

Exploring The Relationship Between ICT Dissemination and Individuals' Economic Well-being in Sub Saharan Africa

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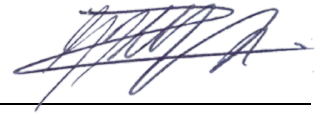
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DECLARATION

I, Kayembe Gilles Ilunga, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Management in the field of Digital Business at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

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On the 15th of November 2023

KEYWORDS

Relationship

Economic well-being

ICT Dissemination

Sub Saharan Africa

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LIST OF ACRONYMS

ICT: Information and Communication Technologies

GDP: Gross Domestic Product

OECD: Organisation for Economic Co-operation and Development

SLR: Systemic Literature Review

SSA: Sub-Saharan Africa

TAM: Technology Acceptance Model

TPB: Theory of Planned Behaviour

TRA: Theory of Reasoned Action

UTAUT: The Unified Theory of Acceptance and Use of Technology

WEF: World Economic Forum

CHAPTER 1. INTRODUCTION

1.1 Purpose of the study

The purpose of this qualitative study is to explore the reported or published relationship between ICT dissemination and individuals' economic well-being in Sub-Saharan Africa (SSA) through a systemic structured literature review. The purpose of this proposal is to clearly articulate the need for this study by presenting the study's context and problem description. The aims and research questions will serve as a guiding framework for the investigation.

1.2 Background of the study

As depicted in Figure1, in 2015 Africa's GDP per capita was \$2,817.38 compared to Asia at \$1,599.77. If we look at other continents such as North America, Europe, Central Asia, and the Arab World, it was \$51,490.26, \$24,475.27, and \$6,412.34, respectively.

Figure 1: GDP per Capita Across World Regions (2015). (World Bank, 2017)

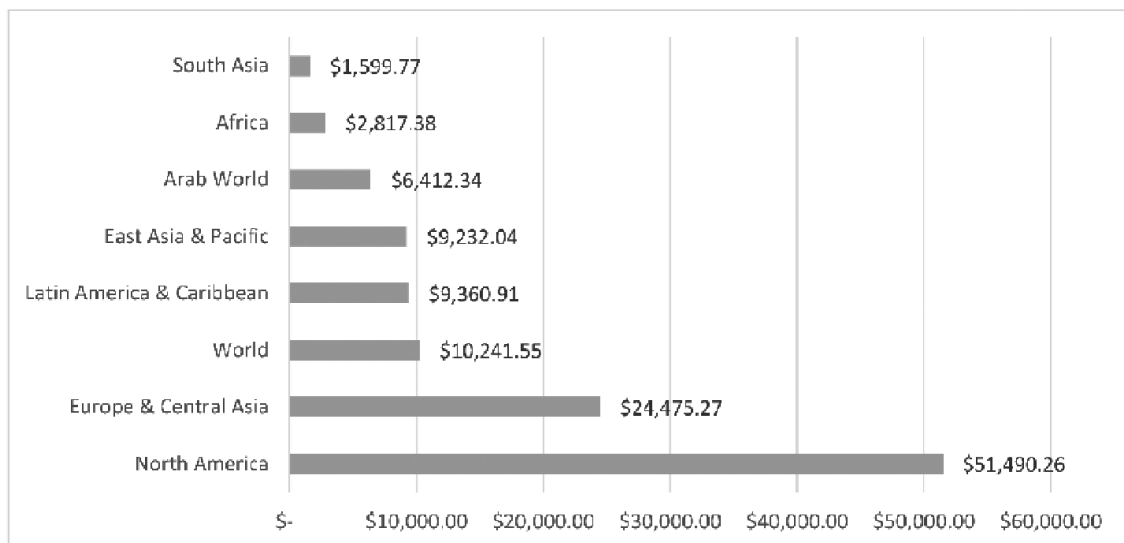


Figure 1 plainly indicates that Africa is the poorest continent on the planet. However, the increasing rates of penetration of mobile phones and Internet usage have raised much speculation and optimism that ICTs have enormous potential to drive economic development in the continent (Von Braun, 2010; Adeola and Evans, 2017). Information and knowledge have been considered as the 'new element of production,' equal to the old factors of production - land, labour, and capital – in terms of human progress (Sinyolo, 2020). The concept that knowledge is critical to resolving society's economic and social issues – has gained widespread acceptance over the last few years (Steffen and Schmidt, 2017).

According to the World Bank and African Development Bank in 2012, two-thirds of African adults now have access to ICTs. By enabling users to access health information, agricultural market data, or instructional games, ICTs have the potential to improve other industries, and the entire economy (World Bank, 2012).

Computers, telephones, and the internet have been identified as critical instruments for socio-economic growth in underdeveloped nations (Veiko, 2019). As a result, in recent years, some developing countries have put a high value on the role that ICTs may play in stimulating economic growth, combating poverty, and attaining sustainable livelihoods (Goosen, 2018).

Literature shows that ICTs may contribute to rural residents' lives by providing them with access to information that may help increase agricultural output and offer marketing information for agricultural goods and therefore thus increasing the farmers' income. Furthermore, ICTs could improve poor people's access to services such as education, health, government, and money (Cecchini and Scott, 2005; Mathur and Ambani, 2005).

It's worth mentioning that the role of information and communication technology in promoting economic growth and meeting the needs of the poor has been a source of contention. The issue has been exacerbated by the high failure rate of

ICTs for development projects, particularly in poor nations (Chapman and Slaymaker, 2002; Heeks 1999; Maepa and Mphahlele, 2004).

Some detractors of the "ICTs for Development" movement say that, considering so many other pressing challenges, ICTs are a waste of money. They propose that money should be diverted away from ICT development and toward areas where there is a higher impact and true demand (Wyatt et al, 2000: 3-8; Moodley and Cloete, 2004).

1.3 Research problem

Deutsche Welle (DW), Germany's global broadcaster and one of the most successful and significant international media organizations, claimed in a video uploaded on March 26, 2021, that more than 40% of the world's population lacks internet access. Most of them live in Africa. As the digital gap increases, the continent will lose millions of jobs. (Deutsche Welle 2021).

Despite all the investments that have been made by African countries, the literature shows us that the economies of the continent have not been materially positively impacted. The cause of this is due to a persisting digital divide, which includes a lack of digital skills, ICT infrastructure gaps, and high-cost structures (Banga and Velde, 2018; Melia, 2020; Yoon, 2020). Relating to the paragraph above, Counted and Arawole (2016) again highlight how internet inequity has posed significant obstacles for young digital businesses in Africa.

When it comes to the results, it's a bit of a mixed bag. Although many theories accept that information and communication technology (ICT) plays an essential role in promoting economic progress, empirical investigations on the influence of technology distribution have yielded varied results. (Vu, 2011; Sassi and Goaied, 2013).

Several empirical studies have confirmed the positive and material role that ICT dissemination plays in increasing economic growth, particularly in wealthy

countries (Roller and Waverman, 2001; Inklaar et al, 2005; Koutroumpis, 2009), whereas other studies have discovered that ICT adoption has a negative impact on economic growth in some countries (Dewan and Kraemer, 2000; Pohjola, 2002; Papaioannou and Dimelis, 2007; Yousefi, 2011; Pradhan et al, 2015).

This study will seek to systematically explore the literature discussing the relationship between ICT dissemination and the influence on individuals' economic well-being.

1.4 Research objectives

Research Objective 1:

Explore the nature and scope of empirical studies aimed at investigating the relationship between ICT dissemination and individuals' economic well-being in SSA.

Research Objective 2:

Explore the dimensions and characteristics of the instruments applied to determine the relationship between ICT dissemination and individuals' economic well-being.

Research Objective 3:

Explore potential factors that mediate the relationship between ICT dissemination and individuals' economic well-being.

1.5 Significance of the study

Even though numerous studies have discovered a relationship between digital infrastructure and productivity. (Baquero Forero, 2013; Castellacci, 2011; Evangelista et al., 2014), African nations' understanding of this link is limited (Myovella et al., 2020). To add to this, Wamboye et al. (2015) advocated for more

study on these linkages in an African context due to the rapid development of ICT and the use of cellular technology in the spread of digital financial transactions.

Although a qualitative analysis cannot be the sole basis of establishing a link between ICT disseminating and well-being, the findings unearthed from the qualitative study in this research should provide some evidence as to whether there is a positive or negative relationship between ICT dissemination and an individuals' economic wellbeing in SSA.

Less developed and emerging countries are falling behind as technology spreads rapidly throughout the rich world. In SSA, almost 90% of children do not have access to a computer, and approximately 80% do not have access to a basic internet connection. (Gokhale 2021), As a result, the digital gap in Sub-Saharan Africa has emerged as a major source of the continent's current dilemma. (Gokhale 2021). It is clear from the literature above that ICT dissemination in Africa is not at the same level as the developed world. Therefore, the conceptual significance of the research is that although there have been several research papers done on the digital divide and the impacts thereof.

“The best way to predict the future is to influence the conversation about what it could or should be” (Corley & Gioia 2011). The quote resonates with the researcher as they will seek to draw attention to areas of ICT dissemination that need to be understood to positively influence an individual's well-being across SSA from a theoretical point of view.

As a result, this research will be based on theoretical predictions. The process of deciding what we need to know and influencing the conceptual framing of what we need to know in order to enlighten both academic and reflective practitioner domains is known as theoretical prescience. (Corley & Gioia 2011).

1.6 Delimitations of the study

- Excludes re-modelling of quantitative data (remodelling)

- Although this derives from global studies on the relationship between ICT dissemination and individual's well-being, the study will focus on SADC countries.

1.7 Definition of terms

When researching ICT, it's imperative that we define what exactly are we talking about. As Zuppo (2012) states "The challenge of defining ICT, in a universal sense, becomes apparent when one considers that diverse applications of the term ICT exist within several contexts and treatments of the term." However, the fundamental concept of ICT, according to Zuppo (2012), revolves around the devices and infrastructures that enable the digital flow of information.

The NRI (2020) addresses ICT in 3 buckets namely Access, Content and Future Technologies. The researcher will limit their research to the Access part of ICT. In the NRI (2020), access is described as a country's basic level of ICT, which includes factors such as communication infrastructure and affordability.

Merriam-Webster define dissemination as the distributing or spreading anything is an act or a process: the state of being dispersed. (Merriam-Webster 2021).

Therefore, based on the adopted definitions of ICT and dissemination, the researcher will be using the following definition for ICT Dissemination: A process that involves the transference of ICT from one party to another. This can be done by transfer, adoption or dissemination.

Economic Well-being is determined by people's consumption possibilities and their command over resources. (OECD Framework for Statistics on the Distribution of Household Income, Consumption and Wealth, 2013).

1.8 Assumptions

1. A relationship exists between ICT dissemination and an individuals' economic well-being in SSA.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

“The ability to create, acquire and adapt new technologies is a critical requirement for competing successfully in the global marketplace. Various international forums and agreements on technology access and technological capacity building have recognized the importance of the transfer of technology, especially to developing countries. It is also a well-documented fact that the African continent has not kept pace with technological advancement. Africa's technological gap could be the source of its increasing economic deterioration because other developing regions are constantly upgrading their own technological capabilities, and the global marketplace has become increasingly liberalized and competitive.” (United Nations Conference on Trade and Development, 2003)

Many empirical studies have been done utilizing various econometric models and cross-country data to investigate the link between technology dissemination and economic growth in developing countries. Nasab and Aghaei (2009); Andrianaivo and Kpodar (2011); Sassi and Goaied (2013); Pradhan et al. 2015, 2018; Aghaei and Rezagholizadeh (2017) These research papers produced inconsistent results, and experts are divided on whether ICT distribution has a major growth-enhancing effect in developing countries.

According to Orthofer et al. (2019), empirical data shows that ICT spread, and investment have a favourable and considerable impact on economic growth in underdeveloped nations. There appears to be a growing tendency in empirical studies that show that ICT adoption and investment have a favourable and considerable impact on economic growth in these countries. Several ICT metrics were employed in these research papers, including mobile phone and landline telephone penetration rates, as well as the cost of local calls. ICT contributed greatly to African countries' economic growth from 1988 to 2007, according to Andrianaivo and Kpodar (2011).

2.2 ICT Dissemination

2.2.1 *ICT Dissemination in SSA*

When researching ICT, it's imperative that we define what exactly are we talking about. As Zuppo (2012) states "The challenge of defining ICT, in a universal sense, becomes apparent when one considers that diverse applications of the term ICT exist within several contexts and treatments of the term." Zuppo (2012), on the other hand, claims that the primary definition of ICT is "devices and infrastructures that support the movement of information via digital methods. Refer to your research objective one:

Several studies have shown a link between ICTs and overall economic development (Jorgenson and Vu, 2016; Niebel, 2018; Romer, 1990). In the 1980s, Africa experienced a surge of economic liberalization measures supported by foreign financial institutions. (Babb and Kentikelenis, 2018; van Klyton et al., 2019). This corresponded with the introduction of ICT investments and internet infrastructure, leading to broad acceptance of ICT goods and services throughout Africa. (Chavula et al., 2013; Evans et al., 2019; Ojong et al., 2016)

In support of the preceding paragraph, Albiman and Sulong (2016) investigated the long-run impact of ICT on economic growth in the SSA area from 1990 to 2014. Their analyses indicated that ICT proxies such as fixed phone lines, mobile phones, and the internet had a statistically significant positive direct linear influence on economic development. However, when they looked at nonlinear effect research, they discovered the inverse. As a result, extensive usage of ICT proxies appears to be reducing SSA economic development. The findings revealed that mobile phones are a key economic driver in Sub-Saharan Africa. This data is correct and aids the efforts of several SSA nations (Kolko 2012; Jayakar and Park 2013; Pradhan et al. 2018).

Lee et al. (2012) investigated the link between economic growth and investments in communications infrastructure in the SSA area, such as landline telephony and mobile phones. They utilized a linear GMM estimator using data from 44 Sub-Saharan African countries from 1975 to 2006. According to the data, mobile phone expansion is a key influence on the SSA's economic development rate. According to Bahrini and Qaffas (2019), information and communication technology (ICT) facilitates the attraction and opening of new markets for developed countries at the expense of developing countries by allowing developed countries to increase their dominance in international markets by exploiting new technologies.

2.3 Economic Well-being

2.3.1 *Economic Well-being in SSA*

Between the years 2000 and the early 2010s, as ICT penetration rose across the African continent, the focus shifted to the uptake and impact of these ICTs in order to transform communities and economies, because improving information flows alone is insufficient to seize development prospects.

There is a well-documented claim that digitalization contributes to economic growth, according to one of the studies examined (Bukht and Heeks, 2017). Another study went on to say that the way business functions have shifted from e-commerce to business process outsourcing and digital technologies (Lacity et al., 2016; Liu and Aron, 2014). Furthermore, the usage of e-government platforms has had a significant influence on how people communicate with one another and how governments interact with citizens (Zhao et al., 2015).

Some studies have shown a strong interest in investigating the influence of ICT adoption on the economy of emerging nations in the SSA region (Andrianaivo and Kpodar 2011; Lee et al. 2012; Wamboye et al. 2015; Albiman and Sulong 2016). The reason for this increasing interest in recent years is that most SSA

countries have witnessed significant growth in ICT use (World Bank 2017; International Telecommunications Union 2017).

Another research backed up the earlier findings, suggesting that increased Internet usage and mobile subscriptions can improve economic growth (Sassi and Goaied 2013; Shahiduzzaman and Alam 2014; Das et al. 2016; Adeola and Evans 2019b): For starters, it encourages the spread of technology and innovation across the economy. Second, it improves the decision-making of economic agents. Finally, it boosts output by increasing demand for products and services while decreasing production costs (Das et al. 2016: 141). According to the report, information, and communication technologies (ICTs) are a key component of Africa's economic development, suggesting that increased ICTs have aided economic development.

The combination of economic well-being and information and communication technology (ICT) increases productivity and, as a result, revenue. Higher money allows people to meet their requirements according to their preferences, resulting in a happy attitude and desire to live (Maiti and Awasthi, 2019). Maiti and Awasthi (2019) used GDP per capita proxy as a result. They go on to argue that varying degrees of ICT access can have a wide range of consequences on people from various socioeconomic strata. If it does not assist low-income individuals, inequality may rise (Lin et al. 2017), and rising disparity raises societal conflict. As a result, the Gini coefficient is used to quantify the level of social tension (Kakwani and Son 2016). Increased unemployment exacerbates already-existing societal tensions. Unemployment has a negative influence on one's happiness. As a result, Maiti and Awasthi (2019) identified unemployment as a source of stress related to ICT exposure. Maiti and Awasthi (2019) integrate these three variables using a simple arithmetic average with equal weights to reflect the level of economic well-being. Even though the weights are identical, the sign of the weight provided to GDP per capita is positive, but the sign of the weight given to GDP per capita is negative. These indicators will be used by the researcher to

see if there is a link between ICT dissemination and an individual's economic well-being.

