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Exploring ICT Skills Dynamics in Mozambique

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ABSTRACT

The current state of Information and Communication Technology (ICT) in Mozambique is inadequate in terms of education, skills, infrastructure, government support, language, and culture. There is poor education available at all levels, and there is a lack of basic ICT skills countrywide. Language and cultural differences constitute barriers to ICT, due to English not being commonly spoken. The infrastructure of the country remains insufficient to fully reap the potential of ICT. As there is insufficient literature regarding ICT as a field in Mozambique, this study lays some of the groundwork in this regard, by inductively exploring the dynamics around ICT skills supply and demand, 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 findings reveal a never-ending loop of a lack of the supply of ICT opportunities (employment, education, and training) to gain ICT skills on the one hand, and a lack of skills available to demand ICT skills in the country as a result of the lack of current conditions for ICT growth, aided by a lack of support from the government for ICT on the other. Some of the dynamics raised that were insufficiently covered within the literature review were the centralisation and reliance on the capital city, the hierarchy of the different regions of the country, and the heavy reliance on foreign companies and talent. For future research, studying the role of the government may assist in better understanding the different dynamics at play. Interviewing participants from the different parts of the country will broaden understanding. Lastly, comparing the dynamics in Mozambique to dynamics in similar countries (in terms of development indicators) may provide further insight.

Keywords: ICT, skills, Mozambique

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 (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 (Qureshi, 2015; Walsham, 2012). However, despite its potential, ICT is not a silver bullet. The realisation of its potential is not entirely straightforward, and it can exacerbate some negative aspects of society (Karunaratne, Peiris, & Hansson 2018).

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

Mozambique, as a country with poor education levels, where people lack basic ICT skills, where there is a lack of access to funding, continuing corruption, language and cultural barriers both within and between countries, lack of policy reform and poor infrastructure, is one of the many developing countries yet to sufficiently realise the potential of ICT (Gillwald, Mothobi, & Rademan, 2019; Onkokame, Schoentgen, & Gillwald, 2018; World Bank, 2019). ICT in Mozambique is still in its infancy, both from an industry perspective, and from an ICT research discourse perspective (Ribeiro Ribeiras, 2018).

Even when compared to other countries in the region, there is relatively limited research on the state of the Mozambican ICT industry. The aim of this exploratory study is to understand the role of the supply and demand dynamics 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 paper begins by reviewing extant literature. Subsequently, an overview of the methodology used for the study is discussed. The findings are then presented in the results section, showing the

different elements affecting the dynamics of ICT skills. This is followed by a discussion of the link between the current state of ICT skills and the effect this has on the dynamics of ICT skills. Finally, the conclusion is presented.

BACKGROUND

ICT can be defined according to three broad perspectives, namely: 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 complete a task, the value added, a dynamic network in a social context, and capabilities of ICT) (Twinomurinzi et al., 2017).

ICTs enable development to occur by providing access to new markets, increasing access to knowledge, and increasing competitiveness when applied to challenges and problems faced in a given 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 always the answer to all problems (Karunaratne et al., 2018). Without suitable existing policies, governments are not able to ensure resources are made available to face the opportunities and challenges that come with the usage of ICTs (Kang & Park, 2017; Manda & Dhaou, 2019). Poor quality of education creates poor digital skills, leading to graduates having poor skills, and causing a skills gap which could potentially result in financial losses due to inefficiencies and loss of data for businesses (Kasparova, 2019; Schelenz & Schopp, 2018). Language and cultural barriers disrupt the flow of knowledge and technology, due to differences in the languages being spoken (Kumar & Singh, 2019). Imported technologies, which are often unavailable in local languages, risk enabling digital imperialism (Schopp, Schelenz, Heesen, & Pawelec, 2019). Poor infrastructure and lack of investment 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 next sections introduces the type of ICT skills receiving focus. Then, the stakeholders of ICT skills are highlighted, along with the channels used by them to supply and demand ICT skills. Finally, different dynamics of ICT skills in developing countries are discussed, concluding with the state of ICT skills in Mozambique.

ICT SKILLS

Skills refer to the capability to perform a given task (Patacsil & Tablatin, 2017). Skills are acquired in a structured or an intentional manner, such as non-formal learning, informally, such as with friends or using the internet, and formally through schooling (Fonseca, Conde, & Garcia-Penalvo, 2018). Non-technical skills are considered ‘soft’ skills’, while technical skills are considered ‘hard’ skills (Patacsil & Tablatin, 2017).

