

**KWAME NKRUMAH UNIVERSITY OF SCIENCE AND TECHNOLOGY**

**INSTITUTE OF DISTANCE LEARNING (IDL)**

**COLLEGE OF HUMANITIES AND SOCIAL SCIENCES**

**DEPARTMENT OF ACCOUNTING AND FINANCE**

**MASTER OF SCIENCE  
(ACCOUNTING & FINANCE)**

**TOPIC: DIGITISATION AND FINANCIAL SECTOR DEVELOPMENT IN SUB-  
SAHARAN AFRICAN COUNTRIES**

**BY**

**ABDUL LATIF SULEMANA**

**(PG9413321)**

**THESIS SUBMITTED TO THE DEPARTMENT OF ACCOUNTING AND FINANCE  
OF THE SCHOOL OF BUSINESS, KWAME NKRUMAH UNIVERSITY OF SCIENCE  
AND TECHNOLOGY, IN PARTIAL FULFILLMENT OF THE REQUIREMENTS FOR  
THE AWARD OF MASTER OF SCIENCE IN ACCOUNTING AND FINANCE (IDL)**

**NOVEMBER, 2023**

## DECLARATION

I hereby declare that this thesis is my own work produced from research I carried out under supervision. This thesis has not been presented by anyone for any academic award, in this or any other institution. Proper attribution has been provided for all references to the work of others. I bear full responsibility for any deficiencies present in this work.

ABDUL LATIF SULEMANA .....

(PG9413321)

Signature

Date

Certified by:

Prof. KINGSLEY OPOKU APPIAH .....

(Supervisor Name)

Signature

Date

Certified by:

Prof. KINGSLEY OPOKU APPIAH .....

(Head of Department)

Signature

Date

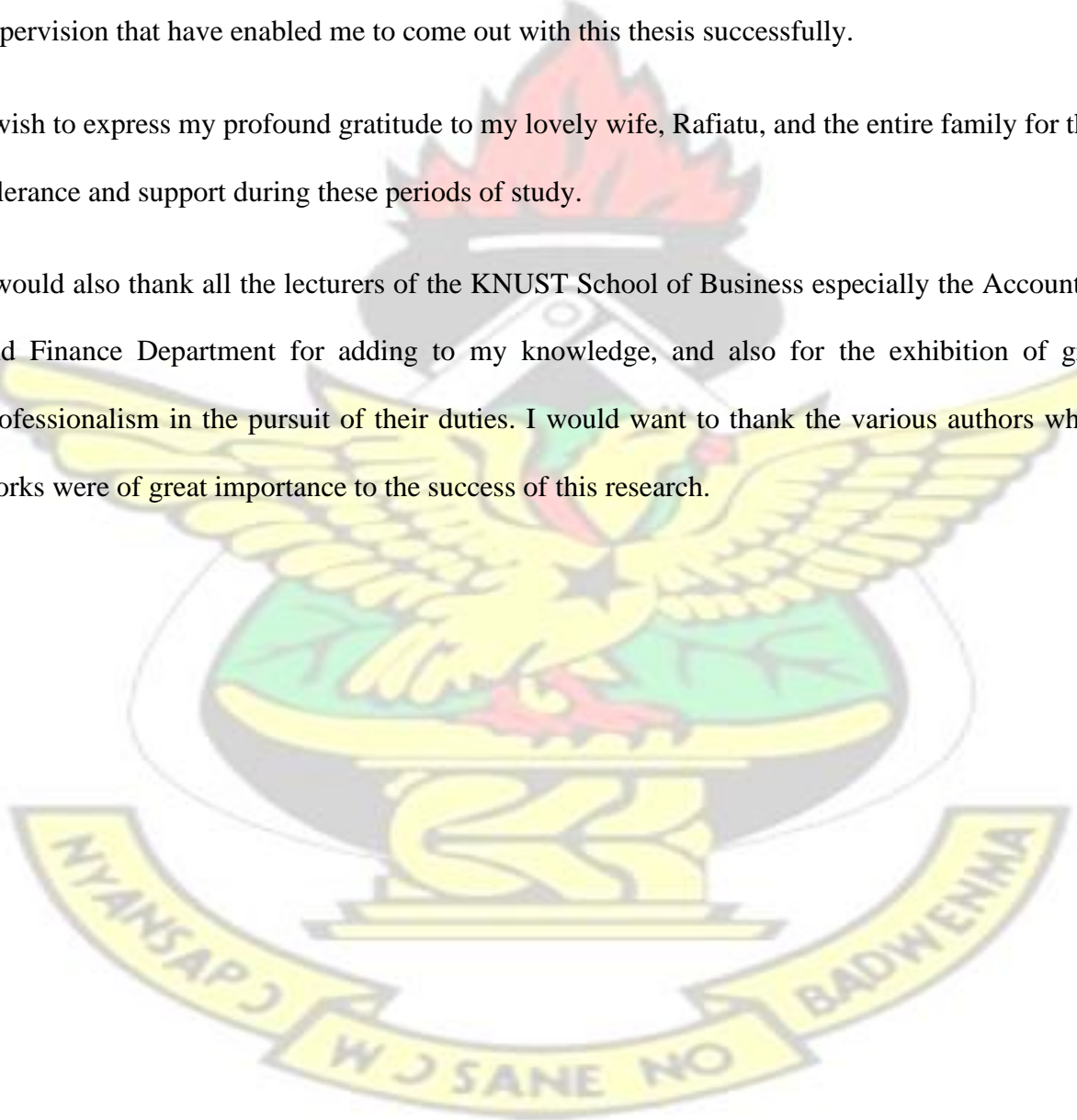
## ACKNOWLEDGEMENT

My first and foremost acknowledgement goes to the Almighty Allah for HIS elegance and providence in my life. But for HIS grace, I would not have made it this far. I am highly indebted to HIM for his wisdom, strength, and providence bestowed on me in the period of this work.

I would like to thank my supervisor, Prof. K.O Appiah for his candid instructions, criticisms and supervision that have enabled me to come out with this thesis successfully.

I wish to express my profound gratitude to my lovely wife, Rafiatu, and the entire family for their tolerance and support during these periods of study.

I would also thank all the lecturers of the KNUST School of Business especially the Accounting and Finance Department for adding to my knowledge, and also for the exhibition of great professionalism in the pursuit of their duties. I would want to thank the various authors whose works were of great importance to the success of this research.



## DEDICATION

I dedicate this work to the Almighty Allah for HIS elegance and providence in my life. I dedicate it to my lovely wife, Rafiatu, and the entire family and my supervisor Prof. K.O Appiah.



## ABSTRACT

The study sought to examine how digitisation–innovation interaction shocks affect financial development in Sub-Saharan African countries. The explanatory research design based on the positivist research paradigm was adopted. All 54 Sub-Saharan Regions were chosen as the demographic for this research. Census sampling was used in this study to sample all 54 Sub-Saharan Regions due to data availability. Secondary data was gathered through the WDI database. The information was gathered from the period (2000-2021). Bayesian Panel Vector Auto-Regressive (BPVAR) was adopted to estimate the parameters involved in the study objectives. In conclusion, the studies highlighted the positive impact of digital innovation on financial development in Sub-Saharan Africa. The results indicate that digitalisation can help to increase financial inclusion, reduce transaction costs, and promote the development of new financial products and services, all of which can contribute to economic growth and poverty reduction. The findings also suggest that other factors, such as financial inclusion, economic development, institutional quality, government support, and infrastructure, are important for the development of the financial sector and should be addressed in conjunction with digital innovation. Policymakers in Sub-Saharan Africa should take note of these findings and work to create an enabling environment that supports digital innovation and financial sector development. Efforts to improve institutional quality, governance, and infrastructure can help to create a more conducive environment for financial development and economic growth. Overall, the studies suggest that digitalisation has the potential to complement financial sector development in Sub-Saharan Africa and other regions, and can play a key role in promoting economic growth and poverty reduction

## TABLE OF CONTENTS

DECLARATION .....	ii
ACKNOWLEDGEMENT .....	iii
LIST OF TABLES .....	viii
ABSTRACT .....	v
CHAPTER ONE .....	1
INTRODUCTION .....	1
1.0 Background of the study .....	1
1.1 Problem Statement of the study .....	3
1.2 Research Objectives of the Study .....	5
1.3 Research Questions of the Study .....	6
1.4 Significance of the Study .....	6
1.5 Overview of Methodology .....	7
1.6 Scope and Delimitation of the Study .....	8
1.7 Organisation of the Study .....	8
CHAPTER 2 .....	10
LITERATURE REVIEW .....	10
2.1 Introduction .....	10
2.2 Conceptual review .....	10
2.2.1 Digitisation .....	10
2.2.2 Digital innovation .....	12
2.2.3 Financial development .....	12
2.3 Theoretical Review .....	14
2.3.1 Theory of Innovations .....	15
2.4 Empirical Review .....	15
2.4.1 Effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa .....	15
2.4.2 Factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries .....	20
2.4.3 The role of digitisation in complementing financial sector development in Sub-Saharan Africa. ....	23
2.4 Conceptual Framework .....	27
2.6 Summary of Chapter .....	28
CHAPTER THREE .....	32

METHODOLOGY .....	32
3.0 Introduction.....	32
3.1 Research Design.....	32
3.2 Population and Sample.....	33
3.3 Variable Description .....	33
Data Analysis .....	35
Chapter Summary .....	38
CHAPTER FOUR.....	39
RESULTS AND DISCUSSION .....	39
4.1 Introduction.....	39
4.2 Descriptive Statistics.....	39
4.3 Correlation Analysis .....	42
4.4 Cross-Sectional Dependence Tests .....	45
4.5 Results and Discussion according to the Objectives of the Study .....	48
4.5.1 The effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa .....	48
4.5.2 Factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries.....	49
4.5.3 The role of digitisation in complementing financial sector development in Sub-Saharan Africa .....	53
CHAPTER FIVE .....	55
SUMMARY CONCLUSION AND RECOMMENDATION .....	55
5.1 Introduction.....	55
5.2 Summary of the Study .....	55
5.2.1 The effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa .....	55
5.2.2 Factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries.....	56
5.2.3 The role of digitisation in complementing financial sector development in Sub-Saharan Africa .....	57
5.3 Conclusion .....	57
5.4 Recommendation .....	58
5.5 Suggestion for Future Research.....	60
REFERENCES .....	62

## LIST OF TABLES

Table 4. 1.....	40
Table 4. 2: Correlation Matrix.....	43
Table 4. 3 Panel Unit Root Test .....	47
Table 4. 4 Table 4.4: Model Estimation (1) .....	48
Table 4. 5: Model Estimation (2) .....	49
Table 4. 6: Model Estimation (3) .....	53



## CHAPTER ONE

### INTRODUCTION

#### 1.0 Background of the study

Over the last 20 years, digitalisation has exploded in popularity and transformed how individuals, organisations, and consumers act, operate and communicate on a worldwide scale. This tendency is attributable to the emergence of Information and Communication Technologies (ICT), especially internet and mobile phone technologies, which generate new goods and processes, new market channels, and organisational complications, as well as technical progress (Myovella, Karacuka and Haucap, 2020). In the same vein, the financial sector remains the lifeblood of any country's economy. Therefore, progress in the field of finance is essential to a nation's progress. According to Opoku, Ibrahim, and Sare (2019), financial development is the most dependable way to mobilise and pool resources, promote the exchange of goods and services, and monitor investments and the application of corporate governance, trade, diversification, and risk management.

With the potential to boost economic growth and development, financial development has been a topic of advocacy, particularly in developing nations (Yeboua, 2019). According to Otchere, Senbet, and Simbanegavi (2017), the function of financial development in fostering growth is contingent on its capacity to stimulate productive savings and distribute resources effectively. In addition, Aboal and Garda (2016) suggest that financial services boost productivity by encouraging technological innovation. Ibrahim (2017) suggested that well-established domestic financial sectors, such as those in industrialised nations, may considerably help to boost the savings and investment rate and, eventually, economic development.

The dire nature of the economic crisis that engulfed SSA in the 1970s and 1980s forced the continent to go for the Britain Wood economic recovery programme. According to Graham (1996), the severity of economic problems in Sub-Saharan Africa (SSA) around the end of the 1970s pushed SSA nations to undertake structural adjustment plans aimed to reorganise and revitalise their economies. Financial liberalisation was a crucial component of the regional structural adjustment programme that began in the mid-1980s. It was claimed that the banking sector in SSA was suppressed and was to blame for obstructing the region's economic development. Reforming the banking sector was seen to be the most effective means of enhancing the development prospects of these nations (Graham, 1996). Financial liberalisation, according to the views of many prominent development economists, promotes more savings and investment at home and more effective use of available resources (Kararach, Kedir, Ajambo and Suominen, 2017; Kodongo, 2018). Consequently, a more open, advanced, and deregulatory financial industry is connected with higher efficiency. To encourage the effective deployment of financial resources and the stimulation of private savings for the sake of economic growth and development, reforms in the financial sector constitute a substantial task as part of financial sector development policies.

Following this assertion, most developing economies such as those of the Sub Saharan Africa have started instituting and recalibrating their digital infrastructure in the financial sector by redesigning economic and financial architecture aimed at enhancing financial sector growth and development in the continent (Alagidede, Ibrahim and Sare, 2020). The development of the financial sector includes the digitisation or the adoption and use of ICT infrastructure to fast-track the operations of the financial institutions, and the institutionalisation of corporate governance policies and financial laws/regulations governing the sector (Ibrahim, Aluko and Vo, 2022).

Otchere et al., (2017) propose that in the financial market, savings mobilisation is not enough to propel economic growth and development unless these savings are intermediated or channelled to the deficit unit for efficient resource allocation through private credit provision. This linkage of these surplus funds from the surplus unit to the deficit unit is done with the aid of digital infrastructure.

There has been a severe gap in the literature about the debate over the effectiveness and influence of digital infrastructure on financial development. Developed and emerging countries are distinguished by disparities in the degree of financial development as well as the determinants or factors responsible for digital or technological adoption by financial institutions in SSA (Ejemeyovwi, Osabuohien and Bowale, 2021). The researcher believes there is a lack of empirical literature examining the impact of digital adoption and innovation on economic development in Africa. The aforementioned problems need this investigation. To that end, this research looks at how digitalisation has influenced the growth of the financial industry in sub-Saharan African nations over the last twenty years.

### **1.1 Problem Statement of the Study**

There are currently encouraging efforts in place by African leaders to integrate Information and Communication Technology (ICT) to digitise almost every sphere of the African economy for the prospect of Africa integrating into the global financial economy (Otchere et al., 2017). Additionally, there is a rising integration of the African financial market with global capital markets, notably those of developing nations, accompanied by a rise in capital mobility (Lane and Milesi-Ferretti, 2018; Karwowski and Stockhammer, 2017). Due to the growth of ICT, obstacles to international money flows have been reduced. In addition, there are tremendous advancements in information technology linking Africa to the rest of the globe, enabling foreign investors seeking

the advantages of global diversification to access African financial institutions more easily (Opoku et al., 2019)

To promote the finance-economic growth nexus with the mediating role of digitisation, most African countries have embarked on financial reforms and a digitisation agenda to resource their financial sector to be able to compete globally and provide the needed capital to the private sector to spur economic growth (Myovella et al., 2020; Tyson, 2021; Zreik, Marzuki, and Iqbal, 2023). Dating back to the 1980s most African nations liberalised their financial sectors and advocated for financial liberalisation as opposed to financial repression culminating in restructuring the African financial sector following the IMF and World Bank Financial Sector Adjustment Programme (FINSAP) leading to the admission of foreign banks into the African financial sector (Alagidede et al., 2020). As part of the structural adjustment plans advocated by the IMF and the World Bank (Sakyi, Osei Mensah, & Obeng, 2017), this initiative was initiated between the late 1980s and the late 1990s. Credit limits, also known as maximum credit control, were eliminated as part of the reforms. Interest rates were liberalised, state-owned banks were restructured and privatised, and new measures were put in place to encourage the expansion of private banking systems and financial markets (Sakyi et al., 2017).

