpretive study, the dynamics in the context of Mozambique made GTM suitable for use. Several studies do not clearly state the variant used from the outset to indicate which variant is more appropriate for their research (Halaweh, 2012; Halaweh et al., 2008). For this study, the Straussian approach was employed. Firstly, the Straussian approach states that a literature review is essential for the researcher to derive the focus of the research question, serves as a supplementary validator to show how the research findings are similar or different from the literature, assists with theoretical sampling and sensitivity (discussed below) and gives some knowledge about the topic being studied (Halaweh, 2012). This study began by conducting a literature review once the topic had been chosen. Secondly, the Straussian approach specifies that the researcher has assumptions or preconceived notions about a given topic, which is supplemented by the literature review conducted (Halaweh, 2012; Halaweh et al., 2008). This is in line with the approach undertaken by this study, as the literature review had given the researcher knowledge about the topic at hand. Thirdly, the Straussian approach specifies that the theory is interpreted by the researcher who remains an active part of the study (Halaweh, 2012), in line with the philosophical assumptions of the study discussed earlier. Lastly, the Straussian approach provides a rigorous and defined technique for analysis (Halaweh, 2012; Halaweh et al., 2008). While the Straussian approach is criticised for forcing theory from data, it specifies that conceptualisation occurs during selective coding (discussed

below) (Halaweh, 2012; Halaweh et al., 2008). Therefore, the Straussian approach of GTM aligned with the study's assumptions.

4.3.3. Justifying CS-GTM

On their own, both the case study and GTM approach are in line with the study. However, for it to be a methodology, they both need to be compatible to be used together in the study (Halaweh, 2012). GTM is consistent with interpretive case studies that study a social context (Halaweh, 2012). Therefore, there is potential to form a methodology by combining both case studies and GTM methods (Halaweh, 2012).

In terms of similarities, both case study and GTM require the review of the literature to gain an understanding of the topic being studied, allow for different sources of data collection, can be used in interpretive research and aim to generalise theory (Halaweh, 2012; Halaweh et al., 2008). On the other hand, GTM provides a rigorous technique for analysis to complement the lack of one in case studies. Case studies require a boundary in the case being studied. However, that may be a weakness as ICT stretches into several domains, blurring the boundary. GTM allows the researcher to follow up on emergent issues outside the boundary (Halaweh, 2012; Halaweh et al., 2008). Lastly, GTM is compatible regardless of the case study's variant (Halaweh, 2012). Several studies have justified using case studies and GTM in a study (Halaweh, 2012). For this study, Halaweh et al. (2008) provided a roadmap for conducting a CS-GTM study (Figure 1).

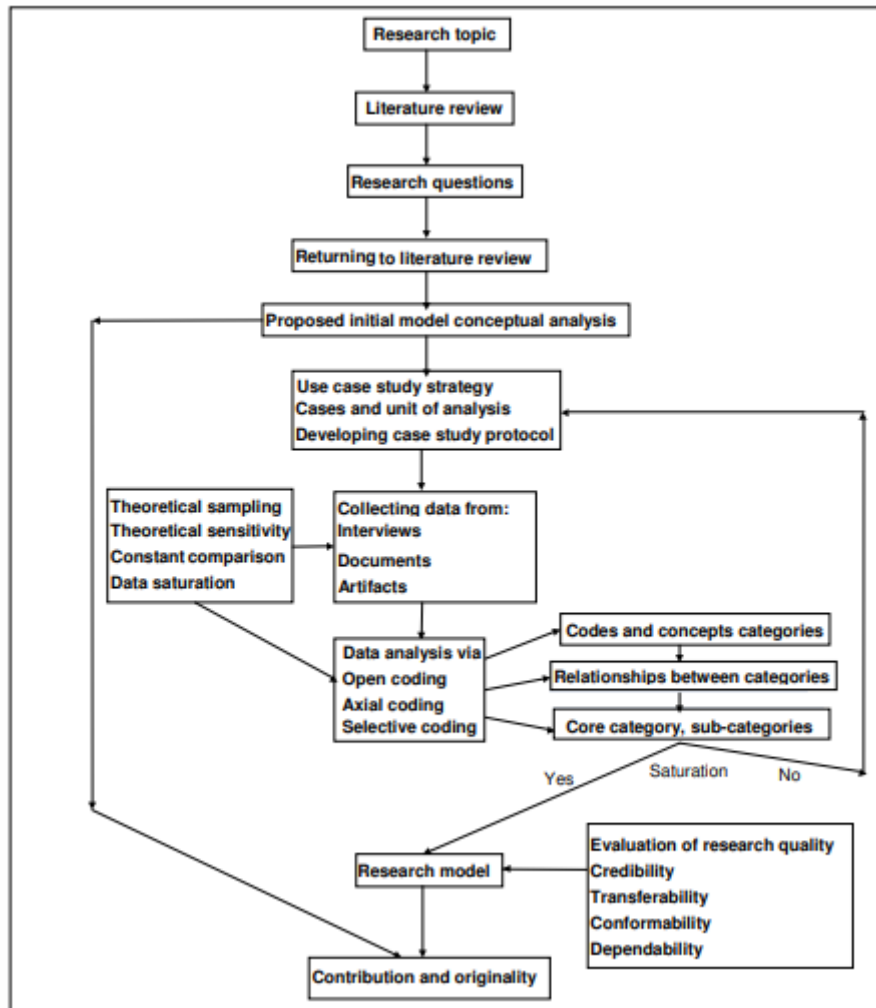


Figure 1: Case Study-Grounded Theory Methodology

4.3.4. CS-GTM Roadmap

This section provides a roadmap for this research based on the framework selected for this study (Figure 1). The first step was to state the case and unit of analysis. As indicated, this study used a single case study, the case being Mozambique's ICT sector. The unit of analysis, the target population (Bhattacharjee, 2012), is the population of Mozambique in the ICT sector.

The next step was to develop the case study protocol (Appendix B: Case Study Protocol). The case study protocol was set before the data collection phase and grew as the study progressed by incorporating emergent issues (Halaweh, 2012). The next step was data collection.

4.4. Timeframe

A cross-sectional study was conducted over a short period (Levin, 2006). The study was conducted to explore the dynamics affecting the supply and demand of ICT skills in Mozambique.

4.5. Data Collection

Having several sources of data benefits case studies (Yin, 2012). Various sources provide evidence for confirming findings through triangulation, making the evidence rigid (Rowley, 2002; Yin, 2012). The next section discusses the instruments used in analysis.

4.5.1. Research Instruments

This study used semi-structured interviews, open-ended questions, and a flexible interview guide to structure the questions (Appendix C: Interview Guide) (Kallio et al., 2016; Zhang & Bhattacharyya, 2008). For this study, semi-structured interviews allowed the researcher to gain insights without the question at hand but also allowed participants to speak openly and freely (Denscombe, 2010). It also allowed for improvising and following up based on the participants' responses (Denscombe, 2010).

Interviews must complement other sources in an interpretive study (Walsham, 1995). Any documentation provided by participants, such as ICT policy, IT recruitment policy, and meeting minutes about ICT-related topics, were utilised to complement the interviews (Hughes & Jones, 2003).

4.5.2. Sampling

The first stage of sampling required the selection of the target population, the unit of analysis as specified earlier (Bhattacharjee, 2012). The second stage required selecting a sampling frame referring to the accessible part of the population (Bhattacharjee, 2012). In this study, the sampling frame was the stakeholders of the ICT skills sector in Mozambique. The final stage required selecting a sampling technique (Bhattacharjee, 2012). Using GTM techniques, purposive sampling was initially used to allow the researcher to select participants that best answered the research question (Hughes & Jones, 2003). The purposive sampling technique targeted stakeholders with substantive insights and direct experiences about the supply and demand of ICT skills in Mozambique. These included stakeholders such as ICT professionals

currently working in the industry (corporate or startup), individuals who began in the ICT industry but ventured to other industries, organizations and businesses that use ICT services both locally and internationally and educational institutions that are involved in shaping the ICT skills available in the country. This was followed by theoretical sampling until saturation was achieved (discussed below).

4.5.3. Participants

Interviews were done in Mozambique, in-person and virtually, averaging around 45 minutes per interview. Table 1 shows the participants interviewed. The labels used to abbreviate are as follows:

- PSB - Small Business
- PMB - Medium Business
- PLB - Large Business
- PTE - Tertiary Education
- PPS - Primary & Secondary Education

Table 1: Participants of the study

Stage	Label	Industry	Role	Age	Experience
1	PSB001	Media & Education	Owner	20-30	Less than 5 years
	PSB002	Healthcare	Management	20-30	Less than 5 years
	PSB003	Media and IT services	Owner	20-30	Less than 10 years
	PMB001	Hospitality	Owner	20-30	Less than 10 years
2	PMB002	Manufacturing, Wholesale & Retail	Owner	50-60	Less than 30 years
	PMB003	Fishing	Management	30-40	Less than 10 years
	PPS001	Education	Management	40-50	Less than 25 years
	PMB005	Accountancy	IT Support	20-30	Less than 10 years
3	PTE001	Telecommunications & IT	Student	20-30	Less than 1 year
	PSB004	IT	Developer	20-30	Less than five years

4.6. Data Analysis

Coding occurs in three steps using three analytical tools – constant comparative analysis, questioning and theoretical sensitivity (Halaweh et al., 2008). Constant comparative analysis

refers to identifying incidents in data and comparing each incident to each other (Chun Tie et al., 2019). Questioning refers to asking what each piece of data means (Halaweh, 2012). Theoretical sensitivity refers to identifying essential parts of the data for your theory (Hughes & Jones, 2003). Lastly, the researcher keeps a memo to note all mental notes and the thought process or ideas generated, providing an audit trail (Chun Tie et al., 2019).

The first step of coding is open coding, whereby data is broken down, examined, compared and conceptualised (Halaweh et al., 2008; Hughes & Jones, 2003). For this study, the researcher identifies key concepts in the data; for example, if the participant mentions that they bring foreign talent to manage their IT division, the researcher compares (comparative analysis) that statement to the existing knowledge based on the combination of a literature review or existing codes (theoretical sensitivity) developed to see if there is any linkage to immigration and ask the question, how does immigration play a role in this case. If there is one, it gets added to the immigration category; otherwise, a new category is created. This process continues until the first step is concluded and all the data has been coded into a category. The thought process or assumptions being made are recorded in the memo.

The second step is axial coding, whereby the broken-down data is reconstructed into categories and sub-categories, and relationships between the categories are identified (Halaweh et al., 2008; Hughes & Jones, 2003). In this step, the researcher compares each code identified to another; for example, businesses use immigration to source talent, but the government passed a law to decrease immigration. Therefore, the researcher will ask how the law affects the supply of ICT skills. By doing this, the researcher identifies the relationship and notes the decision taken while doing axial coding in the memo.

The final step of coding is selective coding, whereby theory is integrated and refined (Halaweh et al., 2008; Hughes & Jones, 2003). A core category that is mentioned frequently is identified as the central aspect of the research (Halaweh, 2012). In this phase, the researcher determines which theme is most mentioned. By comparing all coded categories, the researcher identifies the core category and makes notes in the memo for the reason behind the selection, making it the focus of the study. For example, if immigration is mentioned the most, the study begins to dive deeper into immigration as the core focus.

Once all three steps are concluded, a high-level abstraction illustration is generated containing the key categories, concepts identified in each category and interrelationships between them (Halaweh, 2012).