Tyagi, Vishwakarma, Alexandrovich, & Mohammed (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. Van Laar et al. (2020) support the same definition, but use the term ‘digital skills’ to refer to the concept, as their findings showed ICT skills to focus on information finding (technical) and not using the result of the information found (application).

ICT SKILLS STAKEHOLDERS AND CHANNELS

Stakeholders refer to any individual or group who can influence or be affected by the objectives of an organisation in a context of an organisation (Savga, Krykliy, & Kyrychenko 2018). The government sets policies about ICT, provides employment, and launches e-projects and e-services (Manda & Dhaou 2019; Muzafar & Jhanjhi 2020). Educational institutions produce knowledge, attempt to fill gaps in the market, anticipate ICT skills needs, and provide employment (Raitskaya & Tikhonova, 2019). Businesses in the private sector provide training, shape the type of ICT skills needed, and use ICT to run their operations (Fajčíková et al., 2017; Fonseca et al., 2018). Organisations in the non-profit space create developmental programmes, improve on current standards, increase accessibility, and collaborate with other stakeholders (Dubey & Tiwari, 2020; Tyagi et al., 2020). Individuals use ICT for personal growth and to gain skills for employment (Bejakovic & Mrnjavac, 2020). External stakeholders create developmental programmes, fund research, and advise on policy (Gillwald et al., 2019; Mwalemba, 2019).

The stakeholders use several channels to supply and demand ICT skills. To supply ICT skills, such skills are taught in educational institutions, via on-the-job training in the workplace, through internship and graduate programmes using the internet to learn, in doing short courses, and through immigration (Beerli, Indergand, & Kunz, 2017; Fajčíková et al., 2017; Fonseca et al., 2018; Patacsil & Tablatin, 2017). To demand ICT skills, the internet is used for job listings, advertising

at an educational institution, sponsoring or presenting at a conference, using employment agencies, and hosting career fairs and workshops (Fajčíková et al., 2017).

ICT SKILLS DYNAMICS IN DEVELOPING COUNTRIES

Vilfredo Pareto proposed that society is a system of interrelated parts that are continuously moving, and exists in a state of equilibrium, where any changes to the equilibrium results in changes that restore equilibrium (Caulfield & Maj, 2001). Applying the concept to the ICT skills environment means that changes from stakeholder actions result in continuous fluctuations in the supply and demand of ICT skills (type, quality, and quantity) to or from equilibrium, creating the dynamics that are being explored in this study. To understand the dynamics at hand, the ICT skills environment must be studied as a whole in order to understand its make-up (Caulfield & Maj, 2001). This section highlights several ICT skills dynamics as discussed in the literature on ICT skills in developing countries.

Quality of Education

The quality of education determines the skills it makes available, as gaps in skills emerge with poor education (Nazron et al., 2017; Patacsil & Tablatin, 2017). Sub-Saharan African countries, such as Mozambique rank low on access to ICTs when compared to developed countries, where the youth that has access lack the requisite literacy skills for access (Metu et al., 2020). Notably, children in developed countries have access to ICTs at a very young age (Canani & Seymour, 2021).

Incomplete skillset and high expectations for entry-level jobs

In the Philippines, which remains a developing country, graduates lacked the skills to find a job in the workplace, high school graduates took around three years to find a job, while university graduates took around 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 skillset and prefer not to spend resources on training graduates (Twinomurinzi et al., 2017).

Role of Educational Institutions

Educational institutions and businesses disagree on who is responsible for the lack of skills amongst graduates (Badat, 2010), where the former argue that it is not their role to prepare ‘workers’ for the industry, but rather to create knowledge and educated individuals that can learn (Badat, 2010). Businesses meanwhile claim that it is the responsibility of educational institutions to align with the demands of industries to produce industry-ready graduates (Twinomurinzi et al., 2017). Meanwhile, educational institutions are 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 collaborate to create curricula aimed at reducing the gaps in graduates (Patacsil & Tablatin, 2017).

Upskilling and Training

ICTs are transforming the working environment quickly through innovations and digitisation, which will require workers to be upskilled or re-trained (Tyagi et al., 2020). The G20 recognised the need to upskill and better use the skills of the G20 countries (Chetty et al., 2018).