IMF (2022) and Emiru, and Wajebo, (2023) claim that the financial industry in Sub-Saharan Africa (SSA) is leading the way in the region's fast digitalisation. The advent and expansion of digital currency and electronic communications (mobile money) transactions have been hallmarks of digital progress in the SSA financial sector. The development saw \$698 billion in mobile money transactions in 2021 coupled with African central banks exploring the operationalisation of digital currencies, and the growing trend of cryptocurrency in the continent (IMF, 2022).

Given this advancement in technology and relatively well-developed body of literature in the financial sector development-digitisation nexus as there are studies such as Asongu and Nwachukwu (2019), Otchere et al., (2017), Hofisi, (2023) and Tchamyou and Asongu (2016) that deal with digitisation and financial sector development the missing link, however, is the paucity of literature connecting digital adoption and digital innovation (shock) on financial sector development.

In light of these considerations, the study's primary objective is to analyse the cointegration between digital adoption and innovation, how this relationship relates to Africa's current financial system and the likely consequences of shocks to this relationship for Africa's financial growth. Findings from this research add to the little literature on the issue and may inform policy and practice by governments and others interested in using digitalisation to advance the economies of sub-Saharan Africa.

## **1.2 Research Objectives of the Study**

The main objective of this study is to examine how digitisation innovation interaction shocks affect financial development in Sub-Saharan African countries. Specifically, the following objectives are addressed:

1. To examine the effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa.
2. To examine factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries.
3. To examine the role of digitisation in complementing financial sector development in Sub-Saharan Africa.

### **1.3 Research Questions of the Study**

1. What is the impact of digital-innovation shocks on financial development in Sub-Saharan Africa?
2. What are the factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries?
3. Does digitisation play a role in complementing financial sector development in Sub-Saharan Africa?

### **1.4 Significance of the Study**

This study makes significant contributions to practice, policy and literature. Indeed, given the paucity of literature in the three aforementioned areas namely the financial development–digital innovation nexus, factors affecting the adoption of digitisation by the financial sector and the mediating role in the financial development-digitisation nexus, this work contributes to the body of knowledge in several ways. While the direct implications of digitisation, digital innovation interaction shocks on financial development and its determinants, and the mediating role of digitisation in FD have all been studied, I am unaware of any studies focusing specifically on Africa. Because of this disjuncture across industries, there is a lack of contextual studies. This paper aims to examine the dearth of empirical studies and introduce this hitherto unrecognised but significant relationship in the literature on FD-digitisation. The purpose of this research is to give actual evidence on the impact of shocks from digital innovation on economic development, focusing on the experiences of developing countries. As a result, the research will provide crucial policy implications for fostering financially stable economies throughout Africa via effective and efficient levels of digitalisation. The study's ultimate contribution is its intent to use econometric

methods that have not been frequently used in previous studies. To my knowledge, the Bayesian Panel Vector Auto-Regressive (BPVAR) estimation approach has not been widely used in examining the FD-digitisation nexus in Sub-Saharan Africa, but it will be used here to determine the impact of digital innovation interaction shocks on economic growth in SS. The study's overarching goal is to suggest concrete steps that policymakers may take to boost the continent's economic growth and development via greater use of digital technologies in the financial sector.

### **1.5 Overview of Methodology**

This study adopts the quantitative research approach and explanatory research design. Creswell (2009) defines quantitative research as a technique for evaluating the connection between variables to evaluate objective ideas. These variables, in turn, can be measured using tools to examine numerical data using statistical processes. An explanatory study on the other hand seeks to explain why and how a link exists between two dimensions of a phenomenon or situation. Since the goal of the study is to find a connection between the variables, these strategies and plans are ideal. All of the nations in Africa south of the Sahara are included in the sample. Census sampling was used for this research. Secondary data are used, and the study's time frame, 2000–2020, encompasses all of the nations in Sub-Saharan Africa. The time frame is long enough to assess the ever-changing nature of the relevant factors.

For the study to achieve its objectives, data on the following variables will be obtained from WDI to assist in estimating the model in accordance with the study objectives. The study intends to use private sector access to banks' credit as a variable to measure financial development, Digitisation proxied as Information and communication technology adoption of a country Innovation of country, Digital – innovation interaction variable, Institutional quality Exchange rate, Inflation, Real Gross domestic product growth and Monetary policy rate. The choice of these variables is

grounded in literature where various studies suggest that the aforementioned variables have a significant impact on financial sector development.

Bayesian Panel Vector Auto-Regressive (BPVAR) analysis will be used to look at how shocks in digital innovation interactions have affected financial growth in Africa. Mukhtarov and Aliyev (2021) and Ejemeyovwi et al. (2021) have both employed this technique, and they have found it to be both effective and objective. To guarantee the accuracy and validity of the estimated models, we shall run tests both before and after estimation. To guarantee the model is free of spurious regression and to aid in identifying an appropriate model for the research, a test for the variable's stationarity will be included in the preliminary test. Correlation, multicollinearity, and heteroscedasticity are just a few of the tests that may be run once an estimate has been made.

### **1.6 Scope and Delimitation of the Study**

Countries in sub-Saharan Africa are the only ones included in this analysis. Examining the effect of digitisation-innovation interaction shocks on financial development and drivers of digital adoption across all of SSA, the research will use yearly macroeconomic data from the World Bank's World Development Indicator (WDI).

### **1.7 Organisation of the Study**

In total, the dissertation has five (5) chapters. In chapter one, information about the study's context, problem statement, study objectives, significance, scope, and thesis organisation will be presented. The following chapter focuses on the research's literature review. The research methodology, including sampling strategies, instruments, and data processing methods, is detailed in chapter three. Reports and surveys from the pilot study, as well as the results of the descriptive analysis, are presented in Chapter Four. Also, the study's inferential analysis will be presented and discussed

in detail in Chapter 4. In the final chapter, which is the fifth chapter, the key findings will be summarised, conclusions provided and recommendations for policy and practice.

# KNUST



## **CHAPTER 2**

### **LITERATURE REVIEW**

#### **2.1 Introduction**

There are five (5) sections in this chapter. Concepts related to the study are discussed in section 1 as a conceptual review. The theory employed in the study was briefly explained in section 2, which is the theoretical review. An empirical review is presented in Section 3 and a conceptual framework is discussed in Section 4.

#### **2.2 Conceptual review**

The conceptual review section contains the definitions, operationalisation and how the variables have been used in this study. Under this section, the variables include: Digitisation, Digital innovation, and financial development.

##### **2.2.1 Digitisation**

The term "digitalisation" refers to the practice of boosting business processes by using digital tools and data. This is what we mean when we talk about digitisation. Simple examples include PID control in microprocessor-based systems, automatic shutdown logic, and work sequencing. Something more serious, like a malfunctioning transmitter, would need the establishment of a work order in the ERP maintenance system for a technician to address (Maiti and Kayal, 2017). In addition to cutting expenses, digitisation also boosts output and efficiency. Digitisation improves an existing business process or processes without disrupting or replacing them. In other words, it swaps out a set of manual steps with an automated one generated by software. Any industry's whole manufacturing process has benefited greatly from digitisation and other technical advancements. Studies by (Olamade and Oni, 2016; Maiti and Kayal, 2017) show that the

expansion of IT and ITES is a direct result of improvements in the industrial sector. (Patel and Joshi, 2019; Maiti and Kayal, 2017; Singh et al., 2015) make additional attempts to establish whether there is a connection between the expansion of the manufacturing sector and ITES. Technology advancement increases the need for labour, which in turn fuels the expansion of ITES in India, according to Chanda and Das (2015). Kwayu et al. (2021) investigate five emerging nations and discover that information and communication technology (ICT) infrastructure and communications are development drivers. According to Maiti and Kayal (2017), the growth of ICT has led to the trading of numerous hitherto non-tradable services. According to Al-Kodmany (2015) presentation, the worldwide trade in services is fueled by advances in technology, the servitisation of production, a rise in global values, and increased consumer demand for services. The lack of loan information for SMEs in underdeveloped countries is demonstrated, according to Maiti (2018). They claimed that customers and borrowers for small and medium-sized businesses (SMEs) possess more knowledge than lenders and banks and that this information asymmetry makes SMEs financing difficult. Due to information asymmetry in the lending industry and expensive monitoring costs, banks do not simply offer credit based on interest rate criteria. One of the key considerations for banks when extending SME financing is information openness (Hamali, 2015; Das et al., 2020). Banks' main justification for refusing SME loans to Indian SMEs is a lack of information transparency. Information transparency and credit scoring improve SME funding by banks, according to additional research by (Rahman et al., 2017; Chih et al., 2018; Ciampi et al. 2021; Bianchi et al. (2015). Poor profitability, low capitalisation, a lack of assets, and significant risk are some other reasons why banks do not provide financing to SMEs, according to Quader et al. (2020). Due to operational variations between small and large banks, bank size is also an important consideration when extending a financial loan. Large banks have access to numerous

facilities, including cutting-edge technology. According to Chih et al. (2018), relationship lending is a field in which large banks have comparative advantages over smaller ones. Small banks may take into account soft information for lending whereas big banks may demand informational openness in their business.

### **2.2.2 Digital innovation**

Digital innovation is the creative spark that sparks the development of new technology or cutting-edge applications for previously created technology. Digital change is often preceded by digital innovation (Ciriello et al., 2018). Digital innovation is the use of digital technologies to address business difficulties (Kohli and Melville, 2019). Nylén and Holmström (2015) define digital innovation as the use of digital technologies to address current business challenges. Digitisation and digital transformation are key concepts that are closely related to digital innovation. Many businesses are aware that they must adapt, develop, and accept new technologies if they are to compete in today's dynamic marketplace (Di Vaio et al., 2021). Businesses that are digitally imaginative look for fresh answers to age-old issues. The transition to this new strategy is referred to as digital transformation (Demirkan et al., 2016).

### **2.2.3 Financial development**

The collection of businesses, goods, markets, and legal and administrative structures that permit credit-based transactions is known as the financial sector. Fundamentally, cost reduction for the financial system is what drives the development of the financial sector. Financial contracts, markets, and intermediaries were developed as a result of the process of reducing the costs of learning, upholding agreements, and completing transactions. Due to differences in information, enforcement, and transaction costs as well as legal, regulatory, and tax regimes, diverse financial contracts, markets, and intermediaries have emerged through time and between nations. The five

primary functions of a financial system are as follows: I facilitate trade, risk diversification, and money pooling ex-ante; I monitor investments and engage in corporate governance post-financing; I facilitate trade in goods and services ex-post; and I facilitate trade in goods and services ex-ante. The financial sector is better equipped to carry out its essential economic functions because of financial instruments, markets, and intermediaries, which lessen the effects of information, enforcement, and transaction costs (Rashid and Intartaglia, 2017). Numerous pieces of evidence point to the importance of a flourishing financial sector to overall economic growth. Growth in the economy may be attributed to a number of factors, including increased savings rates, money mobilisation and pooling, the production of investment information, the facilitation and promotion of foreign capital inflows, and the optimum deployment of capital. The quicker long-term growth of countries with more developed financial systems is shown to be causal by several research (Salahuddin et al., 2018). This means that financial development not only follows but also impacts economic success. Investment and production rise, leading to more money being made and fewer people living in poverty as a consequence (Guru and Yadav, 2019). This helps with risk management by protecting the most vulnerable people and communities. As the financial sector expands, it may assist small and medium-sized enterprises (SMEs) to grow by giving them easier access to money (Dogan and Seker, 2016). Small and medium-sized enterprises (SMEs) often employ more people and rely more heavily on human labour than giant corporations. In developing countries especially, they play a crucial role in driving economic development. With the expansion of infrastructure and financial intermediaries, the financial sector is only getting started. All major corporations need to be subject to stringent monitoring and regulatory regimes (Rashid and Intartaglia, 2017). The world's financial crisis brought home the dire consequences of inefficient banking sector practices. Since the financial crisis, evidence has accumulated suggesting that

poorly implemented policies within the financial sector may have negative effects on financial development and the economy at large (Dogan and Seker, 2016). When it works effectively, financing is crucial for development; when it doesn't, stagnation is inevitable. The crisis has sparked a heated debate about the most effective methods for achieving sustainable development and has shattered long-held ideas about the regulations governing the financial industry. The Global Financial Development Report published annually by the World Bank might be used as a starting point for this procedure (Destek and Sarkodie, 2019). Chapter 1 and the statistical appendix of the study include information and statistics on the evolution of the global financial system. One needs a reliable indicator of financial development in order to assess the progress of the financial sector and understand the role it plays in economic expansion and the alleviation of poverty. Financial development is a multifaceted concept, making it difficult to evaluate in practise (Valickova et al., 2015). So far, most empirical studies have used common quantitative measurements that have been collected over extended periods of time and across several nations (Valickova et al., 2015). Deposits, liquid liabilities, and the assets of financial institutions may all be compared to GDP to see how they stack up. These numbers are just approximations, and they may not correctly represent a country's financial performance due to the diversity of financial institutions, markets, and products that comprise a nation's financial sector (Cherif and Dreger, 2016). The World Bank's Global Financial Growth Database created a thorough yet straightforward conceptual framework to examine international monetary progress. This theory proposes that financial depth, access, efficiency, and stability are four sets of proxy variables that accurately characterise a healthy financial system (Svirydzenka, 2016).

### **2.3 Theoretical Review**

The innovation diffusion theory and the theory of innovation will both be applied in this study.

### **2.3.1 Theory of Innovations**

Croitoru (2017) argued that individuals acting alone might initiate productive markets. Aghion and Festré (2017) said this was especially true of self-employed inventors and those engaged in R&D engineering. Those out-of-the-ordinary gains would inspire copycat movements, which would eventually drive down overall sales. However, Mehmood et al. (2019) believed that a new set of inventions would arise, leading to a new economic cycle, before equilibrium could be attained. Thus, the economy as a whole is always experiencing new inventions, and the industry is not exempt. The underlying idea is that entrepreneurs help the economy by discovering and seizing upon untapped potential. Further, the author claims one must differentiate between invention and innovation. To this end, Keklik (2018) defines invention as the search for novel approaches that businesses might embrace, while innovations are seen as the motors of progress inside such a system. According to this theory, those who are willing to take calculated risks are the ones who actively seek out new ideas. Croitoru (2017) argues that businesses and other organisations should keep tabs on technological developments in their fields.