After each participant's interview is analysed, the researcher checks for data saturation. Data saturation is determined when interviews yield repetitive information, and no new idea (or category) is generated once the research questions have been answered and objectives fulfilled (Al-Adwan, 2017; Halaweh, 2012). If saturation is achieved, theoretical sampling is used as described above and the high-level abstraction illustration is developed into a theory (Al-Adwan, 2017). The theory is developed by basing the core category as the central focus and linking it with other categories based on the interrelationships identified to form the theory.

Therefore, codes develop concepts that become categories, and finally, a theory or model is generated.

4.7. CS-GTM in Practice

The study's initial phase, guided by purposive sampling (Corbin & Strauss, 2008), involved interviewing business owners who use ICT in their operations. As business owners use ICT for their internal and external operations, this placed them in a space where they interact with several stakeholders of ICT and can provide insights from different experiences with different stakeholders. Thus, the business owners provided a starting point to understand the current dynamics. In Stage 1, four (4) participants were initially interviewed to have enough data to begin analysis (Table 1). Analysis was done using GTM techniques. The analysis process was the same for each interview. The transcriptions from MS Teams or Otter Notes were reviewed and translated if they were conducted in Portuguese. To ensure the translation's accuracy, the researcher contacted the participant again to ask for clarification. The transcripts were uploaded to NVivo with labels and a memo linked to them for notes when analysing the data (Corbin & Strauss, 2008). Line-by-line coding was used to code the nodes, followed by the three steps of coding, along with tools such as constant comparison, questioning, and theoretical sensitivity (Corbin & Strauss, 2008; Halaweh et al., 2008). The three steps of coding included open coding, axial coding, and selective coding (Figure 2) (Halaweh et al., 2008; Hughes & Jones, 2003). During open coding, key concepts identified that were linked to the topic were coded. Each of the four interviews were open-coded, after which 96 codes were generated from the

data. Examples of some of the codes generated during open coding included: opportunities to learn and grow, found mostly in the capital city, where however, due to the poor infrastructure available in the capital (such as internet speed and reliability), people prefer to remain in the capital instead of returning to their city of origin. These two codes were grouped under people with ICT skills shift and stay in the capital city.

The next step involved further categorising the nodes through axial coding. Categories and sub-categories were generated by comparing each node to the other and questioning what each code meant and the relationships between codes using axial coding dimensions (Day et al., 2009). Four (4) main categories emerged from this process, viz.: Lack of an environment for ICT to grow, Dependence on foreign companies and talent, ICT Skills shortage, and Poor education standards for ICT skills.

At this point, participants from different backgrounds were interviewed (Table 1). Where necessary, the interviewer sent participants messages to get clarification while analyzing and memoing as the analysis process continued. Every participant was sent a summary of the critical points of the interview to provide feedback. Clear gaps needed further exploration before the study could reach data saturation. For instance, it was evident that there is a particular reliance on foreign talent and businesses, but this was at a very high degree, meaning that the country heavily depends on foreign goods, businesses, and talent. At this point, further specific participants were sought, and theoretical sampling began to pursue leads generated during analysis by sampling participants that provided information relevant to the building of a theory (Hughes & Jones, 2003). Participants were asked specific questions but were still allowed to share their experiences. At the beginning the interviews began with questions that addressed the gaps found during analysis, after which the participants were asked open questions about their experiences. This ‘second stage’ analysis occurred after each interview. As each interview was analyzed, the next person interviewed was asked questions to understand the remaining gaps better. Like before, where needed, follow-up questions were asked of the participants. As the picture began to become more apparent, and eight interviews had been conducted and analyzed, there was a repetition of points being mentioned by participants. By now, there was a great deal of data pointing towards poor education levels, lack of skills available, lack of opportunities available, and dependence on foreign companies and talent, bringing up the question – what are the experiences being faced by the students in the field of ICT? This led to pursuing a student perspective – the ninth (9th) interview and the third phase. The researcher

performed the exact steps of analysis as stated above. Having analysed the perspective of a student in the field of ICT, the missing piece was understanding the perspective of a software developer, someone already in the market. This led to the pursuit of the tenth (10th) interview. During the tenth (10th) interview's analysis, new nodes decreased compared to previous interviews, and repetitive information was being gathered. Data saturation was determined when interviews yielded repetitive information, no new idea (or category) was generated, and once the research questions were deemed to have been answered and objectives fulfilled (Al Adwan, 2017; Halaweh 2012). In this case, data saturation was achieved from the researcher's perspective.

Finally, selective coding was done to integrate all the categories to find the core category (Corbin & Strauss, 2008; Halaweh et al., 2008; Hughes & Jones, 2003). While many different experiences were mentioned, the common thread between all of the experiences was that everyone felt that they did not have enough support for ICT growth. For example, ICT graduates mentioned not finding ICT opportunities, business owners mentioned not finding prospective employees with skills, and students said lacking the resources to gain a good education, among other experiences. The main thread revolved around not having the conditions or the environment where ICT may thrive. Therefore, the core category became conditions lacking for ICT growth. The coding paradigm was then developed and iterated several times by revising it on the data gathered to guide the paradigm model and avoid forcing the data (Figure 3).

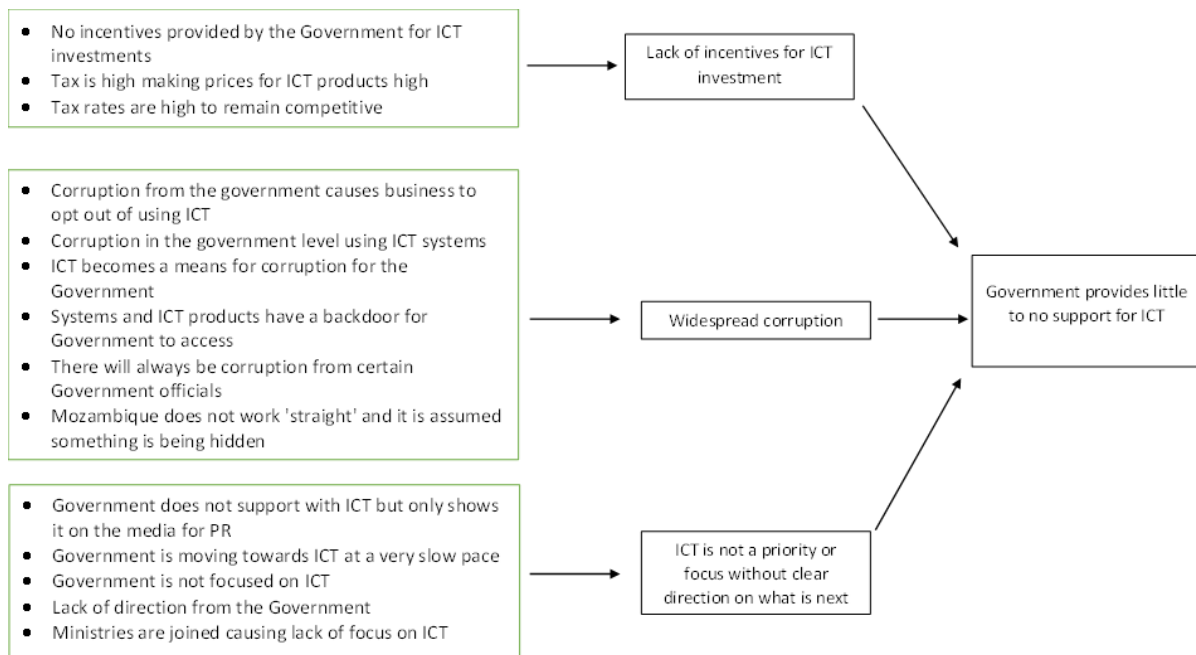


Figure 2: Steps of Coding

4.8. Quality of Research

For qualitative studies, credibility, transferability, dependability and confirmability ensure the quality and rigour of the study (Anfara et al., 2002). For this study, credibility was ensured by using various data sources for triangulation of the data; interviews were sent back to participants to ensure their input was captured correctly, and a panel of academics evaluated the research (peer debriefing) (Anfara et al., 2002; Halaweh et al., 2008).

Transferability was achieved by providing rich descriptions of the context and by using purposive sampling (Anfara et al., 2002; Halaweh et al., 2008). The researcher painted a complete picture of the study, methodology and case being explored. Purposive sampling was used to identify the initial participants, which allowed for a starting point for the study to begin.

Dependability was achieved by creating an audit trail, triangulation and peer evaluation (Anfara et al., 2002; Halaweh et al., 2008). The researcher saved the research analysis at every phase, ensuring a trail of the analysis was saved. Interviewing participants from different industries allowed for triangulation (Anney, 2014). The study was evaluated during various submissions by the supervisor and at a conference where the study was presented as research-in-progress.

Lastly, confirmability was achieved by data triangulation (as mentioned previously), and the findings emerged from the data (Anfara et al., 2002; Halaweh et al., 2008). Table 2 provides a summary of the strategies employed to ensure the quality of the research.

Table 2: Quality of Research

Qualitative Term	Strategy Employed
Credibility	<ul style="list-style-type: none"> • Triangulation • Member Checks • Peer Debriefing
Transferability	<ul style="list-style-type: none"> • Providing Thick Descriptions • Purposive Sampling
Dependability	<ul style="list-style-type: none"> • Creating An Audit Trail • Triangulation • Peer Debriefing
Confirmability	<ul style="list-style-type: none"> • Triangulation

4.9. Ethics, Privacy, Access, Confidentiality and Data Management

Permission was obtained from the university’s ethical committee before conducting the study to ensure the study remains ethical. Once permission was obtained, participants were requested to consent to the interview with the option to leave the study at any time (Appendix E: Consent Letter for Participants). Participants’ privacy was maintained as they were assigned a codename and their statements anonymised. Data collected were stored in a password-protected environment, and access was only available to the researcher and the supervisor upon request. Participants were not compensated for participating in the study, and no harm was done to them. No sensitive information was asked in the study. Once the study was complete, the data was not published to open access as they were interviews and risked privacy concerns. The data management plan for this study is attached in Appendix D: Data Management Plan.

Chapter 5 Case - State of ICT Skills in Mozambique

Mozambique's official language is Portuguese, but interactions occur in local languages as most citizens cannot express themselves in the language (Chimbutane, 2017). Education levels are very low in Mozambique, where around 8% of people complete secondary school, of which only 136 in 100,000 proceed to tertiary education (World Bank, 2019). In Mozambique, students who finish Grade Seven do not have basic reading, writing and arithmetic skills and suffer poor completion rates (Chimbutane, 2017). Therefore, primary ICT education and training is lacking (Mothobi et al., 2018).

Most of Mozambique's population uses a basic phone (70%), which does not connect to the internet (Gillwald et al., 2019). Devices that do connect to the internet prove to be pricey for most (Mothobi, 2021). There are bottlenecks in high-speed internet connection due to poor quality and costly infrastructure deployments (World Bank, 2019). However, there has been an increase in the usage of devices that access the internet, and recently, data costs have fallen significantly due to new entrants into that market (Ali & Muianga, 2020; Gillwald et al., 2019). Overall, the country has not reached the critical mass required to achieve the actual benefits of going online (Mothobi, 2021).

Mozambique is divided into three (3) regions: North, South, and Central. Maputo, the capital city located in the southern region, is also the country's technological hub (World Bank, 2019). The World Bank recommends that Mozambique has a framework for reskilling and upskilling workers (World Bank, 2019). However, access to funding and corruption constitute the biggest challenges for the country as it looks forward (World Bank, 2019). Mozambique has not strategically invested in creating a digital economy and needs to reform its policies (World Bank, 2019). While the country has renewed its focus on policy reform, there is still a lack of regulation regarding the digital economy (Ali & Muianga, 2020; Gillwald et al., 2019).