Language and Cultural Barriers

Language barriers have been the major challenge in digitising Africa (Schelenz & Schopp, 2018). The English language is the main language used online, and is essential to facilitating and enabling the use of ICTs (Bukht & Heeks, 2018; Schopp et al., 2019). ICTs that are imported are usually not available in local languages and tend to prioritise Western content in English in African nations, leading to a form of digital imperialism (Schelenz & Schopp, 2018; Schopp et al., 2019).

Infrastructure

The digital infrastructure, that provides broadband coverage allows ICT skills stakeholders 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 (Onkokame, 2021).

External Influences

There are also various initiatives by international software companies that aim to stimulate ICT skills development in developing countries in order to stimulate the market for their software products (Mwalemba, 2019). 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 give funding to governments play an advisory role, giving recommendations on ways forward (World Bank, 2019). Foreign donors may provide systems for governments to utilise, which are developed using foreign consultants, and never updated, even though they experience issues (World Bank, 2019).

STATE OF ICT SKILLS IN MOZAMBIQUE

Mozambique's official language is Portuguese, but interactions occur in local languages as the majority of citizens are unable to 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, there is a lack of basic ICT education and training more broadly (Onkokame et al., 2018).

The majority 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 (Onkokame, 2021). There are bottlenecks in high-speed internet connection, due to poor quality and costly deployments of infrastructure (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 true benefits of going online (Onkokame, 2021).

Mozambique is divided into three (3) regions: North, South, and Central. Maputo, the capital city, located in the southern region is also the technological hub of the country (World Bank, 2019). The World Bank recommends that Mozambique has a framework for reskilling and upskilling workers (World Bank, 2019). However, access to funding, as well as corruption, constitute the

biggest challenge for the country looking forward (World Bank, 2019). Mozambique has not strategically invested in creating a digital economy and would need to reform its policies to do so (World Bank, 2019). While the country has renewed its focus on policy reform, there is still a lack of regulation when it comes to the digital economy (Ali & Muianga, 2020; Gillwald et al., 2019). Corruption is another substantial challenge in this regard (World Bank, 2019). Overall, 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 state of ICT industry to either improve or deteriorate. ICT skills are needed to reap the potential benefits of ICT, and this study aims to understand the dynamics affecting the supply and demand of these skills to better understand the ICT industry as a whole. The next section discusses the methodology employed.

METHOD

An interpretive philosophy was adopted in order to understand the experiences from the point of view of the participants (Cussen & Cooney, 2017). The study followed an inductive approach to theory, which involves the building and generation of theory by using premises to generate conclusions (Saunders et al., 2019). As this is an exploratory study, it assumes that the theory will emerge from the data being gathered (Stebbins 2001). Furthermore, an inductive approach helps to understand complex data by developing these into summary themes or categories as interpreted by the researcher (Thomas 2003). The choice of a research strategy is guided by the research objectives and helps answer the research question (Saunders et al., 2009). For this study, a Case Study-Grounded Theory Methodology (CS-GTM) is being used. CS-GTM is a methodology that is defined as the process of identifying the research question, selecting a research strategy, and formulating findings and results based on philosophical assumptions (Al Adwan 2017).

A case study approach is useful in order to gain a rich understanding of the context and is often used in an exploratory study (Saunders et al. 2009). It allows the researcher to obtain deeper insights and understand the perspectives of the participants to help answer the research question (Denscombe 2010). Additionally, using a case study approach is appropriate when the scope is unclear, and when the researcher has little to no control over the events being studied (Al Adwan 2017). For this study, defining the scope of ICT is difficult, as it is entrenched in several domains (Twinomurinzi et al. 2017), and the researcher has little to no influence on the dynamics affecting

ICT skills. However, case study research has its limitations. It lacks a systematic way of analysing the large amount of data being gathered (Halaweh, Fidler, and Mcrobb 2008).

For this study, a single case study was employed. A single case is used to study a phenomenon that has not been studied by many (Saunders et al. 2009), as is the case with this study (Ribeiro Ribeiras 2018). It further allows for an in-depth investigation of the topic at hand providing rich descriptions (Walsham 1995). For this study, the case is the ICT sector of Mozambique. Since ICT is embedded across several domains, a sector is defined as “a set of activities which are unified by some related product groups for a given or emerging demand and which share some basic knowledge” (Kruss, McGrath, Petersen, & Gastrow, 2015, p. 96).