## **2.4 Empirical Review**

### **2.4.1 Effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa**

Anarfo et al.'s (2019) research in Sub-Saharan Africa looked at the interplay between financial inclusion and FSD. Financial inclusion and FSD in Sub-Saharan Africa were examined in a dynamic context using a sample generalised autoregressive conditional model. Results show that in both the overall sample and the sample of Sub-Saharan African states, FSD is negatively correlated with financial inclusion. Financial inclusion is strongly linked to FSD.

Anarfo et al. (2020) studied the dynamic and causal relationship between financial inclusion and migrant remittances in Sub-Saharan Africa. Using the panel vector autoregressive (VAR) paradigm, researchers in this study analysed the changing connection between financial inclusion and migrant remittances in Sub-Saharan Africa. The data show that in Sub-Saharan Africa, financial inclusion is negatively correlated with migrant remittances.

The consequences of shifting remittance habits in Sub-Saharan Africa were investigated by Busumtwi-Sam (2019). Although Sub-Saharan Africa only receives a small percentage of the total documented money transfers to developing countries, and despite money transfers being largely eclipsed by aid flows to the region, this study finds that remittances, as a sustainable, private transaction, directly reduce poverty and promote financial development. Taking into consideration the inverse correlation between remittances, poverty, and economic development does not change the findings. According to the report, formalising such flows might provide an attractive entry point for "unbanked" people and families.

Bandura and Dzingirai (2019) examined the correlation between institutional quality and financial development and economic growth in 27 countries in Sub-Saharan Africa using a five-year average dataset spanning 1982-2016. Having more (or less) money may assist (or damage) the region's potential to prosper, as seen by the U-shaped relationship between financial development and growth. At a GDP growth rate of between 33 and 37%, financial development begins to positively affect economic expansion. The link between the institutional factors and economic expansion was weak, but it had positive direct and indirect benefits nevertheless. When monetary progress is rooted in established institutions, it suggests a synergistic relationship between the two in terms of economic growth. Decision-makers and relevant authorities are advised to take stringent steps to

support the growth of institutions and the financial sector in order to sustain long-term economic development in the area.

The implications of digital infrastructure on employment in the services industry were studied by Ndubuisi et al. (2021). The conclusion that digital infrastructure boosts service sector employment is supported by findings from a panel data set covering 45 Sub-Saharan African nations from 1996 to 2017. Studies suggest that several elements, such as level of education, quality of the institutions involved, and macroeconomic circumstances as reflected by the inflation rate, moderate the beneficial benefits of digital infrastructure on employment in the services sector. Improvements in institutional quality and expansion of the service sector are two areas where digital infrastructure has been shown to have a positive effect. The impact, however, flips to the negative side when general economic circumstances deteriorate. Further evidence of the favourable employment benefits of digital infrastructure in the services sector in low-income nations is uncovered by the researchers.

Odhiambo (2020) analysed the dynamic link between financial development, economic inequality, and carbon dioxide (CO<sub>2</sub>) emissions using data from 39 Sub-Saharan African (SSA) nations between 2004 and 2014. The Gini coefficient, the Atkinson index, and the Palma ratio were used to examine these relationships. The estimate process in the research makes use of the generalised approach of moments. Empirical evidence suggests that as SSA countries develop economically, their CO<sub>2</sub> emissions will naturally drop. The results also demonstrate that if we want to stop the negative effects of financial development on CO<sub>2</sub> emissions, we need to keep wealth inequality within reasonable bounds. The research found that the negative effect of financial development on CO<sub>2</sub> emissions is predicted to become positive if the following inequality thresholds are met: Gini coefficient = 0.591, Atkinson index = 0.662, and Palma ratio = 5.59. Policy implications of this

study's findings for SSA countries and developing countries more generally are substantial. Policy implications are being looked upon.

The relationship between remittances and economic development in the leading remittance-receiving countries in Sub-Saharan Africa was investigated by Donou-Adonsou et al. (2020) using a panel cointegration approach. The findings indicate a promising future for the partnership. According to the average of group estimates, financial development increases by more than one percentage point for every one percentage point rise in remittance inflows. A long-term, bidirectional causal link between remittances and monetary progress is also supported by the data. There is further evidence to suggest that remittance pricing has a deleterious effect on the long-term relationship between remittances and economic growth. It has been shown statistically that remittance inflows promote monetary growth, and that migrant workers may plan their payments to coincide with fluctuations in the foreign currency market.

Kumar et al. (2015) investigates the impacts of financial technology inclusion and capital inflows (remittances, direct investment, and overseas development aid), particularly remittance, on per-worker income in Sub-Saharan Africa (SSA) from 1970 to 2010. According to the data, capital productivity is what propels regional growth. When paired with financial development and remittances, information and communications technology (ICT), which has a negative impact on income on its own, produces both short- and long-term advantages. If the remittance business is to be linked with banking and ICT services, inclusion in finance and technology must increase. While FDI and remittances are both negative and not statistically significant, ODA has a negative elasticity. Due to the SSA's predominately rural economic structure, considerable sector reforms, well-managed and analysed ODA and FDI inflows, as well as greater accessibility, affordability, and inclusiveness of banking and ICT services relevant to the remittances market, are all required.

Ofori et al. (2022) looked into the direct and indirect impacts of ICT expansion on inclusive growth. In order to show that ICT skills, access, and use improve equitable growth in SSA and (ii) the benefits of ICT skills, access, and use are reinforced in the context of financial development, we present data from the dynamic system GMM that is robust to numerous specifications. Whether we concentrate on access to financial institutions, these facts remain valid. The goal of the region's green growth and existing initiatives to enhance socioeconomic development are taken into consideration while formulating policy proposals.

Olayungbo and Quadri (2019) studied a panel of 20 Sub-Saharan African countries to determine the connection between remittances, financial development, and economic growth. The research used the panel unit root and cointegration tests, as well as the Mean Group/ARDL and Pooled Mean Group estimates. Cointegration analysis revealed that both remittances and financial development boosted GDP growth in the long and short term. The comparative period showed that growth was more strongly related to financial development than to remittances. Finally, it was shown that remittances had unidirectional causal relationships with both GDP and financial growth. However, there was no connection between remittances and the economic development of SSA countries.

To investigate the impact of digitisation on economic development in Africa and other sub-regions, Ejemeyovwi et al. (2021) conducted an empirical study. In order to model the impulse response function and variance decomposition throughout Africa, Bayesian Vector Auto-Regressive (BVAR) simulations are used. Across all 6 datasets, the analysis demonstrates that the ICT-innovation interaction shock contributes positively to economic growth. Given these findings, it follows that MNCs and other economic players need to fully embrace ICT and creative activity in all sectors if they want to increase financial growth. This is so that they can all perform better,

which depends on money. Insights into the connection between digitisation and the digital economy in African countries are further tested empirically in light of this.

#### **2.4.2 Factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries**

Taiminen and Karjaluoto (2015) conducted a research to shed light on the goals of digital marketing and the elements that influence its acceptance and use by small and medium-sized enterprises (SMEs). The sample includes 16 managers from SMEs who took part in semi-structured thematic interviews and 421 survey respondents from Central Finland. The poll found that small and medium-sized enterprises are not making the most of digital technologies. It's also unclear from the data whether SMEs are recognising the game-changing impact that digitalisation has had on communication.

Molinillo and Japutra (2017) performed a literature analysis to investigate the factors that influence the adoption of digital information and technology inside organisations, with a special emphasis on small and medium-sized enterprises (SMEs). The results show that businesses of all sizes may benefit from using digital information and technology in marketing-related activities. Three primary theories (the diffusion of innovation theory, the technology-organisation-environment framework, and the institutional theory) have been employed to get a deeper understanding of the adoption process. These two concepts, when combined, may simplify the adoption process for everyone involved.

Khan and Qutab (2016) investigated the factors that influence research students' use of the National Digital Library maintained by Pakistan's Higher Education Commission (HEC). The TAM conceptual framework was used as the basis for this research. Pakistani college students were

surveyed about their experiences with the HEC digital library and how they were influenced by various contextual factors. The research hypotheses were evaluated using a multiple-regression analysis. The results show that businesses of all sizes may benefit from using digital information and technology in marketing-related activities. Three primary theories (the diffusion of innovation theory, the technology-organisation-environment framework, and the institutional theory) have been employed to get a deeper understanding of the adoption process.

Refugee migrants' use of digital technology and its relevance to their social involvement in Australia was the subject of a research by Alam and Imran (2015). The "usage" of digital technology provided the conceptual basis for this investigation. Multiple focus groups with Australian-based refugees provided crucial factual data. There is a digital gap amongst refugee migrant groups because of inequalities in physical access to and usage of digital technology, proficiency with the different technologies, and the financial means to pay for the services. Refugee communities arriving in Australia might benefit from the use of digital tools to facilitate their integration into the local community.

Huesig and Endres (2018) conducted a study to look at the distinctive qualities of innovation management software (IMS) and the factors that affect the adoption of specific software solutions. To determine if tool elements like aided innovation methodology and activities had an impact on IMS adoption, 99 innovation managers from German industrial firms responded to an online survey and provided data. Contrary to what is currently believed in the literature, the study's results demonstrate that innovation managers are more likely to use IMS if the tools support portfolio management and concept evaluation but not idea formulation and scenario management.

Ritz et al. (2019) conducted a study to examine how small firms employ digital marketing, utilising the DIY behaviour model and the technology acceptance model to better understand the motivations and anticipated advantages of involvement. 250 small company owners who manage their own digital marketing are polled online. To investigate the relationships between the models, structural equation modelling is used. The results provide credence to the idea that managers of small firms may not be only driven by technological benefits when engaging in digital marketing, which broadens our understanding of small enterprises' behaviour in this area. In conclusion, the DIY behaviour model may be advantageous for small business managers who are obliged to perform tasks that require specific knowledge.

Research by Payne et al. (2018) found that a variety of factors influence how at ease digital natives are dealing with mobile banking activities that employ AI. 218 digital natives provided the information. This study assesses the impact of technical and non-technical aspects on the use of mobile banking and AI-enabled mobile banking services. It does this through the use of two separate multiple regression techniques and multivariate regression. The findings show that digital natives have differing opinions on the relative advantages of our two dependent variables. The previous study has found that the relative advantage construct has the greatest influence on how frequently consumers utilise mobile banking.

Payne et al. (2018) performed research to construct a conceptual model that describes the major determinants influencing Lebanese bank customers' adoption of mobile banking. The hypotheses were evaluated using structural equation modelling and route analysis based on survey data. Clients from Lebanon completed 320 questions. The results demonstrate that consumers' views about adopting mobile banking are mostly influenced by their level of digital literacy, resistance

to change, perceptions of risk, usability, and usefulness. By contrast, awareness and compatibility had no discernible impact on adoption.

### **2.4.3 The role of digitisation in complementing financial sector development in Sub-Saharan Africa**

The subject of what part digital financial instruments play in the funding of small and medium-sized enterprises (SMEs) in Sub-Saharan Africa (SSA) is addressed by Disse and Sommer (2020). It distinguishes the hype surrounding digital finance from actual market developments and trends by discussing the opportunities and challenges of digital advancements for SME finance in general and by discussing three specific financing instruments in Sub-Saharan Africa, namely mobile money and digital credits, crowdfunding, peer-to-peer lending, and public equity. In addition, SMEs are in charge of the most of new job creation or at least as much as larger firms. They give low-skilled individuals and other vulnerable groups a source of money and economic possibilities like employment, skill development, and upward mobility across a number of different locations and economic sectors. SMEs may thereby encourage inclusive economic growth, which in turn encourages social cohesion. The SME sector contributes significantly to the value-added of the nation and is positively and highly correlated with both economic variety and growth (although no causal relationship can be shown in this regard).

The research was conducted by Myovella et al. (2020) to evaluate how the OECD and Sub-Saharan Africa (SSA) economies benefited from digitisation (OECD). Over an 11-year period, from 2006 to 2016, the study used generalised linear methods of moment estimators on a panel dataset of 41 SSA and 33 OECD countries. The findings indicate that digitalisation boosts economic growth in both categories of nations. Mobile telecommunications have a greater influence in SSA than in OECD nations, while broadband internet has less impact.

In Sub-Saharan Africa, Tyson (2021) looked at statistics to determine the relationship between finance and economic growth. It has since 2000 looked at the development of the financial ecosystem and its vulnerabilities. Although there have been significant improvements across the board, including an expansion of the banking system's reach and financial accessibility, there are still significant shortcomings, including inadequate domestic savings mobilisation, underdeveloped capital markets, and insufficient lending to sectors that are essential for equitable growth. It looks into discrepancies in financial development accomplishments and offers suggestions on how to better match funding with the objectives of local economic change.

Asafo-Adjei, Owusu Junior, Adam, Arthur, Boateng, and Ankomah (2023) presented new insights into the asymmetrical relationship between FDI and economic growth, accounting for the impact of FSD and corruption. Data from 48 economies in sub-Saharan Africa are included in the research, which covers a sample period from 2002 to 2020. To achieve these aims, this study employs an instrumental variables panel quantile regression methodology. Foreign direct investment (FDI) inflows are positively correlated with economic development, according to the research, especially in countries with poor growth rates (those in the bottom 50th percentile). For economies with growth rates beyond the 50th percentile, however, the correlation becomes negative.

According to Tinta (2022), the relationship between economic growth in Sub-Saharan Africa and monetary development, environmental change, and other factors was studied. The Augmented Mean Group algorithm, the Pedroni and Westerlund cointegration, and the Dumitrescu and Hurlin causality tests are all used on a sample of 48 countries. The results highlight the significance of institutional quality and human capital, even if they may predominantly help high-income and upper-middle-income countries. Human capital and renewable energy sources begin to have an influence on the financial system's ability to function beyond a certain point. Economic growth is

critical. Only in these nations does the ecological transition appear to be strongly and positively impacted by investments and trade liberalisation.

Nguimkeu and Okou (2021) highlighted what is known about digital technologies in Sub-Saharan Africa, highlighting their relevance as catalysts for entrepreneurship, loan availability, productivity growth, and financial inclusion in the informal sector in their research. A road map is presented to assist Sub-Saharan African policymakers in overcoming the key hurdles governments face in capitalising on the advantages and hazards of digitalisation for the unorganised sector. The study backs tactics that increase output in the unorganised sector and provide employment opportunities by using low-skilled-biased digital technologies in supportive business environments.

Ayimah, Kuada, and Ayimey (2023) Consumers' perspectives and choices on the use of digital financial services (DFSs) in rural and semi-urban areas of Ghana. A quantitative cross-sectional approach was adopted for this investigation. To determine whether the technology acceptance model (TAM) will work in a rural context in Ghana, a representative sample of 727 customers was drawn from a semi-urban town and three surrounding rural communities. In order to test the hypotheses, the researchers used the statistical method of structural equation modelling. The results show that digital financial services are more widely used when people have a favourable impression of their usefulness, trust their banks, and believe that their data is safe and reliable.

Abeka et al. (2021) performed research on the usage of mobile phones in the financial industry, as well as other opportunities for infrastructure development that may expand the financial industry's potential to improve the real sector. The paper claims that by using the system's General Method of Moment estimation technique, communications infrastructure strengthens the impact of financial development on the economic growth of Sub-Saharan African countries. As a result, Sub-

Saharan African nations are urged to take the necessary steps to modernise their telecommunications infrastructure in order to appropriately transform the benefits of the financial industry into economic growth.