Like most other developing countries, the state of ICT in Mozambique remains poor, with little published research indicating what is happening and the potential for the ICT industry to improve or deteriorate. ICT skills are needed to reap the potential benefits of ICT, and this study aimed to understand the influence of the dynamics affecting the supply and demand of ICT skills in the ICT industry. A search on the Scopus database using the keywords "ICT" and "Mozambique" provided 27 documents from 2017. The infancy of ICT is evident as compared

to other countries in the region such as Tanzania and South Africa which produced 149 and 480 documents respectively during the same time period. Therefore, focusing on 1 aspect of ICT would have reduced the ability to gather enough data for the study as ICT is still at its infancy.

Chapter 6 Results

6.1. Findings

This section presents the findings of the study. The findings are organised according to the coding paradigm (Seidel & Urquhart, 2013). The causal conditions show what led to the phenomenon at hand. The context paints a picture of the conditions in which the phenomenon occurred. Some conditions affect the strategies taken to respond to the phenomenon, presented in the intervening conditions section. Keeping the context and intervening conditions in mind, the strategy presents the response to the phenomenon. Finally, the consequences of the strategies taken, both positive and negative, are presented.

Every participant in the study experienced limitations due to the existing state of ICT for growth due to the current conditions of ICT (phenomenon). In simple terms:

“So, it's kind of hard to say that Mozambicans don't like IT, it is mainly because it is really, I mean, it is tough to go into IT in Mozambique.” – PSB001.

Several concepts at play affect the conditions for ICT to grow, involving several stakeholders. Collectively, these concepts have caused the phenomenon previously stated. Several strategies were employed to address the phenomenon, influenced by the context and intervening conditions.

6.1.1. Causal Conditions

Most opportunities, resources, services, and investments are consolidated in the capital city. Those interested in ICT move to the capital city to learn, grow, and reap benefits unavailable in the rest of the country. Those who want to enter the ICT market face several challenges. The cost of entry to ICT is high, and only those that have can join the field. The government provides little to no support for ICT, such as tax relief, funding, or policy interventions. Thus, start-ups in ICT must fend for themselves, as inadequate support is available. At the same time, stakeholders of ICT do not collectively work together to improve ICT. Language poses a barrier, too. English is not a language spoken by many; Mozambicans are limited in using ICT due to language and cultural barriers. Businesses face resistance to adopting ICT from those with low skills who are unfamiliar with ICT. The local products and services offered are of poor quality. These products and services ultimately become a liability to a business. Finally,

with regards to education, overall, it remains poor, with minimal ICT available in schools. However, ICT education is better and more available in certain parts of the country. Table 3 summarises the causal conditions with some data evidence (in verbatim citations).

Table 3: Causal Conditions

Causal Condition	Data Evidence
Consolidation of resources, services, investments, and opportunities in the capital city	“Because if one day let's say Maputo is attacked [...] all State institutions are closed, and if they are closed, business won't run, because the few institutions that are in Maputo - everything will stop.” (PMB004)
Cost of ICT	“Let's say, the middle-class and the higher class have better options to go in IT...” (PSB001)
The government provides little to no support	“The country itself doesn't work straight, so if I make everything easier for you, then they will think I'm still doing something wrong. It is not mentality, it is reality.” (PMB002)
Inadequate support for start-ups	“We have economic zones, we have discounts for manufacturing, for production, but we have nothing for ICT [industry]” (PSB001)
Lacking a collective mindset to improve ICT	“So, if the government is not going to help us, at least we help one another...” (PMB001)
Language and cultural differences	“...even if you translate it to Portuguese, you will be limited.” (PMB004)
Resistance to ICT	“There is always a small resistance to change to this modernisation of this field.” (PMB003)
Local products and support services are inadequate or outdated	“Because local programmers, all, always, always it's crashing. Whenever I speak to people they say it's crash, crash, crash, crash, crash, then then you need to call somebody to come in.” (PMB002)
Poor education levels with minimal ICT resources available	“Eighth class normally you do [ICT] when you are 12/13 years and you have lost six years without knowing what is IT... No, the teacher there is there to say IT is this. Theory only.” (PTE001)
Unequal access and availability of ICT education	“Here you can hear in the classroom and when you go outside and see. It is much easier to get training in Maputo than outside because you can see.” (PMB004)

6.1.2. Context

Currently, there is merely a basic level of ICT in the country. Although ICT usage has increased over the years, it remains a younger market than elsewhere. Working in ICT is not enough to sustain yourself, and you need a second job or a career change to survive. At the same time, the country has a hierarchy of preferential treatment, where preference is given to the capital

city first, even in terms of employment. Finally, most Mozambicans are preoccupied with survival due to widespread poverty.

Regarding employment, foreign companies are the biggest employers in the North. While hiring a foreigner in Mozambique is costly, companies still rely on foreign talent out of necessity.

Lastly, Nampula Province (North) is landlocked, decreasing exposure to the population from neighbouring countries, compared to Maputo, which absorbs knowledge from neighbouring South African cities more easily. Table 4 summarises the context, with some of the data evidence.

Table 4: Context

Context	Data Evidence
Mozambique is divided into a hierarchy, with preference given to the capital	“...even in the employment market, someone who has done IT in Nampula and someone who has done IT in Maputo, it is preferred to have someone who has done it in Maputo. [...] someone who has done IT outside the country and someone has done IT in Maputo, it is preferred to have someone who has done it outside the country.” (PTE001)
About survival due to poverty	“...most people [...] are from poor families, so their daily worries are [...] to sustain themselves or [...] their family.” (PSB001)
Basic level of ICT	“IT in Mozambique is something that I came to realise that it's not very developed.” (PSB003)
ICT usage has increased but it is still a young market	“The market is still too young on this side.” (PMB002) “In terms of ICT, lately there has been more search for ICT.” (PMB004)
ICT salaries are not sustainable	“Yes, most of the time, yes [ICT is not enough and need to do something else].” (PMB003)
Foreign companies are the biggest employers (North)	“So, the biggest employer here, especially in our province, Nampula its VALE, the Brazilian company.” (PSB001)
Hiring foreign talent is costly	“It's not that it's easy to hire foreign talent in Mozambique, for government is being more strict.” (PSB001)
Nampula Province is landlocked	“You're not exposed. This region has not been exposed to much [...] to another region [...] where they are able to get better.” (PMB002)

6.1.3. Intervening Conditions

Mistakes are continually repeated without corrective action. The country does not ‘work straight’, so regardless of what you do, it is assumed you are hiding something. You need to

adapt to the circumstances, as Mozambique still works the ‘old-fashioned’ way, and that is the only way to be able to operate in the country. Going into ICT is a long road with associated challenges, and to remain in any given industry, you need to have passion and curiosity for it. Lastly, using local talent provides more control over the result and is a preferable option for reaching the desired outcome. Table 5 summarises the intervening conditions with some of the data evidence.

Table 5: Intervening Conditions

Intervening Conditions	Data Evidence
Mistakes being made are repeated	“... until we fix out mistakes, [...] the process that could take 5-10 years could now take more than 30 years. The country like this is not growing as fast as it should be growing.” (PSB002)
Assumption that one is always ‘hiding’ something	“So, Mozambique doesn't work straight. The country itself doesn't work straight, so if I make everything easier for you than they will think I'm still doing something wrong.” (PMB002)
Working with the current circumstances	“...what I came to learn, working for the many Mozambican companies is that there's some things that you have to whether you like it or not, do it old fashioned way.” (PSB003)
Passion and curiosity for ICT	“...since I was young, I had passion [...] But the passion continued, and I wanted to do a degree in IT only” (PTE001)
Using local talent gives more control	“Local because you're able to sit on his head and tell him [...] we need to have it in front of us to get it done right.” (PMB002)

6.1.4. Strategies

Various strategies are being used, where ICT has been added as part of the curriculum in some schools to increase ICT skills; people study an ICT-related degree to still be in the ICT industry, but have opportunities after study, find another source of income, or leave the ICT industry altogether to make a living; those interested in ICT learn by themselves or go to another country to study it; people that do have ICT skills go to where opportunities are available such as the capital city; businesses rely on a select few with skills to do ICT tasks; employees are provided training to increase their ICT skills, where if a company needs to reduce costs, ICT is one of the casualties; founders invest in their start-ups when needing funds due to lack of funding available for start-ups; there is dependence on foreign companies and talents to cope with the low level of skills available locally; and lastly, businesses use systems not registered with the government to use ICT without interference. Table 6 summarises the strategies used and some of the data evidence.

Table 6: Strategies

Strategies	Data Evidence
ICT has been added as part of the curriculum	"... computer is just a part of the extra-curricular we had last time. but at present, it's a part now of the academics." (PPS001)
Study an ICT-related degree, find other income or another job, or leave the ICT industry	"Others to be able to survive need to find a job in two places" (PMB003) "We study IT but mainly in telecommunications, because that is where there are work opportunities." (PTE001)
Learn ICT skills yourself or go to another country offering them	"For programming, you need to go out." (PMB004) "... a high-tech guy in a Nampula [...] you find a guy who's self-taught, who learnt everything from YouTube." (PMB001)
People with ICT skills move to where opportunities are available	"Many of us run to Maputo to get training in ICT. Other provinces have training for ICT, but you don't have a value, or these places don't absorb the ICTs." (PMB004)
Rely on the few that have ICT skills	"If I'm just sick or I'm not there, or I travel, nobody will do it." (PSB002)
Training current Employees	"So, what they what we did, we had this trainees we have these trainings, we have seminars." (PPS001)
ICT is a casualty in reducing costs	"...in order for us to [save] [...] [we] take out that cost of computer programme." (PMB001)
Invest in your start-up	"...I'm doing it from a natural point of investing." (PSB003)
Dependence on foreign companies	"Because most of the organisations bring systems made from outside the country to use internally..." (PMB003)
Dependence on foreign talent	"...people end up bringing someone from outside that already has these certifications." (PMB004)
Using software not registered with the Govt	"Because our programs aren't registered they (government) can't ask for it." (PMB002)

6.1.5. Consequences

ICT is not considered a viable industry to go into at present, as the chances of failure are high. There are not enough opportunities available to gain ICT experience. There are skills shortages, and not everyone's entire skillset is used. Those who have ICT skills tend to overvalue themselves. There is little innovation, and it involves adapting to the changes in the market. There is generally a lack of awareness and interest in ICT. The country is slowly shifting towards using ICT more, with the potential of reaping the benefits of ICT still unfulfilled. Table 7 summarises the consequences and some of the data evidence. Figure 3 illustrates the dynamics of ICT skills based on the findings of this study. The following section discusses the findings presented.