GTM is common in information systems (IS) research (Halaweh 2012; Halaweh et al. 2008). GTM may be used to focus on a context to understand the processual elements and actions of stakeholders (Hughes and Jones 2003). It is most appropriate for use in interpretive studies (Hughes and Jones 2003). For this interpretive study, the dynamics of the Mozambiquan context make GTM suitable. Several studies do not clearly state the variant being used from the outset to indicate which variant is more appropriate for their study (Halaweh 2012; Halaweh et al. 2008). For this study, the Straussian approach was employed. The Straussian approach specifies that the theory is interpreted by the researcher, who remains an active part of the study (Halaweh 2012) being in line with it. Moreover, the Straussian approach provides a rigorous and defined technique (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). There have been several studies that justify the use of case studies and GTM in a study (Halaweh 2012). For this study, Halaweh et al. (2008) provided a roadmap on how to conduct a CS-GTM study.

CS-GTM in Practice

A case study protocol was developed. For this study, open-ended interview questions were used to gain insight, but also to allow participants to speak openly and freely (Denscombe 2010). The researcher followed the manner of research used to conduct the data collection and analysis by Corbin and Strauss (2008). There were no set questions asked, but only a guide to start the interview, such as asking about their positive and negative experiences with ICT. In this study, the

sampling frame was stakeholders of the ICT skills sector in Mozambique. Using GTM techniques, purposive sampling was initially used so as to allow the researcher to select participants that have experiences that may answer the research question (Hughes and Jones 2003). Interviews were done in Mozambique, both in-person and virtually, averaging around 45 minutes per interview.

Table 1 shows the participants interviewed so far. The labels used abbreviate the following:

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

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

Table 1: Participants of the study

The initial phase of the study 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 places them in a space where they interact with several stakeholders of ICT, and can provide insight from different experiences with different stakeholders. Thus, the business owners provided a starting point from which to understand the current dynamics. In Stage 1, there were four (4) participants initially interviewed to have enough

data to begin analysis (Table 1). Analysis was done using the techniques of GTM. 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. In order to ensure the accuracy of the translation, where necessary, the researcher contacted the participant again to ask for clarification. The transcripts were uploaded to NVivo with labels added along with a memo being linked to for notes when analysing the data (Corbin & Strauss, 2008). Line-by-line coding was used to code the nodes, followed by three steps to coding, along with the tools such as constant comparison, questioning, and theoretical sensitivity (Corbin & Strauss, 2008; Halaweh et al., 2008). The three steps to coding included open coding, axial coding, and selective coding (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 was 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 by using axial coding dimensions (Day, Junglas, & Silva 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 analysing and memoing as the analysis process continued. Every participant was sent a summary of the key points of the interview in order to provide feedback. There were clear gaps that needed to be explored further before the study could reach data saturation. For example, it was clear that there is certain dependence on foreign companies and talent, but that this was at a very high level, where the country relies on foreign products, companies, and talent. At this point, further specific participants were sought out and theoretical sampling began to pursue leads generated during analysis by sampling participants or materials that provide information relevant to the building of a theory

(Hughes and Jones 2003). Participants were asked specific questions, but were still allowed to share their experiences, by beginning the interviews with questions that address the gaps found during analysis, after which the participant was asked open questions about their experiences. This ‘second stage’ analysis occurred after each interview. As each interview was analysed, the next person interviewed was asked questions so as to try to gain a better understanding of the gaps remaining. Like before, where needed, follow-up questions were asked of the participants. As the picture began to become clearer, and eight interviews had been conducted and analysed, 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 the pursuit of a student perspective according to the ninth (9th) interview, and third phase. During the analysis of the 9th interview, new nodes began decreasing when compared to previous interviews, and repetitive information was being gathered. The researcher performed the same steps of analysis as stated above. Data saturation was determined when interviews yielded repetitive information, and no new idea (or category) was being generated, and once the research questions deemed to have been answered and objectives fulfilled (Al Adwan 2017; Halaweh 2012).

Finally, selective coding was done where all the categories were integrated to find the core category (Corbin & Strauss, 2008; Halaweh et al., 2008; Hughes & Jones, 2003). While there were many different experiences 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 mentioned lacking the resources to gain a good education among several 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, an analytical tool, was used throughout the analysis and the core category as it guided in coding and defining the relationships between the concepts found (Seidel & Urquhart, 2013). It has five (5) elements: causal conditions, context, intervening conditions, strategies, and consequences (Seidel & Urquhart, 2013). The coding paradigm was iterated several times, by revising it on the data gathered to guide the paradigm model to avoid

forcing the data. The next section presents the results of the study using the coding paradigm as a guide.