Mazzoni's (2019) research provides an overview of Sub-Saharan Africa's present level of energy availability and the technology utilised to deliver it, followed by a description of the important trends and forces impacting the continent's continuous digital transformation. To learn more about how this revolution began a few years ago and how it is influencing society, it may be beneficial to conduct a thorough investigation of the Pay-as-you-go business model in the off-grid solar industry. Policymakers are given advice on how to make use of the digital revolution to increase access to safe and dependable energy by making changes to the electrification plans, laws, business climate, distribution systems, and mobile money environments.

Financial inclusion and inclusive development in Sub-Saharan Africa were studied quantitatively by Sarpong and Nketiah-Amponsah (2022) using a panel of 46 countries from 2004 to 2018. In contrast to the availability and comprehension of financial services, the research reveals that the use of financial services has a quantitative and evident influence on inclusive development. Inclusive development accelerates by 0.03 percentage points for every one percentage point increase in the use of financial goods and services, particularly in Sub-Saharan Africa. The paper contributes to the body of literature by developing a more comprehensive index of inclusive growth using the Arellano-Bover/Blundell-Bond system Generalised Method of Moment estimator to calculate the precise quantitative effects of three categories of financial inclusion indicators on inclusive growth.

Human capital development and economic autonomy were explored by Owusu-Agyei et al. (2020) as part of their research on the connection between ICT and economic growth. Researchers

analysed data from the Global Financial Development and World Bank Development Indicator databases for 42 SSA nations between 2000 and 2016 and found that increased internet access had a beneficial effect on many measures of financial development. Further research reveals that the economic independence and level of human capital development varies across different sub-samples of SSA countries. The findings hold up well under a variety of estimations and specifications that take into consideration the sample's likely endogeneity and heteroscedasticity.

In a research, Li (2021) makes the case that instrumental factors for internet penetration may be constructed by investigating the arrival of underwater cables in Sub-Saharan Africa. The influence of internet penetration on economic growth, productivity, sector value added, and employment shares are then estimated in the article using this exogenous variation. The results indicate that internet penetration has a sizable and considerable impact on real per capita GDP growth and productivity at the overall and industry levels. Higher internet penetration is shown to be favourably linked with the percentage of services in the economy and adversely associated with the share of industries from a sectoral perspective. For the percentage of agriculture, the impact is negligible.

## **2.4 Conceptual Framework**

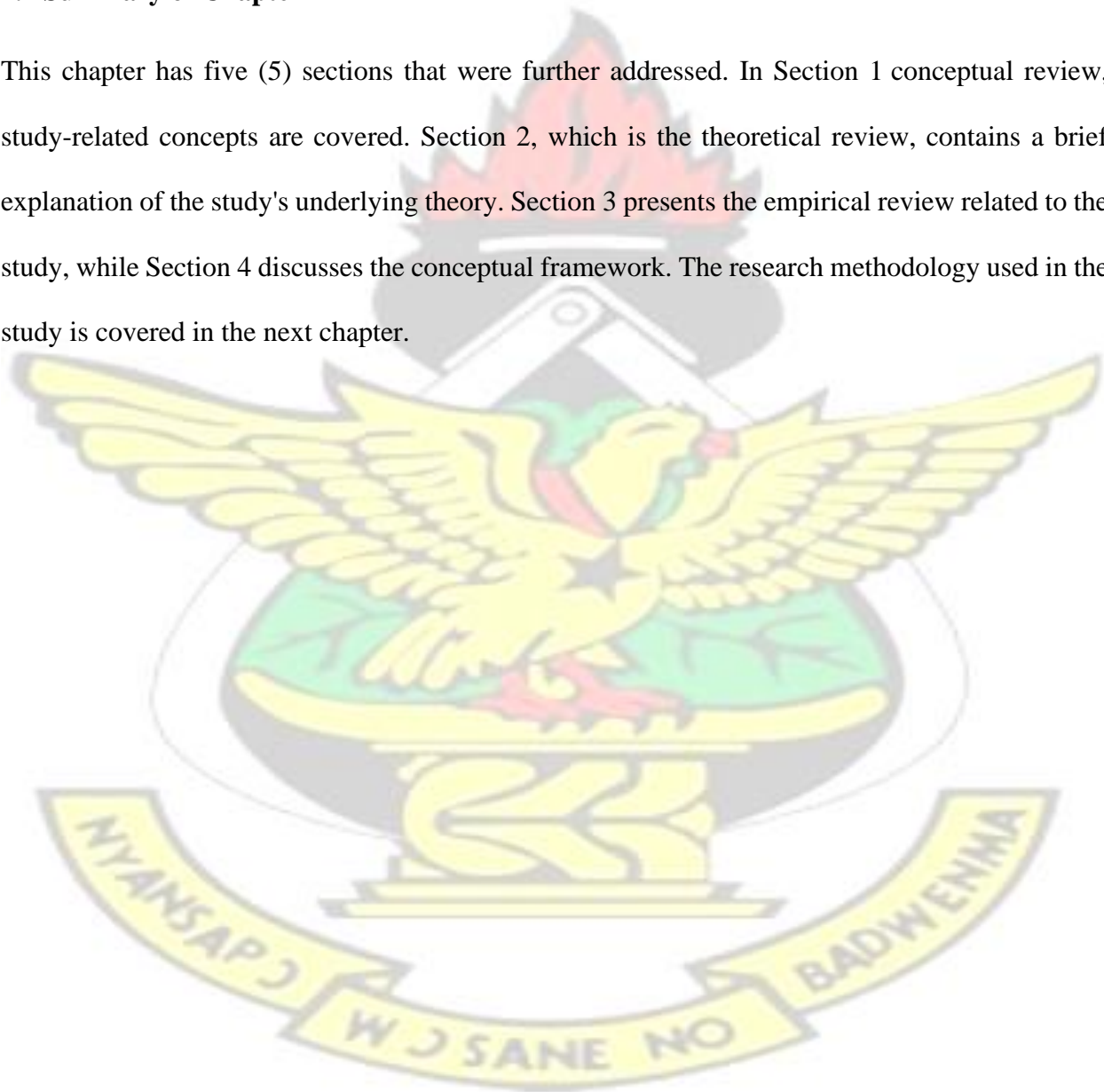
The conceptual framework is supported by the theory of Innovations. This section describes the theoretical foundation and assumptions that underpin how digitisation innovation interaction shocks affect financial development in Sub-Saharan African countries. The worth of financial development was analysed in relation to digital innovation interaction shocks.



**Figure 2. 1 Conceptual Framework**

## **2.7 Summary of Chapter**

This chapter has five (5) sections that were further addressed. In Section 1 conceptual review, study-related concepts are covered. Section 2, which is the theoretical review, contains a brief explanation of the study's underlying theory. Section 3 presents the empirical review related to the study, while Section 4 discusses the conceptual framework. The research methodology used in the study is covered in the next chapter.



Author	(Results in parenthesis)	Dependent variable	Data Source	Theory applied	Country	Industry
Anarfo et al. (2019)	According to the results, there is a reverse causal association among FSD and financial inclusion in both the total sample and the sample of Sub-Saharan African nations. FSD and financial inclusion are closely correlated.	financial development	International Financial Statistics (IFS)	No theory	Ghana	Financial services
Anarfo et al. (2020)	The results indicate a reverse causal association between financial inclusion and migrant remittances in Sub-Saharan Africa.	financial development	panel vector autoregressive (VAR)	No theory	Ghana	Financial services
Busumtwi-Sam (2019)	This study discovers that remittances, as a sustainable, private transaction, directly reduce poverty and promote financial development in Sub-Saharan Africa	financial development	Primary source	No theory	sub-Saharan Africa.	Financial services
Bandura and Dzingirai (2019)	.Even though the connection between the institutional elements and economic growth was tenuous, both direct and indirect effects were favourable.	financial development	secondary source	No theory	sub-Saharan Africa.	Financial services
Ndubuisi et al. (2021)	Researchers additionally uncover evidence that low-income countries commonly benefit from digital infrastructure's positive employment effects in the services sector.	financial development	Primary source	No theory	sub-Saharan Africa.	Financial services
Donou-Adonsou et al. (2020)	there is an indication that the long-term link between remittances and financial growth is negatively impacted by remittance pricing.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services

Kumar et al. (2015)	When paired with financial development and remittances, information and communications technology (ICT), which has a negative impact on income on its own, produces both short- and long-term advantages.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Olayungbo and Quadri (2019)	Remittances and financial development were shown to have positive effects on economic growth in both the short and long terms when cointegration was developed.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Ejemeyovwi et al. (2021)	The study finds that across all 6 datasets, the ICT-innovation interaction shock has a favourable impact on financial development.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Payne et al. (2018)	The findings show that digital natives have differing opinions on the relative advantages of our two dependent variables	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Payne et al. (2018)	The results demonstrate that consumers' views about adopting mobile banking are mostly influenced by their level of digital literacy, resistance to change, perceptions of risk, usability, and usefulness.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Disse and Sommer's (2020)	The SME sector contributes significantly to the value-added of the nation and is positively and highly correlated with both economic variety and growth	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services

Myovella et al. (2020)	The findings indicate that digitalisation boosts economic growth in both categories of nations.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Tinta (2022)	The results highlight the significance of institutional quality and human capital, even if they may predominantly help high-income and upper-middle-income countries.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Nguimkeu and Okou (2021)	The study backs tactics that increase output in the unorganised sector and provide employment opportunities by using low-skilled-biased digital technologies in supportive business environments.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services
Sarpong and Nketiah-Amponsah (2022)	The study finds that consumption of financial services, among other characteristics, has a quantifiable and obvious impact on inclusive growth, in contrast to the accessibility and understanding of financial services.	financial development	Primary source	No theory	Sub-Saharan African nations	Financial services

## **CHAPTER THREE**

### **METHODOLOGY**

#### **3.0 Introduction**

This section entails the various applicable techniques, methods and tools deemed fit to meet the study objectives. The chapter is organised into the study design, the population used, the appropriate sample and sampling technique employed, the approach or methods used, and the variables descriptions and measurements. The chapter concluded with a brief summary of the content of this section of the study.

#### **3.1 Research Design**

A study's research design is its overarching methodological framework. Methods such as data collection, analysis, interpretation, and discussion, as well as the presentation and discussion of results, are all laid out in detail in the design (Edubirdie, 2022). The two primary pillars of a well-designed study are the research paradigm and the research methodology (Kelly, Dowling and Millar, 2018; Saunders et al., 2017). Therefore, the study questions were interpreted using the positivist paradigm in order to find answers. The core tenet of positivism is the belief that scientific methods, such as statistical analysis, may be used to objectively decide what is true (Kelly, Dowling and Millar, 2018). Thus, it was considered that a quantitative strategy would be most suitable for this study. Edubirdie (2022) classifies the three main kinds of research techniques as experimental/exploratory, explanatory, and descriptive. Consequently, this study opted for a method that sought explanations. This technique is useful when understanding the causal link between the variables in the issue is crucial to answering the research questions at hand (Saunders and Thornhill, cited by Tafa and Worku, 2022). When looking at whether or not

two variables could have a connection, explanatory designs are useful (Creswell and Creswell, 2017). Due to the study's focus on the association between digitisation and financial sector development an explanatory or causal research technique was appropriate for this investigation. The research design describes the big-picture plan and method for conducting the study. Methods such as data collection, analysis, interpretation, and discussion, as well as the presentation and discussion of results, are all laid out in detail (Edubirdie, 2022). The selected research design was pertinent to this investigation

### **3.2 Population and Sample**

The population of the study encompassed all eligible participants or study entities that were considered in the study. Thus, the study area is Sub-Saharan Africa, where 54 countries in the sub-region constituted the population. A census study was undertaken, thus all 54 countries were included in the study. The countries included are, Algeria, Angola, Burundi, Benin, Burkina Faso, Botswana, Central African Republic, Chad, Cote d'Ivoire, Cameroon, Congo Republic, Comoros, Cape Verde, Democratic Republic of Congo (DRC), Djibouti, Egypt, Equatorial Guinea, Eritrea, Eswatini, Ethiopia, Gabon, Ghana, the Gambia and Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Libya, Malawi, Madagascar, Mauritania, Mauritius, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Seychelles, Sierra Leone, Somalia, South Africa, South Sudan, Sudan, Tanzania, Togo, Tunisia, Uganda, Zambia and Zimbabwe. The secondary data for these countries was extracted over 21 years, that's from 2000 to 2021 from the World Bank.

### **3.3 Variable Description**

The World Bank's Development Indicators were mined for information on the 54 nations in Sub-Saharan Africa. Specifically, the following variables were elicited to achieve the study objectives:

- 1. Financial Sector Development:** the financial development index of each country was used to measure financial sector development, therefore, the index constituted six measurements; they are financial depth, financial access, financial stability, financial size, financial efficiency and financial activity.
- 2. Digitisation:** Three proxy variables were used to measure the adoption of digitisation in the countries under study. Therefore, the variables of information and communication technology (ICT), national innovation, and the relationship between digitalisation and innovation. The prevalence of ICT was evaluated by tallying the number of mobile phone users and internet browsers. Innovation on the other hand was measured by the number of Scientific and technical journal articles in each country.

The study also included controlled variables based on the extant literature of Ejemeyovwi et al (2021). Therefore, two controlled variables such as institutional quality (IQ) and real gross domestic product growth (GDPGR).

**Institutional Quality:** The quality of governance in each country in Sub-Saharan Africa was taken into account for the research. Therefore, we utilised the World Bank's data to create a governance index.

Consider Table 1 below:

**Table 1: Variable Description and Measurement**

Variables	Description	Measurement	Data Source	A priori Sign
<b>Dependent</b>				
<b>Financial Sector Development (FD)</b>	1. Financial Depth 2. Financial Access 3. Financial Activity 4. Financial efficiency 5. Financial size 6. Financial stability	1. The ratio of private sector credit to GDP 2. Depositors with commercial bank 3. Issuance of private domestic loans from financial institutions 4. The ratio of bank credit to bank deposit 5. Bank assets on central bank assets 6. Z-score of banks	World Bank Financial Development database  Trading Economic, 2022	
<b>Independent Variables</b>				
<b>Digitisation</b>	1. ICT	1. Subscribers of mobile phone 2. Internet users	1. World Bank, 2021a 2. World Bank, 2021a	+
	2. Innovation (INN)	3. The number of scientific and technical journals 4. ICT-Innovation interaction	3. World Bank, 2021b 4. World Bank, 2021b	+
<b>Controls</b>	1. Institutional Quality (IQ)	1. Effectiveness of government 2. Gross Domestic Product growth rate	3. World Bank, WGI Data base, 2022b 4. World Bank, 2021a	+/- +
	2. GDPGR			

Author's computation (2023) sourced from Ejemeyovwi et al (2021).

### Data Analysis

To determine the link and interdependence between microeconomic and financial variables as used in this study, the VAR model is pertinent. However, this model is time-invariant; as such, highly restrictive in accounting for the dynamics of time-series economic data (Pacifico, 2021).