Table 7: Consequences

Consequences	Data Evidence
ICT is not a very viable industry	“it's not financially viable to go in IT right now.” (PSB001)
Not enough ICT opportunities are available	“... those that are doing IT, for example I want to study IT or transition to IT, a lot of times people are scared, I studied IT, after I finish studying, where will I find a job?” (PSB002)
ICT skills shortage and mismatch	“For example, an IT with a lot of experience and many skills and short courses and added skills and is a specialist in 5, 4, 3 areas will be only be using two where he works.” (PMB003)
People with ICT skills overvalue themselves	“And then if you do find somebody, then he charges, so it's so much.” (PMB002)
Less innovation	“We adapt, we adapt according to the to the needs and necessities of our community business.” (PMB002)
Lack awareness and interest in ICT	“But the population in general, I think it's mainly because they're not exposed to it.” (PSB001) “when people see him [cousin], since he has done IT, they say he knows how to work with money, using the mouse and that is it. So, the vision of people in IT is like that.” (PTE001)
Slow shift to ICT	“...but today some companies are changing are changing. Like some big companies that are coming right now, they're using some IT, but yet we are very far behind.” (PSB002)
Potential for ICT is not fulfilled	“They don't want to know about other skills you [have], [...] they just are there for the basic necessities they face in that moment.” (PTE001)

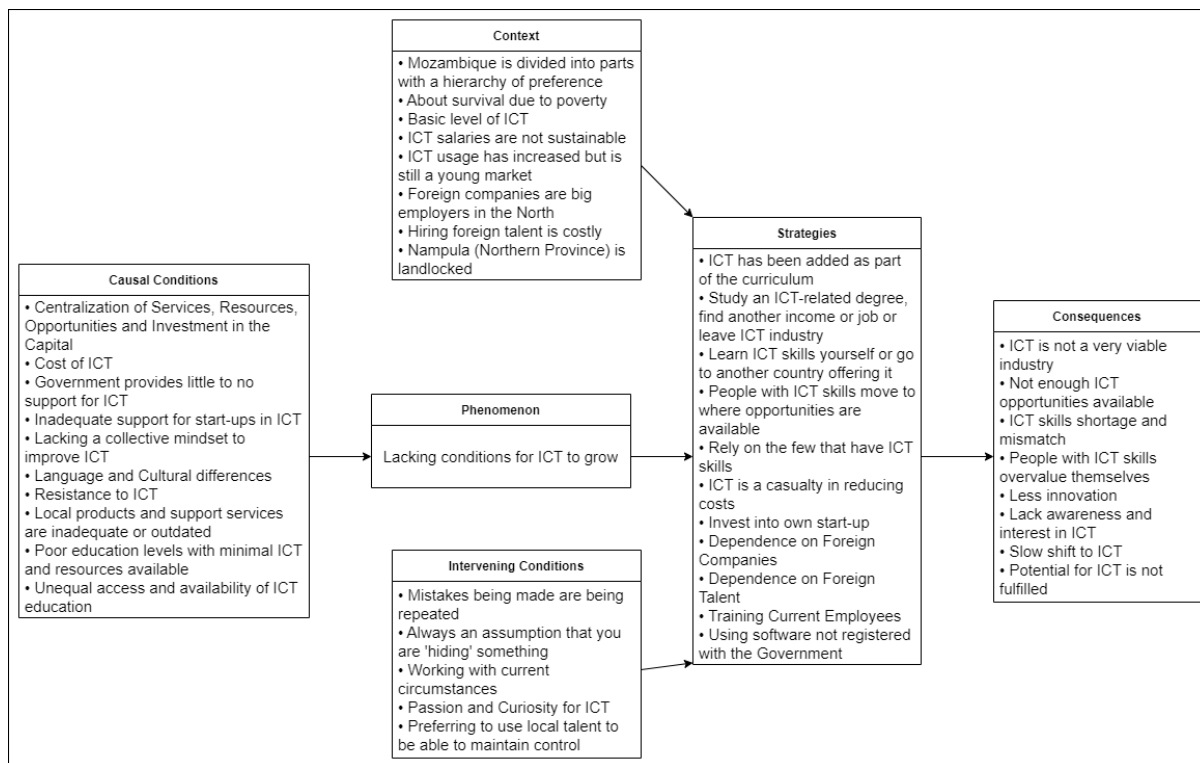


Figure 3: Coding Paradigm Summary of ICT skills concepts in Mozambique

6.2. Discussion

6.2.1. ICT Skills Ecosystem

The Orchestrating Actor Ecosystem (Guggenberger et al., 2020), a type of ecosystem suitable for the context, focuses on a social and technical dimension. Squares refer to the social power, hexagons to central objects and circles with letters as specialised actors. The orchestrating actor implements the collective for the community using a central object to orchestrate individuals' specialisations (Guggenberger et al., 2020). There are 4 (four) dominant characteristics of an orchestrating ecosystem (Guggenberger et al., 2020). Centricity refers to a manifest central hub, in this case, a value proposition. Centralised Power refers to a degree of centricity in the ecosystem. Specialisation refers to contributions mostly from individuals within the ecosystem. Collective Intention is the intrinsic motivation to participate and contribute through competition and collaboration in the ecosystem.

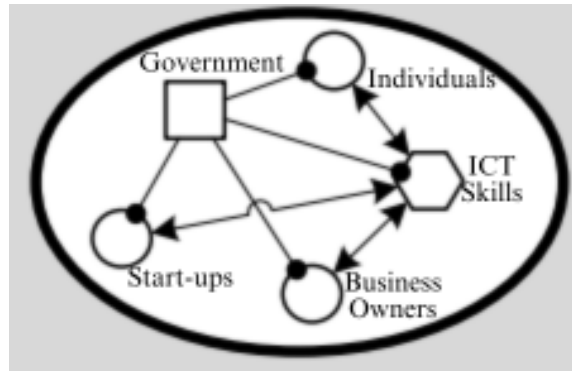


Figure 4: Orchestrating Actor Ecosystem

Note. Adapted from “Ecosystem Types in Information Systems”, by Guggenberger, T. M., Möller, F., Haarhaus, T., Gür, I., & Otto, B, 2020, *Proceedings of the 28th European Conference on Information Systems (ECIS)*, pp. 1-121. Copyright 2020 by ECIS.

In this context, the focus is on ICT Skills, with the value proposition – improving the ICT Skills ecosystem. The government is the central power/social power/orchestrator, as it can influence the ecosystem through policy changes. The government is involved throughout the ecosystem, and every actor must interact with the government to influence the ecosystem. Individuals, in their capacity or as heads of businesses, play a role in navigating through the current context, such as learning skills by themselves or importing foreign-made ICT products. As the ICT Skills ecosystem is still developing, many participating actors are trying to improve the country's ICT levels.

6.2.2. Dynamics of ICT Skills

The dynamics of ICT skills in Mozambique involve a never-ending loop of insufficient opportunities available to gain ICT skills and inadequate skills available to demand ICT skills as a result of the current ICT conditions limiting growth due to the lack of support on the part of the Government (social power). In brief, ICT skills remain limited in quality without opportunities to gain ICT experience (in education, employment or formal training). With only low-quality ICT skills available, opportunities for ICT experience are awarded to those in the capital city, or foreign talents are hired. The need for support from the government is captured by the World Bank (2019). As most of the country relies on the capital city, talent moves to the capital city for opportunities, leaving the rest of the country with fewer skills. There is insufficient literature on consolidating resources and their consequences. Those who stay

behind lack the skills due to poor education levels offered locally (World Bank, 2019) and poor ICT education and training available (Mothobi et al., 2018). English, not being the primary language, poses barriers to learning, as mentioned by Schelenz and Schopp (2018). Chimbutane (2017) indicates that most of the population is unable to express themselves in Portuguese, which is already limiting to learning ICT.

There are not enough opportunities to gain ICT experience, resulting in inadequate quality of products and services available from existing ICT talent, while those with skills tend to overvalue themselves. A lack of ICT opportunities arises due to the advertised skills not being available locally (high entry requirements) (Twinomurinzi et al., 2017). Overpricing your skill was not found in the literature, but it may be argued that it is not specific to ICT but applies to any field where a resource is scarce. This leads to reliance on the capital city (technological hub), foreign companies, and foreign talent, leading to a lack of ICT opportunities for the rest of the country. Immigration is used to attract foreign talent with the necessary ICT skills, a channel used to demand ICT skills, as Beerli et al. (2017) indicated.

Some try to venture as a start-up (specialization) but find it challenging to succeed due to lack of access to funding, finding the need to invest themselves. Lack of access to funding is a challenge faced by Mozambique (World Bank, 2019). As survival is key, Mozambicans opt to study an ICT-related degree with a job prospect, find a second income, or leave the industry. This strategy to mitigate the effects of the lack of conditions of ICT growth on the dynamics of ICT skills is insufficiently covered by the literature. Therefore, the difference between the country's regions will keep increasing, and ICT will grow slowly until action is taken for the better.

Even though limited literature about ICT in Mozambique is available (Ribeiro Ribeiras, 2018), literature provides a high-level overview of the dynamics at play. For example, the dynamic of poor education levels is covered by Kasparova (2019), but the deeper dynamics of this are not explored. Poor education dynamics lead to incomplete skill sets. However, how this dynamic, in turn, affects other dynamics is not extensively covered. One reason that may explain this is that most studies adopt a narrow focus, such as where Badat (2010) focused on the dynamics at play at an educational level.

6.2.3. ICT Skills Dynamics Model

To illustrate ICT skills dynamics, the findings have been presented using a Causal Loop Diagram (Figure 5). The dynamics have two sides: the supply and demand for ICT skills in the ICT ecosystem. As the social power/orchestrator, the government plays an influential role in the supply and demand of ICT skills. The supply of ICT skills increases when ICT resources and quality education are available and accessible. ICT resources are affected by the costs relating to ICT. As the costs to acquire ICT resources increase, fewer ICT resources are available, which in turn directly affects the usage of ICT. At the same time, the centralisation of ICT in the capital city affects the availability of ICT resources throughout the country. The government policy directly influences education levels (investment in ICT education), availability of resources (investment in ICT infrastructure), costs of ICT (Taxation on ICT businesses, products and services) and the centralisation of ICT in the capital city (ICT opportunities allocation policy) acting as the central power in the supply side of ICT skills.

On the demand side of ICT skills, increasing the centralisation of ICT in the capital city decreases the demand for ICT skills as it adds a layer of exclusivity – only those able to go to the capital city can find employment or opportunities. The quality of local ICT products and support services affects the demand for ICT skills. As the quality improves, businesses will begin to use local ICT products instead of foreign ones, requiring more ICT skills to maintain those products. Resistance to ICT adds pressure on businesses to delay the usage of ICT as staff show reluctance to change, leading to fewer ICT skills required to bring about the company's digitisation. Lastly, as the costs of ICT increase, the demand for the skills decreases as businesses may opt to reduce staff, go back to the paper-based ways or only digitise part of their businesses. The government influences the demand side in the same way as it influences the supply side.

From a mathematical point of view, the reinforced loop is due to no negatives being in the loop. In terms of the dynamics, as the demand increases, the more homegrown ICT solutions will exist thus there will be more demand due to more ICT work happening. As there are more homegrown ICT solutions in the country, there will be more awareness and interest in ICT, leading to more people wanting to gain these skills and increasing the supply of ICT skills. With a more excellent supply of ICT skills, ICT usage increases as more people know how to

use ICT products and services, leading to more skills needed to maintain these solutions. Since it is a reinforcing loop, a decrease in demand will eventually lead to a further reduction.