RESULTS

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

Every participant who participated in the study in some way from their own experience felt limited by the existing conditions for ICT to grow (phenomenon). In simple terms:

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

There were several dynamics at play that affect the conditions for ICT to grow, and these involve several stakeholders. Collectively, these dynamics have caused the phenomenon previously stated. Considering the context and the intervening conditions, there were several strategies used to try to address the phenomenon. Figure 1 illustrates the dynamics of ICT skills based on the findings of this study.

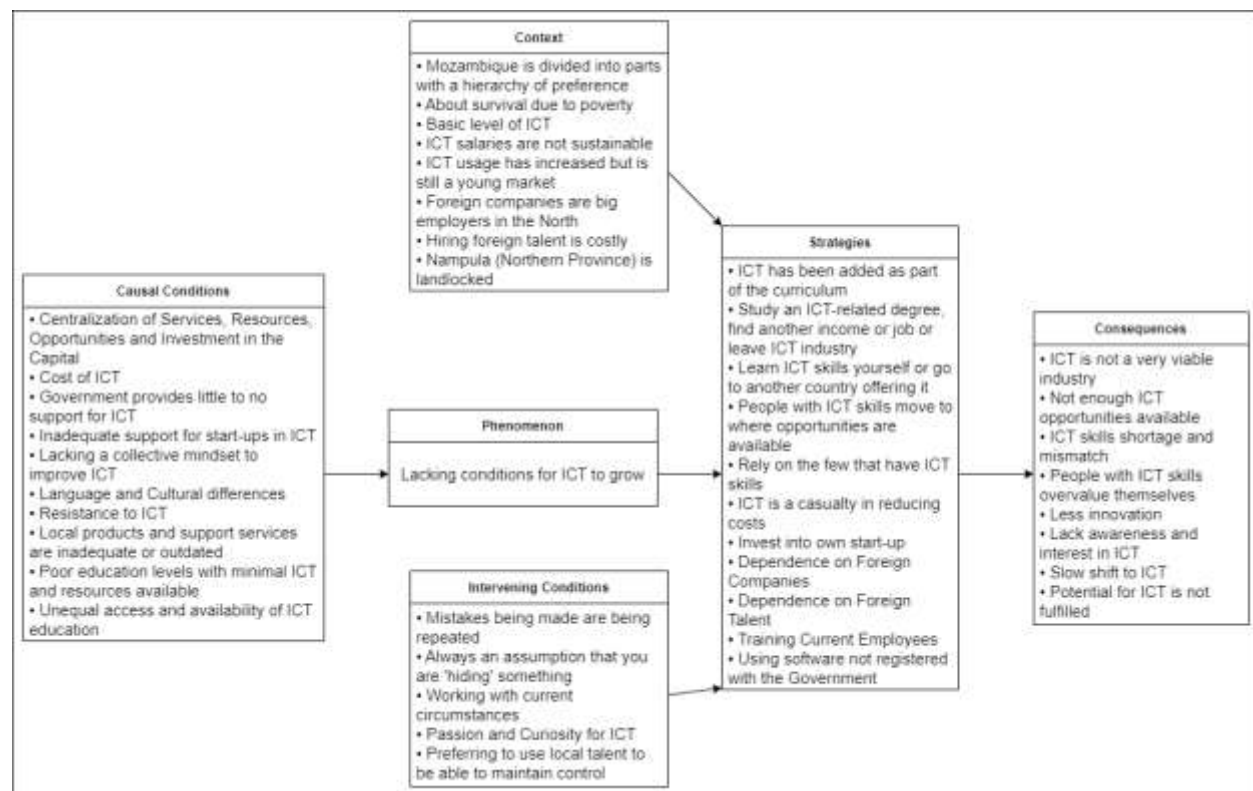


Figure 1: ICT Skills Dynamics

Causal Conditions

This section presents the findings of the dynamics that lead to the occurrence of the phenomenon (Seidel & Urquhart, 2013). Most of the opportunities, resources, services, and investments are consolidated in the capital city. People interested in ICT move to the capital to learn, grow, and reap benefits not available in the rest of the country. 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. Start-ups in ICT have to fend for themselves, as there is inadequate support available. The stakeholders of ICT do not collectively work together to improve ICT. As English is not a language spoken by many, Mozambicans are under limitations with using ICT, due to language and cultural barriers. There is still 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. At the same time, ICT education is better and more available in certain parts of the country. Table 2 provides

a summary of the causal conditions with some of the data evidence (in the form of verbatim citations).

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” (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)
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Table 2: Causal Conditions

Context

This section presents the findings on the properties or conditions where the phenomenon occurs (Seidel & Urquhart, 2013). The country is divided into a hierarchy, where preference is given to capital first, even in terms of employment. Most Mozambicans are preoccupied with survival, due to widespread poverty. 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. Foreign companies are the biggest employers in the North. It is costly to hire a foreigner in Mozambique, but companies still rely on foreign talent out of necessity. Lastly, Nampula Province is landlocked, decreasing exposure to the population from neighbouring countries, compared to Maputo which more easily absorbs knowledge from neighbouring South African cities. Table 3 provides a summary of the context, with some of the data evidence.

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)

Table 3: Context

Intervening Conditions

This section presents findings on conditions that affect the strategy taken to combat a phenomenon (Seidel & Urquhart, 2013). 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 be able to remain in any given industry, you need to have passion and curiosity for it. Lastly, using local talent gives more control over the result, and is a preferable option to be able to reach the desired outcome. Table 4 provides a summary of the intervening conditions with some of the data evidence.

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)

Table 4: Intervening Conditions

Strategies

This section presents findings on the actions taken to respond to the phenomenon (Seidel & Urquhart, 2013). 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 completely 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 business 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 5 provides a summary of the strategies used and some of the data evidence.

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 time, 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)

Table 5: Strategies

Consequences

This section presents findings on the result of the actions taken in response to the phenomenon (Seidel & Urquhart, 2013). ICT is not at present considered a viable industry to go into, as the chances of failure are high. There are not enough opportunities available to gain ICT experience. There are shortages of skills and even then, not everyone's entirety of skills will be used. Those

that 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 6 provides a summary of the consequences and some of the data evidence. The next section discusses the findings presented.

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)

Table 6: Consequences**DISCUSSION**

The dynamics of ICT skills in Mozambique involve a never-ending loop of insufficient opportunities available to gain ICT skills, and not enough 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 Government. In brief, without opportunities to gain ICT experience (in education, employment or formal training), ICT skills remain limited in quality. 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 World Bank (2019). As most of the country rely on the capital city, talent move to the capital city for opportunities, leaving the rest of the country with fewer skills. There is insufficient literature on the consolidation of resources, and the consequences for ICT skills. However, the report by World Bank (2019) indicates that the capital, Maputo, is the technological hub. Those that stay behind lack the skills due to poor education levels offered locally (World Bank, 2019) and poor ICT education and training available (Onkokame et al., 2018). English not being the main language poses barriers to learning, 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 poor 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 skills that are advertised 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 which is a channel used to demand ICT skills indicated by Beerli et al. (2017).

Some try to venture as a start-up, but find it difficult 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 different regions of the country will keep on increasing and ICT will grow slowly until action is taken for the better.

In summary, the dynamics of ICT skills are affected by the strategies taken to respond to the lack of conductivity, which is causal. While it is noted that there is limited literature available about ICT in Mozambique (Ribeiro Ribeiras 2018), it is worth noting that 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, the way in which 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. This study combines all the dynamics covered in literature so as to gain a deeper understanding of the interconnections between each dynamic. The findings will contribute to the discussions in countries similar to Mozambique's context, and development indicators to understand the role that ICT skills plays in shaping the ICT industries.

CONCLUSION

This study aimed to explore the dynamics affecting the lack of conditions for ICT growth in Mozambique. This was done in order to understand the deeper dynamics at play, as there is insufficient literature about ICT in Mozambique.

Mozambique's state of ICT is poor. Education levels are low, people lack basic ICT skills, with poor overall education. Language and cultural barriers make it difficult 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.

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.

The study has limitations, where most of the participants were from the North of Mozambique, with a few from Maputo, or having experiences in Maputo. Since the country is divided into different sections, the dynamics may vary in each part. Another limitation is not having enough access to the government to understand their approach.

For future research, studies may focus the study on the role of the government to better understand how the different dynamics in this study are being strategised. 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.

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