Therefore, the effect of digitisation on financial development in Africa was achieved with the Bayesian Panel Vector Auto-Regressive (BPVAR). This method has been used by Mukhtarov and Aliyev (2021) and Ejemeyovwi et al (2021) which turned to produce very efficient and unbiased results. Prior and post-estimation tests will be conducted to ensure the reliability and validity of the estimated models. The preliminary test such as descriptive statistics (such as mean, standard deviation, skewness and kurtosis) and graphical representation of the data preceded the main data analysis. This was aimed at getting the overall picture and trend of the data set. Also, some important pre-test analysis of the panel data is the stationarity test of the variable to ensure the model is devoid of spurious regression and to assist in identifying a suitable digital innovation study. Post-estimation tests included correlation, multicollinearity, and heteroscedasticity among others. The panel regression model used in the analysis included all dependent, independent and controlled variables, as well as the interaction variable, digital innovation. The Eviews version 10 statistical software was used for the data analysis and presentation of results. Consider the functional form of the model in equation (1):

$$FD = f(S, X, M, Z) \dots \dots \dots (1)$$

Where the independent variables are represented by S, X, M and Z. S represents Information and communication technology (ICT), X is innovation, M is the interactive term of digitisation and innovation, and Z is the control variables.

In panel form, the implicit functional form is represented as:

$$FD_{i,t} = f = (ICT_{i,t}, INN_{i,t}, ICT * IN_{i,t}, GDPGR_{i,t}, IQ_{i,t}) \dots \dots \dots (2)$$

Where the subscripts 'i' and 't' represent country 'i' at time 't'. See Table 1 for variable description and measurements. The explicit model for the study is specified as presented in equation (3).

$$FD_{i,t} = \beta_0 + \beta_1 ICT_{it} + \beta_2 INN_{i,t} + \beta_3 ICT * INN_{i,t} + \beta_4 IQ_{i,t} + \beta_5 GDPGR_{i,t} + \varepsilon_{i,t} \dots \dots \dots (3)$$

To compute for Financial Development (FD), the study employed SPSS v20 to perform the dimensional reduction method. Thus, the widely used principal component analysis (PCA) technique as used by Ejemeyovwi et al (2021) was employed in this study. This method enabled the study to reduce and transform the six constructs (that is; financial depth, financial access, financial activity, financial efficiency, financial size, and financial stability) that measure FD into a smaller data set or variables while still keeping the relevant information of the data.

One of the aims of the study is to gauge the transmission effect of one variable (Digital-innovation, GDPGR, IQ, ICT) onto the other (financial development). This necessitated the use of the Bayesian Panel Vector Auto-Regressive (BPVAR) method. The BPVAR is not entirely different from the conventional VAR model, especially regarding the interdependency and endogeneity of the variables; except that BPVAR incorporated the cross-sectional nature of the data to ensure that shocks from one country do not transmit to other countries (Amu, 2018). Time variations in the coefficients and the variance of the shocks and accounting for cross-sectional dynamic heterogeneities are all easily incorporated into the BPVAR, making it a useful tool for capturing both static and dynamic interdependencies (Amu, 2018; Canova and Ciccarelli, 2013). VARs are statistical models with a great deal of leeway because of their many free parameters. By considering the model parameters to be independent random variables and assigning them prior probability, the BVAR eliminates the issue of over-parameterisation. Using the Bayesian theorem in conjunction with conventional VAR models, the BPVAR approach is able to circumvent the shortcomings of the unconstrained VAR (UVAR) technique, the gold standard for estimating the dynamics of economic issues. The UVAR has been criticised for being excessively open-ended and lacking limitations in its presentation of the

autoregressive components of the model. In their 2003 paper, Ciccarelli and Rebucci highlighted the results of their generalised UVAR models. (1) The problem of overfitting, caused by the lack of prior beliefs and leading to unreliable coefficients, is nearly always present in models with an unconstrained structure. This problem is generated by the fact that there are no prior beliefs. (2) The analysis often provides a straightforward account of the facts it examines. In a nutshell, these findings may not be accurate.

### **Chapter Summary**

The research methods were described in this section. It covered the methodology of research that would be required to accomplish the aims of the study. In particular, a positivist-inspired explanatory research approach was used. The population was successfully mapped. So, they just did a census survey without doing any kind of sample. It was explained how secondary data met the study's needs and what other data sources were available. The methods and tools used to collect the data were also described in detail. The approach of desk analysis was used, essentially. The chapter recommended using Eviews 10 and SPSS V20 to study the data. Digitalisation and progress in Africa's financial industry were linked using the BPVAR approach.

## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### 4.1 Introduction

This section presents and discusses the findings from the research analysis. The variables and their descriptions, correlations, diagnostic tests, and BPVAR model estimations are all included in this chapter. The results are also analysed in light of relevant studies and ideas.

#### 4.2 Descriptive Statistics

Descriptive statistics were chosen because they enable data to be summarised based on frequency and percentage. Using frequency and percentage distributions, descriptive statistics have been shown to give researchers confidence and insight into the nature of their raw data (Garson, 2012). In addition to using histograms, box plots, frequency polygons, bar charts, pie charts, and scatter diagrams, Lind (2008) believes that researchers might use various forms of descriptive statistics to build on the concepts underlying their investigations. When classifying the variables in this study, however, the researcher relied on measures of central tendency (minimum, maximum, mean, and standard deviation).

**Table 4.1 Descriptive Statistics**

(The sample size was all the 54 Sub-Saharan Africa with 1188 observations in the time intervals of 2000 to 2021)

**Table 4. 1**

Variables	Mean	Std. Dev.	CV	Observation
FD	2.143	1.939	0.905	1188
ICT	3.290	1.025	0.3115	1188
INN	3.717	2.824	0.7597	1188
FI	15.738	13.533	0.859	1188
ED	3.368	1.483	0.440	1188
IQ	3.539	1.499	0.424	1188
GS	2.210	0.408	0.185	1188
IFS	4.303	2.460	0.572	1188
GDPGR	15.731	5.403	0.343	1188
INF	9.500	3.500	0.368	1188

Source: Author's Computation (2023): NB; where "FD is the Financial Sector Development, ICT information communication technology, INN is the innovation, FI is the financial inclusion, ED is the economic development, IQ is the institutional quality, GS is the government support, IFS is the infrastructure, GDPGR is the Gross Domestic Product growth rate, INF is the inflation rate"

With a mean score of 2.143, the financial sector in Sub-Saharan areas may be moderately developed, on average. Although the mean degree of financial sector growth is quite consistent throughout these locations, the standard deviation of 1.939 suggests that there is substantial diversity. This can be because of variations in the economic, political, and social conditions that shape the evolution of the financial sector. In contrast, with a mean score of 3.717 for innovation and 3.290 for ICT, Sub-Saharan areas may have a relatively high degree of innovation and ICT adoption on average. This may be attributable to the region's elevated value placed on innovation and entrepreneurship as well as the widespread use of digital technologies. Previous studies have shown that innovation and technology are crucial to the growth of the financial industry in Sub-Saharan Africa (Lazarevski, 2019; Tchamyu, 2020),

and our descriptive findings are in line with those studies. They also support the idea of boosting the region's economy via investment in digital infrastructure and innovation (Ghani et al., 2016; Kshetri, 2018).

The mean score of 3.368 for economic development suggests that, on average, the level of economic development in the study may be moderate. The standard deviation of 1.483 indicates that there is a fair amount of variability in economic development across the sample. These results may be consistent with findings from previous studies that suggest economic development is influenced by a range of factors, including institutional quality and government support (Acemoglu et al., 2019; Rajan, 2015). The mean score of 3.539 for institutional quality suggests that, on average, the institutions in the Sub-Saharan region may be relatively strong. Strong institutions are important for promoting economic development because they can help reduce corruption, promote the rule of law, and provide a stable environment for investment (Rodrik, 2018). The mean score of 2.210 for government support suggests that, on average, the level of government support in the Sub-Saharan region may be relatively low. As Stiglitz (2018) points out, government spending on infrastructure, education, and other public goods may have a significant impact on economic growth.

The mean score of 4.303 for infrastructure suggests that, on average, the level of infrastructure in sub-Saharan Africa may be moderate. However, the standard deviation of 2.460 indicates that there is considerable variation in the quality of infrastructure across the region. This finding is consistent with previous research, which has highlighted the challenges faced by sub-Saharan African countries in developing their infrastructure, such as inadequate funding, weak institutional capacity, and lack of private-sector involvement (African Development Bank, 2018; Asongu et al., 2019). The mean score of 15.731 for GDP growth rate suggests that, on average, sub-Saharan African countries have experienced moderate economic growth in recent years. However, this growth rate may not be sufficient to achieve sustainable economic

development, given the region's high levels of poverty and inequality (World Bank, 2021). Additionally, the mean score of 9.500 for inflation suggests that the region experiences moderate levels of price increases, which could have negative impacts on economic growth and social welfare (Epaphra, 2017).

#### **4.3 Correlation Analysis**

One useful method for determining whether or not the independent variables in a research are multicollinear is to calculate the correlation between the dependent and independent variables. In the preceding section, we summarised the findings of our correlation analysis for elements that aid in the growth of the financial industry in Table 4.2. The degree and direction of the association between two variables are both conveyed by the correlation coefficient. The sign of the coefficient (positive or negative) denotes the direction of the connection, while its absolute value reveals its strength. There may be multicollinearity among the independent variables, and the correlation matrix might help you find it. When there is a high correlation between the independent and dependent variables ( $r=0.7$  or above), it may be hard to draw causal conclusions. This is the case if two predictor variables can predict each other with high precision (Akuoko, Aggrey, and Arhen, 2020; Agyekum et al., 2016). Based on the correlation results, there are no multicollinearity issues.

**Table 4. 2: Correlation Matrix**

S/N	Variables	1	2	3	4	5	6	7	8	9	10
1	FD	1									
2	ICT	0.022***	1								
3	INN	0.035***	0.0389*	1							
4	FI	0.052***	0.4904*	0.3449*	1						
5	ED	0.159***	0.0893*	0.3499*	0.0944*	1					
6	IQ	0.054***	-0.0639	0.2999*	0.0994	0.9988*	1				
7	GS	0.0409*	0.0409*	0.1792*	-0.0939	0.0428*	0.1939*	1			
8	IFS	0.0994*	0.0994*	0.0893*	0.5214*	0.0034	0.0280	0.0440*	1		
9	GDPGR	0.2094*	0.2094*	-0.0639	0.9942*	0.2820*	0.1803*	0.0030	0.3093*	1	
10	INF	-0.149*	0.0304	0.0099	0.2839	0.0594*	0.0438*	0.0449*	-0.294*	0.0389*	1

Source: Author's Computation (2023); NB; where "FD is the Financial Sector Development, ICT is the information communication technology, INN is the innovation, FI is the financial inclusion, ED is the economic development, IQ is the institutional quality, GS is the government support, IFS is the infrastructure, GDPGR is the Gross Domestic Product growth rate, INF is the inflation rate"

According to the findings of the correlation analysis, there is a positive and significant link between the progress made in the Financial Sector and the advancements made in ICT, innovation, financial inclusion, economic growth, institutional quality, government support, infrastructure, and the rate at which GDP grows. In contrast, a negative and statistically significant association exists between inflation and progress in the financial sector. Research in this area has consistently demonstrated a favourable correlation between ICT and the growth of the financial sector. Moshiri and Sulaiman (2015), for example, discovered that ICT usage in banking may boost Financial Sector Development. The use of ICT has been linked to financial innovation, expanded access to financial services, and enhanced efficiency, all of which contribute to the growth of the financial sector, as pointed out by Ayadi et al. (2016). The growth of the financial sector is positively correlated with innovation as well. Arouri et al. (2015), for instance, discovered that innovations in the financial sector may boost the sector's growth by increasing both the variety and efficiency of available financial goods and services. There is a favourable correlation between FSD and financial inclusion, which is the ease with which people and enterprises may get access to and make use of financial services. Access to financial services, investment in productive activities, and effective risk management are all ways in which financial inclusion may stimulate economic expansion (Beck et al., 2014).

Moreover, economic development has been found to have a positive relationship with Financial Sector Development. For instance, Demirgüç-Kunt and Levine (2009) found that economic development can lead to increased financial intermediation, which in turn promotes Financial Sector Development. Institutional quality and government support have also been found to be positively related to Financial Sector Development. According to Beck et al. (2014), well-functioning institutions and supportive government policies can promote financial development by reducing uncertainty and risk, increasing trust, and promoting competition and innovation. Furthermore, infrastructure, such as the availability and quality of

telecommunications and internet infrastructure, has been found to have a positive relationship with Financial Sector Development. Adequate infrastructure can enhance the adoption of digital financial services and expand their reach, as noted by Kshetri (2018). Finally, the GDP growth rate has been found to have a positive relationship with Financial Sector Development. According to Demirgüç-Kunt and Levine (2009), a higher GDP growth rate can lead to increased demand for financial services, which in turn promotes Financial Sector Development. On the other hand, inflation has been found to have a negative relationship with Financial Sector Development. High inflation can increase uncertainty and risk, discourage savings and investment, and erode the value of financial assets, as noted by Beck et al. (2014).

Furthermore, the correlation matrix identified the potential multicollinearity of independent variables. In a circumstance in which the independent variables are strongly linked ( $r=0.7$  or more) such that it is impossible to disentangle the effects of the independent on the dependent variable. In other words, one of the predictor variables may be predicted with near-perfect accuracy by another predictor variable (Akuoko, Aggrey and Arhen, 2020; Agyekum et al., 2016). Therefore, based on the correlation results there are no issues with multicollinearity.

#### **4.4 Cross-Sectional Dependence Tests**

Tests for cross-sectional dependency show that the existence of cross-sectional reliance in the data is confirmed and the null hypothesis is rejected, as shown in the table. Consistent with previous empirical investigations (Hasemyer and Cushman, 2015; Barnard et al., 2021; Fard et al., 2020), we address this problem using the Bayesian Panel Vector Auto-Regressive (BPVAR) technique. Given that the number of explanatory variables in our model exceeds the number of cross-sectional units, the study uses country-fixed effects to estimate the model.

### Cross-sectional Dependence Tests

Test	Statistic	p-Value
Pesaran CD test	2.3571	0.0042
Pesaran scaled LM test	3.4170	0.0236
Breusch-Pagan LM test	23.4144	0.0047

Source: Authors Computation (2023)



**Table 4. 3 Panel Unit Root Test**

Variables	LLC Level	IPS	ADF	PP	LLC difference	First difference	IPS	ADF	PP
FD	0.465	8.319	46.104	68.435	-81.187***	-10.199***	781.311***	891.192***	
ICT	-0.5472	-1.821	75.190	78.171	-21.217***	-23.183***	231.141***	664.119***	
INN	-3.821***	-8.714***	94.972***	161.61***	-19.319***	-24.181***	745.161***	1510.11***	
FI	-6.491***	-4.243***	45.215***	140.112***	-20.130***	-23.812***	389.164***	1219.917***	
ED	-8.738***	-3.7651***	23.815***	32.472***	13.894***	13.892***	283.291***	2138.929***	
IQ	1.483	10.835	54.198	76.576	-89.387***	-20.132***	681.381***	789.392***	
GS	-1.837	-3.936	59.846	88.473	-29.419***	-33.875***	131.491***	558.889***	
IFS	-7.5673***	-7.378***	84.572***	287.687***	-29.349***	-34.291***	775.861***	2510.893***	
GDPGR	-6.745***	-4.378***	39.485***	210.312***	-10.230***	-33.882***	287.164***	1319.817***	
INF	-9.746***	-3.845***	35.485***	42.472***	23.184***	23.772***	283.291***	2938.649***	

Source: Author's Computation (2023): NB; where "FD is the Financial Sector Development, ICT is the information communication technology, INN is the innovation, FI is the financial inclusion, ED is the economic development, IQ is the institutional quality, GS is the government support, IFS is the infrastructure, GDPGR is the Gross Domestic Product growth rate, INF is the inflation rate" Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality

It is vital that the data series be characterised by stationarity in order to improve the accuracy and dependability of BVAR models. According to Dasgupta (2012), a data series is considered stable if its mean and variance are unchanging throughout time and if the covariance between two extreme periods does not rely on the time at which it is calculated but on the lag between them. The integrated level of each series may be calculated using the Augmented Dickey-Fuller (ADF) test (Dickey and Fuller, 1979), the Phillips and Perron (1988) test, or the Kwiatkowski et al. (1992) test. Notably, the panel unit root test results indicate that the dataset is free from issues.