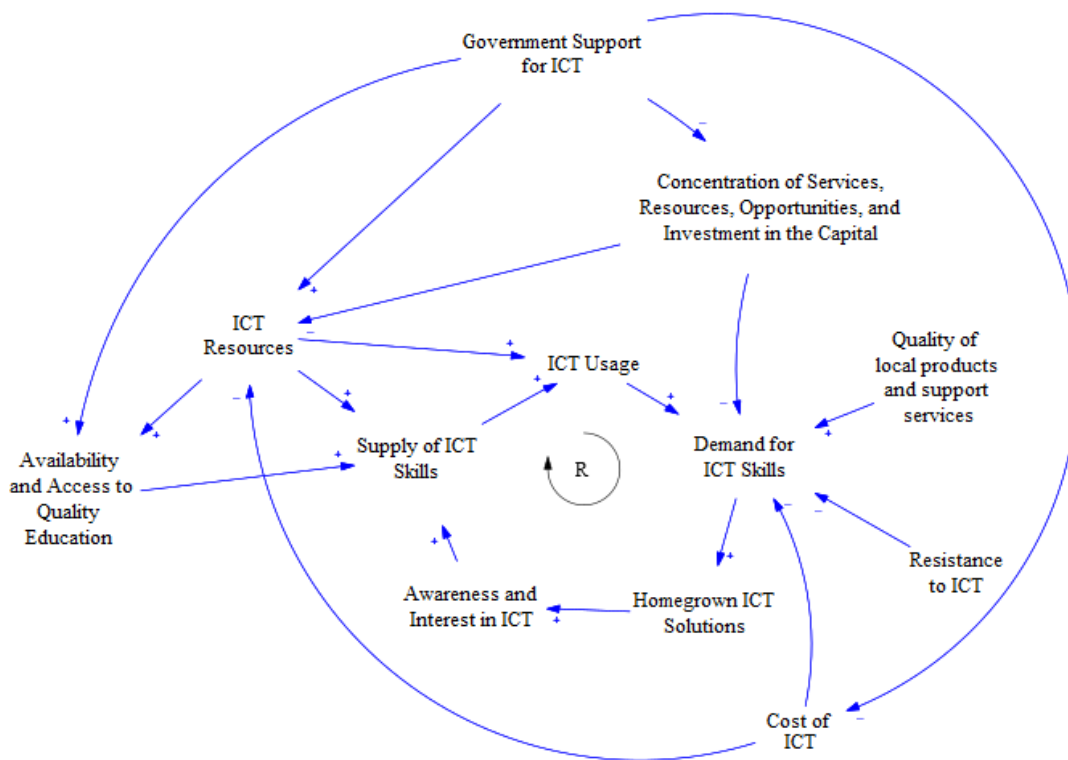


Figure 5: ICT Skills Dynamics Model

In Mozambique, the ICT Skills Dynamics Model illustrates how the never-ending loop of ICT skills not improving for the better occurs, as explained in the sections above. The government is not yet focused on ICT, so support is still inadequate. Opportunities, investments, services, and resources are centralised in the capital city. The quality of education is poor, with limited access and availability. ICT resources are not readily available and are affected by the high costs of ICT; thus, the usage of ICT is low, too. Therefore, the supply of ICT skills is insufficient. On the demand side, resistance to ICT is high due to the lack of ICT education in the country; the quality of products and services found is low, meaning a lot of the ICT solutions are foreign. ICT costs are high, and the centralisation of ICT in the capital leads to a low demand for ICT skills. As the supply and demand of ICT skills are low already, the reinforcing loop does not change ICT skills as it keeps the cycle repeating, keeping ICT skills low in the country.

In summary, the government is a social power/orchestrator, now not prioritising ICT. As the government touches on every aspect of the ICT skills ecosystem, without its active participation, the ICT skills ecosystem continues its current path – a never-ending loop of lack of supply and demand for ICT skills. Other stakeholders try to survive the current ecosystem while some leave the ICT ecosystem.

6.2.4. Engaging ICT Skills Dynamics Model with Literature

In a GTM study, engaging the model with the existing literature is essential to see how it relates to previous studies (Urquhart, 2013). In an orchestrating actor ecosystem found in the literature (Guggenberger et al., 2020), the orchestrator implements the collective will to integrate the contributions of every stakeholder in the ecosystem towards the common goal. At the same time, the orchestrator holds the keys to the central object by giving or restricting access. As the government plays the orchestrator role, it can ease or limit the improvement of ICT skills. However, the study found that while the orchestrating actor is supposed to implement the collective will of the ecosystem's stakeholders, the government has not done so. The role of the government is found in literature – to introduce policies essential to ensure resources and measures are in place to respond to the opportunities and problems that happen with digital transformation. The World Bank (2019) further supports that the government must support ICT more. A lack of collective will implemented by the orchestrator creates adaptive behaviour by other stakeholders – a characteristic of a socio-centric ecosystem where stakeholders organise around the social power - adapting and evolving (Guggenberger et al., 2020). Adaptive behaviour by the stakeholders as individuals or businesses is a consequence of their survival in the ICT skills ecosystem where the government's support for improving ICT skills is lacking – a dynamic belonging to another ecosystem found in the literature. Adaptive behaviour explains the dynamics occurring in the ICT skills ecosystem as stakeholders self-organize (Guggenberger et al., 2020), such as individuals moving to the capital city for ICT opportunities, businesses hiring foreign talent and companies for ICT skills and services. Therefore, in terms of the ICT skills ecosystem, while the literature does not provide a fit-to-match ecosystem, the different dynamics found in other ecosystems combined are located in the ICT skills ecosystem.

Having discussed the orchestrator's role, the next step is to see how the adaptive behaviour of stakeholders leads to a never-ending doom loop. In this context, a never-ending doom loop is

a reinforced loop, as explained above. A reinforced loop amplifies the feedback effect; if a leads to more of b, then b leads to more of a and vice-versa; if a leads to less of b, then b leads to less of a (Morecroft, 2010). Without the government's support (Kapurubandara & Lawson, 2006; World Bank, 2019), the stakeholders are left with ICT skills not increasing keeping supply low, thus leading to less demand for ICT skills and less demand for ICT skills, leading to less supply for ICT skills. A study by Younie (2006) on government policy on ICT indicated that ICT needs to be implemented on various fronts, including infrastructure and creating a culture that values ICT. While the study referred to ICT in a classroom, the same applies to the supply side of ICT in the study. Inadequate infrastructure, interest and awareness of ICT, and high costs, among other dynamics, create inadequate supply and demand for ICT skills due to resource poverty, which was found in a similar study conducted in Sri Lanka (Kapurubandara & Lawson, 2006). Contextually, the current state of Mozambique extensively shows the inadequate supply and demand of ICT skills found in the literature. Therefore, as the reinforced loop amplifies, the lack of ICT skills is boosted, too. Literature does provide the concepts found in this study in parts which this study has integrated at an ICT skills ecosystem level.

6.2.5. Contribution

There are three contribution forms to research – theory, model and rich descriptions (Wiesche et al., 2017). Theory is defined as an abstraction of variables, the relationship and justifications between them, setting the boundaries and the scope of the theory (Wiesche et al., 2017). Models refer to abstracting variables and their relationships generalised from data (Wiesche et al., 2017). Lastly, rich descriptions present narratives (without abstractions) about living and non-living actors in a study (Wiesche et al., 2017).

This study contributes to the literature in two forms – rich descriptions and a model presented. The rich descriptions gave various dynamics experienced between stakeholders. Each dynamic explored was then compared to existing literature to find whether they were existing concepts or built further on existing studies. The rich descriptions presented a story of the elements involved in the ICT skills ecosystem and the actions taken by various stakeholders for their interests in ICT skills. The study further abstracted the dynamics uncovered to understand the bigger picture of ICT skills dynamics through the ICT Skills Dynamics Model. The model illustrated using CLD showed how several dynamics influence one another, and it explained using the ICT skills ecosystem to understand the interconnections between dynamics,

stakeholders, and ICT skills. The study combined all dynamics to better understand the linkages found, which may be applied to countries similar to Mozambique's context and development indicators to understand the role ICT skills play in shaping the ICT industries.

In terms of research, these contributions build a foundation for interest in ICT skills dynamics in countries with a development index similar to Mozambique's. Additionally, it adds to existing literature grounded on local context as it fully incorporated thoughts and ideas from Mozambique, providing findings that may have a lasting impact context-wise (Owusu-Ansah & Mji, 2013) and make meaningful theoretical contributions (Abubakre & Mkansi, 2021). Furthermore, it provides a starting point for further deeper analysis as each dynamic presents the opportunity to uncover further explanations for why ICT skills dynamics are the way they are. For example, suppose a researcher is interested in the educational field. In that case, this study provides a starting point about the dynamics between education and ICT skills, whereby further research may dive deeper, solely focusing on the education front. From a practical point of view, the study provides an overview of how the ICT ecosystem runs in Mozambique, which may be used for similar countries to understand 'how the system works'. For Mozambique, this study highlights the ecosystem and its unspoken ways of operating. It indicates where the power lies if change is introduced to improve ICT in the country. It further showcases how those at the ground level, such as individuals or business owners, are surviving in the system, demonstrating the effects of policies and regulations on the ecosystem as a whole. While the study does not dive into how the ICT skills dynamics may be improved, it has provided a summary of how things work, leaving room for further studies on how things may be improved.

Chapter 7 Conclusion

This study explored the influence of the dynamics affecting the supply and demand of ICT skills in Mozambique. This was done to understand the deeper dynamics, as insufficient literature about ICT in Mozambique exists. This paper specifically addressed the research question: What is the state of ICT skills dynamics (supply and demand) in Mozambique?

Mozambique's state of ICT is poor. Education levels are low, and people lack basic ICT skills and have poor overall education. Language and cultural barriers make it challenging to learn ICT skills. The country lacks policy reforms, and ICT is not a priority for the government. The internet is not accessible to everyone, and the country has not reached critical mass to realise the potential of ICT. These findings helped understand the context of the country of the study.

With regards to the ICT dynamics being faced, the country remains trapped in a never-ending loop, where opportunities (demand for ICT skills) are centralised to the capital, those with skills or financial capacity shift to the capital or go abroad, and those staying behind are unable to provide high-quality services, considering the poor levels of education available. This creates a reliance on foreign companies and employees. It leads to shortages of opportunities available to supply ICT skills, leading to the Mozambicans wanting to survive and choosing to do an ICT-related degree, who ultimately find a second income or change industries. There is little to no support from the government, with ICT not being a priority. The country itself does not 'work straight'. Lastly, ICT skills dynamics are affected by the strategies taken to respond to the lack of conditions for the growth of ICT. These findings addressed the influences on supply and demand of ICT skills dynamics.

An ICT Skills Dynamics model illustrated the abstracted bigger picture of the interconnections of dynamics at hand. The government is the social power that can provide or restrict ICT skills improvements. However, without support from the government, the stakeholders show adaptive behaviour and develop strategies to survive in the ICT skills ecosystem. Without the government's support, a reinforcing loop whereby an inadequate supply of ICT skills leads to insufficient demand for ICT skills which amplifies the lack of ICT skills growth, creating the never-ending loop mentioned above. The model illustrates the complex relationships between stakeholders and their actions causing the dynamics at play.

The study has limitations, as most participants were from the North of Mozambique, with a few from Maputo or having experiences in Maputo. Since the country is divided into different geographical regions, the dynamics may vary in each part. As the researcher studied abroad during the formative university years, gaining access to the government and higher education institutions was a challenge. Being regarded as an outsider posed a challenge in gaining trust and access to these key stakeholders. Therefore, their perspectives were captured through the perspectives of other stakeholders who have interacted with them and not directly from the source – another limitation of the study.