From 1975 to 2010, Wamboye, Tochkov and Sergi (2015) employed the system Generalised Methods of Moment in a sample of 43 SSA countries, to determine the influence of fixed-line telephone, mobile cellular and internet usage on labour productivity growth. Their results indicate that above certain thresholds (penetration rates of between 20% and 30% for phones fixed line and mobile cellular and 5% internet usage) it influences growth in a significant, positive manner.

2.4 The Relationship Between ICT Dissemination and Individuals' Economic Well-being

A few empirical studies have discovered that ICT dissemination has a favorable and considerable influence on economic growth, particularly in developed nations (Roller and Waverman, 2001; Inklaar et al, 2005; Koutroumpis, 2009), while others have found that ICT dissemination has a negative impact on economic growth in many countries around the world (Roller and Waverman, 2001; Inklaar et al, 2005; Koutroumpis, 2009). (Dewan and Kraemer, 2000; Pohjola, 2002; Papaioannou and Dimelis, 2007; Yousefi, 2011; Pradhan et al, 2015; etc.). Due to a persisting digital gap, most African countries have yet to realize the projected economic benefits connected with digitalisation, despite all their investment efforts to date. According to some writers, this is due to a lack of digital skills, a lack of ICT infrastructure, and high-cost structures (Banga and Velde, 2018; Melia, 2020; Yoon, 2020). Counted and Arawole (2016), for example, show how internet disparity in Africa has posed significant problems for millennial digital businesses. Another intriguing finding is that ICT makes it simpler for industrialized countries to attract and open new markets at the expense of developing countries (Counted and Arawole, 2016) As a result, it helps established countries to increase their domination on international markets by fully using their competitive advantage over less competitive developing

countries. As we proceed into the digital age, hopefully, some of the ideas in the literature will address these challenges.

Despite these findings, empirical research on the link between ICT use and economic growth in developing nations has yielded conflicting results. Freeman and Soete (1997) and Aghion and Howitt (1998) shown that ICT distribution had a negative influence on economic growth, particularly in impoverished countries (1998). They indicated that this could happen as a result of the reduction or loss of jobs for unskilled employees, resulting in increased unemployment.

2.5 Factors Influencing the Relationship Between ICT Dissemination and Individuals' Economic Well-being

According to several studies on the relationship between ICT and economic growth, there is an underlying relationship between ICT dissemination at the national, industrial, and organizational levels (Lee, Hong & Hwang, 2017). The relationship between individual well-being and ICT distribution, on the other hand, has rarely been investigated (Lee, Hong & Hwang, 2017). Nonetheless, several studies have investigated the use of ICT and its impact on daily life. According to these studies, there is a link between human advancement and ICT use at the societal level.

ICT has emerged as the most important technology of the last decade. The spread of capabilities such as the Internet, mobile telephone, and broadband networks all show how prevalent this technology has become (OECD, 2004). Through the process of SLR, we are going to determine how these relationships have been assessed in various empirical studies – what parameters are they used, factor.

Even though the OECD's study on the Economic Impact of ICT was published 17 years ago, some of the concerns mentioned in the preceding paragraph are still relevant today. This is because information and communication technology (ICT) has become an essential component of all OECD economies. Almost all

companies today use computers, and most of them have Internet connections. Despite rising ICT use in OECD nations, the question of the technology's influence on economic growth remains unresolved (OECD, 2004). Only a few OECD nations have had undeniable growth in the economic sectors that have spent the most on technology, such as wholesale trade, financial services, and information technology. Following the publication of the OECD (2004) report, great progress has been made in understanding the relationship between technology dissemination and economic well-being. According to the World Economic Forum, increasing digitalization by 10% can result in a 0.75 percent increase in GDP per capita and a 1.02 percent drop in unemployment in some countries (WEF, 2013). According to the OECD (2010), information and communication technologies (ICT) have a critical role in reducing poverty by offering new sources of income and job opportunities. According to the study, it may decrease the cost of access to health and education services for low-income LSMs.

The empirical research indicates several elements that influence ICT adoption. The first of these elements, according to the OECD (2004), is ICT direct expenses. Costs of ICT equipment, telecommunications, or the implementation of an e-commerce system are examples of this. The ability to absorb new technologies is the second significant factor impacting ICT adoption. This includes but is not limited to, know-how availability. Competition and the regulatory environment are other crucial factors, as excessive regulation may make it impossible for individuals to take use of ICT's benefits.

2.6 A Theoretical Review

Some ideas, such as neo-Schumpeterian theories (Schumpeter 1934; Pyka and Andersen 2012) and neoclassical growth theory (Solow 1956), have shown that ICT and economic growth have a considerable positive link. These theories suggest that "ICT enters as an input into the economic supply in the form of capital and causes the improvement of the production process through deepening

capital and making advancements in technology and labour force quality. As a result, ICT creates added value at the firm level and at the sectoral level and therefore leads to the improvement of productivity and economic growth at the country level” (Quah 2002; Aghaei and Rezagholizadeh 2017).

For the purpose of this study, two theoretical models are selected to guide the study, namely the UTAUT-TAM model (Khalilzadeh, Ozturk and Bilgihan, (2017)) and the corresponding fields model (Helsper,2021).

In this section, a discussion is provided on the theoretical developments leading towards the UTAUT-TAM model and the corresponding fields model.

The use of technology including Fintech is underlined by the acceptance and adoption of technology and thus relevant to the discussion of technology dissemination.

The development towards the UTAUT-TAM, can be seen by reflecting on the various models, namely:

- Theory of Reasoned Action (Fishbein & Ajzen, 1974/75),
- Theory of Planned Behaviour (Ajzen, 1977, 1991),
- Technology Adoption Model (Davis, Bagozzi, &Warshaw, 1989), or
- The Unified Theory of Acceptance and Use of Technology (Venkatesh & Davis, 2000) (Lin, 2003 and Cruz et al., 2010).

2.6.1 *The Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1974/75)*

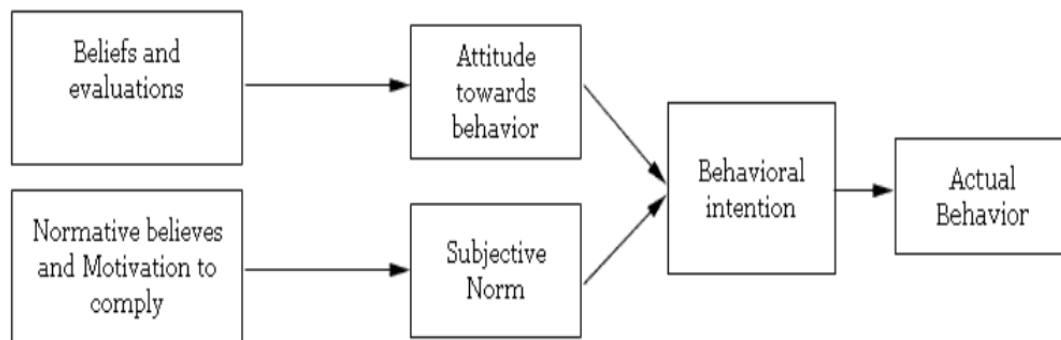
According to the Theory of Reasons Action (TRA), people’s views are impacted and dictated by their attitudes and subjective standards. It argues that an individual’s behaviour is impacted by external variables, and thus by extension, their attitude. Examples of external influences include:

- Characteristics of the tasks,
- Characteristics of the interface or of the user,

- The type of development implementation,
- The political influences,
- The organizational structure

It is vital to emphasize that this idea is based on rational thought, meaning that individuals would always evaluate the possible outcomes of their acts before adopting a certain mindset. (Asongu, 2018). With the foregoing in mind, the theory comes to the following equation: “Behavioural Intention = Attitude + Subjective norms”. It is demonstrated in figure 2 below:

Figure 2: Theory of Reasoned Action (Fishbein & Ajzen, 1974/75)



Theory of Reasoned Action from Davis, Bagozzi et Warshaw (1989)

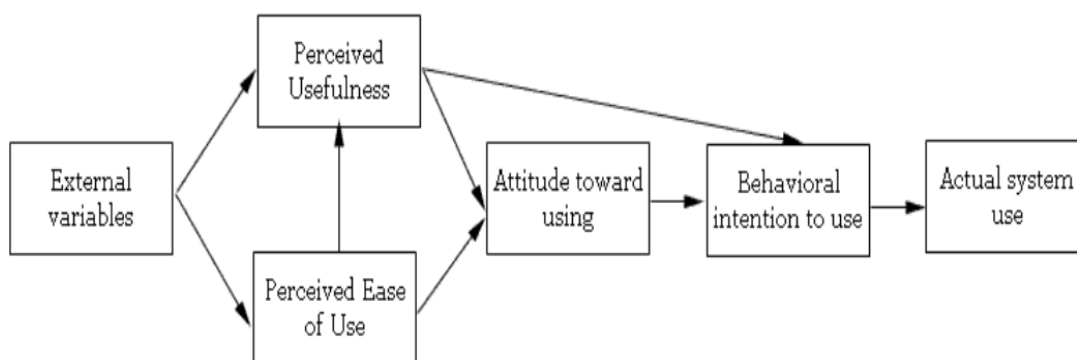
2.6.2 Theory of Planned Behaviour (TPB) (Ajzen, 1977, 1991),

The theory of Planned Behaviour (TPB) integrates a third element into this equation namely “perceived behavioural control” in view of accommodating situations where individuals may have limited situational control. TPB and TRA are both beneficial in modelling and offering vital insights into the behavioural intention. However, both models lack “user intent” in terms of technological acceptability. (Cruz et al., 2010).

2.6.3 Technology Acceptance Model (TAM) (Davis, Bagozzi, &Warshaw, 1989)

Due to the shortcomings of TRA and TPB, the Technology Acceptance Model TM was developed by Davis, Bagozzi and Warshaw (1989). TAM is an extension of the TRA and considers additional factors link to TPB, namely “perceived usefulness” and “perceived ease of use”. According to Davis et. al. (1989) these factors are important predictors of an individual’s attitude toward technological acceptance. TAM has increasingly become a prominent reference paradigm for studies on internet or mobile technology uptake. (Asongu, 2018; Cruz et al., 2010). The TAMs model is depicted in Figure 3 below.

Figure 3: Technology Acceptance Model (TAM) (Davis et al., 1986, p.)



Technology Acceptance Model from Davis, Bagozzi et Warshaw (1989)

However, there are certain worries about TAM in the consumer context of technology adoption. The model is more suited to corporate environments, but it does not completely support technology adoption in a consumer context since it does not include the financial implications of the technology (Nysveen, Pedersen, Thorbjørnsen, 2005). According to these authors, this model disregards the impact of social influence/context and confidence in the user’s adoption of the technology.

2.6.4 Technology Acceptance Model 2 (TAM2)

Due to the shortcomings of TAM, TAM extension (TAM2) was proposed (Venkatesh and Davis, 2000). In this model, the concepts of perceived usefulness and usage intentions are explained in terms of two processes, namely social influence, and cognitive instrumental processes. These authors identify subjective norms, voluntariness, and image as key elements of social influence processes. Cognitive instrumental processes consist of job relevance, output quality and result demonstrability (Venkatesh & Davis, 2000). These theoretical developments improved the understanding of using adoption behaviour.

However, TAM 2 has its own limitations. It is argued that it ignores the expense of technology and solely considers technology acceptability within the context of the enterprise (Meuter et al., 2005; Wu and Wang, 2005). Meuter et. al. (2005), suggest the incorporation of Diffusion of innovation (DOI) theory to add (1) perceived risk and (2) compatibility which they argue to be essential background of technology adoption. Wu and Wang (2005) propose the expansion of the TAM 2 model by including of factors (1) compatibility, (2) perceived risk, and (3) cost.

2.6.5 The Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh & Davis, 2000) (Lin, 2003 and Cruz et al., 2010).

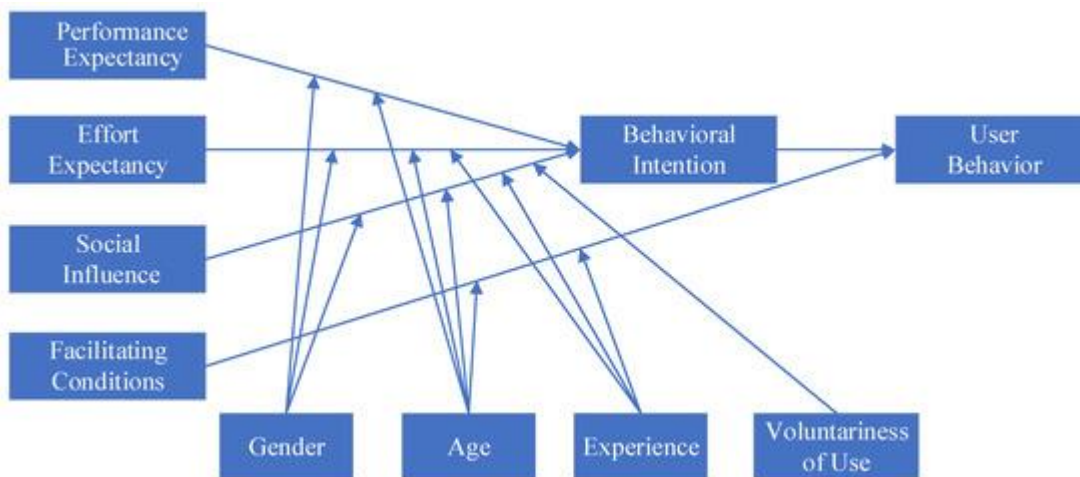
The Unified Theory of Acceptance and Use of Technology (UTAUT) can be used to predict behavioural intentions to accept and use technology. In addition, it also offers a thorough synthesis or fusion of previous technological acceptance studies. UTAUT incorporates elements from expectancy theory and Intention-based models and social cognitive theory (Oshlyansky, Cairns, & Thimbleby, 2007; Venkatesh et al., 2003; and Yu, 2012).

UTAUT posits four major components of tech adoption that influence usage behaviour. These four components refer to:

- the process of social influence, typically experienced from family friends and peers,
- the concept of effort expectancy, referring to the potential benefit derived from the use.
- performance expectancy, which relates to the ease of usage of the technology, and
- the facilitating conditions which refer to consumers' perceptions of the availability of supporting recourses.

However, points of critique were raised against this model, arguing that indirect determinants, such as (1) attitude towards usage, (2) self-efficacy and (3) anxiety are not included in UTAUT. The UTAUT model is depicted in Figure 4 below.

Figure 4: The Unified Theory of Acceptance and Use of Technology



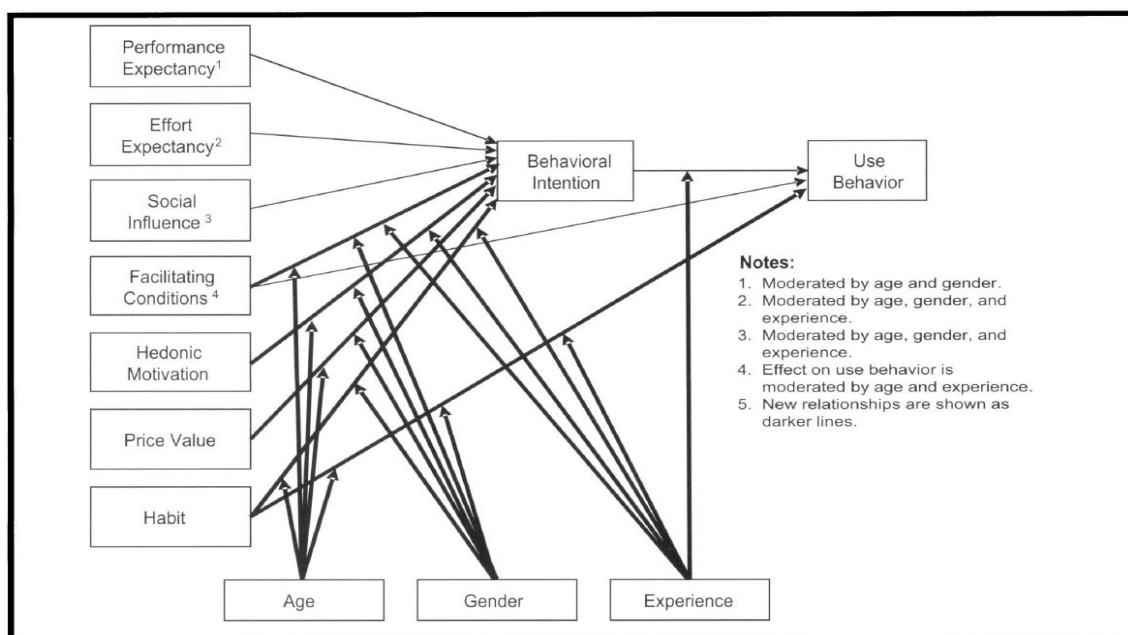
2.6.6 The Unified Theory of Acceptance and Use of Technology 2 (UTAUT2)

However, just as in the case of TAM, it is argued that UTAUT does not consider technology cost. It seems that the core focus is on the organisational context. Venkatesh et al (2012) proposed an extension of the UTAUT to UTAUT 2 by incorporating three additional constructs, namely:

- hedonic motivation referring to the fun and pleasure derived for use of technology,
- The price value- the monetary cost of using the technology and habit, and
- involuntary behaviour towards technology.

The UTAUT 2 model is depicted in Figure 5 below.

Figure 5: The Unified Theory of Acceptance and Use of Technology 2 Page 4 (Venkatesh & Davis, 2000) (Lin, 2003 and Cruz et al., 2010)



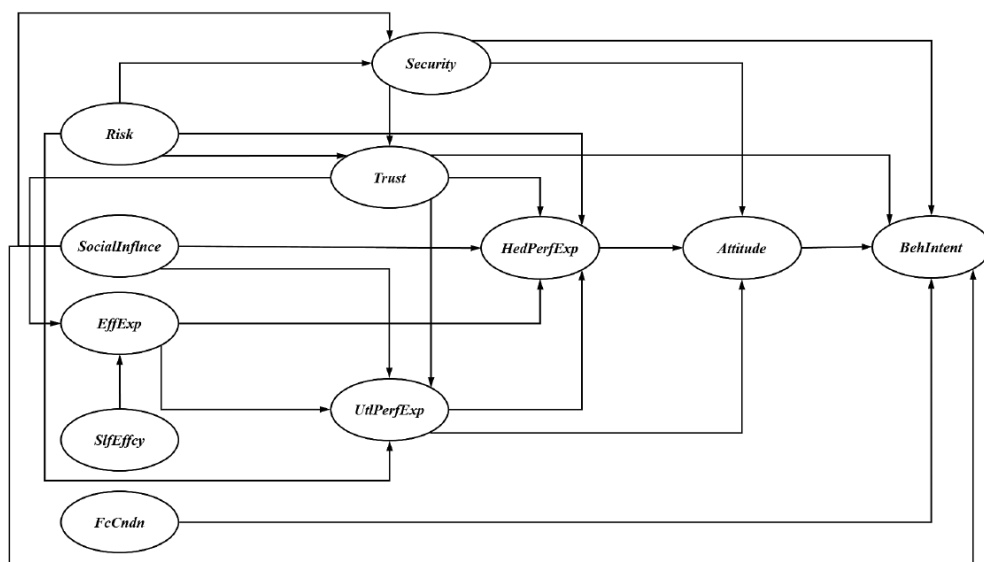
2.6.7 UTAUT-TAM (Khalilzadeh, Ozturk and Bilgihan, 2017)

UTAUT-TAM was created to assure payment protection in the use of technology, to understand the determinants of near field communication based mobile payments, technology that allows two devices to communicate to one other while they are close together, such as a cell phone and a payments terminal. This is why Khalilzadeh, Ozturk and Bilgihan (2017) proposed an integrated model by combining the UTAUT and TAM in order to incorporate security-related constructs such as perceived risk, security and trust.

Perceived risk is a combination of uncertainty, the seriousness of outcome involved, the expectation of losses associated with the purchase and acts as an inhibitor to purchase behaviour” (Featherman and Pavlou, 2003). Perceived security can be defined as the degree to which a customer believes that using a particular MP procedure will be secure while trust can be defined as the belief that vendors will perform some activity in accordance with customers’ expectations.

The success of the UTAUT-TAM model is difficult to dispute, since the model has 20% better explanatory power and predictive accuracy than the original UTAUT, demonstrating strong correlations between perceived risk, security, trust and behavioural intention to adopt a technology.

Figure 6: UTAUT-TAM (Khalizadeh et al., 2017)

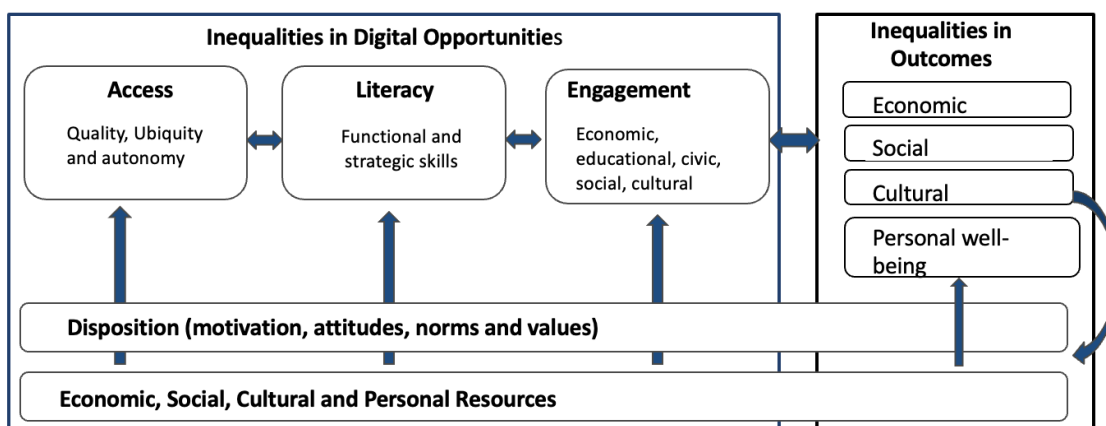


While most theoretical studies have found a positive association between ICT use and economic growth, practical investigations have yielded varied outcomes.

2.6.8 Correspondence Fields Model (Helsper, 2021) on digital inequalities

The correspondence fields model focused on the requirements for individuals to benefit from the use or affordances of digital technologies and discussed those elements that contribute towards inequality in benefits. Helsper (2021) argues that for people to benefit from the affordances of technology, they must have access to the internet (the first level of potential inequality or exclusion) and they need to have the awareness, skills and content to benefit from it. However, this model argues that the ability to capitalise on the affordances of technology, in terms of economic, social, cultural and personal well-being benefits is influenced by the personal disposition of individuals (i.e., motivation, attitudes, norms and values) as well as the context within which individual find themselves such as the economic, social, cultural and personal resources to they have access to. Following the arguments of the correspondence fields models, many factors (technology availability, ability to use, skills levels, resources and personal dispositions) play a role in individuals' ability to derive benefits (such as well-being) from the availability of technology.

Figure 7: A Corresponding Fields Model for the Links Between Social and Digital Exclusion (Helsper 2012)



2.7 Conclusion of Literature Review

Finally, new information and communication technologies like mobile phones, Internet usage, and broadband adoption were identified as important drivers of economic growth in SSA developing countries from 2007 to 2016. (Bahrini et al. 2019) This outcome could be explained by the fact that in many African countries, mobile phones have replaced fixed telephones. This is especially true in SSA nations, where mobile phone adoption rates have recently increased dramatically. According to one set of research, mobile phones had the greatest positive impact on economic growth in SSA countries from 2007 to 2016.

The findings of a study that looked at whether individual, company, or government usage had the most impact on the economy were interesting. Their key result was that individual digital technology use, rather than company or government use, had the greatest impact on African countries' economic progress. Furthermore, they were more explicit in demonstrating that social media and the centrality of ICTs in government vision are linked to economic growth.

It's worth noting that a lot of the literature on the impact of digital technology on economic growth has come up with conflicting results when it comes to interpreting this relationship. According to certain studies, ICTs and economic growth have a beneficial association (Jorgenson and Vu, 2016; Niebel, 2018). According to several studies, ICT usage, rather than access, has an economic impact (Evangelista et al, 2014). The key conclusion is that using these technologies helps to promote the economy by facilitating communication, empowering individuals, creating jobs, and stimulating innovation (Solomon et al, 2020).

The state's crucial role in fostering an enabling environment for technology access and use was also noted in the literature assessment. The state is responsible for facilitating the acquisition or manufacture of modern technologies, as well as for establishing and maintaining a regulatory environment that encourages the use of ICT. In contrast to Pick and Sarkar (2015) and Nhohkwo

and Islam (2013), who discovered that the legal environment is a critical facilitator of both the development and adoption of ICT in African nations, the lack of influence of ICT laws on GDP growth is unexpected.

2.7.1 *Proposition 1*

Empirical studies demonstrate a relationship between ICT dissemination and individual's economic well-being.

2.7.2 *Proposition 2*

There are empirical studies describing the relationship between individuals' economic well-being in SSA.

2.7.3 *Proposition 3*

Empirical studies identify a diversity of factors mediating the relationship between ICT dissemination and individuals' well-being.

Table 1: Consistency Table: Research Questions and Propositions

RQ #	State Research Objective	Proposition #	State Proposition
1	Explore the nature and scope of empirical studies aimed at investigating the relationship between ICT dissemination and individuals' economic well-being in SSA.	1	Empirical studies demonstrate a relationship between ICT dissemination and individual's economic well-being
2	Explore the dimensions and characteristics of the instruments applied to determine the relationship between ICT dissemination and individuals' economic well-being	2	There are empirical studies describing the relationship between individuals' economic well-being in SSA
3	Explore potential factors that mediate the relationship between ICT dissemination and individuals' economic well-being. individuals' economic well-being in SSA	3	Empirical studies identify a diversity of factors mediating the relationship between ICT dissemination and individuals' well-being

CHAPTER 3. RESEARCH METHODOLOGY

The study followed a qualitative research approach, applying an SLR methodology to explore the relationship between ICY dissemination and Individuals' economic well-being.

This chapter describes the research approach, design, data collection methods, sampling procedures, data analysis and interpretations. It concludes with the limitations, validity, and reliability and, ethical considerations.

3.1 Research approach

The qualitative study was conducted by the researcher, and the research method was inductive. The reason for this is because qualitative research is used to investigate and/or comprehend the meaning that individuals or groups attach to a social or human situation. This research technique often includes the creation of novel questions and methods, data collecting in the participants' surroundings, and data analysis that builds inductively from specifics to general themes. The researcher interprets the meaning of the data at the same time. The final written report's structure is adaptable. As a result, people who do this sort of study advocate for an inductive approach to research.

Soiferman (2010), states that in research, there are two main types of analysis typically used quantitative (deductive) and qualitative (inductive). Since this piece of research will be a qualitative research paper, the researcher will be making use of an inductive approach.

3.1.1 *Inductive Approach*

There are three key reasons for employing an inductive method, according to Thomas (2006). They are: 1) compress raw textual data into a concise, summary format; 2) to make clear linkages between the assessment or research objectives and the raw data summary results; and 3) to construct a framework of the

underlying structure of experiences or processes apparent in the raw data. According to Thomas (2006), the inductive method provides a straightforward and systematic set of processes for analysing qualitative data that can yield trustworthy and reliable conclusions. The inductive approach will be used due to its ability to:

- 1) Enable the researcher to condense (raw) textual data into a brief, summary format. This will be necessary as the researcher plans on doing a structured literature review for this piece of research. It will therefore assist the researcher in going through several pieces of content while summarising the main findings.
- 2) As the study's goal is to investigate the relationship between ICT dissemination and individuals' well-being, establishing ties between research objectives and summary conclusions obtained from raw data will be important.
- 3) In order to provide readers of the paper with clear insights on the relationship between ICT dissemination it is important for the researcher to develop a framework of the underlying structure of experiences or processes that are evident in the raw data. For example, one of the important findings will be how the different factors of access to Technology affect the GDP per capita of individuals in SSA.

3.2 Research design

Literature reviews promote theory creation by allowing a researcher to map, consolidate, synthesize, and enhance scattered knowledge in an area. It has, however, been criticized for its lack of rigorous methods and reliance on the researchers' subjective judgments (Seuring and Gold, 2012). In order to ensure that the analysis is independent of the researcher's bias, systemic and transparent ways of reviewing literature have emerged. (Seuring and Gold, 2012

and Haggarty, 1996). To address the three research questions, a systematic literature review was applied.

A systematic literature review (SLR) identifies, selects, and critically evaluates research in order to address a specific topic (Dewey, A. & Drahota, A. 2016). SLRs are appealing to researchers, according to Buenechea-Elberdin (2017), since they provide a history, some critique, and an outline of future research prospects for specific topics. As a result, an SLR is the most appropriate methodology for conducting a reliable analysis of the literature exploring the relationship between ICT dissemination and individuals' well-being in order to present a balanced view of the literature to be examined during this study and to outline future research directions.

Before the review can begin, the SLR must follow a clearly defined process or strategy with clearly stated criteria (Charles Sturt University, 2021). It is a transparent, thorough search of multiple academic databases and literature that other academics may copy and repeat. It includes creating a well-planned search strategy that focuses on a certain topic or responds to a specific inquiry. The review specifies the type of material searched, evaluated, and reported within specified times. The review must include the search terms, search tactics (including database names, platforms, and search dates), and limits (Charles Sturt University).

The preferred reporting Items for Systematic reviews and Meta analysis (PRISMA) guidelines were followed for developing the present systematic review. These reviews along with meta-analysis provide insights into current updates in the field and the future scope associated with the work (Moher et al., 2009). Based on the information above, an SLR is the most appropriate way forward for the researcher to conduct a reliable literature analysis that will explore a relationship between ICT dissemination and individuals' economic well-being in SAA in order to present a fair critique of the literature and outline future research directions.

3.3 Data collection methods

In qualitative research, there are a variety of data collection methods. Observations, textual or visual analysis, and interviews are examples of these (Silverman, 2000). The most crucial aspect of data collecting, according to White and Marsh (2006), is that it provides relevant evidence for testing hypotheses or answering research questions.

Because the study was conducted using SLR, it is critical to articulate and comprehend what data can be used in SLR investigations. Another important feature is that the data communicate; they send and receive messages. Text is expanded in Krippendorff's definition to encompass "additional significant matter" (Krippendorff, 2004). Pictures on a webpage are a wonderful example of this. Because photos on a website are used to express one or more meanings, they can be subjected to SLR either by themselves or by examining the links between images and text (Marsh and White, 2006).

Papers included in the key academic databases Encore (Wits Business School) and Google Scholar were included to ensure that all articles meeting the criteria are included. The series of Network Readiness Indices (NRI) (between the period 2016 – 2021) and the World Bank Report on the Digital Dividend formed part of the population as well as relevant studies referenced in these publications (Network readiness index 2016, 2019-2021, World bank report on digital dividend-2016).

3.4 Population and Sample

3.4.1 Population

Exploring the relationship between ICT dissemination and individuals' economic well-being by means of an SLR process, considering the population of literature to be consulted as those adhering to the following criteria: (individual well-being in SSA, the population to be researched comprised articles that were):

- Publications reporting on the relationship between ICT dissemination and individuals' well-being in SSA.
- Empirical studies, since research should never be divorced from practice (Petty and Guthrie, 2000), published in peer-reviewed journals, which ensured a high degree of quality due to the rigorous refining process inherent in publishing.
- Articles published in English as this is the language that the researcher is comfortable with,
- Articles published between the period 2016 to 2021.

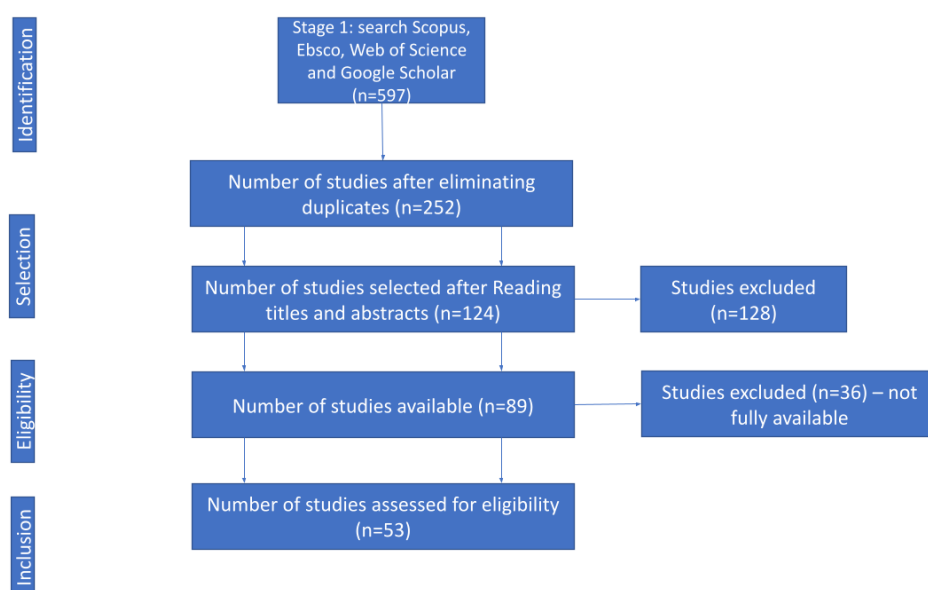
3.4.2 Sampling

According to Kumar (2019), sampling is the process of choosing respondents. A sample, according to Silverman (2016), is a grouping of individual elements selected from a study population to represent it. The sample must encompass all features of the research population. A sample allows the researcher to save time and money that would otherwise be spent if the full research population was used.

The NRI reports and databases above were used to search the keywords "ICT dissemination" and "individuals' economic wellbeing". The results obtained were further refined by analysing their titles and abstracts. Once this was done, metrics that have not yet been identified were used to identify the top publications in several categories related to the field of study.

The search was performed using the keywords “Relationship”, “Economic well-being”, and “ICT”, “Dissemination” and “Sub Saharan Africa”. However, these keywords gave many references, some of them being not very specific. So, search terms were framed using Boolean operators. The search terms included “ICT dissemination and Sub-Saharan Africa”, “ICT dissemination and economic well-being”, “ICT dissemination and economic well-being in Sub Saharan Africa”. The initial search of Encore database for titles, and abstracts based on search terms resulted in the identification of the final 53 references. Since the review was completed by only one researcher, a verification happened during the Research Methodology class when our studied material was presented for marking. A complete strategy is presented in the form of a PRISMA flow sheet.

Figure 8: PRISMA Flow Sheet Summarizing the Identification of Final References for the Study



Four distinct databases were used for identification references which included Scopus, Web of Science, Ebsco and Google Scholar. Based on the search terms a total of 597 references were obtained at the identification stage. After eliminating the duplicates, a total of 252 references were further considered. In the selection process a total of 128 references were excluded based on selection

criteria. Of the remaining 124 references further 36 studies were excluded as the full text was not available resulting in the screening of 88 studies. Of these 88 studies only 53 were found to be eligible for the SLR. Of the 53 papers for meta-analysis around 13 papers were identified for data extraction and forest plot generation. However, of these 13 papers only eight could be used for extracting the data and plotting the graphs as relevant information which was comparable was obtained from these papers only.

3.5 The research instruments.

It is extremely important that data is collected using the right instrument. Creswell, Hanson, Clark-Plano, and Morales (2007); Hamilton and Finley (2019) state that qualitative researchers have a choice of data collection tools to select from, depending on the objective of their study and their ability to utilize them effectively. The types of qualitative research instruments are questionnaires, interviews, observations, publicly published articles and government sources, laboratory and quasi-experiments, and scales (Adosi, 2020).

For this paper, the researcher and archival documents were the research instruments with Relationship, Economic well-being, ICT Dissemination and Sub Saharan Africa. The search terms included “ICT dissemination and Sub-Saharan Africa”, “ICT dissemination and economic well-being”, and “ICT dissemination and economic well-being in the Saharan Africa”.

Four distinct databases were used for identification references which included Scopus, Web of Science, Ebsco and Google Scholar.

3.6 Procedure for data collection

Search engines were used to find professional/trade sources, books and government documents, theses, and dissertations such as World Bank, WEF and OECD publications.

Academic literature platforms were one of the platforms used to gather some of the data required for this research, namely scholarly publications (Journals), theses and dissertations. Four distinct databases were used for identification references which included Scopus, Web of Science, Ebsco and Google Scholar. The search terms were used for identifications of papers that are published between 2010-2022. Since document analysis was used to collect data, the researcher performed SLR.

3.6.1 Literature search and evaluation

The literature collection was done using keywords such as “ICT diffusion”, “Sub-Saharan Africa”, “Africa”, “Economic development”, “individual well-being”, and “Economic well-being”. The various references obtained were collected from the database and the titles and abstracts were screened for the appropriateness of the study.

3.6.2 Inclusion criteria

The various studies that were collected were screened based on inclusion criteria. The inclusion criteria involved articles that were related to the research objectives proposed. All the articles that were considered for further analysis were related to SSA and ICT dissemination between 2016 and 2023. The various aspects associated with these wherever mentioned in such papers were only considered.

3.6.3 *Quality and eligibility criteria*

Quality and eligibility assessment was done by two reviewers (Researcher and Supervisor) who examined the various articles that were collected. Based on the inclusion criteria the full text of the final articles was scrutinised to evaluate if they are in accordance with the research objective framed. Technical reports, committee meetings, posters and only abstracts without full text were used for further exclusion of the papers. A careful review was performed, and the final list of articles was selected. Finally, a few sets of highly quality papers were used for SLR.

3.6.4 *Data analysis and interpretation*

ATLAS.ti is a computer program that can help students conduct their research. It is used by researchers publishing in top journals and in research across many disciplines (Alvira-Hammond, 2012). It is usually used to analyse qualitative research such as literature, videos, and audio. The researcher used ATLAS.ti to read, analyse and tag the literature by coding the literature in order to extract the correct information for this piece of research.

SLR is the process of categorizing information into categories that are connected to the research's primary concerns (Bowen, 2002). This content entails a first-pass document evaluation, which identifies important and relevant language or other data. As directed by Corbin and Strauss (2008),

For the present review research articles were identified based on the search terms. Following the PRISMA methodology a final of 53 references were identified (Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group, 2009). A total of 13 references were identified from the 53 references which were used for data extraction. Finally, eight of the references had been used for data extraction as they had identical information for the generation of the forest plot. Based on the forest plot generated the heterogeneity and the P values were estimated. The relative significance of the research objectives based on the forest

plots and statistical values have been used for giving the final interpretations of the results.

3.6.5 *Data extraction for visualisation of data*

For the present SLR a meta-analysis was performed on selected articles for better representation of the studies and to understand if they match the research objectives of the study. The meta-analysis was done using Review Manager (RevMan). RevMan is a software tool available in Cochrane database (Schmidt et al., 2019). It is used to generate graphic outputs for the data extracted in Meta analysis. For the present review research articles were identified based on the search terms. Following the PRISMA methodology a final of 53 references were identified (Moher, D., Liberati, A., Tetzlaff, J., Altman, D. G., & PRISMA Group, 2009). Data extraction was done based on variables which included ICT diffusion (access, usage, and skills), GDP, FDI, economic growth, Government interest and other hosts of variables which are presented in meta-analysis data in the results section.

3.7 Limitations of the study

The researcher made use of explanatory design hence results would be different if the same research is done using only descriptive research design.

The time that the researcher must complete the study may be a limitation as numerous consultations need to be had.

Another limitation of this study is the deadline of the end of November 2023.

The geographical limitation of this study was Sub-Saharan Africa. The geographical area of the continent of Africa that lies south of the Sahara. According to the United Nations, it consists of all African countries and territories that are fully or partially south of the Sahara.

SLRs require access to a big range of databases and peer reviewed journals. If a researcher does not have access to a wide database, institutional websites may be used to retrieve literature. However, this has its own set of problems since browsing institutional websites may sometimes compromise the impartiality of the search and retrieval process, introducing bias into the review process. This means that many potentially relevant research may be overlooked. (Mallet, Hagen-Zanker, Slater and Duvendack, 2012).

On top of this, SLR relies on the authors' self-proclaimed research design and results. This may introduce another source of bias (Mallet, R. et al. 2012).

3.8 Transferability and Dependability

Transferability refers to the extent to which qualitative research findings may be transferred to various contexts or settings with different respondents. The researcher provided explanations on all the steps taken during the research process, from the criteria of article selection to the process of analysis for transparency. Explanations during each of the steps will aid potential users' ability to assess transferability (Korstjens and Moser 2017).

The consistency of findings across time is referred to as dependability. Dependability refers to participants' assessment of the study's findings, interpretations, and suggestions, all of which are backed by the data obtained from the study's participants (Korstjens and Moser, 2017).

To ensure the transferability and dependability of the study, the researcher presented the steps in the research process and provided the necessary detail to allow readers to follow the research process. The researcher, furthermore, endeavoured to be consistent and reliable throughout the research process, documenting all the steps of the research process for someone outside of the study to follow, audit, and critique the research process if necessary (Polit et al (2006); and Streubert, 2007).

3.9 Ethical considerations

According to research ethics, every researcher is bound by a moral code to which they should adhere (Silverman, 2016). The researcher upheld the ethical guidelines found in the literature and provided by WITS Business School during the entire study. The researcher has ensured to seek consent from all respondents and uphold their desire for anonymity. Confidentiality has been one of the utmost importance during and after the study. No personalised data has been made available to any organizations or the public. The researcher has endeavoured to ensure that the findings are reported truthfully. Permission was always obtained from all authorities for data collection within the organizations or from individuals before any information was used. On top of the above, the researcher conducted the study in such a way that there was minimal disruption to the participant's day and in turn the organization. The researcher considered the possible harm that could be done not only to individuals but also to organizations throughout the research and employed preventative measures to ensure that this does not happen. The raw data that was collected during the research will be made available to ensure that other researchers can verify the contents of this study.

Table 2: Consistency Table: Research Objectives, Propositions, Data Collections and Data Analysis

RQ #		State Research Objective	Proposition #	State Proposition	Data collection detail	Data analysis method
1		Explore the nature and scope of empirical studies aimed at exploring the relationship between ICT dissemination and an individuals' economic well-being in SSA	1	Empirical studies demonstrate a relationship between ICT dissemination and individual's economic well-being	SLR	ATLAS.ti
2		Explore the dimensions and characteristics of the instruments applied to determine the	2	There are empirical studies describing the relationship between individuals' economic well-being in SSA	SLR	ATLAS.ti

RQ #		State Research Objective	Proposition #	State Proposition	Data collection detail	Data analysis method
		relationship between ICT dissemination and individuals' economic well-being				
3		Explore potential factors that mediate the relationship between ICT dissemination and individuals' economic well-being. ICT dissemination occurs in SSA	3	Empirical studies identify a diversity of factors mediating the relationship between ICT dissemination and individuals' well-being	SLR	ATLAS.ti

CHAPTER 4. RESULTS OF STUDY

4.1 Introduction

For this study, three distinct objectives were proposed, namely:

Research objective 1: Explore the nature and scope of empirical studies aimed at investigating the relationship between ICT dissemination and individuals' economic well-being in SSA.

Research Objective 2: Explore the dimensions and characteristics of the instruments applied to determine the relationship between ICT dissemination and individuals' economic well-being.

Research objective 3: Explore potential factors that mediate the relationship between ICT dissemination and individuals' economic well-being.

To address the research objectives a systematic literature review was performed as described in the methodology section. Chapter 4 provides detail on the articles selected by means of the sampling process as well as the results of the review related to the three research questions.

4.2 Description of the selected articles

Four distinct databases were used for identification references which included Scopus, Web of Science, Ebsco and Google Scholar. Based on the search terms a total of 597 references were obtained at the identification stage. After eliminating the duplicates, a total of 252 references were further considered. Among the 597 articles that were derived in the initial searches, 345 articles were identified to be duplicates of the other articles, considering that these 345 articles were eliminated. In order to determine whether the articles were the repetition of the other articles or not, a review of the article titles, year of publication, names of the authors were done. On reviewing the articles on the mentioned four

parameters, the articles were identified to be duplicates of any other selected articles or not, based on which, the articles were excluded. In the selection process a total of 128 references were excluded based on the selection criteria. Of the remaining 124 references further 36 studies were excluded as full texts were not available resulting in the screening of 88 studies. In the case of these 36 articles, followed by studying through the available abstracts, when trying to access the complete articles for evaluating the quality and eligibility of these articles, it has been noted that access to complete articles was not available, due to which these articles were excluded. Of these 88 studies only 53 adhered to the selection criteria and were therefore included in the structured literature review. In order to choose these 53 articles, the selection was done based on the determined inclusion and exclusion criteria, as mentioned in the below section. Among these 88 articles, 10 articles were found to be technical reports, and as the SLR focused on including only articles that comprised of peer reviewed process which was not the case of these 10 technical reports, due to which these reports were excluded. In the case of another five articles, it was noted to be published in languages apart from English, due to which these articles were excluded. In case of another eight articles the details and guidance associated with guidance on review methodology were missing which resulted in considering these articles to lack the necessary quality to be incorporated into the SLR. In the case of another twelve articles as these were published prior 2010, these articles were excluded from this study.

Exclusion criteria of the study comprised of studies that were not at par in terms of quality of the study or were not published in reputed journals were rejected. The studies that were published in other languages apart from English were also excluded from the SLR. In addition to that, the studies that deviated from the topic of the study were also excluded from the literature review for obvious reasons.

The Table 3 provides a summary of the articles adhering to the selection criteria of the study. The complete set of articles enlisted in table fall into three categories:

- Articles focusing on ICT diffusion in the SSA.

- Articles related to ICT diffusion, economic growth and individual well-being.
- Articles that a give a general idea of extent of ICT and economic development.

Table 3: Summary of the Various Articles Included in SLR

Author	Publication type and year	Timeframe of analysis	Country	Area of research	Major outcome
Mapiye et al	Manuscript, 2021	2007-2021	Sub Saharan Africa	Role of ICT in improving agricultural information and services	Development and deployment of user driven mobile applications encourage for better feedback and participation
Onyancha& Onyango	Manuscript, 2020	1991-2018	Sub Saharan Africa	Application of ICT for agriculture (ICT4Ag)	ICT based applications in agriculture are less implemented in area of interest when compared to developed nations
Ajani	Review, 2014	Not applicable	Sub Saharan Africa	Application of ICT for agricultural transformation	Establishment of ICT networks and active participation of farmers for agricultural transformation is much needed in SSA
Oyelami et al	Manuscript, 2022	1997-2018	Sub Saharan Africa	Application of ICT for agricultural transformation	Increased investment in ICT infrastructure. Educating farmers for effective utilisation of ICT infrastructure
Bakibinga-Gaswaga et al	Commentary, 2020	Not applicable	Sub Saharan Africa	Application of ICT in SSA. The various problems, policies and promises	Digital illiteracy, Poor infrastructure, excessive cost of ICT installation, and volatile political environment have serious effect on establishment and penetration of ICT in SSA
Mateko	Thesis, 2022	1989-2019	Sub Saharan Africa	ICT diffusion and poverty level in SSA	ICT is helpful in reducing poverty. Fixed effect and

					random effect models show a distinct decrease in poverty with penetrance of ICT.
Haftu	Manuscript, 2018	2006-2015	Saharan Africa	Impact of mobile phone and internet on per capita income of SSA	Increase in mobile phone penetration increases the GDP per capita thus reducing the poverty. However, internet does not contribute for GDP improvement.
Albiman	Manuscript, 2016	1990-2014	Sub Saharan Africa	Role of ICT on economic growth in SSA	Mobile phone and internet have triggered economic growth as per direct impact analysis. Domestic investment, institutional quality and human capital showed increase which affected economic growth
Olayemi	Manuscript, 2020	2015-2016	Sub Saharan Africa	Impact of ICT on agricultural productivity	ICT services have helped in rapid increase in crop productivity and improved standard of living of farmers
Ofori et al.	Manuscript, 2022	1980-2019	Sub Saharan Africa	ICT diffusion and inclusive growth in SSA countries	The study based on dynamic GMM model observed ICT usage, access and skills showed inclusive growth in SSA countries. Financial development has significant role in ICT usage and inclusive growth
Balogun et al	Manuscript, 2020	Not applicable	Sub Saharan Africa	Utilization of ICT among rural dwellers of SSA	Usage seen among rural dwellers, but more training and education need to be provided for effective usage of ICT
Metu et al	Manuscript, 2019	1991-2018	Sub Saharan Africa		Mobile phone usage reduced the unemployment

				Role of ICT in ending unemployment in SSA	whereas internet usage had no effect on employment. The ICT penetration needs to be more effective to reduce unemployment
Ofori and Asongu	Manuscript, 2022	1980-2019	Sub Saharan Africa	Role of ICT diffusion and FDI in inclusive growth in SSA	FDI and ICT diffusion induce inclusive growth. ICT skills are more effective in inclusive growth
Ofori et al	Manuscript, 2021	1980-2019	Sub Saharan Africa	Role of ICT and FDI in reducing poverty in SSA	ICT skills reduce the poverty in presence of enhanced financial development
Alimi et al	Manuscript, 2020	2004-2017	Sub Saharan Africa	ICT diffusion, financial inclusion, and poverty reduction in SSA	ICT diffusion reduces poverty in short run. However, ICT diffusion and financial inclusion are both needed to reduce poverty in long run
Kallal et al	Manuscript, 2020	1997-2015	Tunisia	ICT diffusion and economic growth	ICT diffusion has positive impact on economic growth in long term
Sassi and Ali	Manuscript, 2017	1996-2014	Africa	Corruption in Africa and role of ICT diffusion	Policies framed on using internet and mobile are effective in combating corruption in Africa
Adebowale and Chuks	Study,2020	2003-2017	Sub Saharan Africa	Impact of ICT on welfare in SSA	Mobile phone penetration and fixed broad band subscription has positive impact on welfare in SSA
Mramba	SLR,2020	Not applicable	Sub Saharan Africa	ICT for informal workers	There is no proper distribution of ICT among informal workers in SSA
Kalu	Manuscript, 2019	2000-2015			

			Eighty-nine countries across world	ICT diffusion and Government effectiveness	Long term orientation and ICT have positive effect on Government effectiveness
Myovella et al	Manuscript, 2019	2006-2016	Sub Saharan Africa	Digitalization and economic growth in SSA	Impact of mobile telecommunications is economic growth is higher in SSA and thus more approach must be done for the improvement of digitalization in SSA
Mbongo	Manuscript, 2019	1995-2015	Africa	ICT diffusion and employment in African countries	ICT diffusion helps in employment and in more in youth employment in Africa
Avom et al	Manuscript, 2020	1996-2014	Sub Saharan Africa	ICT diffusion and environmental quality	The use of ICT results in enhanced consumption of energy and carbon dioxide emissions
Evans	Manuscript, 2019	1995-2015	Sub Saharan Africa	Internet usage and economic well-being in SSA	Internet usage helps in economic well-being in both short and long term
Odhiambo	Manuscript, 2020	2004-2014	Sub Saharan Africa	ICT, economic growth, and income equality in SSA	ICT development leads to economic growth in SSA
Hundie& Tulu	Proceedings, 2022	Not applicable	Ethiopia	Financial inclusion and gender gap	Gender gap in financial inclusion is high and their multiple factors that control it
Owusu-Agyeyi et al	Manuscript, 2020	2000-2016	Sub Saharan Africa	Internet adoption and financial development in SSA	There is positive impact of internet adoption and financial development in SSA
Kponou	Paper, 2017	Not applicable	Africa	ICT diffusion and inequality in Africa	Inequality contributed to development of ICT in Africa
	Article, 2019	2007-2016			

Bahrinin and Qaffas			Developing countries	ICT diffusion and economic growth	Fixed telephone, mobile phone, broad band connections enhanced the economic growth
Asongu	Article, 2020	1980-2015	Sub Saharan Africa	Enhancing ICT for productivity in SSA	Enhancing ICT has positive effects on the productivity. Mobile penetration and internet penetration have significant role in this process
Asongu and Odhi-ambo	Manuscript, 2019	1980-2014	Sub Saharan Africa	ICT, FDI and economic growth in SSA	Internet and mobile phone penetration helps in enhancing FDI which improves the overall economic growth
Ghalayini et al	Manuscript, 2020	2000-2018	Multiple countries	ICT diffusion and economic growth	ICT capital plays a significant role in high income countries only
Andres et al	Manuscript, 2016	2000-2012	Sub Saharan Africa	ICT adoption and inclusive human development	ICT adoption effects development and is mediated by FDI
Breuer and Groschek	Manuscript, 2016	Not applicable	Urban Togo	Potential of ICT for development in SSA	Development of digital skills and ICT access play a significant role in development
Ofori and Asongu	Manuscript, 2021	1990-2020	Sub Saharan Africa	FDI, Governance and inclusive growth	FDI and Governance are inclusive growth enhancers in SSA
Asongu and Odi-ambho	Manuscript, 2018	2000-2012	Sub Saharan Africa	Education, ICT, and human development in SSA	Education quality is a mediating variable for ICT and human development in SSA
Andrianaivo and Kpodar	Manuscript, 2011	1998-2007	African countries	Impact of ICT on economic growth	ICT including mobile phone penetration help in economic growth
Cariolle	Manuscript, 2020	1990-2015	Sub Saharan Africa	Digital divide in SSA	Over the analysis period there has 3-5% increase in internet penetration in SSA

Solomon and Klyton	Manuscript, 2020	2012-2016	African countries	Role of ICT usage and economic growth	The ICT usage at individual and Government level has positive impact on economic growth
Aker and Mbiti	Review, 2010	Not applicable	African countries	Mobile phone usage and economic development in Africa	Mobile phone coverage has increased in SSA and has significant role in economic development
Guerriero	Report, 2015	2005-2014	Sub Saharan Africa	Internet connectivity and economic development in SSA	Internet connectivity is still at initial stages in SSA and needs development for fostering growth
Alshubiri et al	Manuscript, 2019	2000-2016	Gulf cooperation countries	Role of ICT in financial development	Fixed broadband has positive effect on financial development
Oluwatobi et al.,	Manuscript, 2018	1996-2012	Sub Saharan Africa	Knowledge capacity of SSA and its role in economic development	Elements of knowledge economy have impact on economic growth
Simplice and Sara Le	Manuscript, 2016	2000-2012	Sub Saharan Africa	Role of ICT In human inclusive development in SSA	Policies associated with ICT penetration will help enhancing economic development
Coffie et al	Manuscript, 2020	Not applicable	Sub Saharan Africa	Diffusion of Fintech payment by SME in SSA	Optimal design of Fintech payment services is needed
Albiman and Sulong	Manuscript, 2017	1990-2014	Sub Saharan Africa	ICT on economic growth	Fixed telephone lines have better impact on growth than mobile phones with mediation from income as a factor
David and Grobler	Manuscript, 2020	2000-2016	Africa	ICT penetration and economic growth	ICT penetration has positive impact on the growth and development
Simplice	Manuscript, 2021	2008-2018	Sub Saharan Africa	Asymmetric internet access and economic growth	There is positive effect of internet access on growth

					based on Government policies
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4.3 The nature and scope of the relationship between ICT dissemination and individual's well-being in SSA (RO 1)

Forty (40) of the fifty-three articles talk about ICT, and its role in economic growth. Most of these articles address the ICT dissemination, economic growth, and individual well-being in SSA. To elaborate further, in the studies conducted by Mapiye et al. (2021), Onyancha& Onyango (2020), Ajani (2014), Oyelami et al. (2022), Bakibinga-Gaswaga et al. (2020) the primary theme of these studies has been application of ICT in agriculture. However, a few of these articles takes a slightly broader perspective in the sense that it focuses on Africa and developing nations with low income which also include studies on SSA. For instance, in studies such as Albiman (2016) the primary theme of the study remained the role of ICT and economic growth in SSA, for Haftu (2018) the primary theme remained the impact of ICT GDP on SSA, while Mateko (2022) focuses on (primary theme was) ICT and poverty levels in SSA. Whereas in studies like Ofori et al. (2022) and Olayemi (2020) a broader perspective has been given in terms of the themes emphasized in these studies, wherein the focus has been given on the overall impact of ICT on agriculture and the growth of SSA countries. All the articles have one conclusion that ICT dissemination has a significant impact on economic growth. Two of the articles provide a good illustration of the typical nature of this argument. In the study conducted by Adam (2020), it has been opined that E-government development has accelerated across Africa, and these projects have been associated with decreased levels of corruption, which in turn impacts the lives of individuals positively. The study has stated that the growth of e-government affects the decline of corruption. According to the findings, there is a strong correlation between institutional quality, ICT development, and corruption as well as a link between e-government development and all three. All of this provided evidence that the growth of ICT had a negative impact on corruption. The results highlight the important roles institutional quality and ICT development play as

mediators of e-government impacts on corruption. In addition to that, it is essential that there should be internet skills taught to the public so that they are aware of using ICT. Similarly, the study conducted by Albiman&Sulong, (2016), highlighted the impact on economic growth due to internet access and the availability of mobile phones. The study shows that the internet and mobile phones directly boosted economic growth in the sense that fixed telephonic connections and mobile penetration had a significant impact on ICT dissemination and the subsequent well-being of individuals. Finally, the findings showed that the key growth-enhancing transmission channels of ICT usage in the economy, excluding financial development, were human capital, institutional quality, and domestic investment. Agriculture is one of the main occupations associated with SSA. The studies on ICT interlinking with agriculture also showed that technological advancement improves the quality of life of farmers and aids in agricultural productivity for instance, as observed in the study conducted by Olayemi (2020).

In context to financial development and growth due to ICT dissemination, the finding from the study conducted by Ofori et al. (2022) can also be mentioned in this context. Based on the findings from the study it has been noted that apart from population growth, all the controls are significant, which included economic globalization, vulnerable employment and inflation. It has further noted in this regard that vulnerable employment and inflation are damaging for the shared growth. It has also been noted in this regard that financial access and economic development are significant in enhancing inclusive growth. It has also been noted in this context that access to ICT skills and usage are statistically significant and positive. The estimation of the study also demonstrates that for every 1% improvement in ICT usage, access, and skills, enhancement in inclusive growth occurs by 0.06%, 0.08%, and 0.15%, respectively. The empirical evidence of the study, on unconditional impacts of ICT dissemination supports the claim that access to productive assets can result in formulating capacities and contribute to enhancing inclusive growth. Most importantly, the findings of the study provide with the evidence for the proposal that ICT dissemination can support the process of shared prosperity. Specifically, with the advancement of globalization in sub-

Saharan African region, along with implementation of the African Continental Free Trade Area, it has been stated in the study that ICT dissemination can support information dissemination, commercial connectivity, while further expanding the effectiveness of inbound open innovation in the sub-Saharan African region. In the opinion of the researchers, it would not only enhance the advancement of the human capital base required to meet the technical requirement of the region focusing on industrialization, but it would also result in emergence of the dynamic business class who has the ability of supplementing the efforts of policymakers in a realistic manner in formulating opportunities. It is furthermore supported by the fact that ICT dissemination can result in eliminating inequalities, discrimination regarding accessing information and high cost of accessing opportunities because of administrative procedure's polarization in SSA. It has been stated in this context that with increasing tech hubs in nations like South Africa, Kenya, Nigeria due to favorable ecosystems for startups in the form of good internet coverage, network and large markets, ICT usage, access and skills can boost inclusive growth through product development and ideation. Based on the findings of the study it has also been stated that with every 1% improvement in ICT access there is net effect of 0.246% considering the current average financial development in SSA. A similar result has been noted for impact of ICT skills and access and inclusive growth wherein it has been noted that for every 1% enhancement in ICT skills and access, increase in inclusive growth occurs by 0.13% and 0.09% respectively. Based on the mentioned findings from the above-mentioned findings of this study, it is further supported that ICT dissemination contributes to the well-being of individuals by promoting inclusive growth.

For the economic scenario of South Africa, agriculture plays an integral role in supporting food security, reducing poverty and economic growth in the region. In this context, regarding studies interlinking ICT with agriculture, the findings from the study conducted by Olayemi et al. (2020) is also mentionable here. The findings of the study, based on t-test revealed that "ICT Services Short Message (SMS text reminders)" have positive impact on the agricultural productivity of

smallholder farmers, which has been noted to have a significant impact on it. The findings of the study revealed that 52% of the respondents of the study, experienced drastic increase in the productivity of their crops along with enhanced living standard of farmer due to “ICT Services Short Message (SMS text reminders)”. Thus, findings of this study, clearly reveals the fact that ICT dissemination have significant positive impact on enhancing the individual wellbeing of individuals regarding agricultural productivity among smallholder farmers as well in sub-Saharan communities as well. In addition to the above-mentioned aspects, the findings of this study have also put forward the fact that ICT SMS text reminders is highly beneficial for majority of smallholder farmers, which is evident from the fact that 92% of the respondents in the study stated that ICT SMS text reminders are advantageous for them. The results of this study have also revealed that television, radio, and mobile phone are among the most available ICT devices to the small-holder farmers in Nigeria, wherein it has been noted that mobile phone and radio are the most readily available ICT devices, with 85.7% and 97% availability among the respondents. Based on the mentioned findings from the study, it is seeming to be evident that the dissemination of ICT devices in the region, have positively impacted in enhancing the wellbeing of individuals by promoting economic wellbeing.

4.4 Dimensions and characteristics of the instruments (RO 2)

The role of ICT in individual well-being and inclusive growth of the economy has been checked by multiple control and experimental variables in the study. The various variables that are considered for (measuring)ICT (dissemination)include internet penetration, mobile penetration, and fixed broadband connection (which has been) mentioned in the study conducted by Albiman&Sulong, (2016). In the study conducted by Bimber (2001) as well, it has been stated that regarding information technology and civic engagement, Internet technology has played a significant role in the technological revolution, which has contributed to public interest in the aspect of civic engagement.

In context to the role of ICT in employment of African countries, the finding of the study conducted by Metu et al. (2020) is also worth mentioning. The findings indicate that mobile phone subscriptions increase young employment in SSA. This suggests that increased young adult mobile phone use creates space for finding new enterprises and other possibilities in key economic areas, which in turn creates jobs for the region's young people. As a result, policymakers should anticipate that a percentage rise in mobile phone subscriptions will dramatically lower the rate of young unemployment in the SSA area by 0.72% (Metu et al., 2020). The researchers further states that it is significant to note that most African nations' reforms in the telecommunications industry over the past 20 years have drastically increased the number of jobs available to young people in SSA. For young people in SSA who use mobile phones, mobile phone subscriptions have significantly boosted access to and transmission of information. Young people can get and exchange information about employment availability, for instance, via mobile phones. Young people's unemployment rates in the SSA area are significantly impacted negatively by the ultra-modern internet connectivity components including broadband, Wi-Fi, and bandwidth. According to estimates, the broadband internet subscription will lower young unemployment rates by around 0.03% for every percentage increase in the area's broadband internet users. This suggests that the development of high-speed internet infrastructure, including digital subscriber lines (DSL), cable modems, and other related technologies, would help in the process of creating jobs for young people in the SSA area. It has also been noted in the study that with one percentage of increase in subscription in Wi-Fi internet would result in a 0.04% decrease in youth unemployment in the SSA region. It is indicative of the fact that elevated access to wireless network technology by the individuals of the SSA region would in turn result in reduced youth unemployment in the region. In addition to that, with the help of elevated access to internet bandwidth by the users of internet, the study stated that it is expected to bring approximately 0.07% reductions in the unemployment rate in the SSA region. Based on the findings of the study, the researchers opined that from a generic perspective, ICTs have resulted in significantly reducing unemployment among youths in the SSA region during the last two decades (Metu

et al., 2020). Due to the expansion and adoption of ICTs in the region, new businesses have been formulated which have resulted in providing opportunities of employment for the young population. In addition to that the use of ultra-modern internet facilities and mobile phone technologies have resulted in supporting quick access to information and its dissemination, providing scope for timely knowledge about availability of job to the youth of the regions along with the scope for discovery new opportunities of business.

A similar finding has been reported in the study conducted by Alimi and Okuade (2020). The findings of the Pooled Mean Group (PMG) reveal that financial inclusion (COM) decreases poverty over time by having a long-term, considerable beneficial impact on household consumption per capita. However, financial inclusion has had a significantly negative impact on poverty. This finding suggests that financial inclusion short-term affects poverty levels. Internet penetration (IP), which is used as a proxy for ICT dissemination, has a considerable beneficial impact on household spending per capita. This indicates that while internet penetration has a short-term negative impact, it has a long-term reduction in poverty. According to this finding, ICT dissemination as shown by internet penetration (IP) is a useful strategy for eradicating poverty in the SSA area. The result also demonstrates that household consumption per capita is favorably influenced by economic growth (GDP), demonstrating the importance of economic growth for both the short- and long-term reduction of poverty. The trickle-down hypothesis, which states that economic expansion is significant to eradicate poverty as long as income distribution in a particular nation remains constant, is supported by this finding of the study. Additionally, both over the short and long terms, inflation rate helps to reduce poverty. The error correction term's coefficient must be negative and substantial. Indicating the existence of a long-term link between financial inclusion, ICT dissemination, and poverty reduction, the estimate of the lagged error term (ECT) is negative (-0.43) and statistically significant at the 5% level (Alimi and Okuade, 2020).

The positive impacts of ICT on the economic wellbeing of individuals have also been documented in the study conducted by Kallal et al. (2021). The findings of the study reveal that the long-term impact of dissemination of information and communication technologies on economic growth is favorable (2.93%), but the short-term impact is strongly negative (-2.37%). This pattern may be explained by the original ICT investment's high fixed cost and the long-term, widespread economic expansion. In other words, ICT capital investment costs decrease as importance increases. ICT dissemination takes time to contribute to economic growth. One explanation might be the latency in the effects of ICT dissemination investments. The term "time lag effect" refers to this phenomenon (Kallal et al., 2021). The fact that Tunisia's infrastructure is not sufficiently developed to take advantage of ICT potential explains why ICT has a negative short-term impact on economic growth. In addition, the fact that ICT stimulates the activity of the many economic sectors through a variety of routes helps to explain the favorable long-term effect. The utilization of computer hardware, software, and communication tools enables the integration of ICT capital stock into the economy at elevated levels of ICT dissemination. Due to the mentioned aspect, different ICT will be used by different industries, including Internet access, computer technology, mobile Internet, landlines, processing power, cell phones, artificial intelligence, 3D printing, the Internet of Things, big data, or cloud technologies. ICT integration, for instance, will result in technologies with stronger telecommunications infrastructure for the financial services sector. ICT dissemination consequently changes the organizational structure of sectors, which are then distinguished by improved economic performance, higher productivity, lower costs, and more effective use of labor. The study also found that labor makes a favorable and substantial contribution to economic growth. This beneficial effect is demonstrated both in the short and long periods, as economic growth is more sensitive to labor in the long term (29%), compared to the short term (27%) (Kallal et al., 2021). The result provides support to the idea that ICT proliferation promotes labor productivity in both the short and long terms. The benefits of ICT on learning by doing and labor quality may be considered to explain this. Thus, based on the empirical findings, ICT capital has been noted to have a favorable effect on labor,

which can be explained by the fact that it improves human capital and keeps personnel's abilities up to date. In addition, as knowledge growth boosts labor productivity, workers may gain new skills and keep their current ones up to date by using ICT.

In context to positive impact of ICT dissemination on the wellbeing of individuals, the study conducted by Adebowale and Chuks (2020) can also be referred. The findings of the study reveal that penetration of mobile phones and broadband subscriptions significantly impacts and has positive influence on ISEW (Index of Sustainable Economic Welfare) per capita (WEF). It is clearly indicative of the fact that penetration of mobile phones and broadband subscriptions has a direct impact on the economic wellbeing of individuals. Furthermore, the findings of the study also reveals that the policy initiative formulated to boost ICT, observably contributed to mobile phone penetration, and fixing broadband, which is having the ability of enhancing the welfare level in Sub-Saharan Africa. In addition to the above-mentioned finding, in the study it has also been noted that certain control variables of the study are significant, which were identified to be trade openness and inflation, gross fixed capital formation, manufacturing value-added capital formation. The study also reveals that fixed broadband subscription has a statistically significant and positive impact on ISEW per capita (WEF). Furthermore, the study also revealed that manufacturing value added (MVA), trade openness (TOP) and fixed broadband (FBB) have significantly positive impact on WEF. The results from this study based on varied estimation techniques demonstrated that there is evidence of positive impact of fixed broadband subscription and mobile phone penetration on WEF which has been evaluated by Index of Sustainable Economic Welfare (ISEW) per capita. The implication of the finding of this study is that information and communication technology penetration have a pivotal role to play in impacting the level sustainable welfare in the region of sub-Saharan Africa. Hence, based on the findings from this study, it can be inferred that with the enhancement of level of ICT penetration in the continent, the level of awareness in the region would also be enhanced. The results can be explained by ICT's ability to minimize information asymmetry in the system and transaction cost.

Higher internet facilities and mobile phone access helps in ascertaining that individuals acquire more information at a reduced cost which in turn allows them rationalized choices in their buying and selling activities. The researchers also opined in this regard that the ability of ICT to fill the gap of information between the potential employer and job seekers also helps in enhancing the standard of living of individuals, which attributes in the above discussed impact of ICT. The integration of the above-mentioned elements contributes to the positive impact of welfare of ICT.

Thus, based on the findings from the above-discussed studies, it can be inferred that economic growth in a nation is considered on the basis of Foreign Direct Investment (FDI), Government expenditure, total income based on the investments and return on investment. Herein, ICT helps in bridging the gap between the investors, fund seekers, employers and employees, thereby increasing the economic productivity of a nation.

Can you make a summary comment (one sentence) about the focus of methods: generally, on individual well-being or broader?? – given that your study focuses on well-being

4.5 Mediating factors (RO 3)

Studies included in the analysis identified several mediating factors in terms of the relationship between technological dissemination and individual well-being. Age is considered a typical mediating factor. Quality of education has an important role in identifying ICT skills and is therefore considered as a mediating factor for inclusive growth (Asangu& Odhiambo, 2019). Government policies related to ICT establishment and dissemination have also been identified as a mediating factor which was considered in the studies.

Variables included in the study to determine the experimental variables for the study include Growth in GDP, employment, ICT usage, access, and skills. Social inclusion, CO2, Energy, Internet usage, penetration, Mobile usage, Expenditure,

Fixed Broadband, Broadband Subscriptions, Financial Development, Education, and Youth employment.

4.6 Approach to Meta-analysis

Meta analysis is a systematic and formal method by which a quantitative summary of the previous research observations is provided. The conclusions from meta-analysis are based on the data extraction and subsequent generation of forest plots with various statistical observations. Thus, meta-analysis is a very novel way of summarising the existing observations in the literature. The various papers that have been selected were analysed in terms of data available to perform the meta-analysis. The meta-analysis was performed based on the data extracted from those papers that included the datasets. Of the 52 references, eight references had relevant information that could be used for data extraction and meta-analysis. The summary of eight papers that have been used for meta-analysis along with the characteristics of the studies is presented in Table 4. It is worth mentioning here that in order to perform the meta-analysis RevMan software has been used in the study. Funnel plots or forest plots are generated by the software. It is based on the data extracted from the selected articles using the software that forest plots are generated that are either in support or against the experiment conditions. Details associated with the software along with its functioning are available online for RevMan which can be accessed from the Google [<https://training.cochrane.org/online-learning/core-software/revman>].

Table 4: Study Characteristics of the Selected References Used for Meta-Analysis

Title	Author	Year	Problem state- ment	Methodology	Major observation
ICT and environmental quality in Sub-Saharan Africa: Effects and transmission channels	Avom et al	2020	Relationship between ICT and environmental quality in SSA	Extended Stochastic Impact by Regression on Population, Affluence and Technology model to understand the impact of ICT	ICT has significant impact on economic development but worsens environmental quality
Digitalization and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies	Godwin et al	2019	Contribution of digitalization in economic growth in SSA	A panel dataset of 11 years was analysed using GMM estimators	Digitalization has positive impact on economic growth
ICT diffusion and employment in Africa	Louis de BerquinEyikeMbongo	2019	Impact of rapid ICT diffusion and its role in employment	A dynamic panel model using GMM method on 20 African countries from 1995-2015	ICT diffusion favours youth employment
ICT Diffusion, Foreign Direct Investment, and inclusive Growth in Sub-Saharan Africa	Ofori &Asongu	2021	Role of ICT diffusion and FDI on inclusive growth in SSA	A dynamic panel model using GMM method in SSA from 1980-2019	ICT skills are effective in driving the inclusive growth and FDI modulates the process
Addressing the severity and intensity of poverty in Sub-Saharan Africa: how relevant is the ICT and financial development pathway?	Ofori et al	2021	ICT diffusion and financial development and its role in reducing poverty in SSA	A dynamic panel model using GMM method in SSA using data from 1980-2019	ICT skills reduce poverty however the effect is mediated by financial development
Information technology, Income inequality and economic growth in sub-Saharan African countries	Nicholas M. Odhiambo	2022	Dynamic relationship between ICT, income inequality and economic growth in SSA countries is examined	GMM estimation technique was used to examine data between 2004-2014	ICT development leads to increased economic growth

Foreign direct investment, information technology and economic growth dynamics in Sub-Saharan Africa	Asongu& Odhiambo, 2019	2019	ICT modulation of FDI and economic growth in SSA	GMM method was used for estimation of data between 1980-2014	ICT penetration modulated FDI to induce positive effect on the economic growth
The impact of digital technology usage on economic growth in Africa	Solomon &Klyton	2020	Impact of digital technology on economic growth	GMM estimator to analyse data between 2012 to 2016	Digital technology facilitates growth

4.7 Meta Analysis Data & Interpretation

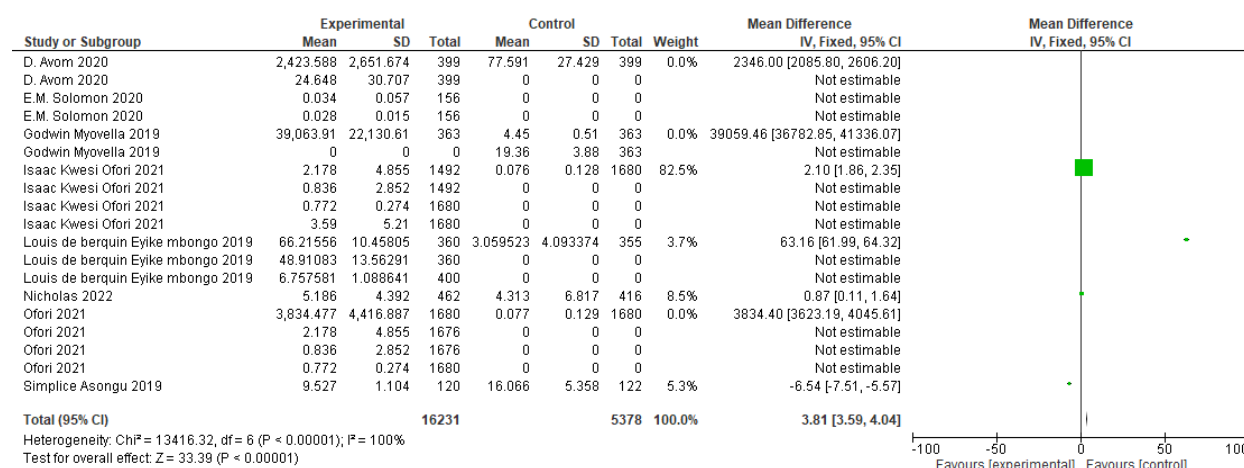
For the present meta-analysis only research objective 1 and 3 have been considered given the availability of quantitative data in the selected articles.

Research objective 1

Explore the nature and scope of empirical studies aimed at exploring the relationship between ICT dissemination and individuals' economic well-being in SSA.

In this context, the forest plot has been deployed in the study, which is a graphical display of estimated results from the chosen studies wherein the questions addressed in the research are focused along with the overall results. The forest plot generated is shown in Fig 8. The plot was generated from the outlined studies in Table 4.

Figure 9: Forest Plot for ICT Dissemination and Individual's Economic Well-being in SSA



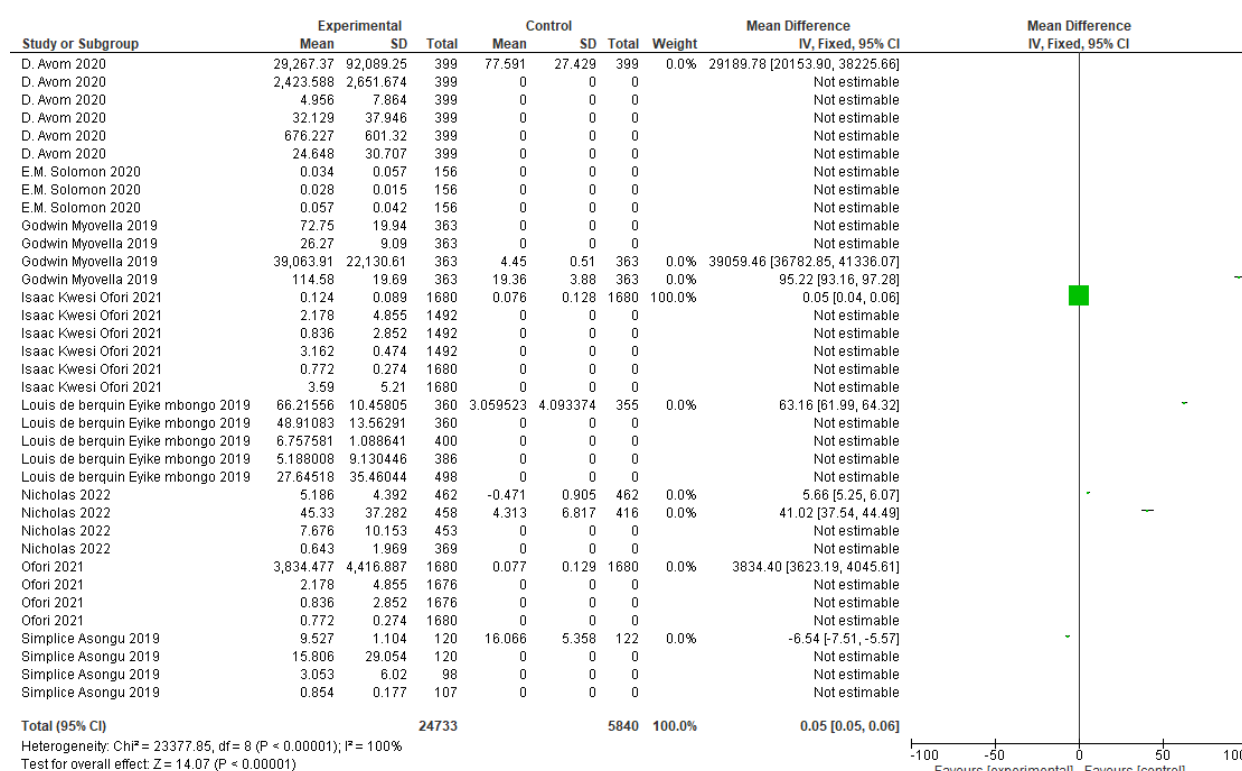
The forest plot depicted has control and experimental variables. The depiction of the plot is to see if it is favouring control, or it is favouring experimental assessment. It also has various statistical parameters highlighted such that the significance of overall observations can be obtained (Seth, 2019). The experimental variables for this study included GDP, growth in GDP, Growth in

Employment, ICT access, usage, skills and financial development. As instance, in the study conducted by **Haftu (2018)**, the variables of the study were the impact of mobile phones and the internet, and GDP per capita. for the analysis included openness/ trade, Government expenditure and financial deepening. The forest plot analysis shows a mean difference of 3.81 which is favouring control variables more than experimental variables. The P value for the analysis was less than 0.0001, making it statistically significant. The analysis is favouring control variables which in turn are governed by the experimental variables. Control variables considered for the analysis are indicators of economic well-being. ICT dissemination leads to an increased impact on government expenditure which in turn has a positive impact on individual economic well-being. Thus, the various control variables serve as factors that affect the dissemination of ICT and individual economic well-being in SSA.

Research objective 3

Explore potential factors that mediate the relationship between ICT dissemination and individuals' economic well-being. The forest plot generated is shown in Fig 10. The plot was generated from the outlined studies in Table 4.

Figure 10: Forest Plot of Factors That Mediate Relationship Between ICT Dissemination and Individuals' Economic Well-being in SSA



The experimental variables for the study include Growth in GDP, employment, ICT usage, access, skills. Social inclusion, CO2, Energy, Internet usage, penetration, Mobile usage, Expenditure, Fixed Broadband, Broadband Subscriptions, Financial Development, Education, and Youth employment. The control variables include Openness/ trade, Political Stability, Remittance, Investment, Government, Financial Deepening, Financial access, and Government Consumption. The P value was less than 0.0001 which shows that the results are statistically significant. The findings from the forest plot for the mentioned experimental variables, which is the P value of less than 0.0001 is an

indicative of the fact that the mentioned factors are positively correlated with the economic wellbeing of individuals in South Africa. As instance, in the studies conducted by Evans (2019), Odhiambo (2020), Owusu-Ageyi et al. (2020) it has been revealed that the inclusion of ICT usage, contributes to income equality and economic growth in SSA, and financial development. Similarly, in the study conducted by Oyelami et al. (2022), the findings of the study revealed that beyond country-specific study, based on the estimates it has been noted that the provision of ICT infrastructure guarantee elevated usage and access of ICT products which have positive impact on the performance of the agricultural sector in SSA in the long run. In this alignment on considering the study conducted by Haftu (2019) it can be noted that the findings of the study clearly reveal that due to the increased penetration of mobile phone major contributions to the GDP per capita of SSA has been noted. It has also been noted in this study that an increase of 10% in mobile phone penetration has resulted in 1.2% change in GDP per capita in this region. In addition to that in the study conducted by Metu et al. (2020), regarding the factors that mediate relationship between ICT dissemination and economic wellbeing of individuals, it has been revealed that there is a reverse relationship between unemployment and economic growth rate. In the opinion of the researchers, it is implication of the fact that in SSA nations, the economic growth can function as a means for eliminating unemployment among the youth population in the region. Furthermore, the findings of the study reveal that Youth unemployment in SSA is positively but insignificantly impacted by trade openness. The fact that SSA nations are mostly import dependent and frequently import more than they export may be the cause of the encouraging trend. In addition, the outcome demonstrates that education level has a negative and substantial influence on adolescent unemployment in SSA. This suggests that educated youths are more likely than uneducated young to have productive work.).

In context to ICT dissemination and economic wellbeing of individuals, the study conducted by Mramba et al. (2017) focused on the impact of ICT dissemination on informal workers in sub-Saharan Africa. On analysing the impact of ICT

dissemination on informal workers, the researchers noted that majority of the solutions being provided to informal workers focuses on the challenges being faced by small scale farmers, which includes farming education, market access, farm management, whether conditions business finance, mobile money, education, and networking. The review in this study also noted that small scale farmers find various ICT projects to be helpful in overcoming their various challenges. It has been categorized to market marketing information, education, recordkeeping, weather information, insurance services, veterinary care, and medications. In context to money mobile, with the help of ICT, the informal workers can withdraw and save money, reduce transitional costs, and earn interest on savings, access loan and solar power, send and receive money. In business finance, the ICT projects have been identified to enable the informal workers to perform accounting, financial recording, and bookkeeping. Based on the findings of the study, the researchers also inferred that with drastic growth of ICT across the globe, the potential to transform the informal sector has also evolved with increasing competitiveness, increasing growth and sustainability with the help of cost reduction, better market access and increased opportunities of businesses. It has also been stated based on the review of existing literatures in this study that in Africa, among informal workers mobile phones have been a popular tool the reason for which has been wide access, lower costs, availability, and affordability of mobile phones. The cell phone has allowed for chances for social and economic growth throughout Africa faster compared to any other invention in the past. The results demonstrate that many ICT programmes for the informal workforce are mobile phone compatible. These include phone calls, SMS, USSD, mobile applications, and mobile websites. The findings confirm earlier study that indicated cell phones to be widely used among Africans. Accessibility, availability, and price are factors that influence mobile phone choice. Since most informal labourers are low wage earners, they can only afford to purchase entry level mobile phones and not smartphones or laptops. A number of applications have been developed, according to the report, to help small farmers in Africa. These have been divided into the following categories: recordkeeping, market and marketing information, veterinary care and medicine,

education, weather data, and insurance services. The ICT initiatives for small-scale farming that have been found make use of a range of technology tools, including voice calls, SMS, mobile applications, websites, solar power, FM radio, USSD, and cloud computing. Through effective information flow, networking of farmers with insurance, auction, important stakeholders, marketplace, farming management, weather updates, disease prevention, marketing information, education, record keeping, and advisory services, developed technologies have improved the performance of small-scale farmers. The research reveals a number of mobile money services useful to informal workers. These include utility payments, solar energy, savings, remittances, and credit. These services are crucial since bank saving practises vary widely across various African nations. Less than 11% of people in Ethiopia, Tanzania, and Nigeria have bank accounts, making it risky to save money. The results imply that small and micro informal firms have challenges due to the costs connected with mobile money, notwithstanding its significance. Like this, the credit and loans provided by mobile money businesses must be returned in a short amount of time (one month), which puts informal workers at danger, especially when the production takes longer than a month. In context to business finance, it has also been revealed through this study that informal workers lack systematic strategies, procedures, and structures for business finance. The financial monitoring, plan and evaluation are done intuitively for the informal workers, and they are unable to access credit from formal financial institutions. The ICT solutions that have been identified through this study for business finance of informal workers enables users to keep getting business education, keep records of business finance, financial reporting, accounting, financial decisions, cash management, and financial decisions. These applications provide with the scope to overcome the challenges of inadequate record keeping which is usually noted among informal workers.

4.8 Conclusion

Thus, in this chapter of the study, the various findings from the existing body of literatures have been analysed and discussed in alignment with the objectives of the study. In the analysed studies, it has been noted that according to majority of the researchers in this arena, ICT dissemination has been noted to be positively associated with the economic well-being of individuals in SSA. It has been identified to reduce the gap of information and thereby promote employment and economic wellbeing of individuals.

CHAPTER 5: DISCUSSION OF THE INCLUDED STUDIES FOR META-ANALYSIS AND RELATED RESULTS

5.1 Introduction

Digitalization involves extensive connectivity through information and technology portals. Digitalization helps in revolutionising the way people communicate and firms operate. Based on the previous findings it has been demonstrated that digital communication may act as a driving force for the development of the economy. There is a tremendous impact digital strategies have in generating new opportunities and in driving the overall social and economic perspective. The present study aims to understand the role of ICT and its dissemination in individual and economic well-being in SSA. The various studies that have been used for meta-analysis will be discussed in detail in this section.

5.2 RO 1

The meta-analysis done based on the papers and their subsequent discussion shows that ICT dissemination has a significant role in the overall development of the economy. There is evidence that more physical capital accumulation, lower levels of corruption, and greater economic growth can all help to reduce youth unemployment in Africa. 41 countries analysed by SSA show that digitalization has a positive impact on economic growth irrespective of countries' developmental levels. Internet penetration has a positive impact on development in both SSA and OECD countries. However, the impact is not prominent in SSA due to the lack of internet infrastructure in these nations. ICT dissemination, financial development and poverty are intricately linked. Sustainable livelihood depends upon the dissemination of ICT and its help in making vulnerable groups acquire skills that could help overall development. ICTs have been used extensively in helping poor countries to improve their resources and in overall development. Thus, understanding the role of ICT in financial development and in poverty reduction was analyzed by collecting data for 20 years in SSA. The

study has shown that ICT dissemination helps in the reduction of poverty, however this is dependent on the financial stability of the system. Financial development and access to finance both would help in effective ICT dissemination which could result in better employment opportunities. Thus, in conclusion, the study observed that in the presence of an extraordinarily strong financial sector, ICT could help in the rapid development of SSA countries and reduce poverty significantly. Among the various ICT aspects analyzed like in previous studies ICT skills are the major contributing factor in financial development and access which could in turn help in reducing poverty. Thus, ICT and finance are effective channels that could be used for improving the livelihood in SSA. Government policies should be related to these two channels for effective growth and economic improvement in SSA (Ofori et al., 2021).

5.3 RO 2

ICT dissemination measures by variables such as internet penetration, mobile penetration and broadband connectivity have links to the overall usage of ICT. The use of ICTs to spread knowledge on skill development can help young people actively consider their career goals or drive to expand their career capabilities to prevent being shut out of the labor market and contribute to the workplace. Based on the findings from previously conducted studies it can also be inferred that higher ICT deployment and usage can lower young unemployment in Africa.

ICT in particular internet and mobile phone technologies helps in economic prosperity. This fact has been established in many of the developed countries. In developing countries, the use of ICT and its penetration into economic infrastructure could help in overall economic development. In SSA though growth has been seen there is a digital divide which makes it difficult for presenting proper economic development. A comparison of SSA with OECD countries has been done to understand the extent of digitalization and its impact on economic growth and prosperity. The analysis of available data in this study has shown the results of ICT dissemination and its role in improving society. ICT penetration and

trade openness have a positive relationship. The penetration of ICT helps in better trade options. However, in SSA nations the Government has not supported enough penetration of ICT which has resulted in a lack of trade openness. There should be more Government policies which should encourage the same such that there is more development seen (Godwin et al., 2019).

The role of ICT in overall employment in various African countries has been investigated by collecting data from 20 African countries over a period of 20 years (Louis de BerquinEyikeMbongo, 2019). Louis de BerquinEyikeMbongo, 2019 state that existing studies have shown that there is a positive impact of ICT on the employment of youth. The idea of the study was to understand the skill bi-ased technology change and its relationship with driving the overall development. Using a linear model for the panel data that has been generated along with GMM and fixed effects as estimators, the study observed that ICT dissemination in African countries leads to enhanced employment. With the use of GMM estimators, it was further seen that there is an inverse relationship between ICT dissemination and youth employment. The variables considered in ICT dissemination such as variable mobile phones have significant effects. Similarly, internet penetration also has a significant effect. Thus, digital technologies play a key role in employment in Africa. Thus, Governments could enhance the overall ICT infrastructure such that it could drive youth employment (Louis de BerquinEyikeMbongo, 2019).

ICT dissemination, foreign direct investment (FDI) and the growth of the economy are all interlinked and play a key role in substantial development. As per the modernization theory, FDI contributes to the development of a country by improving technology transfer, enhancing employment, and linking the economy Janos, (Webster, 1990). ICT dissemination and inclusive growth are interrelated with a sustainable livelihood. To understand the role of ICT in terms of access, usage and skills was conducted to check the joint effect of ICT and FDI on growth in SSA. The data analyzed in the study showed that both ICT and FDI help in inclusive growth in SSA. The higher dissemination of ICT helps in more

pronounced growth by FDI. Among the three parameters of ICT evaluated, which include access, skills, and usage ICT skills have a significant effect on inclusive growth in SSA. There is a direct modulation of ICT by FDI which in turn fosters inclusive growth. Thus, fostering ICT skills in SSA could help in better dissemination with the overall improvement in FDI that could be channelized for inclusive growth (Ofori & Asongu, 2021).

ICT dissemination and economic growth have been well documented. However, income inequality which is associated with individual well-being has not been discussed much. A study was conducted to understand the relationship between ICT dissemination, economic growth, and income inequality. Higher income inequality has distinctive negative effects. Higher income inequality is detrimental to economic growth, causing political instability and social unrest. The direct correlation between ICT dissemination and income inequality has been addressed in the study being discussed (Asangu & Odhiambo, 2019). With the help of GMM estimators, the study found that ICT leads to an increase in overall economic growth. ICT based increase in economic growth was found to be dependent on mobile phone penetration, internet penetration and broadband subscriptions. Fixed broadband subscriptions had the maximum impact on economic growth when compared to the other two. The ICT effect on economic growth tends to become negative over and above specific income inequality. Thus, there is a fixed effect of income inequality which needs to be considered while framing policies for ICT infrastructure which helps in economic growth. The SSA has very high-income inequality and hence the policies framed with ICT dissemination and growth needed to be formulated based on this aspect. Any Government decision and its later implementation need to consider income inequality so that it would not affect the overall economic growth of the region (Nicholas M. Odhiambo, 2020).

To understand and ascertain the role of ICT dissemination further a study was done to evaluate the link between ICT, FDI and Economic growth in SSA

(Asangu & Odhiambo, 2019). In this study, ICT based modulation of FDI and its impact on economic development were monitored for 25 SSA countries. The data extracted between 1980-2014 was used for the study. Economic growth was measured in terms of GDP, GDP per capita and ICT was measured in terms of mobile penetration, and internet penetration. Using GMM estimators, the study found that both internet and mobile penetration modulate FDI and positively enhance the countries' overall economic growth. However, the positive effects were more consistent in internet associated analysis than in mobile phone related analysis. Based on the study it could be concluded that ICT has relevance in improving the overall FDI. A good ICT infrastructure helps in better foreign investment resulting in economic prosperity. The overall ICT, FDI and economic growth depend on other factors such as population, education, government expenditure and economic growth amongst the population. Thus, while framing policies for integrating ICT into the system such that there is an overall positive effect Government needs to consider the numerous factors to achieve overall growth (Asangu & Odhiambo, 2019).

The role of digitalization in the overall development of 39 African countries was studied (Solomon & Klyton, 2020). In the study individual usage of ICT, business usage of ICT, and the importance of ICT to Government vision were checked for understanding the overall development. The study observing the control variables related to rules pertaining to ICT, tertiary education and FDI are insignificant with respect to economic growth. The various variables associated with business usage of ICT also had no significant effect on growth and development. The results indicated that of the various categories that have been checked individual usage of ICT had a positive association with growth. The importance of ICT to Government vision also had a significant effect on GDP growth. When ICT usage was further broken down into individual components the usage of social media usage and the usage of ICT by Government organizations served as key indicators for economic development. The effects of ICT could be easily observed by employing skilled labor and having an ICT policy enabled setup. Thus, investment in human capital is an important aspect for

consideration for ICT based economic growth. Governments in African countries should consider these aspects while framing policies and should encourage mobile phone penetration so that there is extensive learning and digitalization. Thus, an unobstructed vision of ICT by the Government could help in utilizing ICT and foster a competitive environment. Such implementation strategies by Governments would help enhance overall economic growth (Solomon & Klyton,2020).

Various studies have observed that ICT skills play an important role since having such skills increases employment which subsequently helps in economic growth. Studies have shown how ICTs are used, the digital divide, and how well these interventions work for young people. There is evidence that education increases the use of ICT's potential to lower young unemployment as well.

5.4 RO 3

The study's findings revealed a number of ICT initiatives for enhancing business relationships between informal workers and their primary stakeholders, such as clients. By connecting with consumers, suppliers, producers, marketplaces, sellers, and buyers, the identified applications help the informal workers save costs, boost customer happiness, and enable greater business access. The study's conclusions demonstrate that most company finance apps use online, mobile, SMS, and mapping technologies. The findings of the research demonstrate that SMS, digital storytelling, e-novels, and social networks are all common ways for informal workers to obtain education. These programmes allow informal workers to document issues or queries they are having with their projects and transmit them to extension staff for assistance. The currently available alternatives also give informal workers the chance to discuss their difficulties and concerns with their colleagues and obtain guidance and answers. These findings conform and align with the findings derived with the help of the forest plot for this objective three. Thus, based on the findings from this study, the researchers have opined that enhancing access to mobile phones plays an

integral role in reducing the level of poverty of the region by elevating per capita income of the population.

5.5 Summary of Discussion

Based on the findings from the studies, it can be inferred that through information and technology portals, digitalization implies widespread interconnectedness. The way individuals interact, and businesses run has been revolutionised because of digitalization. It is having been well established with the help of the findings of the studies that the growth of the economy has been fuelled by the rise of digital communication. Digital strategies have a significant influence on the creation of new possibilities and the general direction of the social and economic viewpoint. Internet and mobile phone technology, specifically, have been observed to support developing economies. In many of the industrialised nations, this fact has been proved. ICT adoption and integration into the economy in emerging nations may contribute to broader economic growth. Even though SSA has witnessed progress, the digital divide makes it impossible to portray meaningful economic development. Data from 20 African nations were collected over a 20-year period in order to study the influence of ICT on overall employment in different African countries. Studies already considered for the SLR have demonstrated that ICT has a favourable effect on young people's employment. Digital technologies thus have been observed to have a significant impact on employment in Africa. ICT adoption, FDI, and economic expansion are all interconnected and have a significant role in substantive development. ICT adoption, financial growth, and poverty are all interconnected. The spread of ICT and its role in assisting disadvantaged populations in learning skills that might aid in overall development are essential for sustainable livelihood. Economic expansion and ICT dissemination have a long history. The study's findings support the idea that ICT is important for enhancing FDI. A strong ICT infrastructure encourages better foreign investment, which promotes economic growth.

In alignment with the above-mentioned findings, if the Correspondence Fields Model (Helsper, 2021) on digital inequalities is taken into consideration it can be opined that, for the purpose of ascertaining dissemination of ICT in SSA and promote economic wellbeing of individuals, accessibility to internet for the people of this region is required. In addition to emphasizing on expanding internet connectivity in this region, focus is required to be given on increasing their awareness about it and related technologies which would in turn ensure that the people of these region can avail the optimum benefits from ICT and improve their economic wellbeing.

CHAPTER 6: RECOMMENDATIONS

6.1 Introduction

The current study focused on analyzing the association between ICT dissemination and economic wellbeing of individuals in the SSA region. For this purpose, in the current study systematic literature review has been conducted for the purpose of analyzing the association between ITC dissemination and economic wellbeing of individuals. In this chapter of the study, a brief summary of the findings from the study in alignment with the objectives of the study, recommendations and limitations associated with the current study would be discussed.

6.2 Conclusions related to RO1.

Based on the studies considered for the study, it has been noted that the majority of the studies emphasize the role of ICT in economic growth. In the majority of these considered studies, it has been mentioned that ICT dissemination has a positive association with economic growth and individual wellbeing in SSA. In a considerable number of studies included in this study, the implementation of ICT dissemination in agriculture has been emphasized, considering the significance of agriculture for SSA. It also helps in promoting industrialization by helping dissemination of information, which also supports economic wellbeing of individuals in the region. The findings of the study have revealed that dissemination of ICT has a major positive impact on the individual wellbeing of individuals associated with agricultural productivity. Thus, on the basis of the findings of the studies considered for the study, it can be stated that ICT dissemination in the region seems to have positive impact on improving the wellbeing of individuals by developing their economic wellbeing.

6.3 Conclusions related to RO 2

On the basis of the findings from the studies considered for the SLR, it can be inferred that ICT contributes to bridging the gap between fund seekers, investors, employers and employees, which in turn has a positive impact on the economy of the nation. FDI, total income based on the investments and return on investment, Government expenditure has been identified in the majority of the studies as to be indicators for economic growth in a nation. Instruments and its characteristics used in these studies include the following: The economic growth was considered based on Foreign Direct Investment (FDI), Government expenditure, total income based on the investments and return on investment. Individual well-being was assessed based on Gross Domestic Product (GDP) and per capita income. All the studies have considered and utilized mostly generalized method of moments (GMM) based fixed model or dynamic model-based effects for assessing the correlation between ICT and various variables. All the studies used at least 10 years of analysis and in most cases, it was for a period of at least 16-19 years. Thus, studies use different approaches, though demonstrate several similarities.

6.4 Conclusions related to RO 3

Based on the studies considered for the analysis in this study, it has been identified that there are various mediating factors in the association between individual well-being and technological dissemination. Age, quality of education, and government policies related to ICT development and dissemination has been identified through these studies to have major mediating role in identifying ICT skills and inclusive growth. In accordance with the considered studies, it has also been revealed that improving the accessibility to mobile phones plays a pivotal role in improving the economic wellbeing of individuals in the region.

6.5 Recommendations

6.5.1 Integrating and developing ICT at the educational level.

Regarding the current study, it has been noted that the quality of education plays a significant role in recognizing ICT skills and hence it is considered as a mediating factor when it comes to inclusive growth. For preventing the crisis associated with ICT dissemination and skills, ensuring developing ICT skills in the educational system of the nation is essential. The initial step in the process is to integrate ICT into teaching practices. It has been noted in previously conducted studies that ICT use in the absence of integration with a pedagogical method can result in providing worse results as compared to not using ICT at all (World Bank, 2023). In the Digital Skills: The Why, the What and the How published by the World Bank, they give 5 examples on how education should be reformed in order to integrate the development of ICT schools in education. They are enable all students to acquire intermediate level digital skills (programs at ISCED level 4, 5, and 6), reform advanced level digital skills programs at Undergraduate level (programs at ISCED level 6), reform highly specialized digital skills programs at postgraduate level (programs at ISCED Level 7), reform TVET level courses for ICT Professions (programs at ISCED Level 4, Intermediate level skills), rapid skilling programs (in institutions offering programs at ISCED level 4-6) (World Bank, 2023). Craffert et al (2023) go on to state that the basic education sector should concentrate on the development of digital skills up to an intermediate level for all learners and that digital skills proficiency level for access to the world of work (work readiness) implies the development of intermediate digital skills by learners in the upper secondary school and students in technical vocational and undergraduate non-ICT programs,

It is indicative of the fact that it is essential to disseminate and develop efficacious innovative methods wherein the goal is to make them a standard practice. It is required to scaffold ICT integration in education, which incorporates actors at various levels. In this regard, one of the major actors in the process is teachers. Digital technologies are constantly changing, and it poses fundamental

challenges for teachers who are trying for integrating them in the teaching process. Hence, professional development is required on the part of teachers for getting an understanding about the constraints and affordance associated with relevant technologies. It has been demonstrated that instructors' ability to adapt their teaching practises successfully depends on both their personal and collective capabilities. The term "capacity" describes a complicated concoction/combination? of infrastructure of support, organisational circumstances, and culture, as well as motivation, skill, and positive development. Based on these abilities, organised professional social networks, also known as "Professional development Communities (PLC)," enables individuals to critically and collectively analyse their practise in a way that is focused on professional development.

It is also mentionable in this context that integration of ICT in the educational system also requires activities at district / municipality levels and at school. The success of innovation is based on the way in which changes get managed, particularly the balance between joint participation and leadership in the innovation process. In this context, teachers can develop individually regarding their professional skills and proficiencies, however, to make largescale use of efficacious ICT-supported teach methods it is required to find ways of disseminating them and lead the process of change. The leadership on the part of principals can be taken into consideration in this process which has been observed in previously conducted studies to have direct effect on the technology initiative success. It has also been noted in previously conducted studies that school's organizational structures directly impact the possibility of teachers to develop and adopt new competence. In this regard it has been noted that it is the distinction between the internal and external factors which results in some teachers integrating ICT in teaching practice and other teachers to not integrating it. For integrated use of ICT, elevated demands on ways of instructing students by the teachers, classroom culture, along with the adaptability to new conditions, is placed. Change and effective integration requires belief on the part of teachers that proposed new methods will bring improvements. Thus, for the purpose of

effective integration and developing ICT at the educational level, apart from the professional development of the teachers, effective leadership, classroom culture, appropriate ways of instructing student, adaptability to change and support on the part of the school's principals is required, which would encourage developing ICT skills and effectively integrating it at the educational level.

6.5.2 Monitoring the use of ICT in schools to enhance inform education policies.

Particularly in developing nations, reliable data from school-based surveys can offer the quality ICT use data needed to better guide education policy and practices. A representation of what is offered and used by learners as well as educators will be more accurate if the complex collection of elements involved is captured. This includes data on the accessibility of digital infrastructure, the speed of internet connections, the educational activities in which teachers use ICT, the training that teachers receive to enable them to incorporate ICT into their practices, the strategies used by schools to foster digital literacy, and the opinions of principals and teachers regarding ICT use in education and its challenges.

In addition to the above-mentioned factors, schools must provide students with the knowledge and abilities necessary to transition to these online learning environments in order to promote remote education. Government spending on assisting students in the early grades of school is also necessary to address the "digital divide." In this undertaking, the first stage is to identify the areas inside and across nations that require the most investment. For this, access to and utilization of digital technology in schools must be adequately measured.

6.5.3 Increased Connectivity

In order to the effective implementation of the above-mentioned strategy for enhancing dissemination of ICT, increasing the connectivity is highly integral. Approximately forty five percent of homes worldwide lack internet connectivity, according to UNESCO. According to UNICEF research, 1.3 billion children between the ages of three and seventeen do not have access to the internet at

home. This is equivalent to over two thirds of all school age children worldwide. The digital gap was more obvious than ever during the COVID-19 epidemic. As already mentioned in the study, it is also the scenario in Sub Saharan Africa. Lack of connectivity made remote learning challenging for pupils as millions of schools and professions migrated online. Adults who were unable to physically execute their occupations were frequently let go or had their hours shortened. Increasing connection across all communities is a key strategy for closing the digital gap. Increasing internet accessibility can enable individuals who were previously unconnected to benefit from business and educational possibilities. Having access to computers can promote greater connectedness. Strong, futureproof architecture as well as unrestricted broadband access are crucial. Governments and organizations may link as many people as possible to the digital world by making these investments.

It is worth mentioning here that to bridge the technology divide in South Africa, the private sector must execute a crucial role. Large technological corporations have already stepped up, including IBM, Google, and Microsoft. For instance, Google's "Africa Online Safety Fund" addresses online safety issues, while Microsoft's "Skills for Africa" program assists in delivering digital skills development to young Africans across the region. Local businesses including Vodacom, MTN, and Telkom have contributed significantly to increasing access to mobile broadband and low-cost handsets.

The South African government, on the other hand, has initiated various programs to bridge the digital gap. Through initiatives like the "Broadband Infrastructure Project, the Department of Communications and Digital Technologies" is attempting to enhance internet connectivity in underserved regions. To create policies to facilitate the nation's digital transformation, the government has established the "Presidential Commission on the Fourth Industrial Revolution." Through the distribution of free Android smartphones, Vodacom, the company's principal African brand, will make mobile services available to hundreds of individuals in 11 communities around South Africa's Limpopo region. Vodacom

and Google South Africa have partnered on the project as part of their ongoing efforts to close the digital gap. Residents will be able to communicate with close one another and increase their communication, as well as access information and services that promote health and education. Access to mobile services is essential for assisting residents in improving their economic chances. The initiative also includes providing basic digital skill training to guarantee that locals can fully benefit from the internet. This contains instructions on using an Android smartphone and Google products like YouTube and Google Maps. To close this gap, it is necessary to both expand network capacity and offer more reasonably priced network access devices. On top of the above there should be collaboration with the relevant training institutions for the integration of digital skills and sector- or job specific digital skills into existing curricula (Craffert et al, 2023).

However, despite the various initiatives being taken on the part of government regarding increasing connectivity, in collaborative or partnership work, there are still areas of improvement. It is required for ICT solutions to be appropriate, equitable, and affordable for every member of the community to address the existing digital divide. However, technology adoption faces considerable challenges, such as a lack of funds and knowledge as well as limited language accessibility. Collaborative work between the private sector and the government sector would further contribute to enhancing the ICT connectivity in this region. A private enterprise is unlikely to create a comprehensive solution on its own, and a for profit business model could hinder users' capacity to become digitally literate. To further develop broadband infrastructure, however, governments could require more assistance. These projects may be conducted with the assistance of partnerships with digital companies and service providers. For this purpose, the private sector can consider collaborating with the government for providing the expertise and resources that are required for expanding digital literacy and access to technology. Moreover, compared to a private corporation working in a foreign area of the world, government agencies and public organizations are more likely to have a deeper understanding of a local community. Collaboration between

these organizations can promote information exchange and facilitate the creation of locally relevant, culturally relevant solutions. It is with the help of such collaborative operation; the private and public sectors can further develop innovative solutions which are formulated for the unique requirements of Sub-Saharan African region.

6.5.4 Increasing investment in digital education

Digital literacy forms the basis of digital skills and the path to access (Craffert et al, 2023). It is clear indicative of the fact that digital education is integral for adults as well, to help previously unconnected groups to become proficient users of the internet. In this regard, governments and organizations are required to invest in digital education. Further broadening proficiency programs for public schools would function as a contributing factor for students from various backgrounds to acquire these skills at an initial stage, even if they lack access to computers at their home. The advantages of digital education should extend beyond students. Adults who lack these abilities must also have access to priced training to develop their skills and keep up with changing employment demands. Private businesses should create online training courses for their staff.

Investments in education for individuals of all ages, from young people in public schools to adults with decades of job experience, could help in bridging the gap and encourage digital inclusion. Participants from various backgrounds, including those in rural areas, marginalized groups, and citizens of nations with a history of poor internet connectivity, must have access to these programs.

6.5.6 Formulating enhanced Broadband Infrastructure

People without internet connectivity lose out on social, educational, and economic possibilities. There are numerous communities that are impacted by the digital divide that are in places with weak internet infrastructure. Users cannot get as much usage out of computer equipment if there is not a strong fiber backhaul to connect to the global internet. In addition, these towns require middle mile and access networks that link the backhaul to remote areas. Internet

connection is essential to the operation of contemporary civilization, just like power grids and natural gas production. Unfortunately, a lot of organizations still see internet connectivity as a luxury rather than a useful resource. This way of thinking needs to shift if the digital gap is to be closed. Government organizations must provide solutions that improve connection for rural and distant places while also guaranteeing steadfast access for many years to come. In the long run, it will have adverse impact to develop a solution that is only practical for a short period of time. Governments and organizations will consequently need to think about developing stronger, more durable networks and infrastructure. This might entail spending money on maintenance, renewable energy, and improved power grids in addition to the essential infrastructure.

6.6 Limitations of Study

The current study focused on understanding the association between ICT dissemination and economic wellbeing of individuals in SSAs. In order to understand this association, the researcher has implemented SLR methodology. This provided the researcher an understanding of the associated based on the existing body of literatures, which provided secondary data. It can be considered as a limitation of this study, as it deprives the study from first-hand data and findings associated with the relationship between ICT dissemination and economic wellbeing of individuals. It also exposes the study to biases of the researcher. Considering collection of primary data would have enriched the study with first-hand information. In addition, the study focused on the SSA region, specifically. The regional restriction of the study also provided with specific region related and lack of universally applicable information associated with ICT dissemination and economic wellbeing of individuals, which can also be considered as another mentionable limitation of this study.

6.7 Conclusion

Due to the remarkable growth that digital, physical, and biological technologies have seen in their respective fields—and the significant convergence of their applications—this has allowed for the transition into a new era of development. In order to participate equally in the international information-based economy, many African nations are striving to develop into information societies and ultimately knowledge societies. It has also prompted African nations to launch ICT development initiatives to address the continent's lack of digital literacy and other communication networks. The SDGs have been promoted, advanced, and measured thanks to the positive effects of ICTs in industries like the telecommunications sector, which has collaborated on an accelerated data revolution for sustainable development to make sure that tools and applications are created with vulnerable populations and communities in mind so that no one is excluded. ICTs are anticipated to assist in addressing issues with unstable economic development, unstable pricing levels, and in particular, youth unemployment that affect SSA nations. Through the creation of additional jobs for young people, the spread of communications in SSA during the past several decades has significantly contributed to the decline in youth unemployment. In fact, the African communications industry provides many opportunities for young people, including internet services and mobile repair and distribution. Mobile phones also facilitate information sharing in the labor market, matching the supply and demand of labor, which helps lower unemployment. According to the findings, youth employment is negatively impacted by real GDP growth, inflation, trade openness, educational attainment, and institutional quality. CT and education working together may be a potent growth engine for the African continent. All African nations' development objectives should place a high priority on improving their higher education institutions. African policymakers and higher education institutions must make sure that their populations can compete, innovate, and deal with complicated social, environmental, and economic problems. Governments need to make sure that they build the necessary physical and ICT infrastructure in collaboration with the private sector and civil society to

support an educated and skilled population, an effective innovation system, and allow businesses to create and use knowledge to gain a competitive advantage in the market. Thus, ICT dissemination and individual economic well-being in SSA get closely linked.

The variables considered for the study include ICT dissemination related, GDP related, FDI, income inequality and Government interest in ICT development. Various studies have used these as instruments and have considered the various dimensions associated with them. Thus, studies correlate and interconnect the various aspects resulting in overall ICT dissemination, FDI and economic growth which are interrelated to youth employment and individual well-being. These observations thus explore the various dimensions of the instruments used for understanding the proposed research objective 2. The ICT dissemination and individuals' economic well-being are mediated by ICT infrastructure, Governments interest in the development of infrastructure, financial stability, FDI and income inequality. Various methodologies were applied to explore the relationship and factors in assessing the interrelationship between ICT dissemination and wellbeing, as it involved a multiple of factors and as the report researcher paper has outlined is a complex matter that can never be looked at through a single lens. .

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