## 4.5 Results and Discussion According to the Objectives of the Study

### 4.5.1 The effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa

**Table 4. 4 Table 4.4: Model Estimation (1)**

Variables	Coefficient
ICT	0.300*** (6.25)
INN	0.015*** (4.72)
ICT*INN	0.016*** (3.62)
GDPGR	0.005** (2.52)
INF	0.017 (1.30)

Source: Authors Computation (2023): NB, where “ICT is the information communication technology, INN is the innovation, ICT\*INN is the information communication technology and innovation interaction, INF is the inflation rate and GDP growth rate”

According to the research, there is a positive and statistically significant link between digital innovation interaction shocks and economic growth in Sub-Saharan Africa. According to these findings, digital innovation has the potential to play a decisive role in fostering financial development in Sub-Saharan Africa, therefore contributing to economic expansion and the alleviation of poverty there. Several studies have shown that digital innovation has aided the economic growth of Sub-Saharan Africa. Tchamyou (2017), for instance, revealed that mobile

phone use significantly contributes to economic growth in Sub-Saharan Africa. According to the research, this is because mobile phones make it easier for people to use banking services, lower transaction costs, and broaden their participation in the financial system. Saidu and Oluwagbemiga's (2018) research on Nigeria, a nation in Sub-Saharan Africa, concluded that financial innovation, especially digital innovation, positively affects financial growth in the country. In addition, the theoretical foundations of the literature on the influence of technology on economic growth are compatible with the favourable effect of digital innovation on financial development in Sub-Saharan Africa. Increased production and economic development have been linked to technical innovation in the past (Grossman and Helpman, 1991).

#### 4.5.2 Factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries.

**Table 4. 5: Model Estimation (2)**

Variables	Coefficient
ICT	0.0413*** (0.0028)
INN	0.0671*** (0.0199)
FI	0.0167** (0.0082)
ED	0.0120*** (0.0032)
IQ	0.0167** (0.0078)
GS	0.0609** (0.0284)
IFS	0.0802 (0.0716)
GDPGR	0.0345*** (0.00220)
INF	-0.0179 (0.0975)

Source: Author's Computation (2023): NB; where "FD is the Financial Sector Development, ICT is the information communication technology, INN is the innovation, FI is the financial inclusion, ED is the economic development, IQ is the institutional quality, GS is the government support, IFS is the infrastructure, GDPGR is the Gross Domestic Product growth rate, INF is the inflation rate"

The study's findings imply that financial inclusion, economic growth, institutional quality, government backing, and infrastructure all play crucial roles in the sector's evolution. This result agrees with previous research on the factors that influence the growth of the financial industry (Moshiri and Sulaiman, 2015; Tchamyou, 2017). Researchers and policymakers are paying more attention to financial inclusion because of the positive effects it has on economic growth and poverty alleviation. Masha et al. (2021) discovered that expanding access to banking services stimulates economic development in Sub-Saharan Africa. According to the research, this is because more people are able to get the loans and other financial aid they need, which in turn boosts investment and output. Financial inclusion was also identified to be a key factor in the growth of the financial services industry in another research by Kasekende and Atingi-Ego (2018). According to the research, the expansion of access to banking services is one factor that might boost the growth of the financial industry. Financial inclusion may have a beneficial effect on poverty reduction, according to research by Demirgüç-Kunt and Klapper (2013). In order to alleviate poverty, the research concluded that more people, especially those with lower incomes, need access to banking, credit, and insurance services.

Research also indicates that a growing economy is a good contributor to the expansion of the financial system. The expansion of a country's financial industry is often a result of rising demand for such services as the economy expands (King and Levine, 2013). A rising amount of research has shown the importance of a well-developed financial sector to a thriving economy. Financial sector development in Sub-Saharan Africa is positively correlated with economic growth, according to research by Odhiambo (2020). According to the research, the expansion of the economy increases the need for financial services, which might fuel the growth of the financial industry. Economic growth was also revealed to be a significant factor in the evolution of financial

systems in different nations in a research by Beck et al. (2011). According to the research, a more complex economic system necessitates a more complex financial system because of the rising need for financial intermediation. Additionally, Aiyar et al. (2013) discovered that financial development might positively affect economic growth, especially in underdeveloped nations. Financial sector development was highlighted as a key factor in the study's findings that investment and innovation may boost productivity and economic growth.

Institutional quality, which refers to the strength and effectiveness of a country's legal and regulatory institutions, has also been identified as an important determinant of financial sector development (Beck et al., 2003). Countries with stronger institutional quality are more likely to have better-developed financial sectors, as these institutions provide a stable and predictable environment for financial transactions to take place. The importance of institutional quality in promoting financial sector development has been extensively discussed in the existing literature. Studies have shown that countries with stronger institutional quality are more likely to have better-developed financial sectors, as they provide a stable and predictable environment for financial transactions to take place. For example, a study by Beck et al. (2003) found that institutional quality is a key determinant of financial sector development. The study emphasized that well-functioning legal and regulatory institutions can create a favourable environment for financial intermediation, reduce information asymmetry, and lower transaction costs, which are crucial for the development of a robust financial sector. Similarly, a study by Khan and Senhadji (2000) found that institutional quality is positively related to financial sector development in developing countries. The study highlighted that strong institutional quality can improve the governance of financial institutions, increase transparency and accountability, and reduce corruption, all of which are important factors for the development of a sound financial sector. Furthermore, a study by

Demirgüç-Kunt and Klapper (2012) found that institutional quality is positively associated with financial inclusion. The study emphasized that well-functioning legal and regulatory institutions can increase the availability of financial services, reduce barriers to entry, and promote competition, leading to greater financial inclusion.

Government support is an important factor that can promote financial sector development. Policies and regulations implemented by the government can have a significant impact on the growth and development of the financial sector. For example, governments can encourage financial institutions to lend to certain sectors of the economy by providing incentives, such as tax breaks or subsidies. This can help to direct credit to areas that may have been previously underserved by the financial sector, leading to increased economic growth and development. The establishment of credit bureaus is another example of government support that can encourage the growth of the financial sector. Credit bureaus can facilitate credit scoring, which can help to increase access to credit and reduce credit risk. This, in turn, can lead to an expansion of financial services and increased financial sector development.

Infrastructure is also a key factor that contributes to financial sector development. The availability of electronic payment systems and the quality of telecommunications networks are crucial in ensuring the efficient delivery of financial services. Increasing financial inclusion and advancing the financial sector are two outcomes that may result from the widespread use of electronic payment systems. A reliable communications infrastructure is also important for the efficient distribution of financial services since it facilitates the free flow of data between banks and their clients. Financial sector growth is linked to improvements in infrastructure, such as telecommunications networks, according to research by Honohan and Beck (2007). In order for

the financial industry to expand and improve, the research emphasised how important it is to have access to efficient and trustworthy infrastructure.

#### 4.5.3 The role of digitisation in complementing financial sector development in Sub-Saharan Africa

**Table 4. 6: Model Estimation (3)**

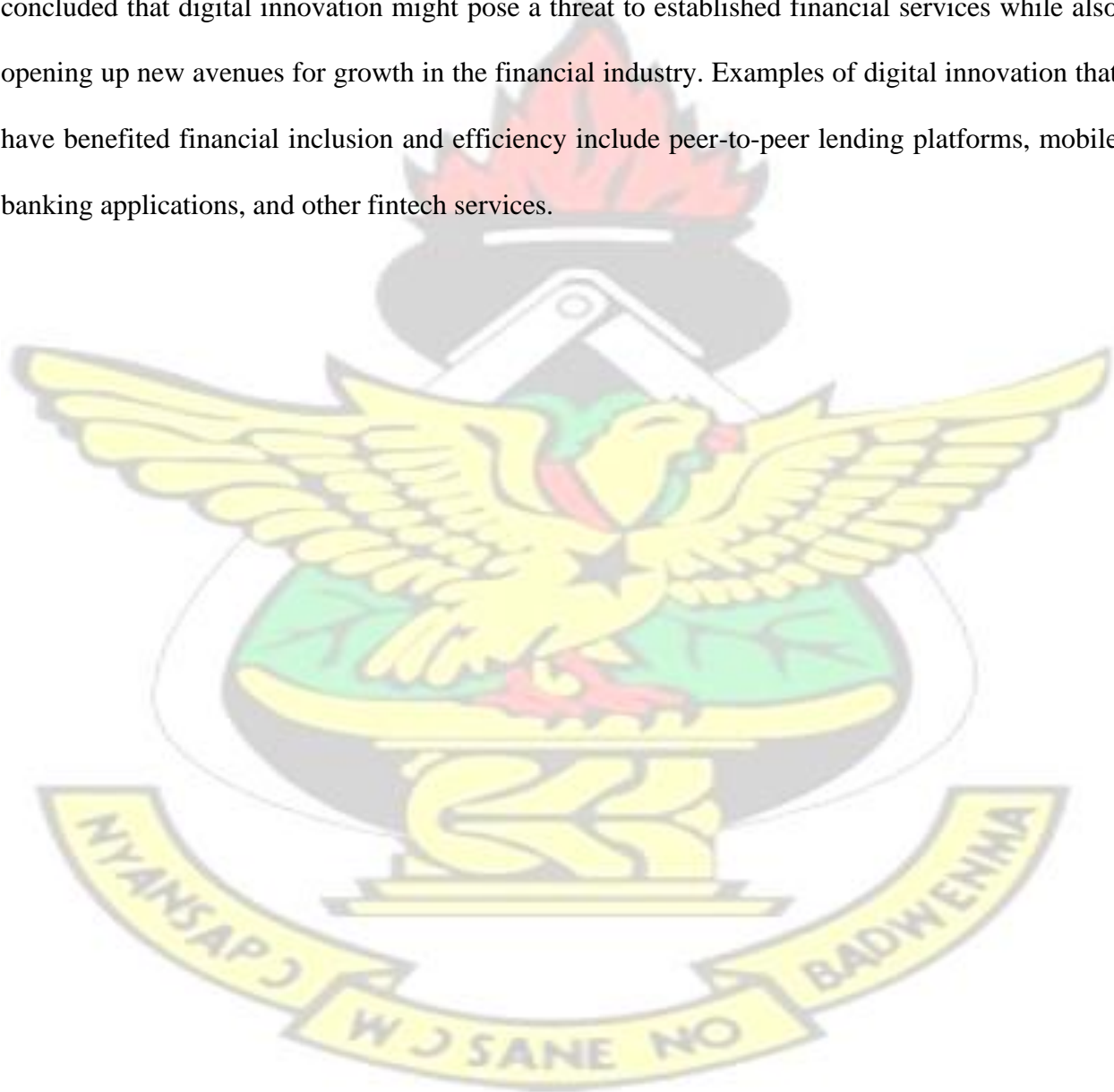
Variables	Coefficient
ICT	0.0334*** (0.0023)
INN	0.0939** (0.0415)
GDPGR	0.0167* (0.0101)
INF	0.0609** (0.0289)

Source: Authors Computation (2023): *NB, where “ICT is the information communication technology, INN is the innovation, INF is the inflation rate and GDP growth rate”*

The growth of the financial industry benefits greatly from digitalisation (and by extension, ICT and innovation). The favourable effects of digitalisation on the growth of the financial industry are supported by a growing body of research. Akhtar and Hussain (2020) did research in Pakistan and discovered that digital financial services significantly boosted financial inclusion, which in turn stimulated economic expansion. Digital financial services were also shown to significantly contribute to the growth of the financial industry. Zhu et al. (2019) came to a similar conclusion, concluding that digitisation helped the growth of China's banking industry. Access to financial services was widened and transaction costs were lowered thanks to the development of China's digital payment systems, online lending platforms, and other digital financial services, according to the report.

Beck et al. (2019) conducted research that confirmed digitisation helped advance Africa's banking system. The research concluded that the widespread use of mobile money has enhanced financial inclusion and boosted regional economic development. Dzansi and Dzandza (2021) also observed

that digital innovation contributed to the growth of Ghana's banking industry. The research concluded that the widespread use of digital financial services has promoted the growth of the financial industry by increasing access to financial services, decreasing transaction costs, and boosting financial inclusion. In addition, research shows that digitisation helps the financial industry grow by sparking new forms of innovation and service provision. Arner et al. (2015) concluded that digital innovation might pose a threat to established financial services while also opening up new avenues for growth in the financial industry. Examples of digital innovation that have benefited financial inclusion and efficiency include peer-to-peer lending platforms, mobile banking applications, and other fintech services.



## CHAPTER FIVE

### SUMMARY CONCLUSION AND RECOMMENDATION

#### 5.1 Introduction

This section provides a synopsis of the studies' findings and outcomes. The study's findings are summarised, and suggestions are provided. This study's results highlight the ways in which the financial growth of Sub-Saharan African nations is impacted by the shocks caused by the relationship between digitisation and innovation. Brief descriptions of the study's variables, a rundown of the research procedures, an overview of the results, and a discussion of the implications are all included in the summary.

#### 5.2 Summary of the Study

The study sought to examine how digitisation–innovation interaction shocks affect financial development in Sub-Saharan African countries. The explanatory research design based on the positivist research paradigm was adopted. All 54 Sub-Saharan Regions were chosen as the demographic for this research. Census sampling was used in this study to sample all 54 Sub-Saharan Regions due to data availability. Secondary data was gathered through the WDI database. The information was gathered from the period (2000-2021). Bayesian Panel Vector Autoregressive (BPVAR) was adopted to estimate the parameters involved in the study objectives.