The study contributed to research in two ways – providing rich descriptions of various dynamics found and a model providing a big-picture view showcasing the interconnections between the stakeholders and dynamics. For future research, studies may focus on the role of the government to better understand how the different dynamics in this study are being strategized. Additionally, including participants from more diverse parts of the country will help understand the dynamics further. Further studies comparing the dynamics faced in Mozambique to other developing countries whose context (development indicators) are like Mozambique, especially in the African context, may be beneficial to understanding how different countries in the continent work with the dynamics of ICT skills.

References

- Abubakre, M., & Mkansi, M. (2022). How do technologists do “ICT for development”? A contextualised perspective on ICT4D in South Africa. *European Journal of Information Systems*, 31(1), 7-24.
- Afawubo, K., & Noglo, Y. A. (2022). ICT and entrepreneurship: A comparative analysis of developing, emerging and developed countries. *Technological Forecasting and Social Change*, 175, 121312.
- Al-Adwan, A. S. (2017). Case study and grounded theory: A happy marriage? An exemplary application from healthcare informatics adoption research. *International Journal of Electronic Healthcare*, 9(4), 294-318.
- Alderete, M. V. (2017). Examining the ICT access effect on socioeconomic development: the moderating role of ICT use and skills. *Information Technology for Development*, 23(1), 42-58.
- Alhassan, M. D., & Adam, I. O. (2021). The effects of digital inclusion and ICT access on the quality of life: A global perspective—technology *in Society*, 64, 101511.
- Ali, R., & Muianga, C. (2020). The Future of Work (Ers) In Mozambique in The Digital Era. *SCIS Working Paper Number 8*. Southern Centre for Inequality Studies, Wits University.
- Alismail, H. A., & McGuire, P. (2015). 21st century standards and curriculum: Current research and practice. *Journal of Education and Practice*, 6(6), 150-154.
- Allen, D., Karanasios, S., & Slavova, M. (2011). Working with activity theory: Context, technology, and information behavior. *Journal of the American Society for Information Science and Technology*, 62(4), 776-788.
- Ananiadou, K., & Claro, M. (2009). 21st century skills and competences for new millennium learners in OECD countries.
- Anfara Jr, V. A., Brown, K. M., & Mangione, T. L. (2002). Qualitative analysis on stage: Making the research process more public. *Educational researcher*, 31(7), 28-38.

Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: Looking at trustworthiness criteria. *Journal of emerging trends in educational research and policy studies*, 5(2), 272-281.

Badat, S. (2010). The role of higher education in society: Valuing higher education. *HERS-SA Academy*, 13-19.

Badran, M. F. (2021). Digital platforms in Africa: A case-study of Jumia Egypt's digital platform. *Telecommunications Policy*, 45(3), 102077.

Beerli, A., Indergand, R., & Kunz, J. (2017). The supply of foreign talent: How skill-biased technology drives the skill mix of immigrants Evidence from Switzerland 1990–2010. *Technical report KOF Working Papers*, 436. ETH Zurich.

Bejaković, P., & Mrnjavac, Ž. (2020). The importance of digital literacy on the labour market. *Employee Relations: The International Journal*.

Ben, S., Bosc, R., Jiao, J., Li, W., Simonelli, F., & Zhang, R. (2017). Digital Infrastructure: Overcoming the digital divide in China and the European Union. *Centre for European Policy Studies*.

Bevir, M., & Kedar, A. (2008). Concept formation in political science: An anti-naturalist critique of qualitative methodology. *Perspectives on Politics*, 6(3), 503-517.

Bhattacharjee, A. (2012). *Social science research: Principles, methods, and practices*. USA.

Bukht, R., & Heeks, R. (2018). Digital economy policy in developing countries. *DIODE Working Papers No. 7*. Manchester: University of Manchester.

Canani, A., & Seymour, L. F. (2021, May). Describing Emergency Remote Teaching Using A Learning Management System: A South African Covid-19 Study Of Resilience Through ICT. In *Proceedings of IFIP 9.4 Virtual Conference, 2021*, (pp. 28–42).

Caulfield, C. W., & Maj, S. P. (2001, October). A case for systems thinking and system dynamics. In *2001 IEEE International Conference on Systems, Man and Cybernetics. e-Systems and e-Man for Cybernetics in Cyberspace (Cat. No. 01CH37236)* (Vol. 5, pp. 2793-2798). IEEE.

Cha, H., Park, T., & Seo, J. (2020). What should be considered when developing ICT-integrated classroom models for a developing country?. *Sustainability*, 12(7), 2967.

Chetty, K., Qigui, L., Gcora, N., Josie, J., Wenwei, L., & Fang, C. (2018). Bridging the digital divide: measuring digital literacy. *Economics: The Open-Access, Open-Assessment E-Journal*, 12(2018-23), 1-20.

Chimbutane, F. (2017). Language policies and the role of development agencies in postcolonial Mozambique. *Current Issues in Language Planning*, 18(4), 356-370.

Chun Tie, Y., Birks, M., & Francis, K. (2019). Grounded theory research: A design framework for novice researchers. *SAGE open medicine*, 7, 1-8.

Corbin, J., & Strauss, A. (2008). *Basics of qualitative research: Techniques and procedures for developing grounded theory*. Sage Publications.

Cussen, N., & Cooney, T. (2017). How can Local Communities use Effectuation to Increase Local Economic Growth Within Existing Levels of Government Support? In *ECRM 2017 - 16th European Conference on Research Methods in Business and Management* (pp. 392–398). Academic Conferences and publishing limited.

Day, J. M., Junglas, I., & Silva, L. (2009). Information flow impediments in disaster relief supply chains. *Journal of the Association for Information Systems*, 10(8), 1.

Denscombe, M. (2010). *The good research guide for small-scale social research projects* (4th Edition). Maidenhead: Open University Press.

Diaz Andrade, A. (2009). Interpretive research aiming at theory building: Adopting and adapting the case study design. *The Qualitative Report*, 14(1), 42–60.

Dubey, R. S., & Tiwari, V. (2020). Operationalisation of soft skill attributes and determining the existing gap in novice ICT professionals. *International Journal of Information Management*, 50, 375-386.

Erstad, O. (2010). Educating the digital generation. *Nordic journal of digital literacy*, 5(01), 56-71.

Fajčíková, A., Urbancová, H., & Fejfarová, M. (2018). New trends in the recruitment of employees in Czech ICT organisations. *Scientific papers of the University of Pardubice. Series D, Faculty of Economics and Administration*, 43/2018.

Fonseca, D., Conde, M. Á., & García-Peñalvo, F. J. (2018). Improving the information society skills: Is knowledge accessible for all?. *Universal Access in the Information Society*, 17(2), 229-245.

Geisinger, K. F. (2016). 21st century skills: What are they and how do we assess them?. *Applied Measurement in Education*, 29(4), 245-249.

Geisinger, K. F. (2016). 21st century skills: What are they and how do we assess them?. *Applied Measurement in Education*, 29(4), 245-249.

Gillwald, A., Mothobi, O., & Rademan, B. (2019). The State of ICT in Mozambique 2018. Cape Town, South Africa: Research ICT Africa (RIA).

Gogolova, M., Ponisciakova, O., & Ivankova, K. (2015). The use of external personnel marketing in Slovakia. *Procedia Economics and Finance*, 26, 131-138.

Graham, M., Hjorth, I., & Lehdonvirta, V. (2017). Digital labour and development: impacts of global digital labour platforms and the gig economy on worker livelihoods. *Transfer: European review of labour and research*, 23(2), 135-162.

Griffin, P., & Care, E. (2015). Policy pathways for twenty-first century skills. In *Assessment and teaching of 21st century skills* (pp. 293-310). Springer, Dordrecht.

Guggenberger, T. M., Möller, F., Haarhaus, T., Gür, I., & Otto, B. (2020, June). Ecosystem Types in Information Systems. In *Proceedings of the 28th European Conference on Information Systems (ECIS), 2020*, (pp. 1-21). Marrakech, Morocco.

Guggenberger, T. M., Möller, F., Haarhaus, T., Gür, I., & Otto, B. (2020, June). Ecosystem Types in Information Systems. In *ECIS*.

Halaweh, M. (2012). Integration of grounded theory and case study: An exemplary application from e-commerce security perception research. *Journal of Information Technology Theory and Application*, 13(1), 31-51.

- Halaweh, M., Fidler, C., & McRobb, S. (2008). Integrating the grounded theory method and case study research methodology within is research: A possible'road map'. *ICIS 2008 proceedings*, 165.
- Hendarman, A. F., & Cantner, U. (2018). Soft skills, hard skills, and individual innovativeness. *Eurasian Business Review*, 8(2), 139-169.
- Hughes, J., & Jones, S. (2003). Reflections on the use of grounded theory in interpretive information systems research. *ECIS 2003 Proceedings*, 62.
- Kallio, H., Pietilä, A. M., Johnson, M., & Kangasniemi, M. (2016). Systematic methodological review: developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*, 72(12), 2954–2965.
- Kang, D., & Park, M. J. (2017). Competitive prospects of graduate program on the integration of ICT superiority, higher education, and international aid. *Telematics and Informatics*, 34(8), 1625-1637.
- Kapurubandara, M., & Lawson, R. (2006). Barriers to Adopting ICT and e-commerce with SMEs in developing countries: an Exploratory study in Sri Lanka. *University of Western Sydney, Australia*, 82(1), 2005-2016.
- Karunaratne, T., Peiris, C., & Hansson, H. (2018). Implementing small scale ICT projects in developing countries—how challenging is it?. *International Journal of Education and Development using ICT*, 14(1).
- Kasparova, E. (2019). Digital skills and their development in the Czech Republic. *Periodicals of Engineering and Natural Sciences*, 7(2), 637-643.
- Kirlidog, M., van der Vyver, C., Zeeman, M., & Coetzee, W. (2018). Unfulfilled need: reasons for insufficient ICT skills in South Africa. *Information Development*, 34(1), 5-19.
- Klimas, P., & Wójcik, D. (2018). Core skills in ICT—systematic review of academic and grey literature. *Studia Ekonomiczne*, 360, 7-27.

- Komives, S. R., Owen, J. E., Longerbeam, S. D., Mainella, F. C., & Osteen, L. (2005). Developing a leadership identity: A grounded theory. *Journal of college student development, 46*(6), 593-611.
- Kruss, G., McGrath, S., Petersen, I. H., & Gastrow, M. (2015). Higher education and economic development: The importance of building technological capabilities. *International Journal of Educational Development, 43*, 22-31.
- Kumar, S., & Singh, B. (2019). Barriers to the international diffusion of technological innovations. *Economic Modelling, 82*, 74-86.
- Levin, K. A. (2006). Study design III: Cross-sectional studies. *Evidence-Based Dentistry, 7*(1), 24–25.
- Liesa-Orús, M., Latorre-Coscolluela, C., Vázquez-Toledo, S., & Sierra-Sánchez, V. (2020). The technological challenge facing higher education professors: Perceptions of ICT tools for developing 21st century skills. *Sustainability, 12*(13), 5339.
- Manda, M. I., & Backhouse, J. (2017, July). Digital transformation for inclusive growth in South Africa. Challenges and opportunities in the 4th industrial revolution. In *2nd African conference on information science and technology*. Cape Town, South Africa.
- Manda, M. I., & Ben Dhaou, S. (2019, April). Responding to the challenges and opportunities in the 4th Industrial revolution in developing countries. In *Proceedings of the 12th International Conference on Theory and Practice of Electronic Governance* (pp. 244-253). Melbourne, Australia.
- Metu, A. G., Ajudua, E., Eboh, I., Ukeje, C., & Madichie, C. (2020). Ending youth unemployment in sub-Saharan Africa: Does ICT development have any role?. *African Development Review, 32*, S20-S31.
- Morecroft, J. (2010). System Dynamics. In M. Reynolds & S. Holwell (Eds.). *Systems Approaches to Managing Change: A Practical Guide* (pp. 25-85). London: Springer
- Mothobi, O. (2021). Digital Labour in Africa: Opportunities and Challenges. *Research ICT Africa, Policy Brief 2021, number 1*. Cape Town, South Africa.