##### 5.2.1 The effect of digital innovation interaction shocks on financial development in Sub-Saharan Africa

According to the research, the financial infrastructure in Sub-Saharan Africa benefits greatly from the interaction shocks brought about by digital innovation. This demonstrates the potential significance of digital innovation in stimulating economic development and alleviating poverty in

the area by expanding access to financial services and decreasing transaction costs. Other studies have also documented the positive impact of digital innovation, such as mobile phone usage, on financial development in the region. These findings are consistent with the theoretical idea that technological innovation can lead to productivity gains, increased output, and economic growth

### **5.2.2 Factors that determine the adoption of digitisation by the financial sector in Sub-Saharan African countries.**

The study's findings point to the importance of financial inclusion, economic growth, high-quality institutions, government backing, and sound infrastructure in the progression of the financial system. The study's results are noteworthy because they provide evidence that technological advancement may promote economic growth in Sub-Saharan Africa. This matters greatly since financial progress is a major factor in the region's economic growth and poverty alleviation. Financial development may boost economic growth and alleviate poverty if digital innovation is used to expand access to financial services, lower transaction costs, and increase financial inclusion. Financial inclusion, economic growth, high-quality institutions, government assistance, and sound infrastructure are all mentioned as important contributors to the expansion of the financial industry. To achieve long-term and equitable economic development, it will be necessary to address all of these concerns simultaneously. These results have important implications for policymakers in Sub-Saharan Africa, who should use their knowledge to foster conditions favourable to digital innovation, financial inclusion, and the growth of the financial sector. To this end, measures should be enacted to boost spending on digital infrastructure, expand access to financial education, and foster the development of cutting-edge financial innovations. Efforts to enhance institutional quality, governance, and infrastructure may also contribute to creating a more favourable setting for economic growth and monetary prosperity.

### **5.2.3 The role of digitisation in complementing financial sector development in Sub-Saharan Africa**

This conclusion is consistent with the rising body of evidence suggesting that technology may play a crucial role in fostering financial inclusion and economic growth in the financial sector. The studies cited in the summary come from a variety of locations, including Pakistan, China, Africa, and Ghana, and show that digital financial services can help to improve financial inclusion, lower transaction costs, and expand access to financial services overall. New financial goods and services are one of digitalisation's most important contributions to the growth of the financial industry. The digital revolution, as proposed by Arner et al. (2015), has shaken up the financial services industry and opened up new avenues for development. As a result, new financial technology (fintech) firms and products have emerged, making it easier for more people to have access to banking and lending services and boosting fintech's overall efficiency. Additionally, research indicates that digitisation promotes financial inclusion, a key factor in economic expansion and the alleviation of poverty. According to the mentioned research, persons in rural regions or with limited access to conventional financial services may benefit greatly from the expansion of digital financial services. More individuals in the formal financial sector are beneficial to economic development, and digital financial services may assist by lowering transaction costs and increasing ease.

### **5.3 Conclusion**

The purpose of this research was to analyse the impact of digital innovation shocks on financial growth in Sub-Saharan African nations. In sum, the research showed that digital innovation has contributed to the growth of the financial sector in Sub-Saharan Africa. The findings point to the positive effects digitisation may have on financial inclusion, transaction costs, and the creation of innovative financial goods and services on economic growth and the alleviation of poverty.

Financial inclusion, economic growth, high-quality institutions, official backing, and enough infrastructure are all mentioned as variables that, together with technological advancement, are crucial to the growth of the financial industry. These results have important implications for policymakers in Sub-Saharan Africa, who should use their resources to foster digital innovation and the growth of the financial industry. Efforts to enhance institutional quality, governance, and infrastructure may assist in making conditions more favourable for monetary innovation and economic expansion. Taken together, the findings point to the promise of digitalisation as a tool for fostering economic growth and reducing poverty, particularly in Sub-Saharan Africa.

## **5.4 Recommendation**

### **5.4.1 Practical Implication**

The practical implications of the study are significant for policymakers, financial service providers, and consumers in Sub-Saharan Africa. The findings highlight the need for concrete actions to promote digital innovation and financial inclusion in the region, with the aim of fostering economic growth and reducing poverty. Policymakers can utilise the study's findings to develop and implement policies that support digital innovation in the financial sector. This could involve investing in digital infrastructure, providing regulatory support, and promoting public-private partnerships to drive innovation. By creating an enabling environment for digital financial services, policymakers can expand access to financial services, particularly for those with lower incomes. This can contribute to financial inclusion and empower individuals and businesses to participate more fully in the economy.

Financial service providers can leverage the study's insights to develop and offer innovative digital financial products and services. By embracing digitalisation, financial institutions can reach a wider customer base, reduce transaction costs, and enhance operational efficiency. This can lead

to increased profitability and contribute to the overall growth and development of the financial sector in Sub-Saharan Africa. Investment in training and capacity building for individuals and institutions in the financial sector is also crucial to ensure the effective utilisation of digital innovation tools and technologies. For consumers, the practical implications of the study are particularly promising. The adoption of digital financial services can bring easier access to a range of financial products, lower transaction costs, and increased convenience. By embracing digital innovations, individuals can benefit from improved financial inclusion, access to credit, and enhanced financial literacy. These factors can contribute to improving financial well-being and empowering individuals to make informed financial decisions.

#### **5.4.2 Theoretical Implication**

The theoretical implications of the study are significant in advancing our understanding of the relationship between digital innovation and financial growth in Sub-Saharan Africa. The findings contribute to the existing literature by providing concrete examples that support the theory that technical progress can stimulate economic growth and development.

The study highlights the importance of digital innovation in improving the efficiency of financial intermediation. By embracing digital technologies, financial institutions can streamline their operations, enhance service delivery, and reach a broader customer base. This, in turn, can lead to increased regional productivity and economic development. The findings align with previous research that emphasizes the role of technology in fostering economic growth, particularly in underdeveloped nations (Akuoko, Aggrey and Arhen, 2020; Agyekum et al., 2016).

Moreover, the study underscores the need to investigate the impact of digital innovation on financial growth in underdeveloped countries, specifically in Sub-Saharan Africa. While the positive effects of digital innovation on financial growth in developed nations are well-

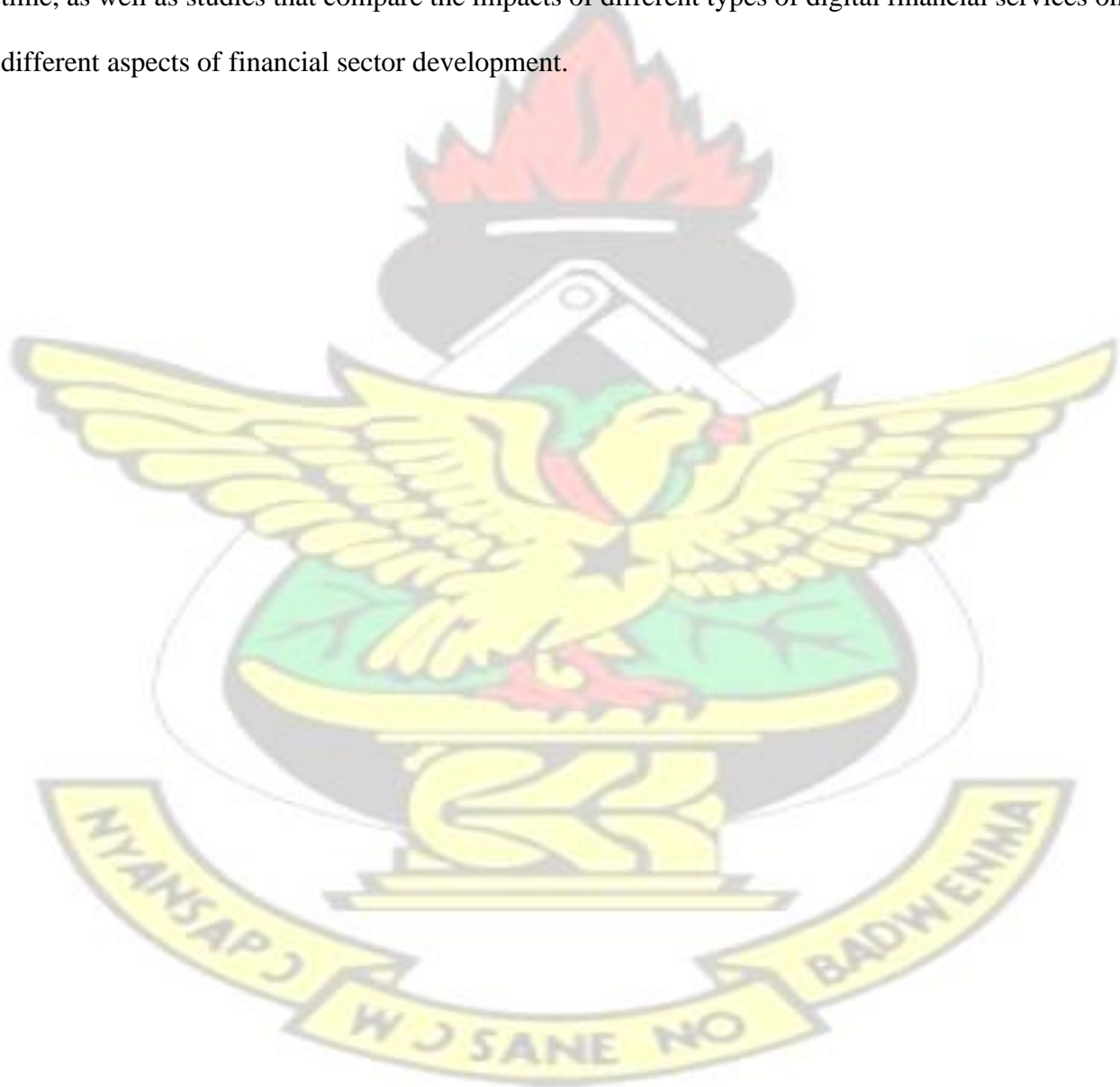
documented, there is a lack of research in the context of developing countries. This study fills that gap and highlights the potential of digital innovation in boosting economies and reducing poverty in underdeveloped regions by stimulating the expansion of their banking sectors.

Additionally, the study emphasizes the significance of financial inclusion in driving economic growth and development. By promoting access to digital financial services, individuals and businesses in Sub-Saharan Africa can overcome traditional barriers and participate more actively in the financial system. This aligns with previous research that emphasizes the role of financial inclusion in fostering economic growth and reducing poverty.

### **5.5 Suggestions for Future Research**

While the studies cited in the summaries provide important insights into the relationship between digital innovation and financial sector development in Sub-Saharan Africa, there are some limitations to consider. One limitation is that the studies may not capture all of the relevant factors that contribute to financial sector development, as there are likely many other social, economic, and political factors that play a role. Additionally, the studies may not be generalisable to all countries in the region, as different countries may have unique economic and political contexts that affect the relationship between digital innovation and financial sector development. There are several areas where future research could build on the findings of the studies summarised above. First, more research is needed to understand the specific mechanisms through which digital innovation promotes financial sector development and to identify the conditions under which these mechanisms are most effective. This could involve more detailed case studies of specific digital financial services or fintech companies in the region, as well as quantitative analyses that examine the causal relationship between digital innovation and financial sector development. Second, greater investigation into the factors preventing the widespread use of digital financial services in

Sub-Saharan Africa is required. Qualitative studies might be conducted to better understand the potential barriers to and enablers of digital financial service uptake, such as the perspectives of customers and suppliers. Last but not least, there is a need for additional study into the longer-term effects of digital financial services on financial sector growth and regional economic development. This could involve longitudinal studies that track the evolution of digital financial services over time, as well as studies that compare the impacts of different types of digital financial services on different aspects of financial sector development.



## REFERENCES

- Abeka, M.J., Andoh, E., Gatsi, J.G. and Kawor, S., 2021. Financial development and economic growth nexus in SSA economies: The moderating role of telecommunication development. *Cogent Economics & Finance*, 9(1), p.1862395.
- Aboal, D. and Garda, P., 2016. Technological and non-technological innovation and productivity in services vis-à-vis manufacturing sectors. *Economics of Innovation and New Technology*, 25(5), pp.435-454.
- Acheampong, A.O., Amponsah, M. and Boateng, E., 2020. Does financial development mitigate carbon emissions? Evidence from heterogeneous financial economies. *Energy Economics*, 88, p.104768.
- Adegboye, F., 2020. Digitalisation in the Agribusiness Value Chain and Payment Systems: Evidence from Sub-Saharan Africa. *Journal of African Development*, 21(1), pp.96-115.
- Aghion, P. and Festré, A., 2017. Schumpeterian growth theory, Schumpeter, and growth policy design. *Journal of Evolutionary Economics*, 27(1), pp.25-42.
- Alagidede, I.P., Ibrahim, M. and Sare, Y.A., 2020. Structural transformation in the presence of trade and financial integration in sub-Saharan Africa. *Central Bank Review*, 20(1), pp.21-31.
- Alam, K. and Imran, S., 2015. The digital divide and social inclusion among refugee migrants: A case in regional Australia. *Information Technology & People*.
- Al-Kodmany, K., 2015. Tall buildings and elevators: A review of recent technological advances. *Buildings*, 5(3), pp.1070-1104.
- Amu, B. (2018). Real business cycles in Sub-Saharan Africa [Unpublished master's thesis], Department of Economics and Development Studies, Covenant University, Ota, Ogun State, Nigeria
- Anarfo, E.B., Abor, J.Y., Osei, K.A. and Gyeke-Dako, A., 2019. Financial inclusion and financial sector development in Sub-Saharan Africa: A panel VAR approach. *International Journal of Managerial Finance*.
- Anarfo, E.B., Amewu, G. and Dzeha, G.C., 2020. Financial inclusion and migrant remittances in Sub-Saharan Africa: a panel VAR approach. *International Journal of Social Economics*, 47(7), pp.809-829.

- Asafo-Adjei, E., Owusu Junior, P., Adam, A.M., Arthur, C.L., Boateng, E. and Ankomah, K., 2023. Asymmetric relationships among financial sector development, corruption, foreign direct investment, and economic growth in sub-Saharan Africa. *Cogent Economics & Finance*, 11(1), p.2182454.
- Asongu, S.A. and Nwachukwu, J.C., 2019. The Role of Openness in the Effect of ICT on Governance. *Information Technology for Development*, 25(3), pp.503-531.
- Ayimah, J.C., Kuada, J. and Ayimey, E.K., 2023. Influence of Antecedent Beliefs on Digitised Financial Services Adoption among Customers in Rural and Semi-urban Towns in Ghana. *African Journal of Innovation and Entrepreneurship*, 2(1), pp.2549.
- Ballabringa, F. C., Gonzalez, J., & Janero, J. (2000). A BVAR Macroeconometric Model for the Spanish Economy: Methodology and Results. *Estudios Economicos*. DOI: 10.13140/2.1.3014.3682.
- Bandura, W.N. and Dzingirai, C., 2019. Financial development and economic growth in Sub-Saharan Africa: the role of institutions. *PSL Quarterly Review*, 72(291), p.315.
- Bianchi, C., Cosenz, F. and Marinković, M., 2015. Designing dynamic performance management systems to foster SME competitiveness according to a sustainable development perspective: empirical evidences from a case-study. *International Journal of Business Performance Management* 31, 16(1), pp.84-108.
- Busumtwi-Sam, J., 2019. Remittances, regulation, and financial development in Sub-saharan Africa. In *The Failure of Financial Regulation* (pp. 153-190). Palgrave Macmillan, Cham.
- Canova, F., & Ciccarelli, M. (2013). Panel vector autoregressive models: A survey. *Advances in Econometrics*, 32, 205–246. Doi:10.1108/aeco
- Chanda, U. and Das, S., 2015. Multi-stage diffusion dynamics in multiple generation high technology products. *The Journal of High Technology Management Research*, 26(1), pp.88-104.
- Cherif, M. and Dreger, C., 2016. Institutional determinants of financial development in MENA countries. *Review of Development Economics*, 20(3), pp.670-680.
- Chih, S.H., Liang, L.W. and Huang, B.Y., 2018. The study on the relationship between bank M&A, SME lending, credit guarantee and bank efficiency. *Romanian Journal of Economic Forecasting*, 21(2), pp.95-117.