Mothobi, O., Schoentgen, A., & Gillwald, A. (2018). What is the state of microwork in Africa? A view from seven countries. *Policy Paper*, 5, 55-76.

Muzafar, S., & Jhanjhi, N. Z. (2020). Success Stories of ICT Implementation in Saudi Arabia. In *Employing Recent Technologies for Improved Digital Governance* (pp. 151-163). IGI Global.

Mwalemba, G. (2019, September). Confronting Challenges Facing Enterprise Systems Education in Africa. In *2019 Conference on Next Generation Computing Applications (NextComp)* (pp. 1-5). IEEE.

Nazron, M. A., Lim, B., & Nga, J. L. (2017). Soft skills attributes and graduate employability: A case in Universiti Malaysia Sabah. *Malaysian Journal of Business and Economics (MJBE)*.

O'Gorman, K. D., & MacIntosh, R. (2014). *Research methods for business and management*. Goodfellow Publishers Limited.

Organisation for Economic Co-operation and Development (OECD). (2016). Skills for a Digital World.

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying Information Technology in Organizations : Research Approaches and Assumptions. *Information Systems Research*, 2(1), 1–28.

Owusu-Ansah, F. E., & Mji, G. (2013). African indigenous knowledge and research. *African Journal of Disability*, 2(1), 1-5.

Park, J., & Yoo, S. (2023). Evolution of the smart city: three extensions to governance, sustainability, and decent urbanisation from an ICT-based urban solution. *International Journal of Urban Sciences*, 27(sup1), 10-28.

Patacsil, F. F., & Tablatin, C. L. S. (2017). Exploring the importance of soft and hard skills as perceived by IT internship students and industry: A gap analysis. *Journal of Technology and Science Education*, 7(3), 347-368

Pogge, T. (2023). The African Union-Rising. *Journal of Academics Stand Against Poverty*, 3(1), 57-60.

Qureshi, S. (2015). Are we making a better world with information and communication technology for development (ICT4D) research? Findings from the field and theory building. *Information Technology for Development*, 21(4), 511-522.

Raitskaya, L., & Tikhonova, E. (2019). Skills and competencies in higher education and beyond. *Journal of Language and Education*, 5(4), 4-8.

Reiter, B. (2013). The epistemology and methodology of exploratory social science research: Crossing Popper with Marcuse. *Government and International Affairs Faculty Publications*. 99.

Ribeiro Ribeiros, MDF (2018). *Information and Communication Technologies as a factor of Social Inclusion in Mozambique* (Doctoral dissertation). Instituto Superior de Gestao, Lisbon, Portugal.

Ritala, P., Agouridas, V., Assimakopoulos, D., & Gies, O. (2013). Value creation and capture mechanisms in innovation ecosystems: a comparative case study. *International journal of technology management*, 63(3-4), 244-267.

Rowley, J. (2002). Using Case Studies in Research. *Management Research News*, 16–27.

Sakil, A. H. (2018). ICT, youth and urban governance in developing countries: Bangladesh perspective. *International Journal of Adolescence and Youth*, 23(2), 219-234.

Saunders, M., Lewis, P., & Thornhill, A. (2009). *Research methods for business students*. Pearson education.

Saunders, M., Lewis, P., & Thornhill, A. (2019). Research methods for business students eight edition. *QualitativeMarket Research: An International Journal*.

Savga, L., Kryklyi, O., & Kyrychenko, K. (2018). The role of internal and external stakeholders in higher education system in Ukraine. *Business ethics and leadership*, 2(1), 32-43.

Schelenz, L., & Schopp, K. (2018). Digitalization in Africa: Interdisciplinary perspectives on technology, development, and justice. *International Journal of Digital Society*, 9(4), 1412-1420.

Schopp, K., Schelenz, L., Heesen, J., & Pawelec, M. (2019). Digitalization in the Global South. *TATuP-Zeitschrift für Technikfolgenabschätzung in Theorie Und Praxis*, 28(2), 10-51.

Seidel, S., & Urquhart, C. (2013). On emergence and forcing in information systems grounded theory studies: the case of Strauss and Corbin. *Journal of Information Technology*, 28, 237-260.

Stebbins, R. A. (2001). *Exploratory research in the social sciences*. SAGE Publications, Inc., <https://doi.org/10.4135/9781412984249>

Šviráková, E., & Bianchi, G. (2018). Design thinking, system thinking, Grounded Theory, and system dynamics modeling—an integrative methodology for social sciences and humanities. *Human Affairs*, 28(3), 312-327.

Thomas, D. R. (2003). A general inductive approach for qualitative data analysis.

Twinomurinzi, H., Schofield, A., Hagen, L., Ditsoane-Molefe, S., & Tshidzumba, N. A. (2017). Towards a shared worldview on e-skills: A discourse between government, industry and academia on the ICT skills paradox. *South African Computer Journal*, 29(3), 215-237.

Tyagi, R., Vishwakarma, S., Alexandrovich, Z. S., & Mohammed, S. (2020). ICT Skills for Sustainable Development Goal 4. *Quality Education*, 435-442.

Urquhart, C. (2013). Writing up a grounded theory study. In *Grounded Theory for Qualitative Research: A Practical Guide* (pp. 148-175). SAGE Publications, Ltd.

Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & De Haan, J. (2017). The relation between 21st-century skills and digital skills: A systematic literature review. *Computers in human behavior*, 72, 577-588.

Van Laar, E., Van Deursen, A. J., Van Dijk, J. A., & de Haan, J. (2020). Determinants of 21st-century skills and 21st-century digital skills for workers: A systematic literature review. *Sage Open*, 10(1), 2158244019900176.

Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems*, 4(2), 74–81.

Walsham, G. (2012). Are we making a better world with ICTs? Reflections on a future agenda for the IS field. *Journal of Information Technology*, 27(2), 87-93.

Wiesche, M., Jurisch, M. C., Yetton, P. W., & Krcmar, H. (2017). Grounded theory methodology in information systems research. *MIS quarterly*, 41(3), 685-A9.

World Bank. (2019). *Digital Economy for Mozambique Diagnostic Report*. Retrieved from <http://pubdocs.worldbank.org/en/833211594395622030/Mozambique-DECA.pdf>

Yell, M. M., & Box, J. (2008). Embrace the future: NCSS and P21. *Social Education*, 72(7), 347-349.

Yin, R. K. (2012). A (very) brief refresher on the case study method, 3-20. In *Applications of case study research*, Thousand Oaks: Sage.

Younie, S. (2006). Implementing government policy on ICT in education: Lessons learnt. *Education and Information technologies*, 11, 385-400.

Zhang, P., & Bhattacharyya, S. (2008). Students' Views of a Learning Management System: A Longitudinal Qualitative Study. *The Communications of the Association for Information Systems*, 23, 353–375.

Ziemba, E. (2019). The contribution of ICT adoption to the sustainable information society. *Journal of Computer Information Systems*, 59(2), 116-126.

Appendix A: Literature Summary

Stakeholders in the ICT Environment			
Stakeholder	Role in supplying of ICT Skills	Role in demand of ICT Skills	References
Government	<ul style="list-style-type: none"> Set policies affecting ICT Skills (regulation, funding, skills, investment) 	<ul style="list-style-type: none"> Provide employment For ICT procurement (tender for ICT systems) To provide e-services Launch e-government projects 	(Manda & Backhouse, 2017; Manda & Dhaou, 2019; Muzafar & Jhanjhi, 2020; Ziemba, 2019)
Educational Institutions	<ul style="list-style-type: none"> Produce and disseminate knowledge (research & teaching) Attempt to fill gaps in ICT skills demand Anticipate future ICT skills needs 	<ul style="list-style-type: none"> Employ to acquire skills to provide educational services 	(Badat, 2010; Canani & Seymour, 2021; Mwalemba, 2019; Raitskaya & Tikhonova, 2019)
Business – Private Sector	<ul style="list-style-type: none"> Training (on the job, internships & programs) Shape the type of ICT skills needs in the labour market 	<ul style="list-style-type: none"> Business Operations through employment Contracts 	(Fajčíková et al., 2017; Ziemba, 2019)

Organisations – Non-Profit	<ul style="list-style-type: none"> • Create Developmental programs • Improve on current standards of ICT Skills (framework & policy) • Collaborate with other stakeholders • Increase accessibility and promote learning opportunities 	<ul style="list-style-type: none"> • Employment to create ICT projects 	(Dubey & Tiwari, 2020; Griffin & Care, 2015; Tyagi et al., 2020)
Individuals	<ul style="list-style-type: none"> • 	<ul style="list-style-type: none"> • For personal growth to upskill or learn new skills • To gain skills to be employable 	(Bejakovic & Mrnjavac, 2020)
External Stakeholders	<ul style="list-style-type: none"> • Create developmental programs • Fund research • Advise on Policy 	<ul style="list-style-type: none"> • Employment to create ICT projects 	(Gillwald et al., 2019; Mwalemba, 2019; World Bank, 2019)
ICT Skills Channels			
Supply	Demand	Reference	
Higher Education	Internet (Social Media, Website etc.)	(Kang & Park, 2017)	

		(Fajčíková, Urbancová, & Fejfarová, 2017)
On the Job Training (OJT)	Advertise and present at Educational Institutions	(Patacsil & Tablatin, 2017) (Fajčíková et al., 2017; Gogolova, Ponisciakova, & Ivankova, 2015)
Internship Programs	Career Fairs	(Patacsil & Tablatin, 2017) (Fajčíková et al., 2017; Gogolova et al., 2015)
Immigration	Use of Agency	(Beerli, Indergand, & Kunz, 2017) (Fajčíková et al., 2017; Gogolova et al., 2015)
Internet	Workshops	(Fonseca et al., 2018) (Fajčíková et al., 2017; Gogolova et al., 2015)
Training	Conferences	(Fonseca et al., 2018) (Fajčíková et al., 2017; Gogolova et al., 2015)
Graduate Programmes	Internet (Social Media, Website etc.)	(Nazron et al., 2017) (Fajčíková, Urbancová, & Fejfarová, 2017)
Short courses	Advertise and present at Educational Institutions	(Kang & Park, 2017) (Fajčíková et al., 2017; Gogolova, Ponisciakova, & Ivankova, 2015)

Dynamics in Literature

Dynamics	References
Quality of Education	(Mothobi, Schoentgen, & Gillwald, 2018)
Incomplete Skillset & High expectations for jobs	(Nazron et al., 2017; Patacsil & Tablatin, 2017;)
Role of Educational Institution	(Badat, 2010; Twinomurinzi et al., 2017)
Upskilling & Training	(World Bank, 2019)
Language & Cultural Barriers	(Bukht & Heeks, 2018; Chimbutane, 2017; Schopp et al., 2019)
Government Policies	(Ali & Muianga, 2020; Gillwald et al., 2019)
Infrastructure	(Mothobi, 2021)
External Influences	(World Bank, 2019)

Appendix B: Case Study Protocol

The case study protocol developed contains questions at a high level on the topics being touched on and will be revised as the study progresses.

The objective of the study

The main aim of this study is to explore the influence of the dynamics affecting the supply and demand of ICT skills. To obtain relevant and in-depth information on the research question, semi-structured interviews with open-ended questions will allow participants to supply their knowledge, opinions and experiences on the topic.

The key issue of the study is:

1. Understand the dynamics affecting the supply and demand of ICT skills
2. Understanding the relationship between and among stakeholders and channels.

The main research question is:

What influences ICT skills dynamics in Mozambique?

Field note

The fieldwork of this study will occur in Mozambique. The researcher attained consent from participants before interviewing them.

Interview guides

- The researcher will inform the participants about the setting of the meeting.
- The researcher will give a brief introduction to the study.
- The researcher will inform the objectives of the study.
- The researcher will record and take notes during the interview (after being given permission).
- The researcher will compile and send the key points to the participant to comment on after the interview.

Stakeholder questions

- About themselves
 - Please describe your role(s) relating to ICT so far.
- Role in the supply of ICT skills
 - What have been your experiences when supplying ICT skills?
- Role in the demand of ICT skills
 - What have been your experiences when demanding ICT skills?
- Dynamics of ICT skills
 - Based on your experiences, what support have you received?
 - Based on your experiences, what are the challenges you faced and how did you overcome them?

Appendix C: Interview Guide

Procedure:

1. Start the conversation to create an open environment for the participant
2. Focus on the participants input and take notes (on paper or mental notes)
3. Follow up on points raised to understand the participant better
4. Observe and note the participant's body language (if possible)
5. If need be, rephrase questions to help the participant understand the question
6. If need be, narrow the conversation to a topic at hand raised by the participant or is the focus point of the study

Section 1: Introduction

Thank you for taking the time, especially during these times, to participate in this study. A quick reminder of the objectives

1. Understanding the dynamics affecting the supply and demand of ICT skills
2. Relationship between stakeholders of ICT skills
3. Relationship between channels of ICT skills
4. Relationship between stakeholders and channels

Section 2: About You

The aim of this section is to understand the role of the participant in relation to ICT. This will how the rest of the interview will flow e.g., whether to focus on the ICT supply or ICT demand or in some cases both.

Examples of a questions that may be asked is:

- Please describe your role(s) relating to ICT so far.
- How have you been involved in ICT so far?

Section 3: Role in Supply of ICT Skills

The aim of this section is to understand the experiences of the participant in the supply of ICT Skills. This section attempts to uncover their role relating to the supply of ICT skills.

Examples of questions that may be asked are:

- What have been your experiences when supplying ICT skills?
- What have your experiences been when contributing to the increase of ICT skills in Mozambique?

Section 4: Role in Demand of ICT Skills

The aim of this section is to understand the experiences of the participant in the demand of ICT Skills. This section attempts to uncover their role relating to the demand of ICT skills.

Examples of questions that may be asked are:

- What have been your experiences when demanding ICT skills?
- What have your experiences been when searching for or recruiting ICT skills in Mozambique?

Section 5: Dynamics of ICT Skills

The aim of this section is to understand the experiences of the participant with regards to the dynamics they have faced with regards to ICT Skills. This section attempts to uncover how participants maneuver their way around in the ICT environment.

Examples of questions that may be asked are:

- Based on your experiences, what support have you received?
- Based on your experiences, what are the challenges you faced and how did you overcome them?
- Ask participant about the last time they were looking for ICT Skills to do a certain job – how did it happen and what happened?
- Ask participant about the last time they were offering ICT Skills to people – how did it happen and what happened?

Section 6: Closing

Thank you for your time and responses.
I have gathered that your role in supply is:
[Give summary]

Please feel free to stop me and correct me.
I have gathered that your role in demand is:
[Give summary]

The dynamics you faced were:
[Give summary]

Would you like to touch on any sections again?

If you would like to provide more feedback, please feel free to contact me and we can schedule another interviewee.

Thank you, hope you stay safe.

Appendix D: Data Management Plan

EXPLORING ICT SKILLS DYNAMICS IN MOZAMBIQUE

A Data Management Plan created using DMPRoadmap

Creator: Ammar Canani

Affiliation: University of Cape Town

Template: University of Cape Town

Project abstract:

Information and Communication Technology (ICT) is the foundation for innovation. It offers economic and social advantages, access to knowledge, increased competitiveness and inclusive growth. However, it's important to acknowledge that despite its potential, ICT is not a silver bullet as several challenges affect the realization of its potential. The current state of Mozambique with regards to ICT is inadequate. ICT is an emerging topic with scarce literature available nationally and requires further study. This study aims to explore the ICT Skills Dynamics in Mozambique by doing a qualitative study using the Case Study-Grounded Theory Methodology to generate a theory to explain the topic being studied.

Last modified: 14-12-2021

EXPLORING ICT SKILLS DYNAMICS IN MOZAMBIQUE - STUDENT OUTLINE DMP

1. GENERAL GUIDELINES

PURPOSE OF THIS TEMPLATE - The purpose of the Outline DMP is to indicate your initial plans for how your data will be collected, shared and stored, and to give you a chance to think about these data-focused aspects of the research process. As you begin doing your research, your data process may change, and it is perfectly acceptable to change your data management plan to accommodate the changes in your research process. Indicate below that you understand the purpose of completing this Outline DMP template.

- I understand the Outline DMP template is a projection of my anticipated data management planning requirements and should be updated as my project develops.

2. AUTHORS AND SUPERVISORS

PROJECT NAME - Replicate the title of your project, dissertation or thesis exactly as it appears in your proposal document.

Exploring ICT Skills Dynamics in Mozambique

PERSONAL DETAILS - Indicate the name(s) and student number(s) of the student(s) who will be involved in this project, dissertation or thesis.

Ammar Canani - CNNAMM001

SUPERVISOR(S) DETAILS - Indicate who will supervise this project, dissertation or thesis. If you do not yet have a supervisor, leave this section blank.

Gwamaka Mwalemba - gt.mwalemba@uct.ac.za

3. DATA COLLECTION/GENERATION

COLLECTION OF ORIGINAL DATA - Indicate whether or not you intend to gather/produce original data for your study, and provide a brief description of the kind of data you think you will collect. If you are unsure at this time, indicate what you think you are most likely to collect. If you are not intending to gather or collect your own data, declare that here.

- I intend to collect original data (described below).

I intend to collect primarily qualitative data in the form of interviews. The number of participants is not fixed as my study follows the principle of theoretical saturation whereby interviews will be conducted up to the point no new information is being gathered. However, it will be at least more than 5-10 participants. The data will be transcribed using Otter.io and then edited in MS Word. The transcribed data should be less than 20mbs while the recordings may range 20-40mbs for audio and 200-500mbs for video.

USE OF EXISTING DATA - Indicate if you intend to re-use existing data, either from online searches or from datasets provided by your supervisor, lab, or funder. If you are not intending to re-use existing data, declare that here.

- I do not intend to reuse existing data.

DATA SHARING - Indicate whether or not you are intending to publish your research data. If you are, indicate where you are intending to publish your data and under what licensing conditions, such as Creative Commons. If you are not intending to publish your data, provide reasons and reference the appropriate ethical considerations, commercial applications/patenting ambition, or data re-use agreements that prevent you from publishing your data.

- I do not intend to share my data because of confidentiality issues.

For privacy concerns as the data collected are interviews.

4. DATA STORAGE

ANTICIPATED DATASET SIZE - Indicate the estimated size of your completed dataset, and indicate whether or not you will need to access additional data storage facilities. If such storage is not provided by your unit or department, you may need to factor in the cost of purchasing additional storage space.

- 20GB or less

DATA BACKUPS - Indicate how you plan to ensure your data is secure and retrievable in case of errors or hardware failure. Describe what procedures you will put in place to back-up copies of your data and where they will be stored.

- I intend to backup my data using a service provided by UCT (UCT Google Drive, UCT OneDrive, Netstorage, ZivaHub etc.).

UCT's One Drive.

I will be working on One Drive and thus my data will always be syncing as I work on it.

5. DATA CENTRE(S)/REPOSITORIES

DATA CENTRES/REPOSITORIES - Once your project, dissertation or thesis is complete, it is advisable to curate and archive your completed dataset with an established data centre or repository. Note that you should archive your data even if you are not intending to publish it. Check with your supervisor or funder if you are required to deposit your data in a specific repository or declare that you will deposit the data in ZivaHub (see the Guidance section).

- At the end of my study, I will deposit my data on ZivaHub.

METADATA - Metadata is descriptive information that others will need to make sense of your dataset. Metadata includes things like study descriptions or abstracts, study instruments (sample collection schedules, codebooks for variables, survey instruments, etc.), subject codes, and keywords. Indicate what metadata will accompany your curated dataset.

The completed dataset will be accompanied by keywords, a short description taken from my dissertation abstract and relevant paragraphs on the data process taken from my methods section.

6. BUDGET

BUDGET - Indicate any costs specifically relating to the management and curation of your data, such as purchasing additional storage space, digitisation of physical media, data storage or curation charges, and data audits. Most student research will be able to make use of free options provided by UCT and will not have to budget for data costs.

- I anticipate data management costs, and I will budget for these accordingly

I already live in Mozambique, so the only costs are travel costs to meet my participants. Other costs may include data in case my Wi-Fi is down, or I am not near a Wi-Fi network. I have budgeted for these expenses. In terms of storage, UCT provided tools will be used which are free of cost.

Appendix E: Consent Letter for Participants



Department of Information Systems

Leslie Commerce Building
Engineering Mall, Upper Campus
OR
Private Bag X3 - Rondebosch - 7701
Tel: +27 (0) 21 650 2261 Fax: +27 (0) 21650 2280
Internet: <http://www.commerce.uct.ac.za/informationssystem/>

12 December 2021

Requesting your participation in an academic research

In terms of the requirements for completing a master's degree in Information Systems at the University of Cape Town a research study is required.

The researcher, in this case Ammar Canani, has chosen to conduct a case study entitled *ICT Skills Dynamics in Mozambique*. The objective of the research is to explore the dynamics that influence the supply and demand of ICT skills within the Mozambique country context. This research has been approved by the Commerce Faculty Ethics in Research Committee.

Your participation in this research is voluntary and you can choose to withdraw from the research at any time. All information collected as part of research will be treated in a confidential manner and used exclusively for the purpose of this study. Personal details of research participants will not be published and any identifiable information that can compromise participants anonymity will be carefully handled.

The data collection method will be through an interview between you, the participant and the researcher. The interview will be conducted either online or face to face at a location convenient to you and should last between 30 and 45 minutes. If you are willing to participate in this study, kindly sign the attached form and return to me at your earliest convenience.

Should you have any questions regarding this research, please feel free to contact the researcher on +27641705525/+258848064660 or through email: cnamm001@myuct.ac.za.

Your participation in this study would be greatly appreciated.

Sincerely,

Signed by candidate

Ammar Canani
Researcher \ M.Com Student, (UCT)
Department of Information Systems
University of Cape Town
Email: cnamm001@myuct.ac.za

Signed by candidate

Gwamaka Mwalemba
Research Supervisor
Department of Information Systems
University of Cape Town
Email: gt.mwalemba@uct.ac.za

Research Participant Consent Form

I, _____, consent to participate in the research on *ICT Skills Dynamics in Mozambique*.

I am aware that participation is voluntary and that I may choose to withdraw from this study at any time, should I choose to do so.

Signature

Date