- Ciampi, F., Giannozzi, A., Marzi, G. and Altman, E.I., 2021. Rethinking SME default prediction: a systematic literature review and future perspectives. *Scientometrics*, 126(3), pp.2141-2188.
- Ciccarelli, M., & Rebucci, A. (2003). Bayesian VARs: A survey of the recent literature with an application to the European Monetary System. International Monetary Fund. Working Paper No. 03/102.
- Ciriello, R.F., Richter, A. and Schwabe, G., 2018. Digital innovation. *Business & Information Systems Engineering*, 60(6), pp.563-569.
- Creswell, J. W., & Creswell, J. D. 2017. *Research design: Qualitative, quantitative, and mixed methods approach*. Sage publications
- Croitoru, A., 2017. Schumpeter, Joseph Alois, 1939, Business Cycles: A Theoretical, Historical, and Statistical Analysis of the Capitalist Process, New York and London, McGraw–Hill Book Company Inc. *Journal of comparative research in anthropology and sociology*, 8(1), p.67.
- Das, S., Kundu, A. and Bhattacharya, A., 2020. Technology adaptation and survival of SMEs: a longitudinal study of developing countries. *Technology Innovation Management Review*, 10(6).
- Demirkan, H., Spohrer, J.C. and Welser, J.J., 2016. Digital innovation and strategic transformation. *It Professional*, 18(6), pp.14-18.
- Destek, M.A. and Sarkodie, S.A., 2019. Investigation of environmental Kuznets curve for ecological footprint: the role of energy and financial development. *Science of the Total Environment*, 650, pp.2483-2489.
- Di Vaio, A., Palladino, R., Pezzi, A. and Kalisz, D.E., 2021. The role of digital innovation in knowledge management systems: A systematic literature review. *Journal of business research*, 123, pp.220-231.
- Disse, S. and Sommer, C., 2020. *Digitalisation and its impact on SME finance in Sub-Saharan Africa: Reviewing the hype and actual developments* (No. 4/2020). Discussion Paper.
- Dogan, E. and Seker, F., 2016. The influence of real output, renewable and non-renewable energy, trade and financial development on carbon emissions in the top renewable energy countries. *Renewable and Sustainable Energy Reviews*, 60, pp.1074-1085.

- Donou-Adonsou, F., Pradhan, G. and Basnet, H.C., 2020. Remittance inflows and financial development: evidence from the top recipient countries in Sub-Saharan Africa. *Applied Economics*, 52(53), pp.5807-5820.
- Dzogbenuku, R.K., Amoako, G.K. and Martins, A., 2022. The mediating role of financial service branding on investment decisions: an emerging market's perspective. *International Journal of Emerging Markets*.
- Ejemeyovwi, J.O., Osabuohien, E.S. and Bowale, E.I., 2021. ICT adoption, innovation and financial development in a digital world: empirical analysis from Africa. *Transnational Corporations Review*, 13(1), pp.16-31.
- Ejemeyovwi, J.O., Osabuohien, E.S. and Bowale, E.I., 2021. ICT adoption, innovation and financial development in a digital world: empirical analysis from Africa. *Transnational Corporations Review*, 13(1), pp.16-31.
- Elhajjar, S. and Ouaida, F., 2019. An analysis of factors affecting mobile banking adoption. *International Journal of Bank Marketing*.
- Emiru, T. and Wajebo, T., 2023. The Impact of Digitisation on Economic Activity in Sub-Saharan Africa.
- Graham, M., 1996. Financial repression, interest rates, and credit allocation in sub-saharan africa. A Case Study of Microfinance in China. *ASEAN Entrepreneurship Journal*, 9(2), pp.9-21.
- Guru, B.K. and Yadav, I.S., 2019. Financial development and economic growth: panel evidence from BRICS. *Journal of Economics, Finance and Administrative Science*, 24(47), pp.113-126.
- Hamali, S., 2015. The effect of entrepreneurial marketing on business performance: Small garment industry in Bandung City, Indonesia. *Developing Country Studies*, 5(1), pp.2225-0565.
- Hinings, B., Gegenhuber, T. and Greenwood, R., 2018. Digital innovation and transformation: An institutional perspective. *Information and Organisation*, 28(1), pp.52-61.
- Hofisi, M., 2023. The Political Economy of Financial Inclusion for Smallholder Farmers in Sub-Saharan Africa. In *Economic Inclusion in Post-Independence Africa: An Inclusive Approach to Economic Development* (pp. 103-122). Cham: Springer Nature Switzerland.
- Huesig, S. and Endres, H., 2018. Exploring the digital innovation process: The role of functionality for the adoption of innovation management software by innovation managers. *European Journal of Innovation Management*.

- Ibrahim, M., 2017. *Studies on financial development and economic growth in sub-Saharan Africa* (Doctoral dissertation, University of the Witwatersrand, Faculty of Commerce, Law and Management, Graduate School of Business Administration).
- Ibrahim, M., Aluko, O.A. and Vo, X.V., 2022. The role of inflation in financial development–economic growth link in sub-Saharan Africa. *Cogent Economics & Finance*, 10(1), p.2093430.
- IMF. 2022. Sub-Saharan Africa Regional Economic Outlook: Digital Currency Innovation in Sub-Saharan Africa., Washington DC
- Kararach, G., M Kadir, A., Ajambo, E. and Suominen, H., 2017. Fiscal Policy, Long-Term Growth and Structural Transformation in Africa. In *Macroeconomic Policy Framework for Africa's Structural Transformation* (pp. 97-143). Palgrave Macmillan, Cham.
- Karwowski, E. and Stockhammer, E., 2017. Financialisation in emerging economies: a systematic overview and comparison with Anglo-Saxon economies. *Economic and Political Studies*, 5(1), pp.60-86.
- Keklik, M., 2018. *Schumpeter, Innovation and Growth: Long-cycle dynamics in the post-WWII American manufacturing industries*. Routledge.
- Kelly, M., Dowling, M., & Millar, M. 2018. The search for understanding: the role of Paradigms, *Nurse. Researcher*, 25, 4(4-13). Doi:10.7748/nr.2018.e1499
- Khan, A. and Qutab, S., 2016. Understanding research students' behavioural intention in the adoption of digital libraries: A Pakistani perspective. *Library Review*.
- Kodongo, O., 2018. Financial regulations, financial literacy, and financial inclusion: Insights from Kenya. *Emerging Markets Finance and Trade*, 54(12), pp.2851-2873.
- Kohli, R. and Melville, N.P., 2019. Digital innovation: A review and synthesis. *Information Systems Journal*, 29(1), pp.200-223.
- Kumar, R.R., Stauvermann, P.J., Loganathan, N. and Kumar, R.D., 2015. Exploring the role of energy, trade and financial development in explaining economic growth in South Africa: A revisit. *Renewable and Sustainable Energy Reviews*, 52, pp.1300-1311.
- Kwayu, S., Abubakre, M. and Lal, B., 2021. The influence of informal social media practices on knowledge sharing and work processes within organisations. *International Journal of Information Management*, 58, p.102280.

- Lane, P.R. and Milesi-Ferretti, G.M., 2018. The external wealth of nations revisited: international financial integration in the aftermath of the global financial crisis. *IMF Economic Review*, 66(1), pp.189-222.
- Langthaler, M. and Bazafkan, H., 2020. *Digitalisation, education and skills development in the global South: An assessment of the debate with a focus on Sub-Saharan Africa* (No. 28). ÖFSE Briefing Paper.
- Li, Y., 2021. The macroeconomic impacts of digitalisation in sub-saharan africa: Evidence from submarine cables. *IMF Working Papers*, 2021(110).
- Maiti, M. and Kayal, P., 2017. Digitisation: Its impact on economic development & trade. *Asian Economic and Financial Review*, 7(6), pp.541-549.
- Maiti, M., 2018. Scope for alternative avenues to promote financial access to MSMEs in developing nation evidence from India. *International Journal of Law and Management*.
- Mazzoni, D., 2019. Digitalisation for energy access in sub-Saharan Africa: challenges, opportunities and potential business models.
- Mehmood, T., Alzoubi, H.M. and Ahmed, G., 2019. Schumpeterian entrepreneurship theory: evolution and relevance. *Academy of Entrepreneurship Journal*, 25(4).
- Molinillo, S. and Japutra, A., 2017. Organisational adoption of digital information and technology: a theoretical review. *The Bottom Line*.
- Myovella, G., Karacuka, M. and Haucap, J., 2020. Digitalisation and economic growth: A comparative analysis of Sub-Saharan Africa and OECD economies. *Telecommunications Policy*, 44(2), p.101856.
- Ndoya, H. and Asongu, S.A., 2022. Digital divide, globalisation and income inequality in sub-Saharan African countries: analysing cross-country heterogeneity. *Social Responsibility Journal*, (ahead-of-print).
- Ndubuisi, G., Otioma, C. and Tetteh, G.K., 2021. Digital infrastructure and employment in services: Evidence from Sub-Saharan African countries. *Telecommunications Policy*, 45(8), p.102153.
- Nguimkeu, P. and Okou, C., 2021. Leveraging digital technologies to boost productivity in the informal sector in Sub-Saharan Africa. *Review of Policy Research*, 38(6), pp.707-731.
- Nylén, D. and Holmström, J., 2015. Digital innovation strategy: A framework for diagnosing and improving digital product and service innovation. *Business Horizons*, 58(1), pp.57-67.

- Odhiambo, N.M., 2020. Financial development, income inequality and carbon emissions in Sub-Saharan African countries: a panel data analysis. *Energy Exploration & Exploitation*, 38(5), pp.1914-1931.
- Ofori, I.K., Osei, D.B. and Alagidede, I.P., 2022. Inclusive growth in Sub-Saharan Africa: Exploring the interaction between ICT diffusion, and financial development. *Telecommunications Policy*, 46(7), p.102315.
- Olamade, O. and Oni, O., 2016. Manufacturing and economic growth in Africa: A panel test of Kaldor's first growth law. *Journal of Economics and Sustainable Development*, 7(22), pp.126-140.
- Olayungbo, D.O. and Quadri, A., 2019. Remittances, financial development and economic growth in sub-Saharan African countries: evidence from a PMG-ARDL approach. *Financial Innovation*, 5(1), pp.1-25.
- Opoku, E.E.O., Ibrahim, M. and Sare, Y.A., 2019. The causal relationship between financial development and economic growth in Africa. *International Review of Applied Economics*, 33(6), pp.789-812.
- Otchere, I., Senbet, L. and Simbanegavi, W., 2017. Financial sector development in Africa-an overview. *Review of development finance*, 7(1), pp.1-5.
- Owusu-Agyei, S., Okafor, G., Chijoke-Mgbame, A.M., Ohalehi, P. and Hasan, F., 2020. Internet adoption and financial development in sub-Saharan Africa. *Technological Forecasting and Social Change*, 161, p.120293.
- Pacifico, A. 2018. Panel Bayesian VAR Modeling for Policy and Forecasting when dealing with confounding and latent effects. EERI Research Paper Series, No. 15/2018 Economics and Econometrics Research Institute (EERI), Brussels.
- Patel, R. and Joshi, R., 2019. A Study on Impact of Financial Performance of Selected IT and ITeS Companies Listed in NSE, India. *Emerging Trends in International Business and Commerce*, p.279.
- Payne, E.M., Peltier, J.W. and Barger, V.A., 2018. Mobile banking and AI-enabled mobile banking: The differential effects of technological and non-technological factors on digital natives' perceptions and behaviour. *Journal of Research in Interactive Marketing*.
- Quader, S.M. and Abdullah, M.N., 2020. Constraints to SMEs: A rotated factor analysis approach. *South Asian Studies*, 24(2).

- Rahman, A., Rahman, M.T. and Belas, J., 2017. Determinants of SME finance: evidence from three central European countries. *Review of economic perspectives*.
- Rashid, A. and Intartaglia, M., 2017. Financial development—does it lessen poverty? *Journal of Economic Studies*.
- Ritz, W., Wolf, M. and McQuitty, S., 2019. Digital marketing adoption and success for small businesses: The application of the do-it-yourself and technology acceptance models. *Journal of Research in Interactive Marketing*.
- Sakyi, D., Osei Mensah, I. and Obeng, S.K., 2017. Inflation targeting framework and interest rates transmission in Ghana: An empirical investigation. *Journal of African Business*, 18(4), pp.417-434.
- Salahuddin, M., Alam, K., Ozturk, I. and Sohag, K., 2018. The effects of electricity consumption, economic growth, financial development and foreign direct investment on CO2 emissions in Kuwait. *Renewable and sustainable energy reviews*, 81, pp.2002-2010.
- Sarpong, B. and Nketiah-Amponsah, E., 2022. Financial inclusion and inclusive growth in sub-Saharan Africa. *Cogent Economics & Finance*, 10(1), p.2058734.
- Saunders, M., & Lewis, P. (2017). *Doing research in business and management*. Pearson.
- Shahbaz, M., Nasir, M.A. and Roubaud, D., 2018. Environmental degradation in France: the effects of FDI, financial development, and energy innovations. *Energy Economics*, 74, pp.843-857.
- Singh, T., Sharma, A. and Singh, N., 2015. Digital library acceptance model and its social construction: Conceptualisation and development. *Journal of Web Librarianship*, 9(4), pp.162-181.
- Tafa, M. D and Worku, S. T. 2022. Determinants of private commercial banks deposit in Ethiopia *Cogent Economics & Finance*, 10:1, 2098608, DOI: 10.1080/23322039.2022.2098608
- Taiminen, H.M. and Karjaluo, H., 2015. The usage of digital marketing channels in SMEs. *Journal of Small Business and Enterprise Development*.
- Tchamyou, V.S. and Asongu, S.A., 2017. Information sharing and financial sector development in Africa. *Journal of African Business*, 18(1), pp.24-49.
- Tinta, A.A., 2022. Financial development, ecological transition, and economic growth in Sub-Saharan African countries: the performing role of the quality of institutions and human capital. *Environmental Science and Pollution Research*, 29(25), pp.37617-37632.

- Tyson, J., 2021. *Financial-sector development and inclusive and sustainable economic growth in sub-Saharan Africa* (No. 2). ODI Working Paper.
- Valickova, P., Havranek, T. and Horvath, R., 2015. Financial development and economic growth: A meta-analysis. *Journal of economic surveys*, 29(3), pp.506-526.
- Valickova, P., Havranek, T. and Horvath, R., 2015. Financial development and economic growth: A meta-analysis. *Journal of economic surveys*, 29(3), pp.506-526.
- Vyas, V., Raitani, S., Roy, A. and Jain, P., 2015. Analysing critical success factors in small and medium enterprises banking. *World Review of Entrepreneurship, Management and Sustainable Development*, 11(1), pp.106-123.
- Yeboua, K., 2019. Foreign direct investment, financial development and economic growth in Africa: evidence from threshold modelling. *Transnational Corporations Review*, 11(3), pp.179-189.
- Zreik, M., Marzuki, S.Z. and Iqbal, B.A., 2023. Deepening Financial Inclusion through Digitisation:

