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The New World of Work: Emergence of New-Collar Skills in Africa

By

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Abbreviations

3D Printing	Three-Dimensional Printing
4IR	Fourth Industrial Revolution
ATMs	Automated Teller Machines
BI	Business Intelligence
CV	Curriculum Vitae
DE	Digital Entrepreneurship
DSN	Data Science Nigeria
EDs	Executive Directors
FDI	Foreign Direct Investment
G7	Group of Seven
GDP	Gross Domestic Product
GSMA	Global System for Mobile Communications
HEI	Higher Education Institutions
IBM	International Business Machine
ID	Identification
IFC	International Finance Corporation
ILO	International Labour Organization
IMF	International Monetary Fund
IoT	Internet of Things
ITU	International Telecommunication Union
MAD	Mobile App Development

MGI	Mckinsey Global Institute
MNCs	Multi-National Corporations
MoE	Ministry of Education
NCEmQ	New-Collar Employability Quotient
NCS	New-Collar Skills
OECD	Organisation for Economic Cooperation and Development
OO	Online Outsourcing
P-TECH	Pathways in Technology Early College High Schools
R&D	Research and Development
RQ1	Research Question One
RQ2	Research Question Two
RQ3	Research Question Three
SMEs	Small and Medium-Sized Enterprises
STEM	Science, Technology, Engineering and Mathematics
TVET	Technical and Vocational Education and Training
UNECA	United Nations Economic Commission for Africa
UNCTAD	United Nations Conference on Trade and Development
UNESCO	United Nations Educational, Scientific and Cultural Organization
WBHC	World Bank Human Capital Report
WEF	World Economic Forum
WDR	World Development Report

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Dedication

I dedicate this DBA thesis to my late father, Mr. Rasheed Erogbogbo, and mother, Mrs. Doreen Joyce Erogbogbo, a true woman of substance.

Declaration

I declare, the thesis titled **The New World of Work: The Emergence of New-Collar Skills in Africa** is my own work and no part of the dissertation has been previously submitted to any other university for any degree, diploma or other qualification.

Previously submitted work by the author in the form of a reviews and conference presentations are drawn on for parts of this thesis. When reference is made to the work of others, the extent to which it has been used is indicated in the text and bibliography. Any errors or omissions within this thesis are the sole responsibility of the author.

This document contains 72,035 words, excluding bibliography and appendices, and, therefore, adheres to the requirements of Warwick Business School, University of Warwick.

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                    Late Professor Mark Skilton

Abstract

The ways in which we work, and the skills required to do so have been continuously evolving since the advent of the Industrial Revolution. This is more evident today with the Fourth Industrial Revolution, and the advent of the machine age and emerging technologies such as artificial intelligence and machine learning. This development is causing anxiety about the sweeping impact of technology on employment, and there is fear that Africa may be left behind as it has yet to fully adopt previous technologies.

This study employed mixed methods and a training intervention to examine over 6600 participants from 10 African countries. It found that a new kind of skill is emerging with the new technological age namely- "The New-Collar Skill". The study defines the New-Collar Skill and finds that it has a positive effect on increasing employability and participation in digital entrepreneurship and online outsourcing in Africa. This effect can be achieved through the focussed application of the New-Collar Skill Employability Quotient, NCEmQ, which assesses the skills and attributes of the candidate and identifies the skill gaps needed to be proficient to a level where there is a higher probability of being employed.

Chapter One: Introduction

1.1   Introduction

This chapter presents the background of the study, statement of the problem, research questions and nature and purpose of the study. The chapter also captures the significance and limitations of the study and conclusion.

1.2   Background of the Study

The future and nature of work are continuously changing globally; the world has witnessed major shifts on a global scale in the last three decades owing to many factors. The recent and most unexpected global shift was spurred on by a pandemic, COVID-19. This has brought unprecedented disruption to the global economy and has forced workers all over the world to embrace remote work (Fox and Signe, 2020). Another major shift at the start of the 1990s increased labour force participation, mainly with the entrance of the major economies of China, India and the former Soviet Union. Other factors affecting the future of work are increased educational access, technological change, automation, globalisation and regional integration (Liu and Chi, 2013). These changes have general and specific impacts on the quality and quantity of the labour force available at any point in time (Strack, Baier, Marchingo, and Sharda, 2014). The world is witnessing an unprecedented change with the dawn of the machine age. This has brought about new kinds of "machine learning" that empowers intelligent robots and computers to self-programme. According to McAfee and Brynjolfsson (2014:16), the "the world is at an inflexion point where the effect of these digital technologies will manifest in full force through automation and the making of 'unprecedented things'."

There is no doubt that the nature of work is changing; global shortage of highly skilled labour is not only imminent but also a major threat to the future of work (Schwab and Samans, 2016). The challenge is further compounded by a shortage of developed human capital of about 35%, resulting from inadequate education, training, and employment opportunities. It was projected that about 200 million workers would be unemployed by 2020, out of which there will be a shortage of about 50 million highly skilled workers (WEF, 2016). The position is likely to be much worse than the earlier predicted number as, according to the World Economic Forum, G7

countries are recording unprecedented levels of unemployment. Hundreds of millions of people could be left without work owing to the impact of COVID-19. The global outlook is not favourable, as the International Labour Organization predicted that 1.6 billion informal economy jobs could be eliminated (ILO, 2020). The situation may become more worrisome in some parts of the globe where children are unable to afford education; it is estimated that about 150 million children are unable to attend secondary school. At the same time, several millions of youths find it challenging to acquire university education, and the shortfall of teachers around the world is estimated at 4 million. However, many of the countries that have invested in education have not truly benefited from labour market gains (WEF, 2016).

As the shortage of skilled labour persists globally, the fallout of its effects has direct and indirect implications for the future of work (WEF, 2016, Delloite, 2019). This is evident in the generational gap that explains how changes in the nature of work influence different demographics. For instance, the youth are three times more likely to experience unemployment than adults (ILO, 2017). The global youth unemployment rate has been on the increase although it had not reached the peak of the financial crisis, when nearly 79 million youths were out of a job. This is set to change with the impact of the pandemic. In developing economies, approximately 17% are more likely to start working in the informal economy and living below the poverty threshold of about $2 a day. Globally, 75% of men and women work in the informal sector. This compares to 95% in the developing economy. The youth labour force fell by about 35 million in the last decade, even though there was significant growth in the youth population by 139 million (WEF, 2016; Mckinsey Report 2016; ILO 2017). Over the last 20 years, youth participation rates have fallen mainly due to young people staying longer in education. This has significant implications for labour participation and economic development (ILO, 2017). All these statistics are more likely to be even worse once the full impact of the pandemic is experienced. According to the ILO, the escalating economic effects of COVID-19 on the world of work are proving to be far worse than the financial crisis of 2008. About 200 million workers are expected to lose their jobs before the end of the year (ILO, 2020).

The emerging technology and innovation have also had a significant impact on the global labour market economy in many ways; they are reshaping the world of work. Automation is

revolutionising business models, tools, tasks and delivery modes. Employees can already see the transformation happening, as artificial intelligence (AI), robotics and other digital innovations are being used increasingly in the workplace (Delloite, 2019). The likely effects of automation are mixed; there are concerns that the advent of technology will bring about the massive loss of jobs (Ford, 2015; Gordon, 2016; Deloitte, 2019). Some believe it will create new jobs and merely complement human labour (McAfee et al. 2014; Autor, 2015). There has been much debate around these issues; however, the one clear thing is that the way we work will change and the skills required for this new age will be completely different (World Development Report, 2019). This is more apparent in the light of recent global events, as more and more organisations are being forced to embrace remote work. Experts believe that remote working is here to stay, especially in tech skills. Remote job openings have been increasing well before the pandemic and rising to about 270% since 2017, according to new research by job search engine Adzuna that analysed 4.5 million US job openings. However, stimulated by COVID-19, more employers are considering recruitment from a vast global talent pool unrestricted by geographic location (Fisher, 2020).

In 1931, John Keynes famously warned about widespread "technological unemployment" due to the discovery of a method for streamlining the utilisation of work, surpassing the pace at which we can discover new uses of labour. This turned out to be a false alarm; however, one asks the question: "What if this is true today?" There has been evidence in the past few years of computers replacing jobs, and everything is happening at a much faster pace than it did in previous Industrial Revolutions, with a complete disruption of entire systems (Ford, 2015; Schwab, 2016).

The anxiety in the minds of job experts, governments, and industry leaders is that automation may hinder the creation of new jobs across industries. However, these changes could increase efficiency and access to services (Schwab, 2016; Deloitte, 2019). The trend can be seen in a situation where a smaller workforce is used to achieve a more significant production. Many job fatalities have been countered by an increase in the service industries or office jobs; however, automation is starting to get rid of office jobs too. In the past, new companies employed far more people than those they displaced. Today's new industries have relatively few jobs for the unskilled or semi-skilled (Frey and Osborne 2013; Autor, 2015).

Today's more digital form of globalisation is changing who is participating, how business is done across borders, how rapidly competition moves, and where the economic benefits are flowing. Even though advanced economies, in general, continue to be the leaders in most flows, the door has opened to more countries, to small companies and start-ups, and billions of individuals across the globe (Mckinsey, 2016; World Bank, 2018). The rise of platform marketplaces allows the impact of technology to be felt more quickly than ever before. Individuals and companies only need an Internet connection in order to trade on online platforms. This brings economic opportunities to millions of people who do not live in industrialised countries. However, despite these encouraging developments with the rise of platforms, some of the working conditions and the inequalities are still quite stark, especially in the developing countries (Anwar and Graham, 2019).

Digital globalisation and automation have also led to changing demand for skills, as there has been a rise in the appropriate skill level in advanced companies and has also led to raising the bar in emerging economies (WEF 2016; McAfee and Brynjolfsson, 2017). While globally, there may be a shortage of labour and skills, Africa's young population has been growing steadily (Filmer and Fox, 2014). The continent has recorded significant economic growth in the last decade, poverty levels have dropped, and a new middle class has begun to emerge in rapidly growing urban cities. Africa's young population seems to be growing at an astronomical rate (Bhorat and Tarp, 2016). According to the WEF, by 2030, sub Saharan Africa will be home to more than one quarter of the world's total under-25 population. Over this period, the continent is predicted to grow the size of its workforce by more than the rest of the world combined. This represents a significant demographic dividend and signifies extraordinary prospects, especially as the rest of the world is ageing (WEF, 2017; Abdychev, 2018).

African countries could grow their economies and boost their place in the global market. However, a significant percentage of Africa's workforce is relatively unskilled; high unemployment rates indicate a gap; and the educational system is not supplying the skills needed by industry (Annunziata and Kramer, 2015; Gaus and Hoxtell, 2019). African economies suffer from vast unemployment and underemployment and are unable to offer jobs to their growing youth population. Research revealed that 60% of Africans are out of a job as compared to the global average of 44%. A total of 80% of them work in the informal economy; this signifies a

low engagement rate into the formal economy and could mean the goal to create jobs cannot be accomplished (WEF, 2017).

The unemployment rate is highest among graduates who come from the high end of the income distribution (Filmer and Fox, 2014). Reducing unemployment rates in the formal economy is critical and should be encouraged. But even if African economies are able to attract investment into the private sector, the formal economy will only attract a small percentage of the workers from the informal sector (Filmer and Fox, 2014). For Africa to take advantage of this demographic dividend, it needs to make more significant investments in skills. The education systems in many African countries are weak, with only a few technical and vocational schools. Many African government leaders, donor agencies, and educational institutions have attempted different interventions to create jobs for the formal and the informal economies. However, they have not been able to come up with any lasting solutions (Annunziata and Kramer, 2015).

The future of work is poised to transform industry, redefining the competitive landscape for companies and countries. It is, therefore, crucial for African leaders to focus on the future of work to create jobs to enhance the future of African youths. In order to do this, policymakers in Africa need to have a more robust education system with closer links to industry, and more open and flexible labour markets, with a localisation strategy. This will encourage deeper collaboration with global companies and build a pipeline of skills needed to successfully leverage technological advances of tomorrow in order to enable the future of work in Africa (Annunziata and Kramer, 2015).

Several global organisations are collaborating with universities to achieve this in different African countries. But are they achieving their goals to improve the skills of young Africans, thus making them more employable? Is this helping to create jobs? Some global organisations have created IT programmes on emerging technologies, such as Google, Microsoft, and IBM. In 2014, IBM launched Africa University –an African skills initiative which focuses on delivering technical education and certification programmes to university students and teachers to expand their technical talent base. This is a career-oriented training programme on emerging technologies, such as Mobile Computing, Cybersecurity, Business Analytics, Big Data, Cloud Computing and Cognitive. The aim is to better prepare the students for a real working environment and to ultimately facilitate their development towards becoming employed IT

professionals in the IT market. The idea is to invest in developing "New-Collar Skills" needed to deliver value that would further the project of rapidly building a talent pipeline by developing graduate programmes for students that will foster talent and build a continent-wide IT ecosystem. IBM has succeeded in deploying this programme in 17 African countries, training young Africans in New-Collar Skills. The main objective of other multinational organisations, like Oracle, Google, and Accenture, is to train many young African graduates in New-Collar Skills to help transition these young citizens into the workforce successfully.

Typically, an individual with New-Collar Skills develops the technical and soft skills needed to work in technology jobs through non-traditional education paths. These individuals may not have a four-year degree and may be trained through community colleges, vocational schools, software boot camps, technical certification programs, high school technical education and on-the-job apprenticeships and internships (Bubenik, 2019). Many of the blue-collar and white-collar jobs that have been a staple in the workforce for many years will be replaced by automation at some point. Instead of waiting for that shift to happen, adopting the most valuable tech skills now will better prepare the African youth for stable work in the future. As more industries and organisations adopt emerging technologies that are moving business forward and making them more efficient and profitable, the need for New-Collar jobs is going to skyrocket. Mastering some of these skills today will prepare workers and provide more opportunities for future of work (Lager, 2020). New-Collar Skills could be part of the solution to the development, growth, and employment of the African youth.

The demand for high-quality software engineering talent is increasing globally, but the local talent supply can no longer keep up in many major cities around the world. High real estate prices intensify this in major cities, like San Francisco, London and New York. This, coupled with the present political climate and difficulties with visa/immigration issues, has made most global companies, especially in Silicon Valley, to hit human scaling limits. It is time to look at the global talent pool; there will never be a better time for Africa to harness its demographic dividend. Will New-Collar Skills be the revolution that changes the trajectory of employability in Africa?

1.3   Problem Statement

The revolution in the nature and future of work is pervasive, impacting on the scope, trend, and relations of work globally. Also linked by the change is the quality and quantity of labour that fit into the flux. While it may be easier for many countries of the world that are technologically advanced and relatively economically stable to respond to these changes with the adaptive shift of human talent and skills of labour, the less economically advanced countries may find it more challenging to adjust to this reality. Thus, with the changing technology landscape and legacy of educational programmes that do not necessarily attend to current skill needs of the job market, many countries in Africa complain of high unemployment, while employers in Africa complain that they have the vacancies, but graduates do not possess the rights skills to fill them. With Africa being predicted as one of the potentially most significant workforces in the world in the next couple of decades, it is imperative that countries in Africa create the right skills to cater to this demographic boom to prepare for the Fourth Industrial Revolution. Could New-Collar Skills could be the solution to this challenge?

1.4   Research Questions

The research question is a broad question that asks for an exploration of a central phenomenon or concept of study. The question is consistent with an emerging methodology of qualitative research as a general issue. Research questions are intended to explore a wide-ranging complex set of factors surrounding the central phenomenon and present the broad, varied perspectives or meanings that participant holds. In addition to the central question, several sub-questions follow, which narrow the focus of the study but leave the question open. Research questions may build on a body of existing knowledge, and the questions become working guidelines. Alternatively, research questions might be generally stated without specific reference to the existing literature.

In this study, the research question was intended to test the relationship between New-Collar Skills and employability in Africa. The overarching research questions that guided the conduct of this exploratory research with a sequential mixed methods design are as follows:

How are New-Collar Skills influencing the New World of Work in Africa?

RQ1.   What are the factors influencing the acquisition of New-Collar Skills in Africa?

RQ2. What is the effect of New-Collar Skills on employability in Africa?

RQ3. To what extent do New-Collar Skills enhance participation in digital entrepreneurship and online outsourcing in Africa?

1.5 Purpose Statement

The purpose of this study was to explore the effects of New-Collar Skills (NCS) on employability in Africa. The central focus was to examine how acquiring New-Collar Skills could increase employability and the extent to which it could lead to an enhanced or increased participation in digital entrepreneurship and online outsourcing by African youths in the Fourth Industrial Revolution. The mixed-methods sequential exploratory study was chosen to explore the impact of New-Collar Skills on employability and entrepreneurship and to examine the factors that influence the acquisition of New-Collar Skills in Africa.
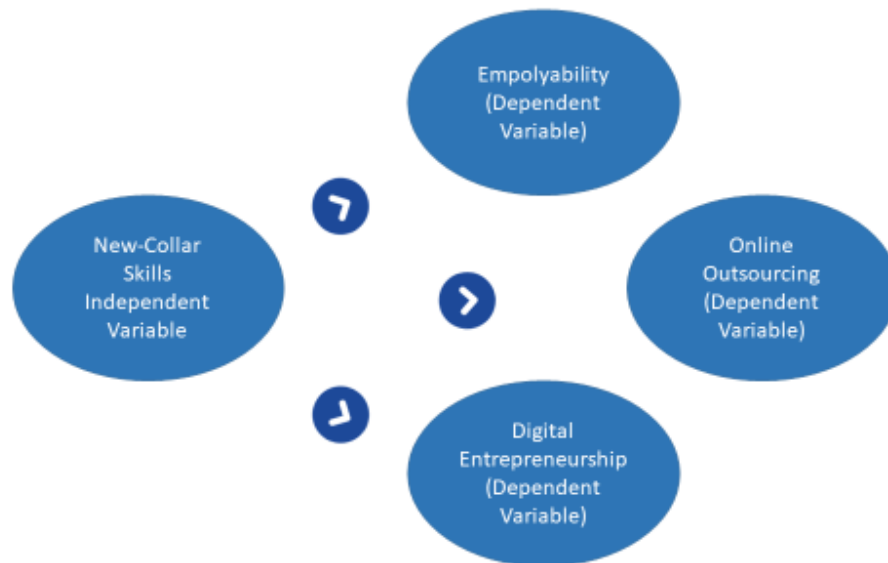
Figure 1.1: Dependent and Independent Variables

1.6 Nature of the Study

This mixed-methods study offers an opportunity to address exploratory research questions. The mixed method comprises a study undertaken by combining quantitative and qualitative

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techniques to gain an in-depth insight necessary for robust analysis and understanding. It allows for the comparing of different perspectives drawn from both qualitative and quantitative data. The mixed-methods sequential explanatory design is suitable for understanding the research problem because the study requires the collection of numeric and non-numeric data to examine and answer the research questions. The mixed method was chosen because of its strength for drawing on both research methods while minimising the limitations. At a practical level, it is a useful strategy to have a full understanding of the research problem, as it would help in comparing different views from both the qualitative and quantitative data sets (Creswell and Creswell, 2018).

The method is appropriate, as it is useful in explaining the quantitative results from a large data set. Over 2000 respondents participated in the first phase of the Qualtrics survey, and over 3000 participated in the second phase. It was also important to have a qualitative follow-up. Therefore, the study deployed semi-structured in-depth interviews as part of the third and fourth phases of the study. The intent of this design is to explore with a sample first so that a later quantitative phase can be tailored to meet the needs of the individuals being studied. This will entail developing a measurement instrument and testing it with a sample. This design is popular in social research when a researcher needs to understand a population before administering an instrument. In this design, data are collected and analysed; the results are developed into an instrument; and then the instrument is administered to sample a population. In effect, the study employs a three-phase procedure, with the first phase as exploratory, the second as instrument development (survey), and the third as administering and testing the instrument to a sample of a population (Creswell and Creswell, 2018).

1.6.1   The Pilot Study

An initial pilot study was conducted. Thirty graduating students were interviewed from a cross-section of private and public universities in Nigeria. These students had participated in the IBM African Skills Initiative and had acquired New-Collar Skills. Other respondents that participated in the pilot were IBM business partners who had employed some of the graduates from the African Skills Initiative, university lecturers – one lecturer from each of the universities. The lecturers had taken part as a train-the-trainer in the IBM skills initiative, and three top recruiters

in Nigeria. Semi-structured in-depth interviews were conducted with the four different stakeholders. Based on the findings of the pilot, a survey instrument and an intervention-training programme were designed.

This study was divided into four phases of data collection:

1. New-Collar Skills Data Set
2. The Open Survey Data Set
3. The Intervention
4. Corporate Interviews

1.6.2   Phase 1- New-Collar Skills Data set

In this phase of the study, the population included university graduates who had participated in the IBM African Skills Initiative in 2014-2017. From the IBM database, the population of the participants that fell within this category was 2214. These 2214 participants were selected from IBM New-Collar Skills Programme from 158 universities in 10 African countries, namely: Ghana, Nigeria, Egypt, Ethiopia, Kenya, Morocco, Tunisia, South Africa, Mauritius, and Rwanda. The population was chosen based on students that had graduated at least two years and completed their one-year mandatory National Youth Service. Five out of the ten countries had a compulsory youth service. These are Nigeria, Ghana, Kenya, South Africa, and Morocco. The target population consisted of the above ten African countries and was selected based on the number of students who participated and passed the IBM relevant certification examination in the New-Collar Skills training in that particular country.

1.6.3   Phase 2- Open Survey Data Sets

This phase consisted of two comparable data sets:

Jobberman Data Set

The population for this data set was randomly selected from participants from an employment recruitment agency database (Jobberman) for three countries: Nigeria, Kenya, and Ghana. The three countries were selected based on availability of data and prominence of these countries on the continent. The selected participants were graduates who had graduated within the last five years, starting in 2018 and were looking for employment. The total population was 3517 participants.

New-Collar Skills Data Set

The population for this data set was randomly taken from the IBM New-Collar Skills data set of graduates in Ghana, Nigeria, and Kenya. The total population was 760 participants.

1.6.4   Phase 3 – The Intervention

The third stage of this research consisted of a two-year longitudinal study, which included a workshop intervention and in-depth interviews. To enable a thorough investigation, the quantitative phase was followed by an intervention to further evaluate the effect of New-Collar Skills on employability. The intervention phase was divided into two stages:

- New-Collar Skills workshop
- In-depth interviews

New-Collar Skills Workshop

The population for this data set was randomly selected from graduates from universities, vocational colleges, and secondary schools predominantly from Southern Nigeria. Sixty participants were selected from a pool of hundred. The respondents had to satisfy the following criteria before being selected for the workshop:

1. They were expected to have a minimum of O level qualification, as this was the minimum qualification required for employment.
2. They were expected to have completed their National Youth Service, if required;
3. They were supposed to have been unemployed for at least six months;
4. They were also required to take three assessment tests, which evaluated critical thinking, analytical skills, and speaking skills; and

5. They needed to be available for the duration of the intervention.

In-depth interviews – New-Collar Skills Intervention Participants

The population for the in-depth interview was randomly selected from the participants who took part in the intervention. Seventeen participants were selected from the sixty participants based on their employment status (employed, self-employed, or unemployed). The final selection included eleven employed, three self-employed, and three unemployed participants.

1.6.5 Phase 4 – Corporate Interviews

Further in-depth interviews were conducted to further validate the results from the previous phases and to have an understanding of the demand side - the corporate organisations, since they were the employers of labour. The population for these in-depth interviews was chosen from prominent organisations and employers and trainers of skills and labour in eight selected countries in Africa. The selection criteria were based mainly on having an extensive presence in the key African countries and having a global presence.

These organisations were technology companies or organisations that have affiliations with more prominent technology companies for training in New-Collar Skills training programmes. Ten executive directors were purposively drawn from organisations like Microsoft, IBM, Oracle, Andela, MEST, Think IT, MTN, Data Science Nigeria (DSN), Sprints, Chanzo Capital, and CCHub. The countries were selected from the four regions of Africa based on their prominence in the regions. From North Africa, Egypt, Morocco, and Tunisia were selected. From West Africa, Nigeria and Ghana were selected. Kenya and Rwanda were chosen from East Africa. South Africa was chosen for Southern Africa.

Table 1.1   Total Data Collected across all Phases of the Mixed-Method Study

Phases of Data Collection	Type of Data	Number of Survey	Number of Responses	Male	Female
Pilot	Qualitative	38	38	29	9
Phase 1 New-Collar Data set	Quantitative	2214	690	1505	709
Phase 2 Open Survey	Quantitative	3517	817	2215	1307
Phase 2 New-Collar Data set	Quantitative	760	111	570	190
Phase 3 Intervention	Quantitative	60	60	42	18
Phase 4 Intervention Participant	Qualitative	17	17	11	6
Phase 4 Corporate Executives	Qualitative	10	10	9	1
Total		**6616**	**1740**	**4381**	**2240**

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THE NEW WORLD OF WORK: EMERGENCE OF NEW-COLLAR SKILLS

                    Pragmatic
                    Paradigm

                    Sequential
                    Exploratory Mixed
                    Method

    Subject Matter                          Subject Matter
    Data Search                             Literature Review

                    Qualitative Pilot
                    Interview

New-Collar Skills    Open Survey        Intervention        Qualitative
Dataset              Dataset            Dataset             Dataset

IBM Skills           Jobberman          Wave                Exec. Directors
Initiative           Database           Academy             (Tech Companies)
Database                                Database

Surveys in 10        Surveys in 3       Intervention in 1   In-depth
African Countries    African Countries  Country             Interviews in 8
                                                            Countries

Kenya    Egypt       Kenya              Nigeria             Kenya    Egypt
Ghana    Tunisia     Ghana                                  Ghana    Tunisia
Nigeria  Morocco     Nigeria                                Nigeria  Morocco
Rwanda   South                                              Rwanda   South
Ethiopia Africa                                                      Africa
         Mauritius

                                        Critical Thinking Skills
                                        Presentation Skills
                                        CV Writing
                                        Certification Exams
                                        Project Based Work

                                        Business        Mobile App
                                        Intelligence    Development

                                        Evaluate after 3, 9    In-depth
                                        & 15 Months            Interviews

Analyse             Analyse             Analyse             Analyse
Data                Data                Data                Data

Findings            Findings            Findings            Findings

                            Triangulation

                Findings, Recommendations & Contribution
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Figure 1.2: Research Map

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1.7   Limitations

This study was limited by the number of participants who completed the survey. The study was limited to participants who consented to participate willingly. Although this investigation utilised approved survey instruments, the participants might have experienced issues in translating the survey questions.

1.8   Delimitation

This study was delimited to conducting a survey of graduates and non-graduates from ten African countries, not the whole of Africa. The participants were selected from only universities that participated in the African Skills Initiative from 2014 to 2017. The participants were selected only if they had passed the IBM certification examinations with a score of 60% and above, which is the IBM pass score. The participants must have completed the mandatory National Youth Service. Delimiting the participants to only those who participated in the African Skills Initiative lessens the generalisation of the results in other African countries.

1.9   Significance of the Study

This mixed-methods study may be significant to society for a number of reasons. First, the result of the study might introduce **African government leaders** to a new way of thinking about education and skills, especially in the light of the recent pandemic. This will enable them to implement essential regulatory policies on education and training structures that will make it easier for young Africans to transition from education to employment. Second, the findings may also help increase awareness of the importance of collaboration among all relevant stakeholders and increase the process of sharing critical data on skills and employability. Third, the study may create a different understanding among government leaders, especially in the light of the recent event of the importance of tech skills and the attendant infrastructure that is badly needed for governments, organisations, and educational institutions to function effectively and efficiently. Also, it may reveal how faster Internet services and reliable electrical supply will make online education and remote working opportunities flourish. The study might also contribute to social change and improve the economies of African communities.

The outcome of the study may provide the leaders of **Multinational corporations** and global enterprises with information on how to attract the right skills in Africa. It may also provide a robust framework or road map on how to design training programmes that will have a more significant impact on employability, skills acquisition and retention. The road map will also help these organisations attract skills in Africa. It may also encourage them to start apprenticeship and internship programmes within their organisations and assist them with their recruitment strategies, as it will help discern what skills are available in different countries in Africa.

University leaders across Africa may also benefit from this study, as it may create awareness on the essential and critical tech skills that are currently required by the market. This may support them to better structure their curriculums, which will, in turn, make graduates employable. It may also encourage more collaboration between these higher educational institutions, government and industry, possibly enabling them to share data and work together to improve graduate employability in Africa.

The study may be significant to the **African youth,** as it will help them in their transition from education to employability if they are interested in working in emerging technologies. It may help create awareness about New-Collar Skills and introduce them to a road map that will give them step-by-step information on what they have to do if they are interested in acquiring a New-Collar Skill. It may also inform them of the necessary steps and procedures to take to secure a job, online, locally or remotely.

1.10   Conclusion

This chapter provided information on the nature of work, the global labour participation rates and the state of the disruption that is occurring in the global skills market owing to global shifts, the pandemic, and the advent of the automation age. As the Fourth Industrial Revolution ushers in the knowledge economy, the workplace skills are fast changing. This has been accelerated by the recent pandemic, which has caused the way of working to change faster than expected.

The present educational systems are not designed to respond to the dynamism of technology and innovations in our everyday life. However, Africa is still way behind other emerging economies, one significant way Africa could catch up with the Fourth Industrial Revolution could be through

harnessing the resources and skills of youths beyond university degrees or conventional formal education. We ask the question: Could New-Collar Skills be the solution to this looming challenge? The mixed methods feature sequential exploratory design examined how young Africans can transition into employment and entrepreneurship by acquiring New-Collar Skills and do so at a faster rate than those who did not acquire these skills.

In chapter two, we will examine the literature, first, we examine the history of the Industrial Revolution, as well as global work trends and experiences, and how these compare to the situation in Africa. Second, the effects of globalisation, automation and technological changes are considered. The third section focuses on the journey from education to employment and examines the concept of employability. The section then considers various interventions and collaborations and the role of industry, educational institutions and government. In the fourth section, the future of work in Africa is examined in the light of available skills, the skills gaps shortages and various processes shaping skill acquisition on the continent.

Chapter Two: Literature Review

2.1   Introduction

This chapter, through a review of relevant literature, interrogates how the future and nature of work are changing globally and how the changes affect Africa. It examines the impact of the changes on the global world of work, the possible interventions and solutions by industry, educational institutions and government amid the growing unemployment and underemployment of graduates. It is divided into four major parts: First, it examines the history of the Industrial Revolution and its impact on global work trends and experiences and how the ensuing facts and factors compare to the situation in Africa. Second, the effects of globalisation, automation, and technological changes are considered, with particular attention given to demographic changes. The third section focuses on the journey from education to employment by assessing the state of Africa's education system to determine the education skills required for the new automation era. Here, the concept of employability is also examined, with attention on various interventions and collaborations and the role of industry, educational institutions and government. In the final section, the focus is the future of work in Africa in the light of available skills, the skills gaps, shortages, and various processes shaping skill acquisition on the continent. The section also examines employability as it relates to the skills concept that is emerging for the automation age and the new world of work. It considers the attendant ways of working, such as online outsourcing and digital entrepreneurship, in relation to start-ups. A closer look is taken at the continent of Africa to determine how these all play out in the selected countries.

The significant contribution of this chapter is the argument that the available literature on the future of work fails to reflect the dynamism, currency, contradictions and prospects of potential skills for the future of work in Africa. The chapter also suggests a new way of working in the new age, giving rise to a new concept. This culminated in proffering, at the completion of the study, an insightful answer to the question: What is the fate of skills in Africa in the dynamic global space of the new world of work and what will be the effect on employability and entrepreneurship?

2.2   The Industrial Revolutions

From the beginning of the 18th century, a revolution transformed the way we think, work, and play. The Industrial Revolution started in the United Kingdom. Until then, most people lived as they had done for generations, an agricultural existence defined by the harvest and the seasons and ruled by the small political and social elite. As the 18th century progressed, an unprecedented explosion of new ideas and new technological inventions transformed the use of energy, creating an increasingly industrial and urbanised country. Thousands of miles of roads, railways, and canals were built. Great cities appeared, and several factories and mills sprang up. This made Britain one of the wealthiest and most powerful nations on earth. This transformation, set in motion helped to make the world in which we all live today, defined by technological progress and innovations (Black, 2011).

Revolutions have happened all through history, when new technologies and novel methods for seeing the world trigger a significant change in the economic system and social structures. The origin of the Industrial Revolution can be attributed to the British. The United Kingdom was immersed in the culture of hard work, taking risks, and developing ideas.

'Industrial Revolution', often referred to as the era of substantial cultural, economic, social, and technological change, which was brought about by the machine, ushers a change in the way we live and work. Several Industrial Revolutions have occurred, each taking a shorter time than the previous. As each Industrial Revolution occurs, there is always a new set of skills required for work; this means workers need to learn fast and adapt to these changes or risk being left behind (Schwab, 2016). The first significant shift in the way we lived happened around 10,000 years ago and was made possible by the taming of animals. The Agrarian Revolution combined the efforts of animals with those of humans for production, transportation, and communication. This eventually gave rise to urbanisation and the rise of cities.

The First Industrial Revolution spanned 1760-1840. This was prompted by the building of railroads and the creation of the steam engine. It ushered in mechanical production. The First Industrial Revolution saw the rise of industries mechanised by steam energy, fast-paced textile industry, evolving stages of metallurgy, and metal works. At the beginning of the First Industrial Revolution came the emergence of the blue-collar worker. However, the term blue-collar worker

was not used until 1924 (Wickman, 2012). The blue-collar worker was skilled or unskilled and worked in the manufacturing, mining and textile industries, and many other types of physical work. Blue-collar often involves physical work or something built or maintained (Gibson and Papa, 2000).

The Second Industrial Revolution started in the late 19th century into the 20th century. This made mass production possible, fostered by the emergence of electricity and the assembly line. People began to leave rural areas in search of work. By the early 1900, 40% of US citizens had migrated to cities to work in factories, compared to 6% in 1800. Urbanisation brought about the invention of the electric bulb, television, radio, and telephone. This changed the way people lived, worked, and communicated (Black, 2011). The Second Industrial Revolution came with the emergence of the white-collar workers, along with the existing blue-collar workers. White-collar workers perform professional or managerial work. The term "white collar" was defined by Upton Sinclair, an American writer, as "contemporary clerical, administrative, and management workers during the 1930s".

The Digital Revolution is the Third Industrial Revolution, in the period 1960-1990s (Schwab, 2016; IMF, 2019). It started at the beginning of the 1960s. It brought semiconductors, mainframe computing, personal computing, handheld devices, 3G, 4G, 5G, and the Internet and Internet of Things (IoT). Devices began to change from analogue to digital, for instance, the analogue TV was replaced by an Internet-connected tablet that streams movies (digital). The change from analogue electronic and mechanical devices to pervasive digital technology dramatically disrupted industries, specifically global communications and energy. Electronics and information technology started to automate production and take supply chains globally (Schwab, 2016; Codrington, 2019). The skills for the Third Industrial Revolution are often referred to as digital skills or digital workers (Schwab, 2016).

2.2.1 The Fourth Industrial Revolution

Schwab (2016) coined the term "Fourth Industrial Revolution". He stated that, "It is characterized by a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres" (Schwab, 2016:1).

Digital technologies, like the Internet of Things (IoT), autonomous vehicles, and artificial intelligence, are becoming ingrained in our daily lives and even our bodies. Examples are virtual voice assistants, face ID recognition, or healthcare sensors. The Fourth Industrial Revolution brings profound shifts, not only in the way we work but also in every facet of our living; it is upending the status quo (Schwab 2016; Codrington 2019). It is, however, not only about more intelligent and connected machines. It has a much bigger and broader scope than the previous revolutions. It is a combination of innovations, such as gene sequencing, nanotechnology, quantum computing, and their communication across physical, digital and organic areas. In this revolution, emerging technologies and broad-based innovations are diffusing much faster and more widely than in previous revolutions, which continue to unfold in some parts of the world (Schwab, 2016).

Codrington (2019) argues that what separates the Fourth Industrial Revolution from the Third is that it is merging more with human lives, and technological change is moving at a much rapid pace. It took 75 years for 100 million users to start using the telephone but took just two months for Instagram to reach 100 million users. The spindle (of the First Industrial Revolution) took almost 120 years to spread outside Europe. In contrast, the Internet permeated the entire world in less than a decade. However, Codrington (2019) has a different view, noting that automation, robotics, machine learning are still part of the Third Industrial Revolution, contrary to the current literature. He contends that these technologies are still digital technologies. He suggests that the Fourth Industrial Revolution is what is going to happen as we realise that these new digital tools are not just tools to help us do the things, we used to do but also to do them in cheaper, faster and better ways. These tools allow us to do new things that we have never done before. Codrington concludes that the Fourth Industrial Revolution is not new technology but the application of digital technology to our world that allows us to change the way we live and work. It is not merely automating things that we have been doing for the last two decades, nor is it putting a business online, but it is about asking if there is another way to change the way we have been working. A few examples are companies like Uber, Netflix, and Airbnb; they did not invent new technologies but changed the way we had been doing things before.

2.2.2 Skills for the Fourth Industrial Revolution

With every revolution, a new set of skills emerges. The First Industrial Revolution gave rise to blue-collar skills, with workers moving from farms to factories. Then came white-collar skills with the Second Industrial Revolution and the need to manage large-scale production. With the advent of the Third Industrial Revolution and automation, workers were introduced to digital skills. The concept of digital skills is defined as technical skills, information management, communication, collaboration, creativity, critical thinking, and problem solving, all within the context of digital technologies (Leahy and Wilson, 2014; Van Laar et al., 2017). Some scholars have used advanced digital skills to describe the skills that will be adopted in the Fourth Industrial Revolution (IFC, 2019). However, this does not go far enough to describe the technical complexities of the skills required for the emerging technologies of the Fourth Industrial Revolution.

2.2.3 The Introduction of New-Collar Skills

Typically, the workforce used to be divided in two distinct groups, namely blue-collar workers or white-collar workers. It was a generalised way of identifying these groups who were named for the typical attire that workers of each group wore to work. Blue-collar workers usually wore simple blue-coloured uniforms and performed manual labour work that did not require degree. White-collar workers typically worked in professional office settings and wore white shirts. This group of workers normally held at least a bachelor's degree and usually earned higher salaries than their blue-collar colleagues. However, today, a new class of workers is blurring this stark divide. More businesses are looking for candidates with a very particular set of skills, in a specific area of technology but who do not necessarily require 4-year degrees to fill their positions (Ohm, 2020; Lager, 2020).

Today's manufacturing can create new products and deliver them more efficiently with better customer satisfaction than ever before. This has resulted in a higher productivity that yields greater profitability. However, as new technologies have converged in modern-day digital manufacturing and new opportunities have emerged in many industries, skilled workers needed to fill manufacturing jobs have diminished. Blue-collar jobs have evolved into digital New-Collar jobs. However, the training for workers have not changed (Boisvert, 2018; Bubenik,

2019). Jobs in advanced manufacturing technologies require higher-level STEM skills than the traditional manufacturing jobs. The Fourth Industrial Revolution is more reliant on high tech systems, sensors, feedback loops and information capturing systems that collect huge amounts of data (big data) in running modern factories. Each year the requirements for manufacturing operators and technicians become more challenging as technology becomes more sophisticated, further increasing the skills gap. In order to remain competitive in a global market, manufacturers need a workforce with digital fabrication skills deeply rooted in 21st century STEM courses. Some organisations refer to these new skills as "Middle Skills", a relatively new term for jobs that demand a higher level of technical skills than was previously required but does not require a four-year science or engineering degree. Alternatively, these jobs require a two-year associate degree, digital badges or certifications, on-the-job training, internships, and apprenticeships. *Harvard Business Review,* in 2012, predicted that, from 2010 to 2020, as many as 47% of all new job openings would fall into this middle skills range (Boisvert, 2018). These middle skills are what the former CEO of IBM, Ginni Rometty, coined New-Collar skills, as it perfectly sums up the kinds of workers manufacturers need for the future of work (Boisvert, 2018).

In the Fourth Industrial Revolution, industries are growing more reliant on technology and the skills needed to meet their new and changing demands. As a result of this, a new skill category has emerged: "New-Collar Skill". As mentioned earlier, IBM Chairman, Ginni Rometty, introduced the term "New-Collar Skill" to refer to the in-demand technical skills that are obtained through vocational training, apprenticeships or boot camps opposed to a traditional four-year college (Bubenik, 2019; Lager, 2020). The advancement of technology and the skills/workers need for business to thrive is changing so quickly that it is becoming difficult to predict what skills will be essential in the next ten years. The old model of learning something in college and carrying that skill set throughout one's career does not match the changing demands of today's labour market. New-Collar jobs take a more agile approach to education – teaching in-demand skills that are more practical for the present technology (Lager, 2020).

The labour market is overflowing with jobs requiring special skills, typically related to digital technology and do not necessarily need a university degree. These are now referred to as New-

Collar jobs. As a result of companies of all kinds being increasingly reliant on online tools and data, these jobs offer promising career prospects and provide salaries in the top half of the US wage scale. Demand is quite considerable that Congress, in the New-Collar Jobs Act 2017, has provided tax credits to employers who pay for workers to be retrained in New-Collar skills, like Cybersecurity (Koenig and Pham, 2018; Cox, 2020).

The term "New-Collar worker" is becoming increasingly important in the STEM lexicon as advances in technology, ranging from artificial intelligence (AI) to the Internet of Things (IoT), continue to accelerate along with demand for a labour force able to address a rapidly evolving set of skills. As a result, the tech industry has been looking to community college, vocational high school, certificate, boot camp, and other programmes to reinforce its workforce, in some cases relaxing previous requirements for a bachelor's degree or higher (Bernstein, 2019; Boisvert, 2018). Although university degrees will still be required for many specialised technology jobs, the continuing tech-labour shortage has led to some creative thinking among tech companies. IT industry association CompTIA, in its report, explained that tech giants, like Apple, Google, and IBM, no longer require a four-year college degree for many of their positions, including those in some technical roles. Relaxing this age-old requirement opens the door for thousands of potential hires. And it is recognised that many of the skills required for a career in tech can be acquired via alternatives to the four-year academic path (Bernstein, 2019).

The COVID-19 pandemic, and the unemployment and economic downturn that has followed, has especially hit white-collar jobs hard. The Mckinsey report, "Covid -19 and jobs: Monitoring the US impact on people and places" estimated that up to 57 million US jobs are vulnerable, including a considerable percentage of white-collar jobs (Lund, Ellingrud, Hancock and Manyika, 2020). This job loss is fast-tracking the inevitable change in the labour market that will continue to automate more jobs. The lasting impacts of the virus to the workforce are still unknown, but it is clear that New-Collar jobs are becoming increasingly vital. While the loss of millions of jobs is frightening, it is also creating an opportunity for millions of people to pivot on New-Collar jobs and develop secure, lucrative careers (Lager, 2020).

2.2.4   Challenges of the Industrial Revolutions

Every new Industrial Revolution has come with challenges. This new era of technology is driving a great deal of innovation, with organisations and governments struggling to keep up with it. The number of patents connected to the Fourth Industrial Revolution for 3D printing and artificial intelligence alone has increased significantly since the beginning of the millennium. Research has shown that investors, shareholders, and innovators stand to benefit considerably from innovation, however, there is a risk of increasing inequality. Privacy concerns are another major issue, as the Fourth Industrial Revolution turns every company into a technology company. Industries, from food to retails and to banking, are turning digital and collecting data about their customers; consumers worry that companies know too much about their private lives (Schwab 2016; World Bank 2018).

The above challenges are not the only concerns among stakeholders. The Fourth and Digital Revolutions have also created significant concerns in the labour market, coupled with the rising inequalities and the growing concerns about unfairness, and the concentration of wealth and benefits to a small percentage of people exacerbated by the platform effect in which digitally-driven companies create networks (Anwar and Graham, 2020) The consequence is the concentration of a few but powerful platforms that dominate the market (Autor 2015; Mckinsey 2016; World Bank 2016). The difficulties made by the Fourth Industrial Revolution seem, by all accounts, to be on the supply side, in the world of work and production. Throughout the years, some developed and emerging economies, like China, have encountered a considerable decrease in their share of labour as a percentage of GDP. This has been mainly due to the advancement of innovation, which is compelling countries to substitute labour for capital (Autor 2014; McAfee and Brynjolfsson 2014).

2.2.5   Africa and the Fourth Industrial Revolution

The increasing automation of work is transforming many industrialised economies. There have been significant discussions on the impact of the Fourth Industrial Revolution on the developed world. However, not much has been said about the possible impact on developing nations, especially those in Africa. Africa is just beginning to embrace the previous revolutions, the

Second Industrial Revolution is yet to be fully experienced by 17% of the world, and nearly 1.3 billion people in some parts of the world, mainly Africa, still lack electricity (Schwab, 2016). The story is similar for the Third Industrial Revolution, with more than half of the world's population, 4 billion people, mostly in the developing world, lacking Internet access. The rate at which society embraces technological change is a significant determinant of progress and adoption (Schwab 2016; GSMA, 2018).

The story of Africa is somewhat different from that of the rest of the world, with Africa being predicted to have the largest youngest population in the world and projected to have 30% of the global workforce by 2050 (Schwab and Samans, 2016; Abdychev et al., 2018). In view of the foregoing, how will the continent fare in the Fourth Industrial Revolution, especially as Africa is yet to fully embrace the Second and Third Revolutions? What will be the implications of the future of work in Africa for the rest of the world, and what do stakeholders have to do to ensure that Africa's demographic dividend does not end in disaster?

However, the Fourth Industrial Revolution is not only a source of concern, but also one of great hope and inspiration. All across Africa, governments and entrepreneurs are already taking advantage of the opportunities provided by the Fourth Industrial Revolution. East Africa has led the development of mobile money, providing access to financial services to millions that were previously excluded. The uptake of technology has not been limited to finance. For instance, Biscate is a phone-based recruitment solution for blue-collar workers in Mozambique. In South Africa, the medical app Vula Mobile has been launched to connect health workers with specialist care providers for their patients. In Nigeria, there are Jumia, O-pay, Interswitch, and Paga, to mention a few. There are many examples of how technology is already providing local solutions across the continent (Abdychev et al., 2018; Choi, Dutz and Usman, 2019).

However, to fully harness the benefits of these opportunities, Africa has some catching-up to do. Although the use of mobile phones has become prevalent, Internet penetration on the continent remains the lowest in the world –less than 50% of the global average. Only few countries, like Kenya, Nigeria, and Seychelles, have achieved penetration levels of close to 50 per cent, slightly above the global average. The cost of a fixed broadband connection in Africa is the highest in the world. Only for mobile broadband are costs comparable to other regions in US dollar terms. However, if costs are scaled by gross national income, Africa has the least affordable mobile

broadband (Abdychev et al., 2018). The Industrial Revolutions are not solely responsible for influencing the demand and nature of skills. Specific shifts and trends have also influenced this. Apart from the current pandemic, in recent years, it has been globalisation. However, some scholars say globalisation has officially ended. They suggest we are moving into an era of digital globalisation, with the rise of digital platforms and automation of processes. This has caused major shifts and trends in the world of work that have changed the way we work and play (, Mckinsey 2016; World Bank 2019).
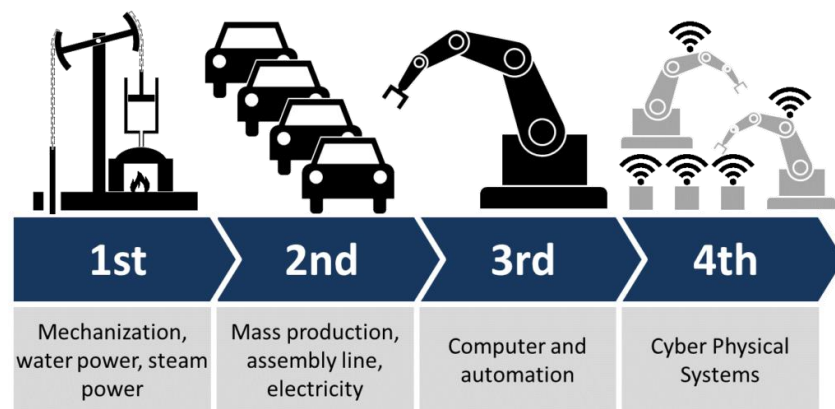
Figure 2.1: The Industrial Revolutions (Medium.com)

2.3   How Globalisation, Digitisation and Automation has Impacted Employment

Globalisation has been a significant catalyst for the 21st century. It refers to the integration of goods, services, and culture among the countries of the world. It has existed since the days of European colonisation; further advances in telecommunication and transportation technologies accelerated globalisation (Bourgeois 2019). In simple terms, it is intended to portray the idea that the world, through its numerous countries, has increased its interconnectedness at an incredible pace over the last two to three decades (MGI, 2016). The Internet has made all nations virtually next-door neighbours; it is truly a worldwide phenomenon. As of April 2020, the Internet is being used by almost 4.57 billion people worldwide, incorporating 59% of the global population (Statista, 2020). From its initial beginnings in the United States in the1970s to the development

of the World Wide Web in the 1990s, and to the social networks and e-commerce of today, the Internet has continued to increase the integration between countries, making globalisation a fact of life for people all over the world (Bourgeois, 2019).

Globalisation is identified by five key economic markers, namely: the development in trade between economies around the world; the expansion of information technology, described more specifically as technological change; the rapid growth in cross-border capital trade; and a process of reducing trade restrictions accompanied by the formation of several regional trade blocs (Bhorat and Lundall, 2004). Some countries (for example, East Asian economies) have seized on globalisation as a potential driver for catch-up growth, effectively utilising globalisation to build the demand for products and services, using fares and advancing the internal exchange of technology. However, there are countries that have been less successful in exploiting globalisation and have endured some negative impacts (Liu et al., 2013).

One of the major shifts accompanying the global evolution of work is the "great doubling", with the entrance of China and its movement towards market capitalism, India's decision to take on market reform, and the collapse of the Soviet Union; these three giants contributed a total of 1.47 billion to the global economy (Freeman, 2006; Liu et al., 2013). This change significantly increased the size of the global labour pool, essentially doubling it to 2.92 billion. The entire world came together to become a single economic world based on capitalism and markets (Freeman, 2006). The advent of China, India, and the Soviet Union's immediate impact on the world economy was to reduce the capital to labour ratio. This shifted the global balance of power to capital. With the new supply of low-wage labour, many companies began to outsource and move their operations to lower-cost settings (Freeman, 2006; Liu et al., 2013).

The second global major shift contributing to the global workforce is the increase in education access. In recent decades, the introduction of mass education has significantly improved access to education in developing countries (Filmer and Fox, 2014). This has produced a large pool of young workers with minimum basic skills, like literacy, numeracy, and other skills. It is making them better prepared to function in the modern workplace, particularly in mass production and service industry. In combination with other shifts, this helped Asia become a major destination for global outsourcing and, as such, jobs shifted from the developed countries (Liu et al., 2013).

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Technological progress has also had substantial impacts on employment, driving up the demand for workers with advanced skills (World Bank, 2018). Globally, technological progress has been interlinked with and enabled productivity, growth, and economic and industrial shifts. It has also had more micro-level effects on employment and types of jobs within specific industries. On the one hand, technological advancement has driven the development of new products and services that did not formerly exist, and thus new occupations. On the other hand, technology has severely affected labour demand.

The State of the Internet Around the World
Global internet penetration rate from 2009 to 2018, by region

2009   2018*

59.8%   79.6%
Europe

24.3%   71.3%
CIS**

46.1%   69.6%
Americas

21.4%   54.7%
Middle East

18.9%   47.0%
Asia Pacific

4.7%   24.4%
Africa

*   Estimate
** Commonwealth of Independent States: a group of 10 ex-Soviet republics
@StatistaCharts   Source: International Telecommunications Union

statista

Figure 2.2: Global Internet Penetration (Statista)

2.3.1 Digital Globalisation and the Rise of Platforms

The world today has a more digital form of globalisation. It is more inclusive and is changing who is participating, how business is done across borders, how rapidly competition moves, and where the economic benefits are flowing. Even though advanced economies, in general, continue to be the leaders in most flows, the door has opened to more countries, to small companies and start-ups, and billions of individuals across the globe (Mckinsey, 2016; World Bank, 2018). Globalisation was once the sole prerogative of and exclusively dominated by governments, large multinational corporations, and major financial institutions. It was also dominated by the more advanced economies. However, today, with the rise of digital platforms, almost anyone can

participate in this global economy, new start-ups, app developers, online entrepreneurs, freelancers, small businesses, and even individuals can participate directly on digital platforms from any part of the world (Mckinsey, 2016; Lund, Manyika and Bughin, 2016). According to MGI (2016: 2)

> *The world has never been more deeply connected by commerce, communication and travel than it is today. But the pattern of globalisation is shifting. Trade was once dominated by tangible goods and was largely confined to advanced economies and their large multinational companies. Today global data flows are surging, and digital platforms allow more countries and smaller enterprises to participate. This shift has far-reaching implications.*

Digital platforms are critical to this new era of globalisation. Many organisations and entrepreneurs have digital platforms to manage suppliers, connect to customers, and enable communication and data sharing for employees and clients around the world. However, a different class of public Internet platforms has emerged to connect anyone, anytime, anywhere. These include online marketplaces, social media, digital platforms, e-commerce websites, and different operating systems (Berg, 2018). Their use of automation and algorithms makes additional interactions cost next to nothing, enabling the platforms to support millions of global users. Now users in the remote corners of the world can more easily see details on products, services, prices, and choices. This eliminates some information asymmetries so that markets function more efficiently and effectively.

However, the drawback to this is that it eliminates the middleman and could cause significant job losses (Chui, Manyika and Miremadi, 2016). However, the rise of platform marketplaces allows the impact of technology to be felt more quickly than ever before. Individuals and companies only need an Internet connection in order to trade on online platforms. This brings economic opportunity to millions of people who do not live in industrialised countries (Williams and Morawczynski, 2019). This also means that there will be a changing demand for the skills here too. Automation has required a rise in the skill level in advanced companies and has led to

raising the bar in emerging economies too (Mckinsey, 2016; Abdychev et al., 2018). As noted by MGI (2016: 4):

> *Individuals are participating in globalisation directly, using digital platforms to learn, find work, showcase their talents, and build a personal network. About 900 million people have international connections on social media, and 360 million take part in cross-border e-commerce. Small businesses worldwide are becoming 'micro-multinationals' by using digital platforms such as eBay, Amazon, Facebook, and Alibaba to connect with customers and suppliers in other countries.*

Digital companies scale faster, and at a lower cost. IKEA, a Swedish furniture company, was founded in 1943, and it took almost three decades to grow its business in Europe and realise gross revenues of $42 billion (Schwab, 2016). However, with digital technology, through the use of platforms, Alibaba took just a couple of years to reach one million users and less than 20 years to accumulate over 8 million online vendors and an annual gross of $550 million. Although more nations are participating in global economy, trade remains concentrated among a fraction of prominent countries. The gaps between the leading countries and those lagging behind seem to be closing gradually, but there are significant opportunities for these countries to catch up (World Bank, 2019; UNCTAD, 2019). Platform-based business is on the rise in every country. It is growing at a tremendous rate in several developing countries, for example Flipkart (in India) and Jumia (in Nigeria), allowing technology to reach more people quicker (World Bank, 2019).

Cross-border data flows are surging and connecting more countries

Used cross-border bandwidth

Regions	NA United States and Canada	EU Europe	AS Asia	LA Latin America	ME Middle East	AF Africa	OC Oceania
Bandwidth Gigabits per second (Gbps)	---- <50	50–100	100–500	500–1,000	1,000–5,000	5,000–20,000	>20,000

2005
100% = 4.7 Terabits per second (Tbps)

2014
100% = 211.3 Tbps

45x larger

NOTE: Lines represent interregional bandwidth (e.g., between Europe and North America) but exclude intraregional cross-border bandwidth (e.g., connecting European nations with one another).

SOURCE: TeleGeography, Global Internet Geography; McKinsey Global Institute analysis

Figure 2.3: Cross- border Data Flows (MGI, 2016: 31, E7)

Digital platforms have given SMEs enormous potential for growth and to expand their operations globally. They have given them a huge global customer base to become major exporters. Amazon now hosts more than two million third-party sellers. In many countries around the world, the number of companies that export globally has increased considerably, thanks to eBay, Amazon, and Alibaba. PayPal acts as an intermediary and enables cross-border transactions. Kickstarter enables microenterprises to borrow capital for their projects. Facebook estimated that it has over 50 million SMEs on its platform. This is incredible since the World Bank announced in 2010 that there were 125 million SMEs worldwide. In a nutshell, this is good for developing countries, as digital platforms are enabling greater participation in the world economy, allowing these countries to overcome many of the local constraints (Mckinsey 2016; Banga, Willem te Velde, 2018).

The effect of digital platforms and the increasing globalisation of small businesses are now being seen in the United States statistics, where the share of exports by multinational organisations dropped from 84% in 1977 to 50% in 2013 (World Bank, 2019). Even new start-ups can form global connections and market to international customers from their inception. A survey carried out by the World Bank, in collaboration with a global incubator, involved 271 start-ups in 19 countries. The findings revealed that even the smallest and youngest of the companies could achieve a global vision with a model built on digital technologies. About 87% of the companies

surveyed were found to have at least one cross-border activity, and almost 50% of them reported sourcing talent from other countries (World Bank, 2019).

Digital platforms have assisted Africa's integration with the rest of the world, which has grown considerably since the early 1990s. Trade openness proliferated in the mid-1990s at a time when export destinations expanded from developed countries to growing emerging economies, particularly China, which is now Africa's leading trading partner. The main exports are commodities, particularly oil. Financial integration with the rest of the world has increased rapidly; capital flows increased from $4 billion in the 1980s to about $60 billion in 2017. The region is also integrating with global value chains, albeit from low starting points. Agriculture, textiles, tourism, transportation, and manufacturing sectors have all benefitted from closer integration. However, Africa remains the region least integrated with itself and the rest of the world; its integration is about 50% that of other emerging countries (Abdychev et al., 2018). There are growing concerns that further global economic integration may be under threat. This could be a major disadvantage for Africa, which is yet to benefit fully from global trade and investment flows. The recent trade disagreements between the US and China, and the UK leaving the EU have raised concerns over protectionist policies (Abdychev et al., 2018).

2.3.2 Inequalities Arising from Digital Platforms in Africa

In recent times, a considerable percentage of digital jobs are moving to Africa. This is mainly due to better Internet and the rising cost of traditional outsourcing destinations. This is making the African worker more competitive in the global market for digital work. In some of the major African countries, like Kenya, South Africa, Ghana, Uganda, Tanzania and Nigeria, an estimated 4.8 million workers derive their income from digital platforms. This number is likely to rise substantially as Internet connectivity continues to spread on the continent (Anwar and Graham, 2020). However, despite these encouraging developments, some of the working conditions and the inequalities are still quite glaring. In the outsourcing sector, African workers, put in unsocial hours and are under strict managerial control. They are sometimes under physical and psychological pressure and other forms of labour insecurities. However, due to non-proximate monitoring, some remote digital workers have some form of autonomy at work and discretion

over tasks, but flexibility is constrained owing to extended and unsociable working hours to offset low wages. Non-payment of salaries is another threat facing workers, as many platforms allow clients not to pay for work they deem unsatisfactory. This has resulted in many workers not being paid by the client (Anwar and Graham, 2020).

However, even though regulation seems like a natural solution, this could lead to some jobs disappearing and relocating to other parts of the world where labour is cheap. Nonetheless, not regulating the sector and expecting the market to solve unemployment could further establish informality or possibly weaken the social and interpersonal relations that define the informal sector. Many digital jobs are characterised by poor working conditions, and many jurisdictions in which those jobs are located lack either the means, motivation or desire to improve them (Anwar and Graham, 2020). Many of these digital workers are not poorly paid by local standards, and they appreciate having these jobs, but high unemployment and a large informal sector mean these digital jobs receive overly positive reviews, and the risks are side-lined (Kuek et al., 2015). Furthermore, digital workers in Africa earn only a tiny fraction of the profits generated from their labour. This shows that, even though the digital economy offers jobs and opportunities to African workers, it offers a considerable opportunity to the international corporations that seek to profit from their labour and makes it nearly impossible for firms and individuals based in the world's economic margins to move up global value chains (Weber 2017; Anwar and Graham, 2020).

There may be a solution to the inequalities of the digital platforms. legal effort has been focused on bringing platform workers within the scope of labour law by proving that they fit the definition of employee or worker, which functions as the gateway to employment rights. However, the Fairwork, a project that aims to encourage platforms to be transparent about the kind of work that they provide, and to ultimately create better and fairer jobs, claim that the "employee" paradigm should be redesigned to meet the needs of platform workers irrespective of their employment status. The project aims to address this by building pressure on platforms to improve working conditions through a public ranking system which scores selected platforms under five broad principles: fair pay, fair conditions, fair contract, fair management and fair representation. They also help by appealing to the reputational concerns of platforms. It can be

used by workers and consumer to negotiate for better working conditions (Fredman, Du Toit, Graham, Heeks et al., 2020)

However, these inequalities do not just stem from the working conditions alone. There is also the issue of gender bias. The current debate concerning the future of work essentially neglects the implications for gender relations. Work is highly unequal and if this foundation is the basis on which the future of work is built, we can only assume existing inequalities will be intensified. According to Howcroft and Rubery (2019), history is inundated with missing women and if we fail to intervene and make it right, women will be missing in our future. The current debate provides an opportunity to institute a number of changes to address these inequalities, so that when facing the next wave of 'disruptive innovation' it will be effected from a more level playing field. If we aim to redress gender inequalities that are built into the system, we may be able to move towards a more gender-equal society with a more equal division between paid and unpaid work (Howcroft and Rubery, 2019).

2.3.3   Technological Unemployment

John Maynard Keynes warned about technical unemployment in 1930. His argument came to pass, but only temporarily, as economies were not prepared for new technology by retraining and educating workers with new skills. The automation of farming prompted the disappearance of millions of jobs and drove farmers into cities in search of factory work. Later, automation and globalisation forced workers out of the manufacturing sector and into new service work. Temporary unemployment was often a problem during these transitions, but it never became permanent. New jobs were usually created, and unemployed workers found new opportunities. The new jobs were often better, with higher wages and upgraded skills (Ford, 2016).

There have been recurring warnings and concerns since the First Industrial Revolution that computerisation and new technology would wipe out massive numbers of middle-class jobs. The Luddite movement of the early 19th century is a classic example, in which a group of English textile workers protested the automation of the textile industry by seeking to destroy some of the machines (Autor, 2015; Aguilera et al., 2015).

This time the main concern is that automation may prevent the economy from creating enough new jobs. All through history, the trend has always been that old routine jobs will be replaced by different jobs, prompting higher production with a smaller workforce. A significant number of factory job losses have been replaced by an increase in the service industries or office jobs. However, automation is starting to move in and wipe out office jobs as well. The new industries typically contract many more individuals than those they put out of business. New industries have relatively few jobs for the unskilled or semi-skilled; the jobs of these classes of workers are being replaced by automation (Autor, 2015). There were similar concerns over automation in the 1950s, which led to the appointing of the Blue-Ribbon Commission. The commission eventually decided that automation did not threaten employment. It stated that the general level of demand for goods and services was the determining factor on who was affected, how long they would be without a job, and how difficult it would be for new entrants to enter the job market. The basic fact was that technology eliminated jobs, not actual work (Ford 2015; Gaus and Hoxtell, 2019).

McAfee and Brynjolfsson (2014), offer a completely different view. They argue that the first machine age led to mechanical muscular work, freeing labour from the agricultural sector; the second automated intricate work and tasks. They note that it is accelerating digitisation that is likely to bring economic rather than environmental disruption; if computers become more powerful, companies will have less need for a particular kind of worker. They contend that technological progress is going to leave behind many people. Nevertheless, there has never been a better time to possess special skills or have the right education, as technology can be used to create and capture value. A worker with ordinary skills will be left behind, as a robot is going to take over these jobs at an incredibly fast rate (McAfee and Brynjolfsson, 2014).

Autor (2015), however, maintains that there is no cause for alarm, as automation and technological change have been around since the 18th century. Despite this, it has not made human labour obsolete. The employment to population rate rose in the 20th century, and even many of the female population moved into the workplace, thus increasing the number of people employed. He asserts that there is an immense concern now because of the rate and power of technological change today. The emergence of highly improved computer power, and artificial

intelligence and machine learning, have changed the game and increased the possibility of robots replacing labour at a scale never seen before now (Ford, 2015; Autor, 2015).

Lastly, Autor (2015) argues that both substitute and complement human labour. To reinforce this point, the author asks the question: "Why doesn't automation necessarily reduce aggregate employment, even as it demonstrably reduces labour requirements per unit of output produced?" Most work processes draw upon a diverse set of inputs, adherence to the rules, and judiciously application of discretion. One cannot have one without the other. For example, in banking, the ATM shows the surprising complementarities between information technology and banking. With the introduction of ATMs, one would have thought most of the bank tellers would be out of job. However, the reverse is the case. The US bank teller employment rose from 500,000 to 550,000 over 30 years. The ATMs indirectly increased the number of tellers. The number of tellers per branch reduced but the number of branches increased, and the bank needed more staff for relationship banking (Ford, 2015).

However, the World Bank report of 2019 found that, in some developed economies and middle-income countries, production jobs are being lost to automation, especially workers involved in a routine task that is codifiable. The report agrees with Autor that technology provides opportunities to create new jobs and increase productivity. However, the report points out that, compared to previous major technological innovations, such as electricity and the assembly line, the current wave of change is striking. Technology is shifting the mix of skills that are required in the present job market, such as problem- solving and interpersonal skills, as opposed to routine skills that can become automated (World Bank, 2019).

2.3.4   Rising Accelerated Automation and Jobs

In his *The Rise of the Robots*, Martin Ford does not entirely agree with Autor's (2015) claim that machines will only take over jobs that can be routinely performed and are "codifiable." He asserts that, "Machine is turning into workers." Information technology is accelerating at an incredible rate. Any job that can be "predictable" is under the threat of being taken over by a

machine. According to Ford (2015), the world of work is moving into a new age defined by a shift in connection between worker and machine.

This shift will ultimately challenge our assumption about technology, that machines are tools that raise the productivity of workers. Instead, machines themselves are turning into workers, and there is now an invisible line between the capabilities of labour like never before. A constant acceleration in computer technology is driving this progress. This is backed by Moore's Law, which states that computing power roughly doubles every eighteen to twenty-four months (Kinnunen, 2015). The law illustrates the speed of information technology and the excellent acceleration of computing power. This has led to incredible progress made in software and design tools, which has made programmers more productive, drastically reducing the number of workers performing routine work. This attests to the implications of the consistent doubling of computing power, especially with the likelihood that it would drastically transform the labour market and the overall global economy. This can be seen in the rise of autonomous cars, and the progress made in artificial intelligence, with the emergence of IBM Watson, the supercomputer that won the game show Jeopardy. IBM is already positioning Watson to play a significant role in health and other prominent fields. Watson may also displace the majority of legal services (Ford, 2015; Vivarelli, 2017).
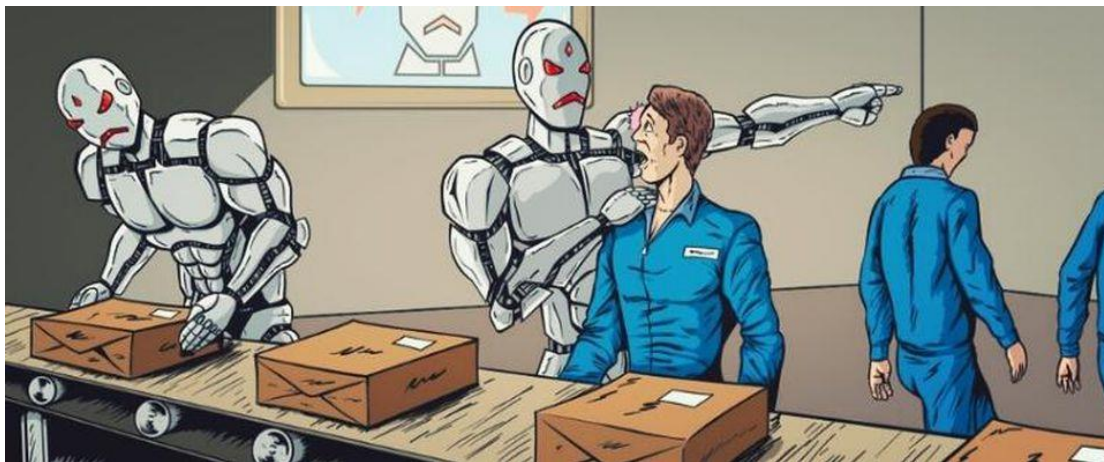
Figure 2.4: Robots Taking Over Human Jobs? (Forbes)

Ford's (2015) view was partially corroborated by Frey and Osborne (2013) in their study of United States jobs. They quantified the possible effect of technological innovation on unemployment by rating 702 different professions according to their probability of being

automated. They started with the least susceptible to the risk of automation to those most susceptible to the risk corresponding to a specific risk of the job being replaced by a computer. They concluded that about 47% of the total employment in the US was at risk, perhaps over the next 10-20 years (Frey and Osborne, 2013). In a similar study in Germany, replicated by Bonin, Gregory and Zierahn (2015), it was found that at least 42% of the jobs with a probability of 0.7 were susceptible to automation in the coming years. However, the evidence to date has been limited to advanced economies – mostly the US and Europe. This evidence does not necessarily apply to developing countries. In a similar survey of developing countries, Santos, Monroy and Moreno (2015) assessed the potential disruption to their labour market. In order to provide a typology on the extent of this disruption, and to classify the countries on the capacity of their skill development systems to adapt to this disruption (Santos et al., 2015).

For Africa, studies revealed massive but uncertain impacts on jobs. World Bank (2016) and McKinsey Global Institute (2017) estimated the number of jobs at risk in some African countries, adjusting for technological viability and diffusion of technology to low-income countries. They found that employment in Africa is a little less susceptible to automation than in advanced economies (Gaus and Hoxtell, 2019), with estimates for individual countries in the region ranging from 40 per cent to 60 per cent. However, African demography makes a significant difference than the rest of the developed world. Most advanced countries are facing this wave of technological change at a time when their populations are decreasing and are keen to increase or maintain output with fewer employees. This is not the case in Africa, with working populations growing at a high rate; most of the countries will need to create jobs every year (Abdychev et al., 2018).

The conclusion is that poorer countries would face a grimmer outlook on the share of employment that can face computerisation, only from a technology perspective. The reason for this is that most jobs are routine. Ford contends that "routine" may not be the best word to describe jobs that will likely be lost to technology. He suggests a more accurate word "predictable" and asks:

> *Could another person learn to do the job by studying a detailed record of anything you have done in the past, or could someone be proficient by*

repeating tasks you have already completed in a way a student may take
a practice test? (Ford, 2015:15).

There is a good chance that an algorithm may someday be able to learn to do much or all of the job. This is more likely as the "big data" phenomena continue to unfold. Companies are collecting phenomenal amounts of data about every part of their operations. This implies that many jobs and tasks are likely to be captured by data (Ford, 2015). In conclusion, scholars seem to agree on the fact that there should be massive retraining of skills, and our education system is not necessarily set up for this new age of automation. Therefore, stakeholders have to find solutions as quickly as possible as a result of the fast pace of change (Ford, 2015).

2.4   The Role of Education to Employment

Education is changing around the world owing to the fast-shifting global economy and the types of employees and thought leaders it demands. Education systems all over the world will have to change, quickly, in collaboration with governments and industry to respond to the automation of knowledge and production (Gleason, 2018). It has a crucial role to play in shaping the societal transitions necessary to adjust to the Fourth Industrial Revolution. However, today's educational institutions are designed to meet the needs of past Industrial Revolutions, with mass production powered by electricity. Those systems are not suited for the automation economy. Today's scholars (of all ages) are faced with major challenges in demographics, population (both growing and shrinking ones), global health, literacy, inequality, climate change, nuclear proliferation, and much more (Gaus and Hoxtell, 2019). As graduates leave university, the Fourth Industrial Revolution world has significantly different demands on them than have previously existed.

Almost everybody will work with digital technologies and artificial intelligence and other emerging technologies. What you specialise in will not determine your job or your career. The content and a deep understanding of it will matter, but it is also about what you can do with it (Gleason, 2018). Investments in human capital development are critical because, without them, economies will fall behind. The shifting frontier for skills is an essential context for the current discussion on human capital. The influence of technology and automation means the future of work will look very different from the present and require a changing set of skills. However,

countries are faced with an unprecedented challenge of updating education systems built for another era. They must confront this reality to prepare the next generation of learners for an evolving landscape with new kinds of jobs. There is an urgent demand for skills, including digital skills and socio-behavioural skills (IFC, 2019). Experts agree that education systems are not prepared for the pace or scale of change required to address the current technological shifts. Investments in human capital are essential, but how those investments are made will be as important as the capital deployed (Annunziata and Kramer, 2015; Abdychev et al., 2019; Gaus and Hoxtell, 2019).

Despite this, changes in education systems in most countries have been slow and inadequate, though some are trying to adapt. In the past few decades, education has generally experienced only small incremental improvements, better classrooms, better support, and advanced libraries. In many countries, access has widened to underrepresented groups, which offers improved social mobility. Thanks to efforts of the Millennium Development Goals to educate young girls, we are seeing much higher enrolment and completion by women as well (Gleason, 2018). Institutions of learning have also offered more diverse skills, with the inclusion of experiential learning. These are all significant improvements, but the Fourth Industrial Revolution requires educational institutions to depart from the current 3-or 4-year undergraduate model to prepare for lifelong learners (Annunziata and Kramer, 2015; IFC, 2019). Traditional undergraduate, graduate, and research education will remain relevant to society. However, provision must be made for adult learners to continue their learning as well. Institutions of higher education, in collaboration with governments and industry, need to prepare lifelong learners (Gleason, 2018).

Traditional undergraduate education through information transfer is no longer a viable form of education to ensure employment and a career. Then, how do we prepare employable and responsible citizens in our tertiary education systems? Education, by itself, will be insufficient to address the problems of technological unemployment (Gleason, 2018). Education through traditional institutions of higher education is still essential, but its collaboration with industry and governments needs to be much more intense (Mckinsey, 2012; Samans and Zahidi, 2015; Annunziata and Kramer, 2015). However, some experts believe that the education system should be changed entirely, especially the core curriculums of many academic fields.

As noted in the report by the World Economic Forum, nearly 50% of the knowledge acquired in the first few years of a technical degree becomes outdated before the students graduate; programme languages are becoming obsolete before the students graduate. According to one estimate, more than 65 per cent of children entering primary school today will end up working in a job that does not yet exist (World Bank, 2019). Who would have thought uploading videos on YouTube and providing content will be a profession a decade ago? During previous Industrial Revolutions, the sole purpose of education was to prepare people for physical jobs in the agricultural and manufacturing sectors. However, the model is changing with new-age schools, transiting into project-based learning; the emphasis is more on each individual, and skills (Samans and Zahidi, 2017).

2.4.1   Upskilling Africa

In most African countries, the standard and quality of primary, secondary, and tertiary education cannot compete with the standard provided in some emerging and advanced economies. This is despite the sevenfold increase in the expenditures on education in the past three decades. The basic metrics, such as school enrolment numbers, the average number of years of education, school dropout and literacy rates, all show that the quality of education accessible to the majority of young Africans is comparatively poor (IFC, 2019). Too few people develop mid-level or advanced skills required in the economy. This, together with the emigration of educated workers, translates into a skills shortage, which is a key challenge for African companies seeking to grow. Employers report that, despite large numbers of people looking for employment, they have difficulties finding workers with the right skills, and that it takes time to fill vacant positions. Most organisations either forgo growth, outsource tasks to service providers outside Africa, or hire expatriate workers (Filmer and Fox, 2014; Annunziata and Kramer, 2015; Samans and Zahidi, 2015; Abdychev et al., 2019; IFC 2019).

Consequently, to enable Africa to capture this demographic dividend, it must be adequately skilled with 21st-century skills (Filmer and Fox, 2014; IFC, 2019). However, many young people in Africa do not have access to digital tools and learning opportunities available to their counterparts in developed economies. Countries like Ghana, Nigeria, and Senegal, to name a few, have the potential and motivation to become global digital hubs. So, they must prioritise the

development of digital skills to sustain economic growth and deliver on the agenda to embrace the digital age (IFC 2019). They face an opportunity –although a tough one –to leapfrog the past revolutions and compete in a new era of accelerated technological change (Schwab, 2016; Abdychev et al., 2019). These shifts in skillsets are already beginning to influence the types of jobs and skills required in the market, and there is more change anticipated (Annunciata, 2015; Canning, Raja and Yazbeck, 2015). Against this backdrop, Africa faces the reality of preparing its people for jobs of the future. A legacy of poor learning is reflected in the fact that the region only captures 55 per cent of its human capital potential. Without addressing the learning gaps present in the current education system, Africa's youth will be unable to reap the benefits of education, whether or not they are in classrooms (IFC, 2019).

Given this diagnostic, it is not an exaggeration to assert that Africa's education system needs a quick fix. Education in Africa also needs to leap forward to catch up with the transformation of labour markets. The changing nature of jobs and life in the 21st century means that, although the conventional ways of educating children may have worked in the past, there is no guarantee that they will continue in the future. The employment landscape is rapidly evolving. One of the ways Africa's education system can be transformed is through innovation and technology. The Internet is an enabler for education, providing unparalleled access to information, and accelerating connections to educational resources, virtual labs, ideas, and people. It opens a way for exponentially expanding the physical limits of the school, giving students and teachers access to online learning resources from around the world (World Bank, 2017).

There are an increasing number of innovations and digital interventions in education. The challenge for Africa will be to know which is worth adopting and which can be scale up. A significant challenge the region faces is lack of infrastructure to avail it of educational technologies. Electricity availability, essential as a prerequisite for computers and Internet access, varies widely in African schools. There is also wide variation in availability of digital technologies, such as Internet access and computers, in schools. According to a recent report by IFC (2019), Africa faces three key challenges to the education and development of skills in the region. These are (i) poor attainment of foundational skills, as the region has the lowest primary school outcomes in the world; (ii) limited school resources, including teachers, and access to technology-based learning materials; and (iii) mismatch of skills taught and those in demand.

Policymakers will need to consider these issues as they determine a successful path to prepare the young workforce for the digital future. Skills are essential to the future workforce in Africa, with basic skills most critical (Annunuziata and Kramer 2015; IFC, 2019).

The labour market for digital skills in Africa is already highly developed, and demand is expected to grow. In a recent survey by IFC (2019), the respondents across the globe, including Africa, asserted that basic digital skills, such as email communication, Internet research, and online transactions, are essential to the future workforce. These skills are more likely to help mobilise the growing middle class on the continent. About 65 per cent of the individuals recruited for jobs in the African companies surveyed required at least a basic level of digital skills. Basic skills are essential, but competitiveness also will rely on the ability of the region's growing services sector to leverage intermediate digital skills, such as using professional software and managing data (IFC, 2019). Intermediate and advanced skills, such as data analytics and artificial intelligence/machine learning, were identified among the top required skills for the future workforce. The share of employees needing more advanced digital skills would likely increase as different sectors become more digitally enabled. According to the study, the employers considered digital skills among the top seven skills required for the future workforce. They also noted that the demand for technical competencies in emerging technologies had increased considerably, and jobs requiring basic digital skills had reduced. In contrast, the digital requirements for most jobs had increased. Demand significantly exceeded supply for almost all key skills. The study further stated that the gap was more severe in Africa, particularly in skills of critical and analytical thinking, problem solving, and the application of technology. This is a serious challenge, given that the most important consideration for companies exploring job locations is the presence of skilled local talent. African government leaders need to reform these systems, or risk failing to provide skills for the future (IFC, 2019).

2.4.2   Employability in Africa

Africa is currently undergoing a major demographic transition, which is expected to accelerate in the coming decades. The total population of the region has more than doubled over the past quarter century, increasing from 800 million in 2000 to close to 1.2 billion as of 2015. This represents an increase of 50% in just 15 years. Based on United Nations *State of the World*

Population 2018 forecasts, Africa's population will continue growing, increasing to 2.5 billion by 2050 –the highest population growth in the world –and to close to 4 billion by the end of the century. In comparison, the population of the rest of the world is expected to increase by only about 16 per cent between now and 2040 (Schwab, 2016; Gaus, Hoxtell 2019). The age structure of the population is also changing rapidly, creating an opportunity to capture a demographic dividend (Filmer et al., 2014). The share of working-age population began to increase in the region in 1985, driven by a decline in child mortality and fertility rates. This trend is expected to continue in the future, with the Africa's share of working-age population increasing for several more decades (Abdychev et al., 2019).

Africa may have the largest labour force in the world, but it remains primarily unskilled and unable to absorb or create sufficient jobs for the rapidly expanding population (Annunziata and Kramer, 2015). Since 2000, job creation has kept up with population growth, even though demographic pressures doubled, compared to the 1990s. The employment-population ratio increased from 63 per cent in 2000 to 64 per cent in 2017, and the region was able to add about 9 million new jobs per year (Gaus and Hoxtell, 2019; Abdychev et al. 2019). This positive performance was possible due to strong economic growth, particularly in the 2000s, as many countries benefited from the commodities boom. Most of those new jobs were in self-employment, although most of them were created in sectors with low productivity levels, such as farming and other low value-added services. Only 2.6 million have gone to employees being paid for their work (Abdychev et al., 2019).
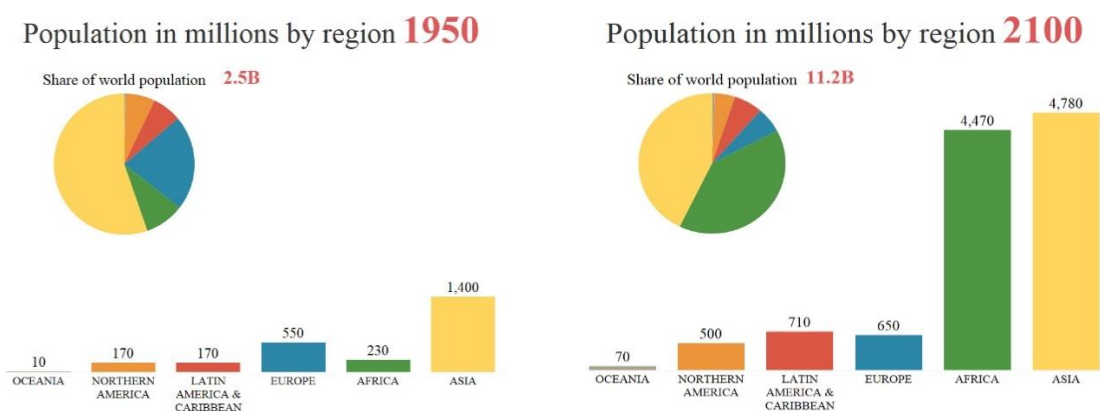
Figure 2.5: World Population figure 1950-2100 (based on UN 2018 forecasts)

Self-employment remains a defining characteristic of labour markets in Africa and has continued to be predominant (Samans and Zahidi, 2015; Abdychev et al. 2019). In the view of UNECA, 10 million new formal jobs are required each year to absorb the enormous youth population entering the market. While new jobs are created every year, the problem Africa faces is that growth in jobs and employment is not growing fast enough to absorb all job seekers. Although total employment has grown from around 254 million in 2004 to around 375 million in 2017, vulnerable employment and total unemployment have also increased, leaving a significant number of people in vulnerable economic conditions (Gaus and Hoxtell, 2019). According to the International Labour Organization, nearly 80 per cent of workers in Africa are in vulnerable forms of employment. African economies are failing to adequately provide jobs and prospects to their young and growing populations. In fact, unemployment disproportionately affects young Africans: they comprise around 60 per cent of Africa's unemployed, compared with a global average of about 44 per cent (Annunziata and Kramer, 2015). Population growth with non-matching job growth translates into a fast-developing labour glut across Africa. This simply provides fewer incentives for firms to automate since labour is cheap. Furthermore, the more the unemployment a country faces, the less likely it will be that government would promote policies that may lead to further unemployment in the short run, even if there is a net positive effect on the job market in the long run (Gaus and Hoxtell, 2019).

2.4.3   The Concept of Employability

There have been significant discussions about the required skills and education for the new technological age (Gleason, 2018). However, less has been said about the employability of skills and what exactly is required apart from generic digital skills.

The concept of employability has a wide range of definitions and continues to be applied within a range of different contexts to those in employment and those seeking it. The term itself is not new; it has been in use since the 1880s, though its meaning changed in the twentieth century. It emphasises the way that employability has come to signify how "employable subjects" are required to continually develop and assert themselves to remain employable (Chertkovskaya and Watts, 2013).

While employability is often evaluated through employment, the two concepts are distinct (McQuaid and Lindsey, 2005). Employability is a quality of the individual facilitating the gaining of employment, but is not a guarantee of it. Many external factors will determine whether an individual acquires employment, including the general availability of jobs, the distribution of different types of job, potential discrimination in the job market and a range of other facilitators or constraints (McCowan, 2013). Yorke (2014) defines employability as a set of achievements – skills, understandings, and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community, and the economy.

According to McQuaid and Lindsey (2005), the theory of employability can be challenging to identify; many factors can contribute to the idea of being employable. Little (2001) suggests that it is a multi-dimensional concept, and there is a need to distinguish between the factors relevant to the job and preparation for work. Morley (2001), however, states that employability is not just about students making deposits in a bank of skills. Employability is a synergic mixture of personal qualities, skills of several kinds, and subject understanding (Knight and Yorke, 2001). Dearing's (1997) understanding of the concept is placed on the job seeker's personal qualities, which suggests less emphasis on these qualities and more on generic academic skills. However, it could be assumed that the individual's personal skills could have considerable bearing on a particular job seeker's success in the employability stakes.

The labour market is rapidly changing, with new sectors emerging, changing the nature of work, and the way employment is perceived. Graduates need to be adaptable and have the capabilities to manage changing and challenging work situations. Employers are looking to recruit graduates who fit into their culture and can use their abilities and skills to transform the organisation by facilitating innovative teamwork (ITU, 2017). In the opinion of Yorke and Knight (2004), employability is influenced, amongst other things, by student's self-efficacy beliefs, student's self-theories, and personal qualities. The critical importance is the extent to which students feel that they can "make a difference." This not only broadens the focus to include a broader range of attributes required to be successful within employment but also includes the attributes required to

manage one's career development in ways that will sustain one's employability (Yorke and Knight, 2004).

Chertkovskaya and Watts (2013) note the emergence of "initiative employability", where job seekers are positioned as being responsible for the results of labour market that they find themselves. Employers and governments become "enablers", making it possible for the individual to make essential choices to become employable but not guaranteeing employment. Furthermore, it is the individuals perpetually maintained "initiative", rather than the ability to do the job, which has become crucial to this understanding of employability. As such, the rise of initiative employability is usually explained by organisations having to be more flexible in order to compete in the global market and governments not being able to build their labour market policies around stimulating demand for labour. This makes it arguable that the rise of employability is a result of unavoidable changes. Individuals are made responsible for their employment: being unemployed is seen as the result of not trying hard enough (Chertkovskaya and Watts, 2013).

According to McQuaid and Lindsey (2005), debates of employability cannot be limited solely to the supply side and demand side of the economic theory. There have been different efforts to develop a more explicit definition of the concept that have stressed the need to understand the interaction of individual and external factors affecting the individual's ability to operate effectively within the labour market. The focus of such analyses is on "interactive" employability – this is the dynamic interaction of individual attributes, personal circumstances, labour market conditions, and other "context" factors. In their employability framework, the authors give a thorough and holistic view of the many factors that interact when identifying components and attributes of employability. The framework considers all the possible factors that may arise when considering employability. However, when considering skills for the new age, these factors and components are still very relevant. In order to consider new age skills, the employability framework requires a more specific approach.

Table 2.1   McQuaid and Lindsay Employability Framework

Individual Factors	Personal Circumstances	External Factors
Employability skills and attributes Basic social skills, Personal competencies, Basic transferable skills, key transferable skills, High-level transferable skills, Qualifications, Work knowledge base, Labour market attachment.	**Household circumstances** Direct and other family caring responsibilities such as financial commitments to children or other family members outside the individual's household; The ability to access safe, secure, affordable and appropriate housing	**Demand factors** Labour market factors, Macroeconomic factors, Vacancy characteristics, Recruitment factors,
Job seeking Effective use of formal search services/information resources (including ICT); awareness and effective use of informal social networks; ability to complete CVs/application forms.	**Work culture** The existence of a culture in which work is encouraged and supported within the family, among peers or other personal relationships and the wider community	**Enabling support factors** Employment policy factors, Accessibility of public services and job-matching technology, Accessibility and affordability of public transport, child care and other support services
Demographic characteristics Age, gender	**Access to resources** Access to transport, access to financial capital, access to social capital	

2.4.4   Journey from Education to Employment in Africa

The journey from education to employment is a complex one, and, naturally, there will be different ways. Too many young job seekers are getting lost along the way (Mckinsey, 2012). Throughout the world, governments and businesses face this challenge: high levels of youth unemployment and a scarcity of job seekers with the right skills. The youth are not well informed when making educational decisions. Many of them lack the means, skills, knowledge, or connections to translate their education into productive employment, neither is there a structured path to follow (Mckinsey, 2012; Filmer and Fox, 2014). How then can a country successfully move its young people from education to employment?

Mckinsey (2012) analysed more than 100 education-to-employment initiatives from 25 countries. The countries were selected based on their innovation and effectiveness. The surveyed participants were youth, education providers, and employers in nine countries with diverse geographic and socioeconomic contexts: Brazil, Germany, India, Mexico, Morocco, Saudi Arabia, Turkey, the United Kingdom, and the United States. In the survey, the employers, education providers, and youth were found to fail to engage one another; as a result, they fundamentally had different understanding of the same situation. They contended that less than 50 per cent of the youth and employers asserted that new graduates were adequately prepared for entry-level positions. The education providers, however, were much more positive: 72 per cent of them asserted that new graduates were ready to work. The same disconnect occurred concerning education; a third of the employers said they never communicated with education providers. Of those that did, fewer than 50 per cent said it proved effective. More than a third of the education providers reported that they were unable to estimate the job-placement rates of their graduates. One important conclusion is that employers who engaged the most and the earliest had the best results.

The report made several recommendations and proposed various paths to increasing transitions. First, stakeholders need better data to make informed choices and manage performance. Two, the role of the system integrator is to work with education providers and employers to develop skill solutions, gather data and identify and disseminate positive examples. Such integrators can be defined by sector, region, or target. Countries need system integrators to take responsibility for the whole of education to the employment process. Third, a non-poaching agreement can also boost employers' willingness to collaborate, even in a competitive environment. The findings also noted that 40 per cent of the youth also said that they were unfamiliar with the market conditions and requirements even for well-known professions.

Owing to lack of this understanding, many students choose courses blindly, without a vision of whether there will be a demand for their qualifications upon graduation. Shortage of data made it difficult even to begin to understand which skills are required for employment. Filmer and Fox (2014) agree with these findings. Many other scholars have also noted that there is a need for better collaboration among all stakeholders concerned, but more importantly data to work with (Annunziata and Kramer, 2015; Samans and Kramer, 2015). Mckinsey (2012) avers that

beginning to fill the knowledge gap is a good start, as this will provide a useful road map for the future. In order to address youth unemployment, two fundamentals need to be in place: skill development and job creation. Undoubtedly, employers need to work with education providers so that students learn the skills they require to succeed at work, and governments have a critical role to play. However, there is little clarity on which practices and interventions work and which can be scaled up. Most skills initiatives today serve a few hundred or perhaps a few thousands of young people; government leaders in Africa need to be thinking in terms of millions (Filmer and Fox, 2014; Samans and Zahidi, 2015).

2.5   Future of Work: New-Collar Skills and New Forms of Employability

The future of work has been a hot topic since 2016, with researchers, employers, and government prescribing what the future of work is as well as what to expect and recommending strategies to adopt as we move into the new world of work. Africa has been a cause for concern mainly because the continent will be home to the highest number of unemployed youths and it has not fully adopted the previous revolutions (Samans and Zahidi, 2017). A number of scholars have proposed different strategies and approaches to enable the continent to catch up with the rest of the world. However, how effective are these strategies and recommendations, and what is of paramount importance as we move into the Fourth Industrial Revolution? Annunziata and Kramer (2015 describe the future of work as:

> *An accelerating wave of innovation driven by the marriage of digital and physical technologies, it comprises of advance manufacturing, the global brain and the industrial internet" The "Future of Work –is delivering transformative progress for people and businesses worldwide. It is redefining the way that work will be performed in the decades ahead: the technologies that will be used, the advanced tools that will augment workers' capabilities, the new skills required, the greater intensity and different forms of collaboration, the organisation of the production process, and the coordination of supply chains and distribution channels (Annunziata and Kramer, 2015: 8).*

World Bank (2019) states that the changing nature of work, at the global level, will be determined by the tension between job losses in "old" industrialised sectors that are prone to automation, and job gains driven by product innovation in "new" sectors (WDR, 2019). However, according to Choi, Dutz and Usman (2019), the future of work in Africa has an opportunity to forge a different path than the rest of the world, given where the continent is today. Digital technology adoption has the potential, if harnessed successfully, to transform the nature of work for all Africans. In most African economies, there is no "old" or "new" sector. There is, however, an enormous opportunity for innovation and growth across all sectors.

Africa must focus on digital technology adoption because digital technologies have the potential to help build skills not just for a privileged few but also for all workers, including those with little education and limited opportunities. This will boost productivity and create better jobs in all enterprises, including informal ones (Choi et al., 2019). This was corroborated by a new study that found that the arrival of faster Internet in Africa increased jobs not only for workers that had gone to university but also for those only had primary school education (Hjort and Poulsen, 2019).

Some authors argue that, if Africa adopts the technology to compete in this new era, the continent may have an opportunity, although a difficult one, to leapfrog into the Fourth Industrial Revolution (IFC, 2019; Williams and Morawczynski, 2019; UN, 2019). However, Gaus and Hoxtell (2019) disagree with the notion of leapfrogging toward the Fourth Industrial Revolution as a solution for the continent. Although other scholars highlight the innovative African approaches, such as the mobile phone payment service M-Pesa or the start-up scenes in Ghana, Kenya, Nigeria, or Rwanda, as signals of such a path, the authors argue that widespread leapfrogging may not be realistic owing to several existing challenges. The lack of infrastructure and capital inability to compete with more advanced economies, weak integration into global value chains, and insufficient regional trade, among other issues, all represent fundamental challenges to bypassing the Second or Third Industrial Revolution and entering the second machine age directly.

Gaus and Hoxtell (2019) contend that the potential for Africa to leapfrog in terms of digital infrastructure by going fully mobile is quite unlikely, given the continent's historical trouble with affordability and regulatory inefficiency that plagued the development of 3G and 4G networks

(Gaus and Hoxtell, 2019). They conclude by stating that full-scale automation in most economies in Africa will be limited. This is because of large-scale informal economy and the lack of essential digital infrastructure, available capital, and forward-looking industrial policies. They further argue that the cost of hiring African workers will remain cheaper than implementing automation technology.

Most scholars seem to agree that, for Africa to compete and have any chance of catching up, it simply has to adopt digital technology. For the continent to evolve, it has to build the right kind of skill base essential to this strategy. This will help lay the foundation for sustainable job creation (Annunziata and Kramer, 2015; Samans and Zahidi, 2017; IFC, 2017). Investment in human capital must aim not just to develop the skills needed today quickly but also to build a pipeline of the right skills for tomorrow. Furthermore, Africa should look for selected opportunities where recent innovations have already been deployed and used them to leapfrog existing practices and immediately pursue new opportunities. This is already a familiar strategy for Africa, like M-Pesa (Choi, 2015; Annunziata and Kramer, 2015).

2.5.1   Factors Influencing the Acquisition of Skills and Technology in Africa

Several researchers have discussed the factors that are vital to African economies' adapting the essential skills required to drive emerging technologies. Scholars agree that the most critical factors preventing adequate development of skills is the availability of reliable digital infrastructure and the capital to deploy new technology. Having the critical infrastructure in place, particularly access to reliable and affordable broadband and uninterrupted power supply, is critical for technology and skills development. This will enable organisations to leverage development in processing power and opportunities provided through cloud computing and the storage and sharing of information across the world (Annunciata and Kramer, 2015; Samans and Zahidi, 2017; Gaus and Hoxtell, 2018; Abdychev et al., 2019).

However, while the region has the fastest-growing proportion of internet users, Internet penetration is still comparatively low in Africa. Ranging on the low end from 12 per cent, in Central Africa, to 50 per cent, it remains the lowest in the world. Nevertheless, many studies have shown that the Internet has indeed been a massive game-changer in Africa. Choi et al.

(2019) assert that the development, diffusion, and adoption of skill-biased and low-skill-biased, worker-enhancing digital technologies are likely to be facilitated by accessible and affordable Internet for all, especially in the low-productivity agriculture and service sectors. The widespread adoption of mobile money accounts in some sub-Saharan African countries provides the starkest positive illustration of the pro-productivity and pro-inclusion effects of these digital technologies. The availability of higher-level digital skills is highly correlated with the availability of broadband, but not mobile voice infrastructure, further highlighting the importance of boosting affordable availability of the Internet for all. This would have a positive and inclusive net effect on jobs. But this outcome would require quick improvement in digital infrastructure.

The second factor, the availability of capital for investment in the development of new infrastructure and technologies, is critical. The burden on companies to remain competitive in a transforming economy is huge and is driving research and development in areas of automation and companies' uptake of automation technologies. Amazon has a highly automated logistics centre, where 45,000 Kiva robots move entire shelves around. Capital is critical for financing investments to bring organizations into the future. Yet, despite reforms and recent growth in Africa, the financial and banking system is largely underdeveloped, and access to finance is among the lowest in the world, presenting a key obstacle to the activity and growth of companies (Gaus and Hoxtell, 2019).

Another critical factor is developing a flexible education system; this will be critical to keeping pace with emerging technologies to ensure that workers have the skills to complement machines and not to be substituted by them (Annunziata and Kramer, 2015; Abdychev et al., 2019). As stated above, the relatively low level of education in many African countries is constraining its growth, as the quality of accessible education for the majority of young Africans is comparatively poor. To start preparing this pipeline of future skills, the continent needs to strengthen the education systems; African governments should place more emphasis on Science, Technology, Engineering, and Math (STEM). Not everyone needs to study engineering or become a data scientist, but the bar on STEM education needs to be raised (Annunziata and Kramer, 2015). Schools and universities should encourage critical thinking, flexibility, and adaptability, as opposed to rote learning. With faster technological innovation ahead, workers

will need to be able to change the way they work as new technologies become available.

In order for Africa to be able to train sufficient skilled workers to run its industries, the continent must significantly increase the number of students of STEM subjects (Science, Technology, Engineering, and Mathematics). According to the UNDP, just one African college student in six will graduate with a science or engineering degree (Samans and Zahidi, 2017; Abdychev et al.2018, Gaus and Hoxtell, 2019). Closer dialogue between education and industry will also help in this area. High unemployment rate signals that the education system is often focused on the wrong priorities. This highlights that African governments need better collaboration with industries to better align demand and supply of skills (Filmer and Fox, 2014; Annunziata and Kramer, 2015; IFC, 2019). The continent has also to find a way to keep its highly skilled workers, and reverse brain drain. An OECD report found that the emigration rates of highly skilled workers in African countries are more than 20 times the overall average global emigration rate. Brain drain is making it that much harder for Africa to build the necessary skills base (Annunziata and Kramer, 2015; Abdychev et al., 2019; Taura, Bolat and Madichie, 2019).

Another key factor that influences the uptake of skills and technology is regulatory decisions by governments; national agenda, labour market policies strongly influence the rate of adoption of automation in a country or sector. Many African countries, in particular those with comparatively large formal economies and strong union activity, have introduced labour market regulations in an attempt to reduce job losses and limit working poverty. The most prominent in this regard is worker protection laws that seek to rein in the ability of firms to lay off workers, as well as minimum wage regulations that mandate a wage floor for certain professions. In terms of worker protection laws, 34 out of the 47 sub-Saharan African countries surveyed by the World Bank for its Doing Business Report 2018 require third-party notification if a worker is to be dismissed. Such worker protection laws shield workers from easy dismissal and unjust treatment. However, they also make firms more cautious in the hiring process, given the difficulty in letting employees go once they have been hired.

The existing industrial policies in some African countries, even those from Kenya, South Africa, Ethiopia, and Nigeria, are currently not conducive to automation. Currently, none of the African countries has an official industrial policy that positions itself in a global economy that increasingly leans toward greater automation. The government must have specific national

agendas on a path to digital transformation and automation (Gaus and Hoxtell 2019; World Bank 2019; Choi, et al., 2019). Other factors include expanding social security net; this will help smooth transitions between jobs for individuals and buffer income volatility as job markets become more volatile (Annunuziata and Kramer, 2015; Abdychev et al., 2019). Research and Development (R and D) is an essential determinant of absorptive capacity and technological progress. Africa's expenditure in R and D is the lowest of any developing regions and almost four times less than the global average. R and D is particularly essential for the education sector. R and D in education outcomes remains constrained, warranting research into the causes and solutions. Several educational technologies are being piloted across the continent. However, few have found scale despite the promise of some, such as online learning, which could help ease shortages of teachers. R and D is needed to explore the potential of these technologies, including impact evaluations, to determine if and how they can be scaled for Africa (World Bank, 2019).

Another key factor that has to be mentioned is entrepreneurship. According to Choi et al. (2019), Africa has to prioritise entrepreneurship. The authors suggest letting good ideas flourish no matter where they come from, so that African entrepreneurs can build apps that enable workers to build their skills as they work. This will enhance the productivity of the informal sector, creating an enabling business environment that helps boost the productivity of informal businesses and workers –rather than focusing on trying to formalise them. All the factors discussed above will help prepare Africa for the future of the work particularly in digital skills. However, it is up to policymakers and industry to make bold choices and investments that will help pave the way for the next generation of African workers, investors and entrepreneurs to innovate and thrive (Choi et al., 2019). This may include skilling these workers for the skills of the fourth industrial revolution. However, many of the scholars advocate factors that influence the acquisition of digital skills. Although most of the factors enumerated above will also influence and be essential for the acquisition of New-Collar skills, we do know that New-Collar skills are a bit more complex than digital skills and may require a more nuanced approach. Consequently, we do not know the factors that will influence the acquisition of New-Collar skills. This is indeed a gap that needs to be explored.

2.5.2　The Effects of Digital Skills in Africa

The evolution of the global knowledge society and the rapid adoption of digital technologies have made it crucial to acquire the digital skills essential for employment and participation in society (Laar, Deursen, Dijk and Haan, 2017). In a report on digital skills by the IFC in 2019, the study found that the labour market for digital skills in Africa is already highly developed. As nearly 50% of the jobs require some form of digital skill, the demand is expected to grow faster on the continent than the global markets. The digital skills challenge in Africa is significant. Whether African countries can take advantage of the digital opportunity to become more competitive and successful will depend on whether their human capital –their populations' health, skills, knowledge, experience, and habits –keeps up with this workforce transformation (IFC, 2019). The demand for social and emotional skills, such as leadership and managing others, will grow nearly 25 per cent through 2030 (ITU, 2019). Employers consider a lack of these skills as challenging, if not more than a dearth of technical skills. Some studies showed that the job market is already compensating professions that put a high premium on social skills.

So, what are digital skills? And are the skills required for the new automation age or the Fourth Industrial Revolution? According to UNESCO (2017), digital skills exist on a spectrum, from basic to more advanced, and encompass a combination of behaviours, expertise, know-how, work habits, character traits, dispositions, and critical understandings. Van Laar et al. (2017), define 21st-century digital skills as (1) the mastery of ICT applications to solve cognitive tasks at work; (2) skills that are not technology-driven, as they do not refer to the use of any particular software program; (3) skills that support higher-order thinking processes; and (4) skills related to cognitive processes favouring employees' continuous learning. Digital skills are often broadly classified into three (UNESCO, 2017; ITU, 2018; IFC, 2019). The first is basic skills –that is, the ability to access and use digital technologies to perform basic tasks. These include the use of digital devices, online communication and finding and managing information and content. The second is intermediate digital skills –that is, ability to use technology to perform work-related tasks. These include using professional software for presentations, analytics, accounting, project management, digital marketing, social media analytics, web design and graphic design. The third is advanced digital skills –that is, ability to perform specialist tasks in professions in the information and communication technology industry. These include computer language

programming, cloud computing, network management, artificial intelligence, data science, big data analytics, cybersecurity, web development, and search engine optimisation.

Leahy and Wilson (2014) and van Laar et al. (2017) define the concept of digital skills as technical skills, information management, communication, collaboration, creativity, critical thinking, and problem solving, all within the context of digital technologies. There have been various definitions of the concept of digital skills. When considering expansiveness and the speed and breadth of the Fourth Industrial Revolution, Klaus Schwab asserts that:

> *Aside from speed and breadth, the Fourth Industrial Revolution is unique because of the growing harmonization and integration of so many different disciplines and discoveries. Tangible innovations that result from interdependencies among different technologies are no longer science fiction. Today, for example, digital fabrication technologies can interact with the biological world"* (Schwab, 2016: 15).

The concept of digital skills does not go far enough to describe the range of technical complexities of the skills required for the emerging technologies of the Fourth Industrial Revolution. There are technologies emerging in the Fourth Industrial Revolution, across a spectrum of inventions and innovations in information technology, bio-technology, nanotechnology, artificial intelligence, and autonomous robotics; astrophysics, cyber-physical systems, augmented reality, additive manufacturing-3D printing, as well as the discovery of smart new materials (Nurula and Aithal, 2018). They are more complex and far-reaching than the concept of digital skills; it appears that as we move into this new Industrial Revolution, a new kind of skill is required.

Basic digital skills

- Ability to access and use digital technologies to perform basic tasks
- Examples:
  - Functional use of digital devices
  - Online communication via emails
  - Finding, managing and storing digital information and content

Intermediate digital skills

- Ability to use technology to perform work-related tasks
- Examples:
  - Using professional software for presentations, analytics, accounting, project management
  - Digital marketing, social media analytics
  - Web design, graphic design

Advanced digital skills

- Ability to perform specialist tasks in professions in the information and communication technology industry
- Examples:
  - Computer language programming
  - Cloud computing, network management
  - Artificial intelligence
  - Data science, big data analytics
  - Cyber security
  - Web development, search engine optimization

Figure 2.6: Basic, Intermediate, and Advanced Digital Skills (IFC, 2019: 18, F3)

2.5.3   The Rise of New-Collar Skills

The concept that seems to be catching on is *New-Collar Skills*. It was first coined in 2016 by the former IBM CEO, Ginni Rometty, as the skills for the new age. Traditionally, work is divided into two skills, blue- and white-collar skills. However, the evolving nature of work and future trends in emerging technology has paved the way for a new way of working that lays more emphasis on skills derived through apprenticeship. Business and industry are slowly adopting this way of training and skills development. Organisations, like Delta and Microsoft, are developing skills programmes and collaborating with community colleges, like IBM's flagship programme P-TECH, to encourage the evolution of New-Collar Skills (Kanter and Malone, 2014). However, there is still no clear definition of New-Collar Skills. What are New-Collar Skills, and how do they differ from advanced digital skills? Ginni Rometty, the former CEO of IBM, referred to these as "relevant skills", sometimes obtained through vocational training have qualifying characteristics of New-Collar work. These include roles in fields such as cybersecurity, cloud computing data science, artificial intelligence, cognitive business user interface design, and other assorted IT roles. She stated that a four-year degree may not be required; however, technical skills and education and soft skills are essential for these roles. Skills may be developed through non-traditional education, such as community college courses and industry certification programmes. Employers of these skills value flexibility, and

the willingness to learn more than a formal education. In addition, training for New-Collar jobs often involves the development of relevant soft skills.

2.5.4   Filling the Gap: The Effects of New-Collar Skills

Due to a widespread skills gap, industry demand for New-Collar workers has led to the development of education initiatives focused on technical skills. Some organisations have become anxious to hire the right worker; they have started to invest in job training programmes, partnering schools to provide students with the skills they will require to acquire a job. Examples of such initiatives include a partnership between Delta Air Lines and about 37 aviation maintenance schools in the US to develop a curriculum focused on skills needed in the aviation industry, and the IBM's P-Tech program for high-school and associate degree. Experts agree that, if there will be different job roles in this new automation age, organisations must create and hire to fill these new roles being created by the unleashing of data and cognitive technology. New education models are also evolving. For example, IBM has championed six-year public high schools that combine traditional education with the best of community colleges, mentoring, and real-world job experience. The market alone cannot solve this problem; there needs to be collaboration across business, government, and civil society. The future of job creation is no longer white-collar vs. blue-collar. It is New-Collar.

In Africa, a number of technology organisations have launched similar initiatives to collaborate with higher institutions to equip students with the right skills. An example is IBM Digital Nation Africa. This is a cloud-based learning platform for free programmes to provide online learning to over 25 million African youths. The goal is to encourage digital competence and innovation as part of IBM's global push to build the next generation of skills needed for "New-Collar" careers. Microsoft has a similar objective in Africa, with its Apprenticeship Factory –an employability and capacity-building programme. It develops the digital skills, coding capabilities, and workplace readiness of young graduates. Apprentice developers spend up to six months working with senior software technicians and develop essential workplace skills and the ability to design and implement modern software solutions. Experts and researchers agree that apprenticeships and or internship programmes seem to be the most effective programmes when transitioning young job seekers from education to employment, as the participants can practise the skills they

learn (Mckinsey, 2012; Filmer and Fox, 2014). Apprenticeship and on-the-job training can help young people, provided that these programmes are closely tied to market signals.

For this reason, private providers, including existing businesses, are often the best source for this training. The most promising are delivering interventions that tackle multiple constraints. They offer behavioural, business, or technical skills training together (Filmer and Fox, 2019). However, although apprenticeships traditionally have provided hands-on experience, there are not enough spaces to meet the demand. Technology, in the form of "serious games" and other kinds of simulations, can help here, too, by offering tailored, detailed, practical experience to a large number of insufficient opportunities to provide youth with hands-on learning (Mckinsey, 2012).

According to the IFC report, "while current apprenticeship reforms indicate this is a priority for governments in Africa, apprenticeships have yet to reach their potential" (IFC, 2019: 34). The advantage of most apprenticeships is that they offer a pathway to employment. For example, IBM's P-Tech and Microsoft Apps-Factory offer employment through huge business partner network. The challenge with programmes and interventions that do not offer a pathway to employment is that participants simply acquire the skills, then have to navigate their way through the maze of finding employment. However, learning intermediate and more advanced digital skills has opened up opportunities for digital businesses and freelancers (ITU, 2018). In Africa, once many youth job seekers have acquired these skills attempt to secure employment either by working as digital entrepreneurs (ITU, 2018) or attempt to find opportunities with these skills through online outsourcing (Kuek, Guilford, Fayomi, Imaizumi and Ipeirotis, 2015). The effects of New-Collar skills, however, have not been explored. So what are the effects of these New-Collar skills on employability? Are New-Collar skills making the desired impact and increasing employability?

New-Collar Skills Leading to Online Outsourcing and Digital Entrepreneurship

2.5.5   Online Outsourcing

Online outsourcing (OO) has become a promising alternative to conventional employment in today's digital era and the future of work. It has transformed where, when, and how work is

performed. It enables employers to have wider access to digital skills, allows a more flexible and faster hiring process, and all-day productivity. For job seekers, especially those in developing countries, this form of outsourcing has created new opportunities to access and compete in global job markets, from anywhere at any time, as long as they have computers and access to the Internet (Kuek et al., 2015). Online outsourcing is an emerging industry that could contribute to tackling the youth unemployment challenge. Developing countries could benefit from this sector by tapping into a new source of earning income. However, the contribution of OO to strengthening employment markets in developing countries has been limited. Broad national employment strategies, which could include OO, are required to adequately address this challenge (Kuek et al., 2015).

The economic impact of OO varies considerably across countries, type of work, and level of engagement. The Philippines benefit most from this opportunity; almost 5 per cent of the country's total labour force is registered as OO workers. The United States accounts for 20% of the registered workers on Upwork (Ipeirotis and Horton, 2012). According to Kuek et al. (2015), employers prefer to hire U.S. workers because of the perception that they can deliver high quality quickly. However, in most cases, OO is used as a supplementary, rather than a primary, source of income. Workers in developed countries often use earnings from OO work for discretionary items and not for typical essential expenses. In Africa, online freelancers reported that they turn to OO after spending a long time unemployed and searching for professional, traditional work (Kuek et al., 2015). Kuek (2015) carried out a survey on Nigeria and Kenyan OO workers. The results showed that OO workers range from university-educated, middle-class workers who choose to work online because salaries are higher than in traditional work, to unemployed students who work online because they cannot get traditional work, and single mothers who work online to enable them to support their family while fulfilling their responsibility as caregivers. New-Collar skills like software and web development still account for a large percentage of demand for OO services. Over time, demand is becoming more diversified over a higher number of skills rather than being concentrated among a few.

However, there are still significant barriers for disadvantaged young people to benefit from OO. These include lack of access to the infrastructure required and, more critically, lack of the skills necessary to procure work. Besides infrastructure barriers, some job seekers in Africa still have

difficulty finding OO opportunities, because of trust issues. Some participants reported that global clients do not trust them because of their Nigerian origin, noting that there is a global perception that all Nigerians are likely to be involved in a scam (Kuek et al., 2019).

According to a study by Malik, Nicholson and Heeks (2018), job seekers looking to participate in OO opportunities could be classified into four. First, there were those who did not take up any freelancing opportunities, about 60% of the participants; they are referred to as the *sinking*. Second, there were those who struggled to find work because of the competitive nature of OO work; they were unable to get a required profile of work experience and therefore unable to work. These are referred to as the *strugglers*. Third, there were the *survivors,* those who did find work but were just subsisting at a low level of activity, owing to the high level of competition. Lastly, there are the *swimmers,* the OO workers who had been able to acquire and build on their experience, reputation, and create valuable contacts, and, as a result, earn a realistic wage (Malik et al., 2018).

2.5.6   Digital Entrepreneurship

Digital entrepreneurship is another area that has grown in this automation era that requires New-Collar Skill base to grow. Digital entrepreneurship has evolved and is perceived as a powerful driver of local innovation, economic transformation and development in Africa (Ndemo and Weiss, 2016). It can be defined as the creative production and distribution of digital software and applications by skilled and opportunity-oriented individuals and ventures. As such, digital entrepreneurship depends on local availability of digital technologies. Individuals and enterprises need digital infrastructures (such as browsers, social network sites, software development kits, and open-source code) to create digital products while users require the Internet to access those products (Tilson et al., 2010).

Digital entrepreneurship is still a new economic activity in Africa. Reliable evidence is lacking both about the extent to which it contributes to economic development, and about the means through which this happens. Where and how entrepreneurial opportunity arises and is exploited following the advent of "the digital"? The optimistic view is that digital entrepreneurs face awfully low entry barriers, which allows entrepreneurs located in resource-scarce environments

to catch up or do just as well as those in affluent contexts. Digital artefacts can be created everywhere and by anyone with a computer and Internet access, upon which they can be distributed to anywhere else in the world, to any other individual with an Internet connection. This notion depicts digital entrepreneurship as boundary-less, spatial, and global in nature (Nambisan, 2017). In view of Africa's young population and robust economic growth, this digital potential has led many to proclaim that Africa is about to be transformed and revolutionised by digital technologies and entrepreneurship (Ndemo and Weiss, 2016; Choi et al., 2019). However, some take a pessimistic view argue that Africa does not seem to be altered by digital technologies. And that it appears to have lagged further behind rather than catch up with the rest of the world when it comes to the economic impact of Internet connectivity and digital entrepreneurship (Friederici et al., 2017).

In a recent study, Hjort and Poulsen (2019) found that fast Internet, a product of investment in knowledge production, has a significant and positive effect on employment rates in the region for the highly skilled and the less educated. The arrival of fast Internet in the region reduced employment inequality by generating comparable magnitudes of positive employment effects for all educational attainment levels (primary, secondary, and tertiary). The sizeable positive employment effects from the arrival of fast Internet are generated through a substantial increase in the entry of new firms that use ICT extensively, and through increases in the productivity of the existing firms and exports. Africa is experiencing a boom in digital entrepreneurship. After a few African success stories of digital businesses in the early 2000s, many new technology start-ups have been created. Policymakers, corporations, development organizations, consultancies, and the media soon began to frame domestic digital economies as a significant source of economic transformation and revival (Taura et al., 2019).

A common challenge for digital enterprises in developing countries is the size and scope of their markets. It is unusual for them to be able to reach international markets. In the diverse sample used in one study on Africa (Friederici et al., 2017), 87 per cent of the digital enterprises targeted their domestic markets. African enterprises typically focus on using digital technologies to cater to a local niche market. Generally, only software outsourcing providers were able to serve customers in high-income countries.

A UNCTAD report released in 2019, titled "Digital Economy Report", charted the flow of data and funds in the global economy. It also outlined the massive possible gains and potential development costs as other parts of the globe connect and buy online. The report stated that wealth creation in the digital economy was highly concentrated in the United States and China, with the rest of the world, especially countries in Africa and Latin America, trailing significantly far behind. The United States and China account for 75% of all patents related to block chain technologies, 50% of global spending on the Internet of Things (IoT), more than 75% of the cloud computing market and as much as 90% of the market capitalization value of the world's 70 most significant digital platform companies. There is a deep concern that this will further deepen the digital divide and inequalities with the rest of the world (Samans and Zahidi, 2017).

The dominance of global digital platforms, their control of data, as well as their capacity to create and capture the ensuing value, accentuate concentration and consolidation rather than reduce inequalities between and within countries. The report forewarned that developing countries risk becoming mere providers of data while having to pay for the digital intelligence generated using their data. If a solution is not found, the deep gap between the under-connected and the hyper-digitalized countries will broaden, and inequalities will aggravate (UNCTAD, 2019; World Bank, 2019). The report stated that, breaking this vicious circle requires out-of-the-box thinking. One way is to consider finding an alternative configuration of the digital economy that leads to more balanced results and a fairer distribution of the gains from data and digital intelligence.

The UNCTAD Secretary-General, Mukhisa Kituyi stated that:

> *This holistic approach will respond to the desire of people in developing countries to take part in the new digital world, not just as users and consumers, but also as producers, exporters, and innovators, for creating and capturing more value on their path towards sustainable development (UNCTAD, 2019:6).*

In Africa, according to the report, four countries accounted for 60% of digital entrepreneurial activities in Africa –Nigeria, Egypt, South Africa, and Kenya. Ghana, Morocco, Senegal, Tunisia, Uganda, and Tanzania made up 20%, while the remaining 44 African countries contributed 20%. In cities like Lagos, Accra, Cape Town, and Nairobi, digital entrepreneurship evolved earlier than in other African cities, and, as a result, they lay claim to more diverse digital enterprises. The report listed the various challenges of digital entrepreneurship on the continent, which include limited entrepreneurial knowledge, lack of a highly skilled workforce – developers, designers, and data scientists, and limited access to finance. Another limiting factor is culture. Most African markets rely on tangibility, and as a result, digital platforms in Africa have to invest more in physical assets than their foreign counterparts. Consequently, digital entrepreneurs in developing countries are unable to compete with global giants in markets they already dominate. In some cases, very successful start-ups are often acquired. However, even though African enterprises seldom do business outside their cities or regions, they can leverage the digital space and a substantial part of the African market to grow without serving other markets (UN, 2019).

The question of skills still arises. Is participation in the OO and DE more pronounced if one acquires a New-Collar Skill? Kuek et al. (2019) assert that web and software development (both New-Collar skills) constitute a large percentage of demand for OO. However, there is a gap in the literature, as it is not clear to what extent New-Collar skill enhances participation in OO and DE or if it does.

2.5.7 Remote Work

According to TechPoint (2019), start-ups and digital entrepreneurship in Africa are thriving, driven by the rise of mobile payments, fast Internet connectivity, and the widespread use of smartphones. This has created a high demand for experienced software developers in Africa. However, does Africa have enough high-quality talent to meet the demands of companies locally? This is somehow ironic, considering the increase in software training outfits, like Andela, Gebeya, and Codetrain, springing up all over Africa. The reason is that African software developers are in high demand all over the world. Lately, experienced developers trained locally prefer working for start-ups and companies abroad because of better compensation, improved work conditions, and opportunities provided by Western companies to start their careers. This

has unfortunately resulted in a dearth of talent in Africa (Techpoint, 2019). Despite the challenges of skill shortages, according to Forbes, the Africa start-ups raised a record amount of seed funding in 2019. They attracted a record high of $1.34 billion in venture capital, with Fintech seeing $678.73 million, Nigeria attracting the significant sum (Shapshak, 2020).

2.6   Conclusion

It is apparent that one of the clear challenges of the evolving new world of work is the shortage of highly skilled workers. Solving this problem is paramount for Africa to leapfrog into the Fourth Industrial Revolution. Therefore, assessing the factors that will influence the acquisition of these skills is critical. Even though many organizations are currently engaged in *New-Collar Skills* training and development programmes, there is yet to be a clear definition of New-Collar Skills, as well as the ways by which they can increase employability and entrepreneurship. The purpose of this study was to explore the effects of New-Collar Skills (NCS) on employability in Africa. The central focus was to examine how acquiring NCS could increase employability and lead to an enhanced or increased participation in digital entrepreneurship and online outsourcing by African youths in the Fourth Industrial Revolution.

Chapter Three: Research Methodology

3.1   Introduction

The purpose of this study is to explore the effects of New-Collar Skills (NCS) on employability in Africa. The central focus is to examine how acquiring New-Collar Skills could increase employability and lead to an enhanced or increased participation in digital entrepreneurship and online outsourcing by African youths in the Fourth Industrial Revolution.

This chapter discusses the methodology used in the research. Included among others are the philosophical stance for the study, description of the research design, limitations of the research design, research questions, data collection techniques, target population, sampling methods, recruitment of participants for the intervention, ethical issues including preserving confidentiality and securing informed consent.

3.2   Research Philosophy

This study took a pragmatism stance in viewing the problems of this research. Pragmatism is considered the appropriate paradigm for exploratory research. This worldview, according to Tashakkori and Teddlie (1998), is problem-centred, pluralistic, and real-world practice-oriented. The pragmatic response is that one specific paradigm of mono-method research should not determine the type of work a researcher must do to fulfil the purpose of the research. The pragmatic position also rejects the compulsory choice between positivism and constructivism concerning methods, logic, and epistemology (Tashakkori and Teddlie, 1998). Brewer and Hunter (as cited in Tashakkori and Teddlie, 1998) stated that the multimethod approach "allows investigators to attack a research problem with an arsenal of methods that have no overlapping weaknesses in addition to their complementary strengths." Tashakkori and Teddlie (1998), added that pragmatists regard the research question to be "more significant than the methodology or the worldview that is supposed to underlie the method." The best researchers prefer to address their research question with any methodological tool available to thoroughly study the research question and align their methods with the purpose of the study.

This applies to the mixed methods study in which researchers draw generously from both qualitative and quantitative techniques when they engage in their research. 'They look at what and how of research based on the intended consequence, where they want to go with it' (Creswell and Creswell, 2018).

3.3   Research Design

In line with the philosophical stance of this research, the mixed-method design was employed for the study. Mixed-Method research offers an opportunity to address exploratory research questions. It involves combining quantitative and qualitative techniques to gain an in-depth insight necessary for robust analysis and understanding. It allows for the comparing of different perspectives drawn from both qualitative and quantitative data (Creswell, 2018).

The mixed-method approach first originated in 1959 by Campbell and Fisk, who conducted a study on the validity of psychological traits. This method became more prominent around the late 1980s and early 1990s based on the work of individuals in diverse fields such as education, evaluation, management, sociology, and health sciences. It has gone through several periods of growth since then and continues to evolve (Creswell and Plano Clark 2018). Subsequently, there has been a significant amount of mixed-method studies conducted by various researchers contributing to the growth and wide-spread acceptance of the design. Today, many researchers support the mixed-method approach and identify it as the third research methodology, especially in the social sciences (Creswell, 2003; Johnson and Onwuegbuzie, 2004; Tashakkori and Teddlie 2003).

The mixed-methods design is suitable for understanding the research problem because the study requires the collection of numeric and non-numeric data to examine and answer the research questions. It also has the advantage of minimising the limitations of qualitative and quantitative research methods when used individually. At a practical level, it is a useful strategy to have a full understanding of the research problem, as it would help in comparing different views from both qualitative and quantitative data sets. (Creswell and Creswell 2018, Johnson and Christensen 2014). Creswell (2018) asserts that although both methods are rigorous and valid, to include only one method falls short of significant approaches adopted today in research.

According to Johnson and Christensen (2014), a researcher aiming to employ mixed-method approach needs to make some critical decisions regarding the way and manner the two research strands (i.e., quantitative and qualitative strand) will be combined as well as the preference to be placed on the findings from each method. In this research, equal emphasis was placed on both methods, which are combined sequentially. Thus, the design of this study is the Sequential Mixed Method approach.

3.3.1   Appropriateness of Mixed Method Design

The mixed-method employed in this study was appropriate as it was useful in explaining the quantitative results from a large data set, as the first and second phase of the research had over 2000 participants. It was vital to have a qualitative follow up with in-depth semi-structured interviews, as the qualitative method allowed the respondents to express themselves or give their perspective (Teddlie, 2002). It is also appropriate because it allowed deep inquiry to explore the social problem of employability as it relates to New-Collar Skills (Creswell, 2018).

The mixed-method design was also appropriate for this study because data analysis from the quantitative phase alone cannot wholly expose the real relationship between acquisition of New-Collar Skills and the propensity for it to accelerate employability; nor can one design independently answer the research questions posed within the study.

Furthermore, investigation through an intervention programme allowed for more in-depth observation, analysis, and understanding of this phenomenon. It also helped remove biases that may be present if a single study was conducted. Combining quantitative and qualitative methods allows for the triangulation of data, which adds rigour, richness, and depth to the study.

3.4   Pilot Study

A pilot test was administered before interviewing the main participants in the study. The purpose of a pilot study was to assess, make revisions, and make determinations about the study. It also helped determine the appropriateness of the research structure and research instruments used for the study (Seidman, 2006).

In line with exploratory sequential mixed method design, data were collected for the pilot, analysed, and the results were used to develop an instrument to administer to a sample

population. In effect, the results of the pilot were employed to design a three-phase procedure with the first phase as exploratory, the second as instrument development (survey) while the third as administering and testing the instrument to a sample of a population in line with the proposition of Creswell and Creswell (2018).

The pilot test ensured the questions achieved the information desired in this study. It assisted in determining if the questions were rational and understandable to the participants (Seidman, 2006). Pilot testing the interview protocol offered a chance to discover inconsistencies and make changes before administering the actual study. Neuman (2003), noted the importance of pilot testing as a manner for developing a system for receiving and recording data and discovering aspects of the research in need of improvement. The sample for the pilot was taken from a population of Nigerian graduates from three different universities in the urban area of Lagos. Semi-Structured In-depth interviews were also conducted with three other stakeholders; (a) University lecturers (b) Business Partners (c) Employment Recruiters.

The pilot gave us sufficient insight to help with the language and wording of the original survey instrument. Some of the questions had to be revised from open-ended questions to closed questions as to meanings that were implied to participants from different countries seemed to differ. The pilot also gave us great insight into what other questions were necessary to be included in the survey instrument to answer the research questions accurately. Responses from employment recruiters gave us sufficient insight into what kind of New-Collar Skills were in demand in the market and, as a result, helped decide on what courses to deliver for the intervention. We also received insight on other software courses and vital practical training that was necessary to be included in the intervention to enhance participants' chances of employability after acquiring New-Collar skills. This helped focus on the possible gaps in the training and develop a well-rounded curriculum for the New-Collar Skills workshop.

Table 3.1: Interview Group for the Pilot Study

Interview Group	Number	Remarks
University Graduates	30	Covenant University
		Lagos State University
		University of Lagos
Recruiters	2	Jobberman
		Career Ng
IBM Business Partners	3	BPs that recruited some of the certified ASI graduates
University lectures	3	University of Lagos
		Covenant University
		Lagos State University
Total	38	

3.5   Research Questions

For emphasis, the central research questions that guided the conduct of this study are presented in this section. According to Creswell (2018), research questions are interrogative statements that limit the purpose statement to specific questions that researchers seek to answer in their studies. The questions are consistent with an emerging methodology of mixed methods research as a general issue. In a sequential mixed method, it is intended to explore the wide-ranging complex set of factors surrounding the central phenomenon and present the broad, varied perspectives or meanings that the participant holds. In addition to the central question, sub-questions follow, which narrows the focus of the study but leaves the question open. The research questions may build on a body of existing knowledge, and the questions become working guidelines. According to Neuman (2011), a proper research question is exploratory, descriptive, or explanatory. Alternatively, the research questions might be generally stated without specific reference to the existing literature.

The research question was intended to test the relationship between New-Collar Skills and employability in Africa. The overarching research questions that guided the conduct of this exploratory research with a sequential mixed methods design were as follows:

How are New-Collar Skills influencing the New World of Work in Africa?

RQ1. What are the factors influencing the acquisition of New-Collar Skills?

RQ2. What is the effect of New-Collar Skills on Employability in Africa?

RQ3. To what extent do New-Collar Skills enhance Participation in Digital Entrepreneurship and Online Outsourcing for Youth in Africa?

3.6   Hypotheses

Hypotheses are predictions the researcher makes about the expected outcome of the relationships among variables. They are narrow versions of purpose statements in quantitative research. They are numeric estimates of the population values based on the data collected from samples (Creswell 2018). A null and alternative hypothesis, which may or may not be supported by findings, formed the basis of testing. According to Creswell (2018), the null hypothesis (Ho) is used to predict that in the general population, there is no relationship between variables or no difference between groups on measured variables, while the alternative hypothesis (H_1) is stated in positive form. These are the four hypotheses that guided the conduct of this study:

RQ1
1. Ho: There are no significant factors influencing the acquisition of New-Collar Skills

    H_1:   There are significant factors influencing the acquisition of New-Collar Skills

RQ2
2. Ho: New-Collar Skills have no significant effect on employability in Africa

    H_1:   New-Collar Skills have a significant effect on employability in Africa

RQ3

3. Ho: There is no significant relationship between the acquiring of New-Collar Skills and participation of youths in Digital Entrepreneurship

    H$_1$:   There is a significant relationship between the acquiring of New-Collar Skills and participation of youths in Digital Entrepreneurship

4. Ho: There is no significant relationship between the acquiring of New-Collar Skills and youths' participation in Online Outsourcing

    H$_1$:   There is a significant relationship between the acquiring of New-Collar Skills and youths' participation in Online Outsourcing

3.7   Target Population, Sampling and Data Collection

Survey and interview data collection techniques were applied to this mixed-method study. Creswell (2018) described data collection as a process of identifying and selecting individuals for a study, obtaining permission to be studied, gather information by administering instruments, through asking people questions or observing their behaviours. However, the data collection process should be appropriate for the study to ensure reliability (Johnson and Onwuegbuzie, 2004). The mixed-methods approach used for this study underpinned the strengths of both qualitative and quantitative methods (Creswell, 2003; Johnson and Onwuegbuzie, 2004; Golafshani, 2003).

This study was divided into four phases of data collection;

1. New-Collar Skills Dataset
2. The Open Survey Dataset
3. The Intervention
4. Corporate Interviews

3.7.1   Phase 1- New-Collar Skills Data set

In this phase of the study, the population included university graduates who had participated in the IBM African Skills Initiative from the year 2014 – 2017. From the IBM database, the

population of participants that fell within this category was 2214. This 2214 was from IBM New Collar Skills Programme from 158 universities in 10 African countries, Ghana, Nigeria, Egypt, Ethiopia, Kenya, Morocco, Tunisia, South Africa, Mauritius, and Rwanda. The population was chosen based on students that had graduated at least two years and completed their one-year mandatory National Youth Service. Five out of the ten countries had a compulsory youth service. These countries include Nigeria, Ghana, Kenya, South Africa, and Morocco.

The target population consisted of the above ten African countries. It was selected based on the number of students who participated and passed the IBM relevant certification exam in the New-Collar Skills training in that particular country.

Participants were selected with purposive sampling from the database. All participants received an introductory electronic mail containing a link to Qualtrics online surveys. A follow-up electronic mail reminder was sent to those who did not take the survey after three days of the initial electronic mail invitation and subsequently sent every other day until a response was received. Participants were asked for their consent before responding to the survey and informed that their participation in the study was voluntary. They could withdraw from the study at any time during the data collection process or after data collection was completed. Demographic data on gender, age, and education was collected from each participant. Data collection lasted approximately eight weeks from the date of sending the first electronic mail message.

The online survey system was hosted and administered at https://wbs.eu.qualtrics.com/. No one other than the researcher had access to the administrative interface of the website. The survey results were extracted from the online database into a single Microsoft Excel file then transferred to Stata, a statistical software package for subsequent analysis. When the laptop computer was not in use, it was always securely kept and locked away on safe premises. The majority of the responses to the survey from Nigeria, South Africa, Tunisia, Morocco, and Ghana were received within the first two weeks. However, in Egypt and Kenya, despite several email reminders, telephone calls had to be placed by IBM representatives in these countries to some of the potential respondents to encourage them to respond to the survey. While Rwanda, Mauritius, and Ethiopia had an abysmal response rate despite several reminders.

Using Yamane's (1967) formula for calculating sample size and a total population of 2214 youths who participated in the IBM African Skills Initiative from the year 2014 – 2017, the formula returned 338 as the sample size.

$n= N1+(e)2$………………………………… 1

Where n = sample size,

N = Total population

e = level of precision or acceptable sampling error.

$$n = \frac{2214}{1 + 2214(0.05)^2}$$

n = 338.

Nevertheless, the questionnaire was administered via email to the whole population of 2214 youths. A total of 690 responses were received and were found to be appropriate for the analyses since the responses exceeded the minimum required sample size as estimated using Yamane (1967) formula. Table 3.2 presents the breakdown of the questionnaire distribution and responses across 158 universities drawn from ten (10) countries.

Table 3.2: Questionnaire Distribution and Response Rate across Ten (10) African Countries

Countries	%	Male %	Female %	No. Universities	Surveys	Responses	%
Nigeria	14	79	21	10	210	97	43.3
South Africa	16	75	25	18	333	113	33.9
Kenya	16	78	22	19	296	110	37.2
Tunisia	13	47	53	24	336	90	26.8
Ghana	12	67	33	4	179	83	46.3
Morocco	11	64	36	18	295	77	26.1
Egypt	11	61	39	46	419	75	17.9
Mauritius	3	64	36	4	67	18	26.9

Rwanda	3	63	37	11	44	17	38.6
Ethiopia	1	91	9	4	35	10	28.6
Total	100			158	2214	690	31.1

Study Demographics

Table 3.2 reveals the demographical information about the respondents for the first phase of this study. As earlier mention in the section above, 690 participants validly return the questionnaire. Nigeria, South Africa, and Kenya had a high response rate of 14%, 16%, and 16% respectively, while Mauritius, Rwanda, and Ethiopia have the lowest response of 3%, 3%, and 1%, respectively. About 68% of the participants were male in comparison, 32% were female, and this pretty much was an accurate representation of all other African countries except Tunisia, whose female participation was higher than their male counterparts at 55%. The age distribution of the respondents, 72% of the total respondents were between the ages of 22-26, while 3% of the respondents were between the ages of 16-21, and 10% of them were over 31 years of age.

3.7.2   Phase 2-Open Survey Datasets

This phase consists of two comparable data sets;

(i)   Jobberman Dataset

The population for this dataset was randomly selected from participants of an employment recruitment agency database (Jobberman) for three countries: Nigeria, Kenya, and Ghana. The three countries were selected based on the availability of data and the prominence of these countries on the continent. The selected participants were graduates who had graduated within the last five years and could be looking for employment. The total population was 3517. Following Equation.1, a sample size of 359 was estimated. In any case, the questionnaire was sent to all the participants (3517 youths). A total number of 817 responses were received, which were found to be appropriate for the analyses since the responses exceeded the minimum required sample size (359) as estimated using Yamane (1967) formula.

A link to the survey was included in the Jobberman recruitment agency website's monthly newsletter, and all respondents received an introductory electronic mail containing a link to the Qualtrics online survey. The distribution of the newsletter covers Nigeria, Ghana, and Kenya. A follow-up electronic mail reminder was sent to those who did not take the survey after three days of the initial electronic mail invitation and subsequently sent every other day. Respondents were asked for their consent before responding to the survey and informed that their participation in the study was voluntary. They could withdraw from the study at any time during the data collection process or after data collection was completed.

Demographic data on gender, age, and education was collected from each participant. Data collection lasted approximately eight weeks from the date of sending the first electronic mail. The online survey system was hosted and administered at https://wbs.eu.qualtrics.com/. No one other than the researcher had access to the administrative interface of the website. The survey results were extracted from the online database into a single Microsoft Excel file then transferred to Stata, a statistical software package for subsequent analysis. When the laptop computer was not in use, it was always securely kept in a locked away on safe premises. About 90% of the responses to the survey from all three countries were received within the first 2 -3 days of administering the survey.

Table 3.3: Questionnaire Distribution, Response, and Demographics.

Jobberman Dataset

Countries	Male %	Female %	Surveys	Resp.	%	STEM %	HD Parent %	Public University
Ghana	65	35	704	172	24.4	34	61	73
Nigeria	64	36	2070	436	21.1	51	76	86
Kenya	58	42	743	209	28.1	44	57	71
Total			3517	817	23			

Table 3.3 reveals the demographical information about the respondents for the second phase of this study. A total number of 817 participants responded to the survey. The average age of

respondents was between 24 – 28, while 63% of the total respondents were male, and 37% were female. This was pretty much an accurate representation of Ghana and Nigeria, while Kenya that had a slightly higher female response rate of 42%. Over 60% of the total participant's parents hold a higher degree of Bachelor's degree and above. However, Nigeria has the highest with over 76% while Kenya has the lowest with 57%. The majority of the respondents attended a public university with Kenya and Ghana recorded 71% and 73%, respectively. At the same time, the number is slightly higher in Nigeria, as 86% of the respondents attended a public university. As regards participants that graduated with STEM degree Nigeria has the highest with 51% while Kenya and Ghana recorded 44% and 34% respectively.

ii.   New-Collar Skills Data set

The population for this dataset was randomly taken from the IBM New-Collar Skills dataset of graduates in Ghana, Nigeria, and Kenya. The total population was 760. Following Equation.1, a sample size of 262 was estimated. However, the questionnaire was sent to all the participants (760 youths). A total number of 111 responses were received, which were found to be appropriate for the analyses since the total responses represented about 42 percent. According to Akintoye (2000), a response rate above 30% can be considered as adequate for social research.

Table 3.4: Questionnaire Distribution, Response, and Demographics.

New-Collar Skills Data set								
Countries	Male %	Female %	Surveys	Resp.	%	STEM %	HD Parent %	Public University
Ghana	83	17	118	16	13.6	100	76	53
Nigeria	81	19	401	35	8.7	95	76	95
Kenya	69	31	241	60	24.9	87	79	83
Total			760	111	14.60			

Table 3.4 reveals the demographical information about the respondents for the second phase of this study. The average age of respondents was between 22 – 26, while 75% of the total respondents were male, and 25% were female. This was pretty much an accurate representation

of Ghana and Nigeria, while again, Kenya is the outlier with a higher female population of 31%. Over 78% of the total participant's parents hold a higher degree of Bachelor's degree and above. However, Kenya has the highest with over 79%, while participants from Ghana and Nigeria both have parents who hold a higher degree of 76%. In Nigeria and Kenya, the majority of the respondents attended a public university, while Ghana recorded the lowest attendant with 53%. As regards participants that graduated with a STEM degree, Ghana has the highest with 100% while Kenya and Nigeria recorded 87% and 95%, respectively.

3.7.3   Phase 3 – The Intervention

The third stage of this research consisted of a longitudinal study, which included a workshop intervention.

Following the previous quantitative phase of the projects, it was followed by an intervention to evaluate further the effect of New-Collar Skills on accelerating employability. The intervention phase was divided into two stages;

- The New-Collar Skills workshop
- In-depth interviews

New-Collar Skills Workshop

The population for this dataset was randomly selected from graduates from universities, vocational colleges, and secondary schools predominantly from Southern Nigeria

Respondents had to satisfy the following criteria before being selected for the workshop:

1. They were expected to have a minimum of 'O' level qualification, as this was the minimum qualification required for employment.
2. Expected to have completed their National Youth Service if required;
3. They were supposed to have been unemployed for at least six months;
4. They were also required to take three assessment tests, which evaluated, critical thinking, analytical, and speaking skills; and
5. To be available for the duration of the intervention

Out of a total of 100 preselected students, the sample was further whittled down to 60 based on motivation, aptitude, and commitment to the programme. The workshop started on 12th March

2018, at the IBM innovation centre in Lagos, Nigeria. A total of 60 participants turned up for New-Collar Skills training. Following the results of the pilot, training on two specific New-Collar Skills was scheduled; these were Mobile Application Development using MobileFirst and Business Intelligence using IBM Cognos. The group was divided into two equal classes of 30 participants. The workshop kicked off concurrently for a three-week duration. The participants were provided with laptops, access to the internet, IBM cloud, and other necessary training materials.

After the participants had completed the core New-Collar Skills courses, they progressed to learn various soft skills, which included critical thinking, presentation skills, and CV writing. The participants were also given real-life work project-based experience over eight weeks to boost their proficiency using these skills. These projects served as work experience to be included in their CVs. Subsequently, the participants were invited to take IBM certification exams, of which all 60 participants passed. They were also exposed to career talks, mentorship, and discussion session on employability during this period and awarded IBM certification and a certificate of participation. The intervention was used as an approach to test and evaluate their employability in the job market. All the participant's progress concerning securing a New-Collar job was monitored and tracked for 18 months, which concluded on 31st August 2019. The content and duration of the program are represented in table 3.5.

Table 3.5: Courses, Duration, and Participants of the New-Collar Skills Workshop

Training	Duration	Graduates	Non-Graduates
New-Collar Skills			
Mobile App Dev. (MAD)	3 weeks	25	5
Business Intelligence (BI)	3 weeks	27	3
Soft Skills			
Critical Thinking	1 week	52	8
Presentation Skills	1 week	52	8

Project-Based Learning	6 weeks	52	8
Certification	1 day	52	8

Subsequent to the workshop/New-Collar Skill training, participants were then asked to seek employment with their newly acquired skills. Three surveys were administered electronically through Qualtrics to the participants at different periods during their search. First, a baseline survey was conducted immediately after the training to evaluate the status of each participant before they sought employment. The survey was sent out to all 60 participants on 12th April 2018, and all participants responded within two weeks. Further surveys were administered to participants 9 and 15 months later to evaluate the effectiveness of New-Collar Skills on accelerating employability. Included in the survey was an option to consent before completing the survey, all respondents agreed. The survey had a total of 36 questions ranging from questions about demographics, educational qualifications, and questions on the intervention and career aspirations.

The second survey, which consisted of 35 questions, was administered electronically to all the participants 9 months after the intervention on 10th January 2019. Initially, less than half responded; it was subsequently followed up with telephone calls, WhatsApp messages, and email reminders. A total of 58 participants responded within a month. Questions ranging from are you working? Are you using New-Collar Skills at your place of work? Why are you not working? Questions on if they were engaging in Digital Entrepreneurship or and Online Outsourcing were also asked. The third and final survey, which consisted of 32 questions, was administered electronically 15 months after the programme on 13th May 2019. A total of 59 participants responded within a month. Questions were ranging from what their employment status was now if they had access to adequate internet, power, and a device. Participants were also asked if they were working with the New-Collar Skills they had acquired, and if they are engaged in Digital Entrepreneurship or and Online Outsourcing. All the data from all three-surveys were collected and analysed through Qualtrics software.

Table 3.6: Intervention Questionnaires and Response Rate

Surveys	Baseline	9 Months	15 Month

Date	April 2018	January 2019	May 2019
No of Questions	36	35	32
No of Responses	60/60	58/60	59/60
% Employed	3%	57%	67%

Study Demographics

As presented in Table 3.7, the 60 participants from the New-Collar Skills workshop consisted of 70% male and 30% female. The average age of participants was 27-30; 75 % of participants hold a Bachelor's degree while the other 25% either have a secondary school certificate or National Diploma. 60% of the participant's parent holds a higher degree of Bachelor or above. Over 70% of participants that hold a degree have a STEM degree.

Table 3.7: Demographic Information of New-Collar Skills Intervention Participants

Gender	Percent	Count
Male	70%	42
Female	30%	18
Total	**100%**	**60**
Age		
18-21	1.61%	1
22-26	36.66%	22
27-30	46.66%	28
31-35	11.66%	7
Above 35	3.23%	2
Total	**100%**	**60**
Degree		
Non-Degree	25%	15
Degree	75%	45

Total	**100%**	**60**
Parents Qualification		
Non-Degree	40%	24
Degree	60%	36
Total	100%	60
STEM		
Yes	71.6%	43
No	28.4%	17
Total	100%	60

In-depth interviews – New-Collar Skills Intervention Participants

The population for the in-depth interview was randomly selected from the participants who took part in the intervention. Seventeen participants were selected from the 60 participants based on their employment status; employed, self-employed, or unemployed. After selection, 11 participants were employed, three self-employed, and a further three unemployed. Telephone calls, email, and WhatsApp messages were used to schedule the interviews with the 17 participants on different days within one week. They received consent form that conveyed assurances of confidentiality of the interviews and also received verbal assurances before the interview commenced. The participants verbally consented to audio recordings and also signed the consent form. (See template in appendix). The audio files were transcribed, and the participants cross-checked the transcribed interview content. This procedure ensured that the participants agreed with the transcriptions of audio recordings. The transcribed audio recordings of the interviews provided data for the qualitative analysis. The transcribed files were transferred into NVivo 12 software for further analysis of emerging themes.

Study Demographics

The sample size consisted of 65% male and 35% female participants. The age range was between 23- 32 years, with an average age of 27 years. A total of eleven participants representing 65% studied a STEM-related course, while the other 35% did not. 88% of the population possess a university degree, while the other 12% had a school-leaving certificate. Among the 17

participants, 82% were employed, out of which 21% were self-employed and the rest of the 79% employed at other organisations, while a further 18% were still unemployed.

Table 3.8: Demographic information of Participants on New –Collar Skill Workshop

Participant	Gender	Age	STEM	Degree/Non-Degree	Status
P1	Male	26	Yes	Degree	Self Employed
P2	Male	29	Yes	Degree	Employed
P3	Female	23	Yes	Degree	Employed
P4	Male	30	Yes	Degree	Employed
P5	Male	26	No	No Degree	Employed
P6	Male	30	Yes	Degree	Employed
P7	Female	23	Yes	Degree	Unemployed
P8	Female	29	No	Degree	Unemployed
P9	Male	25	Yes	Degree	Employed
P10	Female	26	Yes	Degree	Employed
P11	Female	28	No	Degree	Employed
P12	Male	26	Yes	Degree	Self Employed
P13	Male	28	Yes	Degree	Self Employed
P14	Male	32	No	Degree	Employed
P15	Male	25	No	No Degree	Unemployed
P16	Female	23	No	Degree	Employed
P17	Male	24	Yes	Degree	Employed

Phase 4 – Corporate Interviews

The population for these in-depth corporate interviews was chosen from prominent organisations and employers and trainers of skills and labour in the selected countries in Africa. The selection criteria were based mainly on organisations that have an extensive presence in the key African countries and also have a global presence. These organisations were technology companies or organisations that have affiliations with more prominent technology companies for training in New-Collar Skills training programmes. Ten Executive Directors were purposively drawn from organisations like Microsoft, IBM, Oracle, Andela, MEST, Think IT, MTN, Data Science Nigeria (DSN), Sprints, Chanzo Capital, and CCHub. The countries were selected from the four regions of Africa based on their prominence in that region. From North Africa, Egypt, Morocco, and Tunisia were selected. From West Africa, Nigeria and Ghana were selected. Kenya and Rwanda were chosen for East Africa and finally South Africa.

WhatsApp messages and telephone calls were used to schedule the interviews. Most of the interviews were conducted on Skype, WebEx, or WhatsApp video calls. The interviews lasted for about 40 – 60 minutes. The participants all received and endorsed consent forms and were given verbal assurances of confidentiality before interviews commenced. They verbally consented to audio recording, the audio files were transcribed, and the participants cross-checked the contents (See template in appendix). The transcribed files were transferred into NVivo 12 software for further analysis of emerging themes.

Study Demographics

Table 3.9: Demographic information of In-depth Interviews of Corporate Executives

Name	Role/Organisation	Country	Code Name
Dr. Olubayo Adekanmbi	Chief Transformation Officer. MTN Nigeria Founder/Chief Mentor Data Science Nigeria	Nigeria	ED1
Mr. Olufemi Adewumi	Executive Director MEST Ghana	Ghana	ED2
Ms. Lillian Barnard	Managing Director.	South	ED3

	Microsoft South Africa	Africa	
Mr. Ayman Bazaraa	CEO/Founder Sprints Egypt	Egypt	ED4
Mr. Mehemed Bougsea	Founder/CEO Think IT Tunisia	Tunisia	ED5
Mr. Sidi Ali Maelainain	Regional Director IBM Africa Morocco	Morocco	ED6
Mr. Eric Osiakwan	Co-Founder/MD Chanzo Capital/Angel Africa List Ghana	Kenya, Rwanda Ghana	ED7
Mr. Bayo Sanni	Country Director Oracle Nigeria	Nigeria	ED8
Mr. Seni Sulyman	Vice President, Global Operations Andela Nigeria	Kenya Nigeria Uganda Ghana Rwanda Egypt	ED9
Mr. Bosun Tijani	Founder/CEO Co-creation Hub UK	Rwanda Nigeria Kenya	ED10

3.8   Reliability of Quantitative Method and Validity of Qualitative Method

Cronbach's alpha test (α) (Kothari, 2004) was used to ensure the reliability of quantitative data; the face and content validations of the questionnaire were done by an Economics lecturer in Alex Ekwueme Federal University in Nigeria and also by an IBM SPSS instructor. This method is used to measure the reliability of the questionnaire between each field and the mean of the whole fields of the questionnaire. The usual range of Cronbach coefficient alpha (α) value between 0.0 and + 1.0 and the higher values reflects a higher degree of internal consistency. According to Pallant (2005), ideally, the Cronbach alpha coefficient of a scale should be above 0.7. The closer the alpha (α) is to 1, the higher the internal consistency of items in the instrument is assumed. The formula that determines alpha is relatively simple and makes use of the items (variables), k, in the scale, and the average of the inter-item correlations, r.

$$\alpha = \frac{K\,\bar{r}}{1+(K-1)\bar{r}}$$ ……………………………………………………………………1

Data were collected during the pilot survey, analysed, and the results were used to develop an instrument to administer to a sample population. In effect, the results of the pilot were employed to design a three-phase procedure with the first phase as exploratory, the second as instrument development (survey), while the third as administering and testing the instrument to a sample of a population. (Creswell and Creswell 2018). The pilot test ensured the questions achieved the desired information in this study. The pilot tests assisted in determining if the questions were rational and understandable to the participants (Seidman, 2006).

In the case of ensuring the validity of the results from qualitative data, face and content validations of the questionnaire were done by the same Economics lecturer in Nigeria before interviewing the main participants in the study. The purpose of the face and content validations is to justify each question, assess the logic flow, finalize the interview protocol and make necessary revisions before producing the final version of the interview schedule (Seidman, 2006).

3.9   Data Analysis

This mixed-methods design required the gathering and analysis of numerical and non-numerical data in a sequential process (Creswell and Clark, 2011). The link between the two sequential phases involving numerical and non-numerical data analysis is critical because mixed methods sequential exploratory design requires that the numeric data analysis should inform the qualitative data analysis in the same study (Ivankova, Creswell, and Stick, 2006).

The Data analyses in this mixed study were completed in two steps.

1. Quantitative - Phase 1 and 2
2. Qualitative   - Phase 3 and 4

3.9.1   Quantitative - Phase 1 and 2

The data collected from the New-Collar Skills and Open datasets were used for the quantitative analysis. The primary consideration that guided the selection of statistical procedures includes the types of data collected, the appropriate scale, the purpose of data collection, and the rationale for processing the data (Leedy and Ormrod, 2010). According to Teddlie and Tashakkori (2009), interval scales are analysed using parametric statistics to create data sets that can meet the expectations of those parametric statistics. The assumptions of parametric statistics include

measurement with an interval scale, independence of individual scores, and choice of variables from a normally distributed population (Teddlie and Tashakkori, 2009). Examples of parametric statistics are ANOVA, Pearson *r* correlations, multiple and linear regression, odds ratio, and *t*-tests (Creswell, 2018). For this study, parametric statistics were employed due to the normal population distribution of the survey. Parametric statistics apply to data with normal distribution, and nonparametric statistics are relevant if data are not normally distributed.

One of the popular statistical software recommended by Creswell (2018) for the numerical data analysis is Stata 16, which is appropriate for data analysis to support this research. The testing of the hypotheses was at the significance level of 0.05. The overall model used to analyse the research questions and test the hypotheses are linear logistic regression, goodness-of-fit test, Chi-square, and *p-value*.

A linear logistic regression model was used to explore the effects of New-Collar Skills on employability in Africa. The endogenous (dependent) variables estimated are binomial or dichotomous. Linear logistic regression technique fits the model for such binary response data using the method of Maximum Likelihood. A logistic regression model is often used when elements or individuals in the study, is to be categorised into two groups. An element can take any of the two possible values, represented for convenience by 0 and 1. Binomial or dichotomous observations can arise; for instance, an individual is employed (Y=I) or not employed (Y=0) among the surveyed sample. The underlying assumption in this model is that the natural logarithm of odds is linearly associated with the exogenous covariates. Odds ratio refers to the ratio of the probability of an event occurring to the likelihood of that event not occurring (Runyi, 2017).

Given a binary response variable W and an exogenous variable (covariate) X,

Let $\pi(x) = P(W=1/X=x) = 1- P(W=0/X=x)$.

Thus, the logistic regression model is as represented in Equation 2.

$$\pi_i = \frac{exp\left(\sum_{j=1}^{p} \beta_j X_{ij}\right)}{1 + exp\left(\sum_{j=1}^{p} \beta_j X_{ij}\right)} \qquad\qquad 2$$

A mathematical model of a set of exogenous variables is appealed to predict a *logit* transformation of the endogenous variable. Given that the numerical values of 0 and 1 depict the two possible responses of a binary variable let 0 represent a negative response, and 1 represents a positive response, the mean of this variable will be the proportion of positive responses. If p is the proportion of responses with an outcome of 1, then 1-p is the probability that a response is 0. The ratio $p/(1-p)$ is known as the *odds,* and the *logit* is the logarithm of the odds or just *log odds.* Arithmetically, the logit transformation is as represented in Equation 3.

$$l = logit(p) = ln\left(\frac{p}{1-p}\right) \qquad\qquad 3$$

To compare two proportions, such as those who are employed between males and females, the difference between two log-odds will be used. Arithmetically, this difference is as represented in Equations 4 – 8.

$$l_1 - l_2 = logit(p_1) - logit(p_2) \qquad\qquad 4$$

$$= ln\left(\frac{p_1}{1-p_1}\right) - ln\left(\frac{p_2}{1-p_2}\right) \qquad\qquad 5$$

$$ln\left(\frac{\left(\frac{p_1}{1-p_1}\right)}{\left(\frac{p_2}{1-p_2}\right)}\right) \qquad\qquad 6$$

$$ln\left(\frac{p_1(1-p_2)}{p_2(1-p_1)}\right) \qquad\qquad 7$$

$$\ln(OR_{1,2}) \qquad\qquad 8$$

This difference is referred to as the *log of the odds ratio* or merely the *odds ratio*; it is used to compare proportions across groups (Sangeeta and Rakesh, 2018). This shall be used to interpret the results of the estimated logit models in this study.

Evaluation Procedure

Each of these models was examined in terms of the following:

      i.   Overall Model

      ii.   The marginal effect of the individual predictor on odds ratios.

These are explained below:

      i.   Overall Model:

      a.   The goodness-of-fit test of the model will be tested using the p-value of Chi-square (χ^2), where the model is appropriate for the data if p-value $< \alpha$.

      b.   Pseudo-R^2: The value of Pseudo-R^2 between $0.2 - 0.4$ is considered to be indicative of extremely good model fits (Louviere et al., 2000; McFadden, 1977).

      ii.   The marginal effect of the individual predictor on odds ratios.

Test of hypothesis: The estimates of the predictors in the binary logit models were tested (in terms of the associated hypothesis of each predictor) using p_{value} of the predictor with alpha-level (α) = 5%.

Decision rule: Reject Ho if p-value $< \alpha$ (0.05); accept if otherwise.

Following the objectives of the study, the under-stated functions were estimated using the logit model.

Phase 1 - New-Collar Skills dataset

haveNCS = f (Age, Gender, HDParent, Universitytype, STEM, Gradyr, AccessWeb, AccessPC, Accesspwr, Employed, AwareNCS, AwareOO, EngageOO, AwareDE, EngageDE, Nigeria, Kenya, IBM) (9)

Employed = f (Age, Gender, HDParent, STEM, Gradyr, AccessWeb, AccessPC, Accesspwr, AwareNCS, haveNCS, AwareOO, EngageOO, AwareDE, EngageDE, IBM) (10)

EngageOO=f(Age, Gender, HDParent, STEM, AccessWeb, AccessPC, Accesspwr, AwareNCS, haveNCS, AwareOO, AwareDE, EngageDE, Nigeria, Kenya, IBM, mentorship) (11)

EngageDE =f (Age, Gender, HDParent, STEM, AccessWeb, AccessPC, Accesspwr, AwareNCS, HaveNCS, AwareOO, AwareDE, EngageOO, Nigeria, Kenya, IBM) (12)

Phase 2 - Open survey dataset

HaveNCS = f (Gender, HDParent, STEM, AccessWeb, AccessPC, Employed, AwareNCS, AwareOO, mentorship, IBM) (13)

Employed = f (Gender, HDParent, STEM, AccessWeb, AccessPC, AwareNCS, haveNCS, AwareOO, mentorship, IBM) (14)

Table 3.10   Description of the Variables Employed in the Study

Variables	Code	Type of Variable	Definition
Having New-Collar Skills	*haveNCS*	Dummy	1 if participants have acquired New-Collar Skills, and 0 if not
Are you employed	*Employed*	Dummy	1 if participants are employed, and 0 if otherwise
Engaged in online outsourcing	*EngageOO*	Dummy	1 if participants are engaged in online outsourcing, and 0 if not
Engaged in digital entrepreneurship	*EngageDE*	Dummy	1 if participants are engaged in digital entrepreneurship, and 0 if not

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Age of participants	Age	Numeric	Number of years of participants
Gender of participants	*Gender*	Dummy	1 if participants were male and 0 if participants were female
Qualification of the participant's parent	*HDParent*	Dummy	1 if the participant's parent had a higher degree, and 0 if the participant's parent had no degree.
The type of University Participants attended	*Universitytype*	Dummy	1 if participants attended public university and 0 if participants attended a private university
STEM Degree	*STEM*	Dummy	1 if participants studied a STEM-related degree and 0 if participants did not study STEM-related degree
Year of Graduation of Participants	*Gradyr*	Numeric	The year of graduation of participants
Access to the Internet	*AccessWeb*	Dummy	1
Access to Personal Computer	*AccessPC*	Dummy	1 if participants have access to a personal computer and 0 if not
Access to power	*Accesspwr*		
Awareness of New-Collar Skills	*AwareNCS*	Dummy	1 if participants were aware of New-Collar Skills and 0 if otherwise
Awareness of Online Outsourcing	*AwareOO*	Dummy	1 if participants are aware of Online Outsourcing and 0 if they are not aware
Awareness of Digital Entrepreneurship	*AwareDE*	Dummy	1 if participants are aware of the concept of Digital Entrepreneurship and 0 if not.
Open dataset from Nigeria	*Nigeria*		
Open dataset from Kenya	*Kenya*		

3.9.2   Qualitative - Phase 3 and 4

According to Creswell (2018), the purpose of the qualitative study is to make sense of the text and image data. It involves separating and taking apart the data as well as putting it back together. In qualitative data research, the process requires sequential steps to be followed from specific to general. This involves multiple levels of analysis, which are (a) organising and preparing the data, (b) reading and looking at the data (c) coding the data (d) generating descriptions and themes (Creswell, 2018; Neuman, 2011). In this study, qualitative methods were deployed in the intervention phase; in-depth interviews were conducted in two phases. In the first phase, 17 participants were selected from the New-Collar Skills intervention programme. In contrast, ten executive directors were selected from international technology and training organisations for the second phase of interviews. This helped generate data for the qualitative component of this mixed-methods study.

Creswell (2018), recommends NVivo 12 as one of the qualitative data analysis software for a qualitative study, which was used. The NVivo 12 software helped to index data for quick searches and comparisons. Data analysis commenced with reading a large volume of text and sorting through it, followed by coding of the data and organising the data into categories to create themes. Initial data coding in this study produced several themes, collapsing these themes into the main themes allowed classification into categories. The process of linking these themes revealed the main concepts in the study.

3.10   Coding Strategy

The coding process deployed is divided into two methods (i) First cycle coding method (ii) After first cycle coding. In the first cycle coding, the data were identified and coded based on a particular Gioia methodology (Gioia, Corley, Aimee, Hamilton, 2013). After the first cycle, the data is then sorted, and categories and themes were developed based on the relationships that

emerged. Saldana (2013), identified 32 codes; however, four codes were used as shown in Table 3.11

Table 3.11 Coding methods based on the research question

Type of Research Question	Meaning	Examples	Coding methods
Ontological	Related to studying the nature of participants' realities	What is the effect of New-Collar Skills on Employability in Africa?	**In Vivo:** Used by participants own words
			Narrative: Participants stories including their interaction with others and retelling them
Epistemological	Related to knowing and an understanding of the phenomenon of interest	What are the factors influencing the acquisition of New-Collar Skills?	**Evaluation:** assign judgments about the merit and worth of programs or policy
		What extent do New-Collar Skills enhance Participation in Digital Entrepreneurship and Online Outsourcing in Africa?	**Descriptive:** data collected across various periods and charted in matrices are also essential for assessing longitudinal participant change

The type of coding deployed was dependent on the research question. The research questions for this study were both Ontological and Epistemological. Ontological captures the participant's reality while epistemological is related to understanding a phenomenon. This is understanding of

a phenomenon is related to questions like "What are the effects of New-Collar Skills." In contrast, Ontological questions are related to questions like "what factors influence the acquisition of New-Collar Skills."

3.11   Gioia Methodology

The Gioia model was applied to generating new concepts and themes. This helped apply a systematic conceptual, analytical process to develop codes and themes for developing the concepts for this study (Gioia et al., 2013) and applying this methodology for analysing the data, the qualitative phase of the study produced, eight outcomes, or aggregate dimensions. The outcomes were as follows (i) Market-driven education (ii) Government driven Digital Transformation (iii) Global Competition for Applied Skills (iv) Employee Motivation (v) Corporate Motivations (vi) Country-Level Influences (vii) New-Collar Skills (viii) Effect New-Collar Skills. These outcomes further produced forty second-order themes as shown in the data structures in Figures 2-8
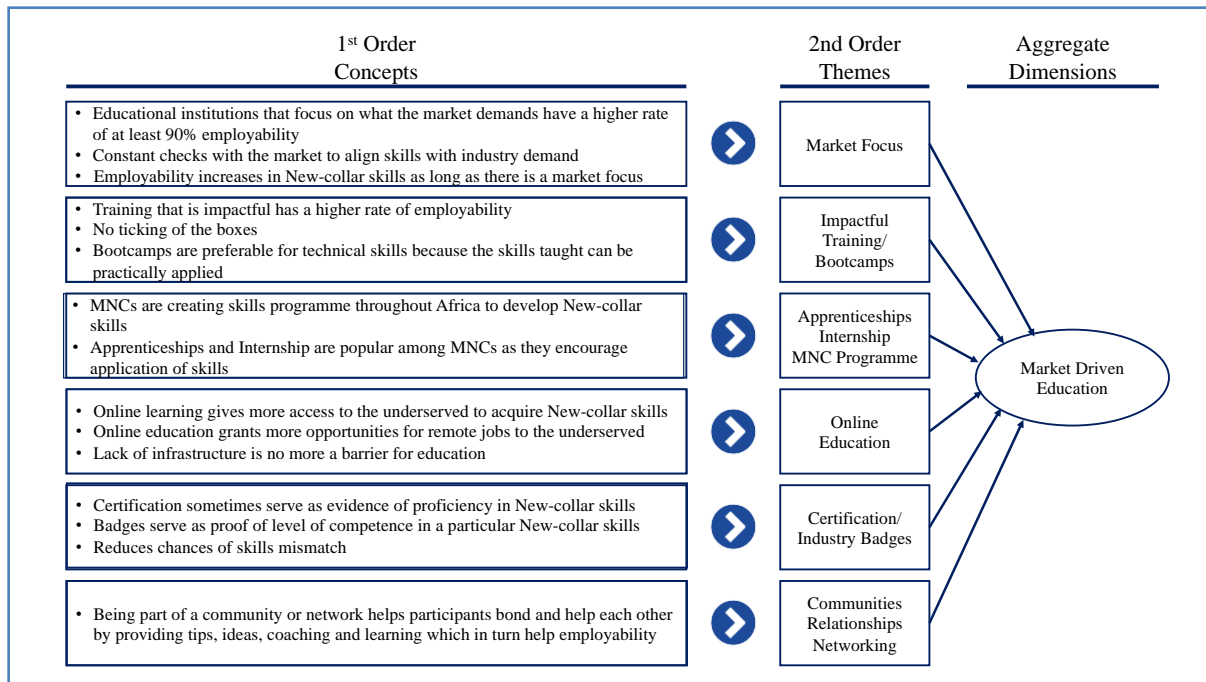
Figure 3.1: Data structure- Market-Driven Education
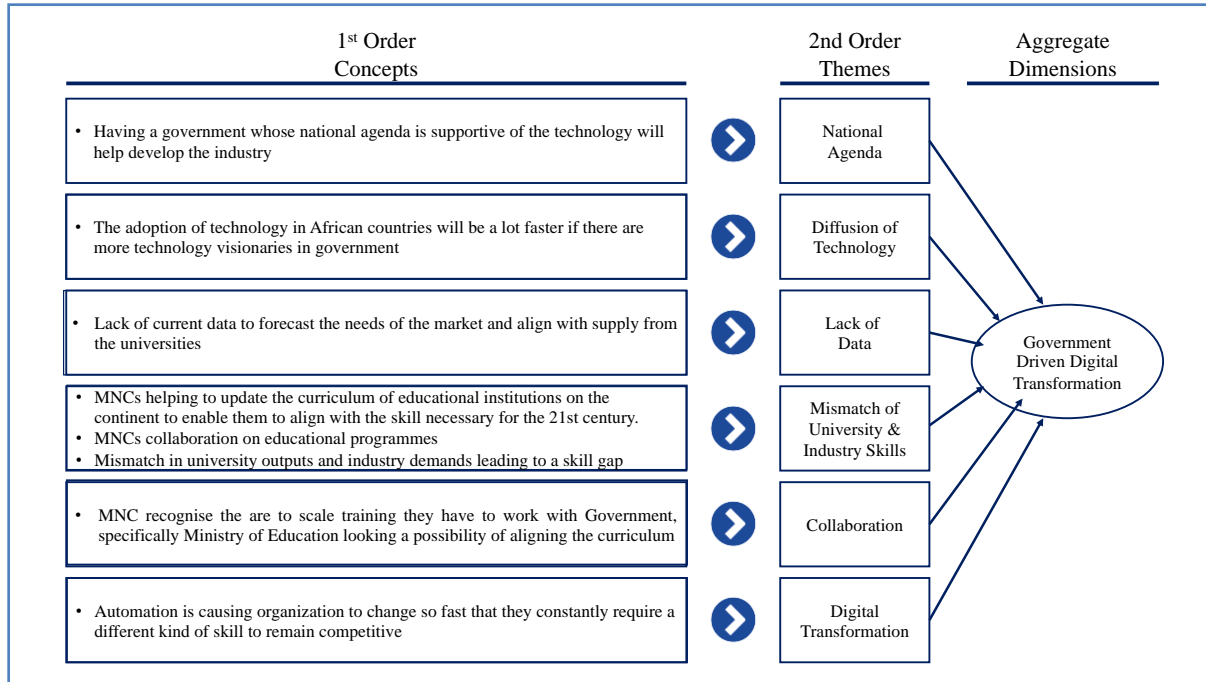
Figure 3.2: Data structure – Government Driven Digital Transformation

Figure 3.3: Data structure – Global Competition for Applied Skills

Figure 3.4: Data structure – Employee/ Corporate Motivation

Figure 3.5: Data structure – Country Level Influences

1st Order Concepts

- Possessing very strong soft skills will increase New-collar skills employability
- Soft skills like communication, problem solving and critical thinking are rated high.
- Higher potential for learning technical skills than soft skills in Africa

- MNCs capacity building programmes lay more emphasis on technical skills than soft skills
- Employers are willing to compromise on technical skills as long as you have the required soft skills

- Online learning gives more access to the underserved to acquire New-collar skills
- Certification, & Badges serve as evidence of proficiency in New-collar skills
- Apprenticeships, Internship, Bootcamps and Online learning and are all new form of learning to acquire New-collar skills

- Constantly updating technical skills.
- Various employability skills that are necessary to acquire a New-collar job
- Applied skill development, Skills evaluation and Personal motivation are critical factors for New-collar skills

- Majority of the MNCs are promoting STEM as a prerequisite to acquiring New-collar skills
- Some people acquire New-collar skills without STEM

- High demand for New-collar skills than the market can supply as a result of automation
- Digital transformation is leading companies to discover the need for new skills and jobs are growing at a faster rate than the skills are available

2nd Order Themes

- Soft Skills
- Technical Skills
- Non-Traditional Education
- Employability Skills
- STEM
- Demand & Supply

Aggregate Dimensions

- New-Collar Skills

Figure 3.6: Data structure – New-Collar Skills

1st Order Concepts

- Africans who have acquire New-collar skills are able to acquire freelance jobs
- Freelancing although has seen some success, in North Africa, its not as popular because of the barrier of proficiency in English language

- Jobs seekers dabble into DE as a side business or an alternative source of income
- Software development and digital marketing (social media marketing) have become very popular as an alternative source of income.
- English is a barrier to DE in some African countries

- There is a rise in start-ups in Africa as a result of New-collar skills
- Increasing venture capital investment for start-ups in Africa
- Nigeria, Kenya and Ghana leading the start-up space

- Proficiency in New-collar skills have a 90% certainty of employability
- Employability is guaranteed provided you have the attendant soft skills

- Young Africans who have acquire NCS are able to secure remote jobs
- Remote work opportunities are growing at a fast rate in many African cities
- A better internet service in Africa has increased opportunities for remote work

2nd Order Themes

- Online Outsourcing
- Digital Entrepreneurship
- Start-ups
- New-Collar Dream Hire
- Remote Work

Aggregate Dimensions

- Effects of New-Collar Skills

Figure 3.7: Data structure – Effects of New-Collar Skills

3.12   Summary

This chapter explained the choice of design for the study. The central focus is to examine how acquiring New-Collar Skills could increase employability and or lead to an enhanced or increased participation in digital entrepreneurship and or online outsourcing by African youths.

The current mixed methods sequential exploratory design involved a focus on the research question, hypotheses, data collection, and data analysis. This chapter also included the research philosophy, design, appropriateness of mixed-method design, confidentiality, informed consent, and study demographics of the data collected. Chapters 4 demonstrates the implementation of the methodology and design presented in this chapter and also includes a complete description and presentation of the analysis of the results of the data collection and provides a thematic analysis of the interview data.

Chapter Four: Research Findings

4.1   Introduction

This chapter presents the research findings derived from the collection and analysis of the research data. This study involved the deployment of a mixed-method sequential exploratory design to explore the effects of New-Collar Skills (NCS) on employability and entrepreneurship in Africa. The central focus was to examine how acquiring New-Collar Skills could increase employability and lead to an enhanced or increased participation in digital entrepreneurship and or online outsourcing by African youths in the Fourth Industrial Revolution. The procedure consisted of quantitative surveys, an intervention, and in-depth interviews in a sequential timeframe. The data collected were analysed and triangulated to further validate and assess the accuracy of the findings. This chapter contains the results, as well as presentation and interpretation of findings. The hypotheses of the study are presented and tested, reliability and validity tests conducted, and the results are presented.

The results of the analysis are presented by answering the following Research Questions: RQ1– What are the factors influencing the acquisition of New-Collar Skills in Africa; RQ2 – What are the effects of New-Collar Skills on employability in Africa; RQ3 – To what extent do New-Collar Skills enhance participation in online outsourcing and digital entrepreneurship in Africa.

4.2.   Assessment of Factors influencing the Acquisition of New-Collar Skills in Africa

In order to assess the factors influencing the acquisition of New-Collar Skills, the logit model was deployed using the New-Collar Skills data set and the Open Survey data set.

As specified in Chapter 3, each of these models were examined in terms of the following:

i.   Overall Model
ii.   Marginal effect of the individual predictor on odds ratios.

The results for each of the two data sets are presented in Tables 4.1 to 4.3.

Table 4.1: Estimation of Factors Influencing Acquisition of New-Collar Skills in Africa Using the Logit Model

Exogenous variables	IBM Participants (Obs=976)			Open survey (Obs=1,368)		
	Odds Ratio	Coef.	P>z	Odds Ratio	Coef.	P>z
Age	1.014771	0.014663	0.429	-	-	-
Gender	0.987731	-0.01235	0.940	1.018987	0.018809	0.879
HDParent	1.167993	0.155287	0.374	0.984393	-0.01573	0.903
Universitytype	1.160283	0.148664	0.451	-	-	-
STEM	1.458468	0.377387	0.020**	1.531872	0.426491	0.003***
Gradyr	1.01863	0.018459	0.460	-	-	-
AccessWeb	1.116343	0.110058	0.012**	0.142318	0.024515	0.000***
AccessPC	1.107318	0.101941	0.651	1.115802	0.109573	0.508
Accesspwr	1.008715	0.008678	0.829	-	-	
Employed	2.648235	0.973893	0.000***	1.782351	0.577933	0.000***
AwareNCS	4.725054	1.552879	0.000***	4.635673	1.533781	0.000***
AwareOO	0.936038	-0.0661	0.772	1.109321	0.103748	0.476
Mentorship	-	-	-	1.696881	0.528792	0.005***
IBM	-	-	-	2.179711	0.779192	0.00***
EngageOO	1.600079	0.470053	0.006***	-	-	-
AwareDE	0.77834	-0.25059	0.221	-	-	-
EngageDE	2.133625	0.757822	0.000***	-	-	-
Nigeria	0.947546	-0.05388	0.812	-	-	-
Kenya	1.540426	0.432059	0.068*	-	-	-
IBM	2.189865	0.78384	0.000***	-	-	-
_cons	0.016595	-4.09868	0.000***	0.03668	-3.30553	0.000***
	LR chi2(18) = 304.77			LR chi2(10) = 245.34		
	Log likelihood = -519.7843			Log likelihood = -824.05644		
	Prob > chi2 = 0.000			Prob > chi2 = 0.000		
	Pseudo R2 = 0.2267			Pseudo R2 = 0.1296		

Overall Model: From Table 4.1, the goodness-of-fit test, Chi-square ($\chi2 = 304.77$) with p-value (0.000), indicates that the model is appropriate for the data.

Marginal effect of the individual predictor on odds ratios: Table 4.1 provides odds ratios and significance level for testing the hypothesised relationships. The results (Table 4.1) showed that, among the two groups of respondents, that is IBM participants and the open survey participants, STEM, access to web, employment and awareness of NCS were major factors influencing acquisition of NCS in Africa. Also, engagement in OO, engagement in DE, and IBM New-Collar Skills training were found to be significant factors among those who participated in IBM African Skill Initiative training. Based on the open data set, STEM, Access to web, employment, and awareness of NCS were also found to be major factors influencing the acquisition of NCS in Africa. In addition, participation in the mentorship programme and IBM New-Collar Skills training were also found to be significant factors. With reference to odds ratio, the regression results indicated that those who studied STEM courses, those who have access web, the employed, those aware of NCS, and those engaged in OO, and those engaged in DE had higher chances of acquiring NCS by about 1.5, 1.1, 2.6, 4.7, 1.6 and 2.21, respectively, than those who did not.

Test of Hypothesis 1:

> Ho: There are no significant factors influencing the acquisition of New-Collar Skills

> H_1: There are significant factors influencing the acquisition of New-Collar Skills

The results revealed that the following factors were significant in influencing the acquisition of New-Collar Skills: access to web, awareness of NCS, STEM-related courses, mentorship, engagement in OO, and engagement in DE. Therefore, the null hypothesis was rejected and the alternative hypothesis accepted.

4.2.1   Open Survey Data set –Cross-tabulation

To further examine the above objective, descriptive statistics and cross-tabulation were deployed to determine the factors influencing the acquisition of New-Collar Skills in Africa.

4.2.1.1 Access to the Internet

From the responses of the survey, Q10 –"How would you rank your access to the Internet as a tool to work?" was cross-tabulated with Q17 –"Are you using New-Collar Skills at your place of work?" and Q13 –"Are you working presently?" This was to identify if access to the internet as a work tool was a factor to influence the acquisition of New-Collar Skills. This was shown to be significant, with a p-value of 0.00006, as shown in Table 4.2.

Table 4.2: Cross-tabulation of Ranking Access to the Internet Vs. Using New-Collar Skills

Access to the internet as a tool to work Vs. Using New-Collar Skills at Work

Using NCS	Total	Yes	No
	816	486	330
1	1.6%	1.9%	1.2%
2	0.86%	1.2%	0.30%
3	1.7%	2.1%	1.2%
4	2.3%	3.1%	1.2%
5	6.3%	8.2%	3.3%
6	6.3%	7.6%	4.2%
7	8.0%	8.2%	7.6%
8	17.0%	19.1%	13.9%
9	16.5%	15.8%	17.6%
10	39.5%	32.7%	49.4%

Overall Stat Test	**0.00006**		
	Ghana	**Nigeria**	**Kenya**
Access to internet	67% rates 8, 9, and 10	70% rates 8, 9, and 10	81% rates 8, 9, and 10

As seen in Table 4.2, access to the Internet seemed to be a crucial factor influencing the acquisition of NCS and one of the highest motivators for employment, especially in the New-Collar Skills workplace. It was shown to be significant, with a p-value of 0.00006. With the above findings, it was found that the respondents who did not use New-Collar Skills at their

workplaces ranked access to the Internet lower (from 1-8) than the employed respondents. However, from the ranking of 9-10, it was found that the employed respondents ranked the Internet higher, which implies that the respondents who have better access to the Internet in Africa are more likely to be employed. In other words, access to the Internet is a major factor influencing the acquisition of New-Collar Skills. Kenya had the highest access to the Internet, as 81% of the respondents rated access to the Internet at 8, 9, and 10, while Ghanaian and Nigerian respondents rated the same access to the Internet at 67% and 70%, respectively.

These findings align with those of the logit model (Table 4.1), which showed that having access to the Internet gives one a higher chance of acquiring New-Collar Skills by an odds ratio of 1.1.

4.2.1.2 Access to a Personal Computer

In order to confirm if access to a personal computer is a significant factor that influences the acquisition of New-Collar Skills, the study went further to cross-tabulate the responses from the survey to Q11 – "Do you have access to a personal laptop/computer?" with Q17 – "Are you using New-Collar Skills at your place of work?" This was shown to be significant, with a p-value of 0.00034, as indicated in Table 4.3.

Table 4.3: Cross-tabulation of Access to Personal Computer Vs. Using New-Collar Skills

Access to a Personal Computer vs. Using New-Collar Skills at Work			
Using New-Collar Skills	Total	No	Yes
No	155	112	43
Yes	661	374	287
Total Count	816	486	330
No	19.0%	23.0%	13.0%
Yes	81.0%	77.0%	87.0%
Overall Stat Test	**0.00034**		

	Ghana	Nigeria	Kenya
	Yes 86%	Yes 78%	Yes 83%
Access to Personal Laptop	No 14%	No 22%	No 17%

Almost all the employed respondents had access to a personal computer, which represents a significant level. Over 70% of the respondents in the three African countries had access to a personal computer. Ghana had the highest level of access, with 86%. It can be inferred that access to a personal computer is a significant factor in the acquisition of New-Collar Skills, since a significant percentage of those who were employed have access to a personal computer and they answered yes to using New-Collar Skills in their respective work.

4.2.1.3 STEM-related Degree

Furthermore, studying a STEM degree was also identified as a significant factor influencing the acquisition of New-Collar Skills in Africa, with a p-value of 0.00398. The study went further to confirm this by cross-tabulating the results from Q8 –"Did you study a STEM-related degree?" with Q17 – "Are you using New-Collar skills at your place of work?" This is shown in Table 4.4.

Table 4.4: Cross-tabulation of STEM-related Degree Vs. Using New-Collar Skills

STEM Related Degree vs. Using New-Collar Skills vs. Using New-Collar Skills

	Total	No	Yes
Total Count	816	486	330
No	438	281	157
Yes	378	205	173
No	53.7%	57.8%	47.6%
Yes	46.3%	42.2%	52.4%
Overall Stat Test	**0.00398**		
	Ghana	**Nigeria**	**Kenya**
STEM Degree	Yes 66%	Yes 52%	Yes 45%

		No 34%	No 48%	No 55%

From Table 4.4, it is evident that 52% of the respondents who were using New-Collar Skills at their places of work had a STEM degree. However, 42% of them did not have a STEM degree. Therefore, even though there was only a slight difference, studying a STEM course was significant and a factor influencing the acquisition of NCS in Africa. Ghana had the highest number of respondents who had a STEM degree, with 66%, while Kenya recorded the lowest, with 45%. Again, this result aligned with the findings of the logit model (Table 4.1), which showed that having a STEM-related degree gives one a higher chance of acquiring New-Collar Skills, by an odds ratio of 1.45.

4.2.1.4 Awareness of New-Collar Skills

Awareness of New-Collar Skills was also identified as a significant factor that influences acquisition of New-Collar Skills in Africa, with a high p-value of 0.0000. Q16– "Are you aware of the concept of New-Collar Skills?" was cross- tabulated with Q17 – "Are you using New-Collar Skills at your place of work?" The result is presented in Table 4.5.

Table 4.5: **Cross-tabulation of Awareness of New-Collar Skills Vs. Using New-Collar Skills**

Awareness of New-Collar Skills vs. Using New-Collar Skills at your place of work			
	Total	No	Yes
Total Count	815	485	330
No	337	274	63
Yes	478	211	267
No	41.3%	56.4%	19.1%
Yes	58.6%	43.4%	80.9%
Overall Stat Test	**0.00000**		
	Ghana	**Nigeria**	**Kenya**
Awareness of New-Collar Skills	Yes 53%	Yes 59%	Yes 64%

No 47%   No 41%   No 36%

The awareness of New-Collar Skills was highly significant to using New-Collar Skills, with over 80% of the employed respondents aware of the concept of New-Collar Skills. Therefore, it is a factor influencing the acquisition of these skills. This aligns with the logit model (Table 4.1) with odds ratio of 4.7.

4.2.1.5 Access to Power

Access to power was also identified as a significant factor influencing the acquisition of NCS in Africa. Q12 –"How would you rank your access to power supply for work?" was cross-tabulated with Q17 –"Are you using New-Collar Skills at your place of work" The result is presented in the table below.

Table 4.6: Cross-tabulation of Access to Power vs. Using New-Collar Skills

Access to power supply for work vs. Using New-Collar Skills

	Total	No	Yes
Total Count	816	486	330
1	2.9%	3.5%	2.1%
2	3.3%	4.5%	1.5%
3	4.5%	5.6%	3.0%
4	4.8%	6.2%	2.7%
5	12.7%	14.2%	10.6%
6	9.7%	11.7%	6.7%
7	8.1%	6.6%	10.3%
8	16.9%	16.3%	17.9%
9	12.7%	11.7%	14.2%
10	24.3%	19.8%	30.9%

Overall Stat Test	**0.00004**		
	Ghana	**Nigeria**	**Kenya**
Access to power	80% rates 8, 9, and 10	34% rates 8, 9, and 10	83% rates 8, 9, and 10

As shown in Table 4.6, access to power was a critical factor influencing the acquisition of New-Collar Skills. It was significant, with a p-value of 0.00004. The respondents who did not use New-Collar Skills at their places of work ranked access to power lower (1-5). Conversely, the respondents who used New-Collar Skills at their places of work ranked access to power higher (6-10) which infers that respondents who have better access to power in Africa are more likely to be employed which indicates that access to power is a major factor influencing the acquisition of New-Collar Skills. Also, Nigeria has very low access to power at 34% when compared to the two other countries, Ghana and Kenya, whose respondents ranked access to power at 8-10 by 80% and 83%, respectively.

4.2.2   In-depth Interviews
   1. *Participants in the New-Collar Skills Workshop*
   2. *Corporate Executives*

To further examine the factors influencing the acquisition of New-Collar Skills, interviews were conducted with 17 participants of the New-Collar Skills Workshop and 10 corporate executives from global organisations. They are recognised New-Collar Skills training organisations in 8 African countries. The data from these interviews were analysed using the Gioia Methodology and themes developed. In assessing the factors that influence the acquisition of New-Collar Skills, the following aggregate dimensions were identified from the interaction with the interview respondents: (i) market-driven education, (ii) government-driven transformation, (iii) country-level influences, (iv) global competition for applied skill, (v) corporate motivation, and (vi) employee motivation. This implies that, apart from the factors found to be significant from the analyses using the logit model and cross-tabulation, these other six dimensions are very important in the acquisition of New-Collar Skills. They are presented in the following sections.

4.2.3 Market-driven Education

This was the first aggregate dimension that emerged from the analysis of the interview data; it produced six 2nd-order themes: (i) market focus, (ii) impactful training/boot camps, (iii) apprenticeships/internships and MNCs programmes, (iv) online education, (v) certification/industry badges, and (vi) communities/networking and relationships.
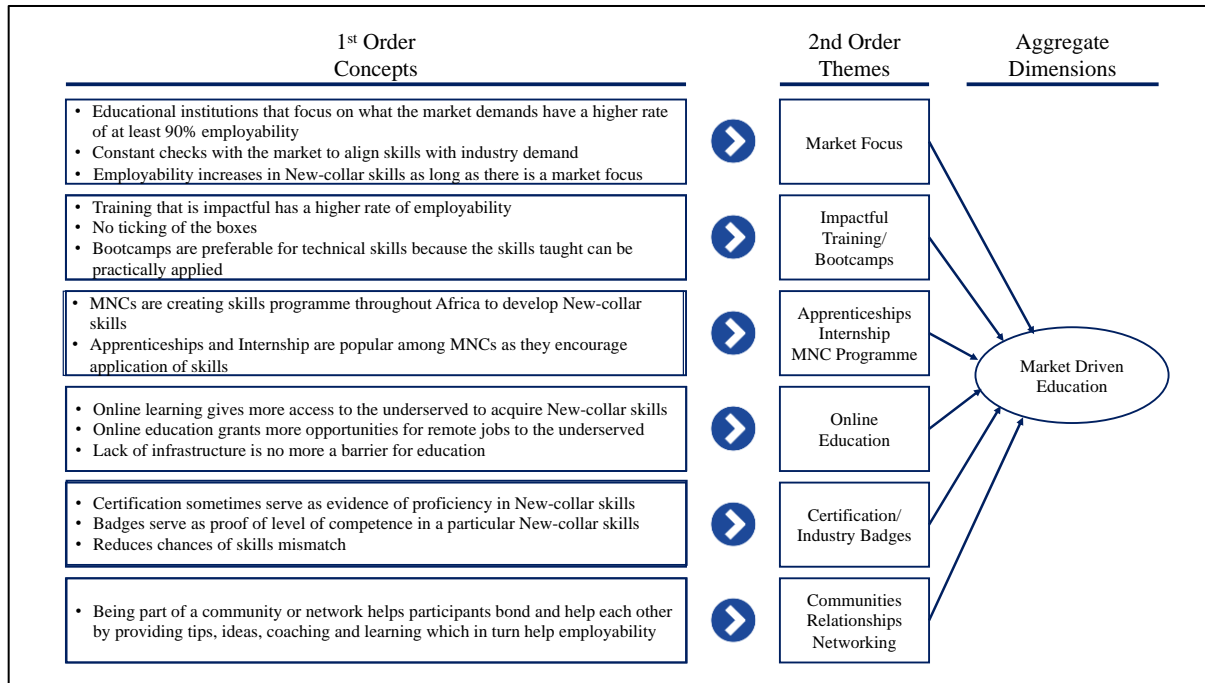

Figure 4.1: Market-driven Dimension to the Acquisition of New-Collar Skills

4.2.3.1 Market Focus

There is a clear disconnect between the skills that educational institutions are producing and what is required by industry. Educational institutions that have a market focus have been able to meet industry needs by providing the skills needed for the automation age. This has had a direct and indirect impact on the acquisition of New-Collar Skills because non-traditional educational institutions have started to align with the industries' changing needs.

This was explained by ED4, CEO/ Founder of Sprints, Egypt. Frustrated by the fact that most universities in Egypt were turning out graduates that did not meet the needs of the many digitally-transformed organisations, he decided to do something about it and set up an organisation called Sprints aimed mainly to train and deploy New-Collar Skills job seekers with a market focus. According to him, he had had a 95% success rate at getting them employed:

So here in Egypt, you graduate at around 23 years, and you start searching for jobs, and you discover that you are not matching the market need. In essence, after like 20 years of education and still, you are not matching the job market needs. I see that there is a lot of optimisation that can be done.

ED4 added that providing "dream hires" purely with a market focus catered for the individual needs of employers:

We went to the employers of technology companies to ask for qualifications they are looking for when they want to hire, and they started listing requirements around both technical and non-technical. Some employers prefer a university degree, and some do not, it depends because I am guaranteeing employment, this is where I have to respect the employer's requirement…carefully select people so that in 3 months they would be able to improve the skills to meet the demands of the market. So even the curriculum that we developed, we validate and co-develop it with some employers to make sure that we provide for them the talent that they want. So, this is how we guarantee the hiring; it is a continuous process of improvement until we perfect it through several cycles.

ED4 emphasised *market focus* at all times as a strong factor influencing the acquisition of New-Collar Skills. He does this by working hand in hand with the employer to explore the exact type of skills the employer requires. He referred to the employee that meets the employer's requirements as a" Dream Hire." Such employees work together every step of the way to ensure the employer gets his dream hire through a strict process of interviews, role plays, business simulation, practical work experience, more interviews, evaluations, and much more. He noted that:

This is mainly the point: employability increases as long as the market needs it. This is why, before we started the programme, we checked the

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market before establishing the boot camp. For instance, we have what we
called the embedded system in the boot camp every month. We graduate
20 engineers; 20 multiplied by 12. So, on the annual base, we graduate
240 engineers. The market requirement is around 500 engineers. So, this
is OK; we are almost providing half what the market needs.

Besides, ED4 highlighted the importance of market-driven education, along with ED10, Founder/CEO Co-creation Hub, Nigeria, Rwanda, Kenya, and Uganda, stating that the current system in the universities in Africa do not seem to be producing what the market requires:

The problem with the current university system is that they do not care
about the market, they care about teaching what they want to teach, and
the market has no impact on the university. What we do here, we develop
the skills which are required by the market.

ED10 confirmed this by stating that it is all about demand and supply:

So now let us focus on the technical skills within this new age digital era,
the real reason why I think people are more employable is because of
demand and supply, this is the new industry, companies are just
beginning to discover the need for the skills, and so there are going to be
jobs.

ED4, CEO/Founder Sprints Egypt, asserted that market focus is critical in this new age of automation and fast-changing skill sets before starting any skills training. It is essential to keep asking these questions every time: "what does the market require at this point?" Is the market saturated?" according to him, it is important to keep a hand on the pulse of the customer (market) needs at all times. He gave an example of when Google flooded the market with Android skills at a time; the market could not absorb these skills:

Experience has shown us that, if you focus on the skills the employer
needs, employability will increase. A problem may occur if you teach

> *New-Collar Skills and the market does not need these skills. For example, Google, two years ago, came to Egypt and taught a lot of people on android and the market did not need android developers. So again, this is not a problem of New-Collar Skills; it is just that there are not enough vacancies for this. So, the only thing those people can do is freelancing.*

This was reiterated by some of the participants from the workshop. P4, a participant from the intervention workshop, stated that it is about making yourself relevant and having the skills for the job market. Acquiring New-Collar Skills, coupled with his employability attributes, got him a job almost immediately:

> *I was able to understand that it is not really trying to get the 9-5 job that matters but making yourself relevant, having the necessary skills needed in the job market, and eventually, you are going to get more than enough if you have the necessary skills. So, I would say the Nigeria system really challenged me. I felt like my life must be better than this. The status quo must be changed. If there is no employment, I would provide employment for myself.*

4.2.3.2 Impactful Training/Boot camps

Boot camps and impactful training emerged as another clear theme from the interview data. Boot camps were identified as an effective path for providing New-Collar Skills that the market requires in a shorter time. Other forms of training identified were training programmes provided by MNCs in Africa. The key requirement is that it should be impactful and not just a tick box exercise, as being practised by some organisations to satisfy their CSR requirements. Boot camps and impactful training have been identified as alternative forms of education for graduates just coming out of school to augment their skills to help align their skills with the market and as a factor influencing the acquisition of New-Collar Skills.

Boot camps are a form of non-traditional education that has become very popular globally, mainly because it is a practical application of skills; it is a new way of preparing young people with employability skills. Some employers prefer students who have been to boot camps because they train the participants to apply their knowledge and skills.

ED10, Founder/CEO Co-creation Hub, reiterated the importance of boot camps and their emphasis on practical skills application:

> *Your ability to do is a major requirement of those skills. It is not enough to study Computer Science, and you cannot write codes, which means someone who gets it through a boot camp and the boot camp is focused more on doing, you know, and that person can brush up on what they acquire over a short period of time literally can have an engineering job.*

ED4, CEO/ Founder of Sprints, Egypt, emphasised the value of boot camps:

> *20 years of education, and still, you are not matching the job market needs. I see that there are a lot of optimisation that can be done there instead of going to the university and wasting your time. So that is why, at Sprints, we are actually trying to, we starting with boot camps, and you know they are guaranteed hired I, as I mentioned. So, we believe that we can compete with universities and provide better education. OK, the boot camp is to simulate the business environment.*

P11, a participant of the New-Collar Skills Workshop who had been successful in acquiring skills and subsequently hired through this route advised job seekers on attending boot camps, said:

> *I would advise you to pick up online training, you know, to start with that. And if you are doing fine, then you can attend boot camps to brush up the skills and apply for an internship to digital companies and other software companies. So, that is what I will advise.*

This point was reiterated by ED1, CTO MTN/Founder of Data Science Nigeria:

> *OK. What I am saying is that all these people did not learn to program from the university, but that is not a problem for me. For me, if I can take somebody that just graduated from high school and ended up in the boot camp, I am just proving your point that we do not need a university degree as a prerequisite for our boot camps.*

ED1 further explained that, in some companies, training is merely "Ticking the box":

> *You know, just a few days ago, I had a session with one of them who was more inspired about ticking the boxes. I have run training across the country; I have trained two hundred thousand kids. ticking the boxes guys let us stop all this... it is not just counting. It is not just ticking the boxes. We are doing a lot of things, but what is the degree of relevance, you know… I like what these big companies are doing, but let us be very realistic, you know, and do it the way it should be done… it is not just one nice CSR to tick the box; it is about building our nation for the future.*

4.2.3.3 Apprenticeships, Internships and MNC Programmes

It was observed that some technology companies in Africa have set up apprenticeship, internship, or specific training programmes as a way to meet their skill requirements and to help close the skills gap in the market. In major African cities, technology companies like Google, IBM, Microsoft, Oracle, and Facebook, are embarking on mass capacity and skills-building programmes. This has been identified as a major factor influencing the acquisition of New-Collar Skills in Africa. Oracle essentially uses the internship programme to help the interns increase their employability quotient as it relates to them as an organisation.

ED8, MD Oracle Nigeria, explained the importance of internship programmes:

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... and place them on an internship programme that goes on a fast track, one full year and that one full year is broken down into four quarters. the first quarter is to really just understand yourself – Who am I? What do I bring to the table? All of those things, some would be answered, some would not. So, the next quarter really be around what is Oracle and what does….

IBM's apprenticeship programme P-TECH has been highly publicised. The aim of the programme, as stated by the ED6, is to bridge the gap between industry and education, by focussing on the skills required by industry. ED6, Regional Director, IBM Africa, explained that:

P-TECH is an education model where we try to bridge the gap between school and industry. It is also a model that helps a new generation of IT professionals acquire New-Collar jobs and the latest technologies. The aim is to teach these students how to work so that, by the time they are on the job markets, they are already familiar with the industry, and they are already certified, which helps them find jobs easily.

Microsoft Apprenticeship Factory (AppFactory) has a similar objective, as ED3, MD, Microsoft South Africa, noted:

Every year, apprentices spend six months working on real-world projects with senior software engineers, developing their skills in bot framework, secure coding, data analytics, and machine learning. Today, there are 19 active AppFactory academies across Africa and Pakistan, which have graduated 1,400 apprentices. Of these, 85% have secured jobs within the first three months of graduating.

The participants from the workshop also identified with internship as a sure way to acquiring New-Collar Skills to increase their chance of employability, as it helps hone their skills. P11, a participant from the intervention workshop who was employed shortly after, advised thus:

I would advise you to pick up online training, you know, start with that, and if you are doing fine, then you can attend boot camps to brush up the skills and the application for an internship to digital and other software companies.

All these programmes, internship and apprenticeship, are factors that have influenced the acquisition of New-Collar Skills in Africa

4.2.3.4 Online Education

This theme was identified in the data by interviewees as a complete game-changer in Africa, as it has served as an inclusive tool for New-Collar Skills education for many young people in Africa (including the underserved) who would not normally have access to digital education.

This was confirmed overwhelmingly by the EDs.

ED1, CTO MTN/Founder of Data Science Nigeria, stated that:

I think this is the biggest thing that's changing skill acquisitions today; it is the fact that knowledge in itself is more readily available. So, compared to a few years ago where you literally have to go to a library or be part of a major classroom to receive better knowledge… is readily available but what is not available today is the know-how, and the ability to apply knowledge…. A lot of young Africans are taking their future into their hands. The nature of knowledge now is that knowledge is now largely distributed; you know a lot of people now have access to the same learning materials available at MIT.

ED1 expressed this sentiment. Location is no longer a barrier to knowledge, coupled with the fact that the underserved in remote villages of Africa aspire for a better life. It gives them huge motivation to learn to help bring their families out of poverty and into the middle class, and this is happening all over Africa.

The classes in MIT yesterday on an area in the research I am doing, I just watched it this morning. So, being in Lagos does not insulate me from access to the best knowledge. so, I can say that a lot of especially those who are keen to learn are optimising the fact that knowledge is now created across all spectrum…and that is why you can see a young chap in a village, like one of the examples we have seen, like in Zaria, whose model can beat somebody in San Francisco, in Massachusetts. Why? Because the same course material is readily available to the guy.

ED2, Executive Director, MEST Ghana, also reiterated this fact on the burgeoning talent online education is producing across the continent in all obscure corners, thereby giving opportunities to young people who would never dream of acquiring these skills because the educational infrastructure is unavailable in these areas.

Now what is happening is online digital education is becoming more and more attractive and where we are seeing more and more interest in digital education, which means that anybody with a smartphone can have access to the best education in the world outside of the current physical infrastructure limitation we have. And here is where I see the greater potentials in the rural areas. And not just the rural areas and even the urban areas, where the infrastructure in education is very bad. They can actually now get access to free online education, like Khan Academy. There are a lot of things on Coursera and also the IBM digital nation Africa.

Many of the participants below would not have been able to improve their skill level without online education, as confirmed by the following participants from the workshop intervention: P9, P7, and P11.

P9 stated:

What motivated me is to find a place for myself and make my life better. In a country like Nigeria, where there is unemployment everywhere, I

was really afraid of when I finished having to join the queue of graduates searching for jobs; I felt there is something I need to do to prevent this. I started taking online courses and downloaded tutorial videos just to make something for myself even while I am still looking for jobs.

The ED1, CTO MTN/Founder of Data Science Nigeria, agreed with the arguments made about online education. However, he claimed that online education is good but must be backed with the right application of skills, not just accumulating multiple certificates.

So, I think there are two ways to it with due respect to what people learn on Edx, Coursera, and all that; I think there is a minimum entry-level that will attract the desired impact. For example, Nigerians love certificates and certificate is different from skills. You know, in my three years of forming this community, I have seen people that just came and say I just need that certificate. It is not certificate; its skills

Online education has become a major factor influencing the acquisition of New-Collar Skills in Africa.

4.2.3.5 Certification/ Industry Badges

This emerged as a theme, as a new form of evaluation used in the technology industry to certify skills. This is a very important component of employability; employers want to see some evidence of skill proficiency. As observed by the interviewees, the prospect of obtaining a badge or certification to show the level of proficiency in a certain emerging technology is an attractive objective for job seekers. So, this is seen as a factor influencing the acquisition of New-Collar Skills. This was attested to by ED6 and ED2:

ED6, Regional Director, IBM Africa, asserted that:

Digital Nation Africa program, where we go to universities and train faculty members and students on the latest technology and help them get

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badges and certificates in these new technologies… if you claimed to be cybersecurity expert, you have the stamp from the industry. If you bring a badge saying I got certified by a cybersecurity specialist, then it is universal; the industry knows it and respects it.

ED2 observed that the fascinating thing is that you can even use a smartphone for online education. ED2, Executive Director, MEST Ghana, averred that:

My son got 30 badges in less than two weeks on the IBM DNA platform using his smartphone; he did not use a laptop. He took all those courses using his phone, 30 badges in less than two weeks. This just shows that it is possible and easy; it is just awareness and incentives. I see this happening just the same way the mobile phone technology was adopted, just the same way mobile money has seen huge adoption, we see digital online education as the next wave in Africa, and this will position us better in the Fourth Industrial Revolution and the New-Collar Skills.

4.2.3.6 Communities, Network and Relationships

This emerged as a theme from many of the participants of the New-Collar Skills Workshop. They asserted that networks and being able to bond and form communities after being part of a boot camp or some form of online learning could be a great advantage and aid employability.

P6, a participant from the workshop intervention, had this to say:

Yes, yes, I did, I did. Another aspect I did not uh get before now is networking. I made a lot of friends that have actually helped me with one thing or the other. So, it met my expectation and not 100%, but to a very large extent… helped me succeed.

P6 also observed that keeping relationships with the other participants was very helpful too in his quest to find a job:

A relationship is more important. If I close my start-up and I want to work, there are some couple of people I can talk to that will open the way for me, just because I met them at IBM and we did the training together. So, everything did not just end in the training; the relationship matters; how you network with people is important. I built relationships, and it is working for me today.

4.2.4 Government-driven Digital Transformation

It was observed that government support was very important, as it would help shape the digital transformation agenda and indirectly influence the acquisition of the relevant skills.
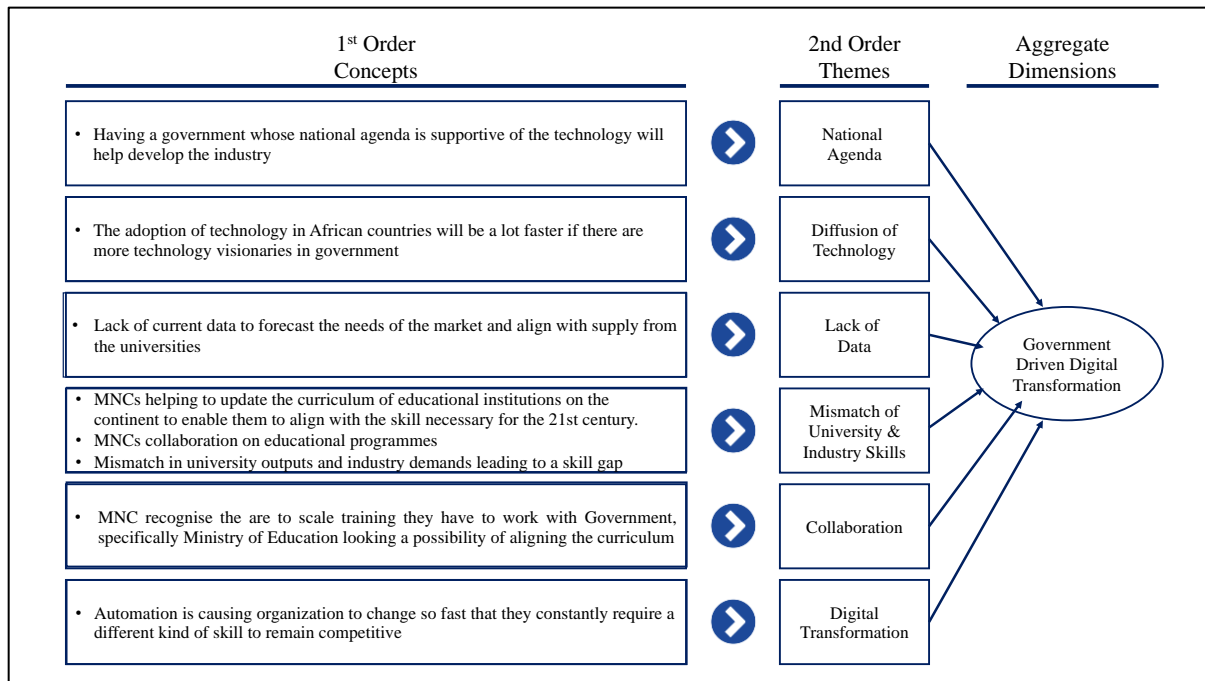

Figure 4.2: Government-driven Digital Transformation Dimension

4.2.4.1 National Agenda

A government whose national agenda is supportive of the technology industry will help grow the industry, as seen with Rwanda. ED10, Founder/CEO, Co-Creation Hub, made this argument in reference to the government inaction to invest in upgrading the Computer Science curriculum and encouraging STEM in schools and universities:

Which is why I always say if government invest in proper upgrading of the Computer Science curriculum in the country or find an extra-curriculum way of churning out software developers, engineers and designers en masse because we are not doing it en masse we are just scratching the surface you will find that more people – we would have more talent.

This is contrary to the Rwanda government that is making clear plans for the technology industry in its national agenda.

He further stated that:

The Rwanda government is really putting a lot of effort in actually attracting technical people, investing a lot in technical training and things like that. So, the pool in most African countries is really limited, and the education system is not as good, as they do not have the depth of skills that you find in a place like Kenya, for instance.

ED7, Co-Founder, Angel Africa List and Chanzo Capital, observed that:

You can see this play out nicely in Rwanda, as the government's national agenda is firmly focused on digital transformation, and this has been encouraging many investors and an inflow of skills into the country

And definitely, Rwanda falls in that category, but the case of Rwanda is that there is no strong private sector, but they have decided that they are building a private sector that's focused on technology. So yes, you begin to see more tech investment going there, and that is good because it is going to create that momentum. But this is because President Kagame has a clear agenda that…. to build a digital economy. And actually, I happened to be involved in the creation of ICT policy for Rwanda many years ago.

ED7 averred that government's intervention and collaboration are needed. They have to have a clear agenda that will facilitate digital transformation and spur collaboration between academia, government, and the technology industry.

> *Governments need to have a clear agenda where you connect the growth sector of the economy or where you want to see growth to the funding that goes to academia and research so that they produce the skill sets that you need to empower those industries. Otherwise, it is arbitrary, and you will not get the kind of outcome that you want in an economy. This leads to the point that I made in the King's chapter, the fact that you need to have close interaction between the government, private sector, research academia, civil societies.*

This argument was supported by ED10, Founder/CEO, Co-Creation Hub, who argued that support from the Nigerian government would benefit the technology industry:

> *We have not seen that government support around how to embed this into learning yet, which is a strong minus.*

Government having a strong agenda on digital transformation will go a long way in influencing the acquisition of New-Collar Skills in Africa.

4.2.4.2 Diffusion of Technology

The adoption of technology in African countries will be a lot faster if there are more technology visionaries in government. The adoption of technology is somewhat slow in many parts of Africa because of the more generation Y at the helm of affairs.

ED2, Executive Director, MEST Ghana, alluded to this:

> *The industrial space in sub-Saharan Africa is still very much governed by traditional people or people with a traditional mindset of people in the older age bracket and with a lot of government influence. As we know,*

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older people and government are still slower to respond to the changes in the environment. So, while there is an opportunity there to absorb this people, I do not think they would be absorbed by a lot of the African industrial organisations.

4.2.4.3 Lack of Data

ED4, CEO/Founder, Sprints Egypt, argued that one of the reasons for a huge skills gap is the lack of proper data to help solve the problem. There is lack of current data to forecast the needs of the market and align with supply with universities. This has become a factor in influencing the acquisition of New-Collar Skills in Africa:

> *Yes, with our employers, they assist us with what the market needs, we have a partnership with an employment website, they have thousands of jobs, and using this data you can … forecast.*

4.2.4.4 Mismatch of Skills

There is a clear mismatch of skills between what the higher educational institutions are producing and what is required by industry. Many of the EDs testified to this. However, some technology companies have taken the liberty of helping to update the curriculum of higher educational institutions on the continent to enable them to be compliant with 21st-century skills.

ED8, MD, Oracle Nigeria, spoke about the work his organisation is doing, collaborating with governments and educational institutions to address the skills gap.

> *We are looking at tertiary institutions as well as secondary schools, and the essence is to build skills in students in the tertiary institution. Today, quite a number of the universities have Oracle as part of their curriculum.*

This was re-emphasised by ED4, CEO/ Founder of Sprints, Egypt, whose organisation addresses the mismatch of skills in the market. He used his personal story to emphasise the fact that he had studied subjects that were not beneficial nor focused on the market:

I believe the university, the way it's set up, is a very long journey; for instance, I graduated from the Department of Engineering in a private university in Egypt, and the journey took me five years. By the way, it is one of the top universities in Egypt and generally engineering in Egypt is five years. If you ask what I learned in the university for five years, I would say only one year is sufficient for me to reach the same level that is one year is enough for me to learn what I learned for five years in the university.

The issue of skills mismatch was reiterated by ED10, Founder/CEO, Co-Creation Hub:

Absolutely. We do not even have enough engineers; not enough people have a background in digital skills that are required; only a few and out of these few; some are not good enough. But the competition is so fierce that even a lot of these companies do not mind taking in junior engineers, junior digital people and then try to train them to become what they want. We just do not have enough people in that space that can mop up the opportunity.

4.2.4.5 Collaboration

Multinational corporations recognise the fact that if they are to scale capacity building in New-Collar Skills, they have to work with government, specifically the Ministry of Education, looking at possibilities of aligning the curriculum with skills for industry.

ED6, Reginal Director, IBM Africa, commented that:

We have worked with the Ministry of Education and specifically to the P TECH program which is a pathway in technology to help students develop IT and STEM skills for finding New-Collar jobs and 21st-century jobs

ED8, MD, Oracle Nigeria, reiterated this:

> *No, government alone cannot do this… nor do they have the funds to be able to achieve this so what organisations like Oracle are doing, for example, are partnering with the Ministry of Education. We are partnering with the ministry of works and establishment in making sure that we have a curriculum where we are training graduates*

4.2.4.6 Digital Transformation

Organisations needs are changing as a result of automation. There has been a significant amount of digital transformation, which has resulted in a rapid change in skills requirements. ED2, Executive Director, MEST Ghana, commented about digital transformation and how it is affecting the demand for skills and indirectly influencing the acquisition of New-Collar Skills:

> *The corporate world is changing, and they are going through digital transformation. In other words, this means bringing emerging technologies into their operations and what that does is putting a lot of their staff at risk because their jobs could either be automated or the skill requirement will change, and this is one of the motivation for now picking New-Collar Skills because those are the skills that are needed in the new digitally transformed corporations.*

4.2.5   Global Competition for Applied Skills

This emerged as an outcome/aggregate dimension. There has been a global shortage of high-skilled workers all around the world as a result of the rapid pace of digital transformation. This has resulted in the demand for a particular kind of skill that focuses on practical application, as noted by the EDs. This demand has caused a significant interest in enabling skills in Africa.
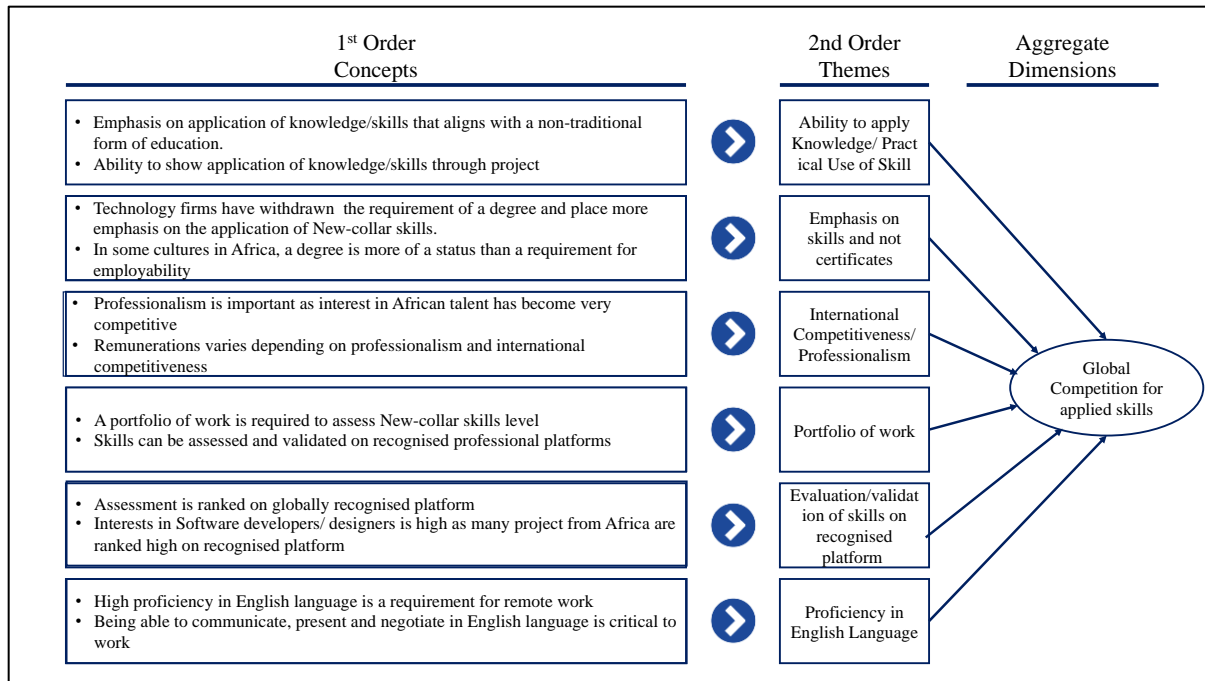
Figure 4.3: Global Competition for Applied Skills Dimension

4.2.5.1 Ability to Apply Knowledge/ Practical Use of Skill

ED1 and ED10 stressed that the application of New-Collar Skills was paramount, and that acquiring the skills was one thing. But they argued that employers only recognise that you have these skills if you can practically apply them to solve problems.

ED10, Founder/CEO Co-Creation Hub, stated that:

> *If you acquire the skills and you can actually apply them…the answer is straight up yes. You know because a lot of the skill set is in demand. you know, people want software developers and a lot of the people who want software developer will never ask you whether you have a degree from university…all they want to know is what programming language do you know, what projects have you worked on in the past.*

ED1, CTO MTN/ Founder DSN, and ED10, Founder/CEO Co-Creation Hub, discussed the tendency of some job seekers to stack up online certificates without being able to apply these skills practically.

ED1 commented;

> *…people learn on Edx, Coursera, and all that. I think there is a minimum entry-level that will attract the desired impact. For example, you know Nigerians love certificates, and a certificate is different from skill…. At Data Science Nigeria, you are not anybody until we see your Kaggle ranking. Because the Kaggle ranking is to prove that you have been able to apply all these certificates because, I tell you, every day, I see people who have done 20 courses on Coursera, 20 courses on Edx. So what? With all due respect to those platforms, it must be practised, and the general excuse is that no company is giving me the opportunity to practise. Kaggle has changed that game.*

4.2.5.2 Emphasis on Skills and not Certificates

Nearly all the EDs confirmed that they would rather hire a person who had the practical application of a skill than hiring a person with degree from the university. They want someone who can get the job done. This argument was confirmed by ED1, ED10, and ED8 below.

ED1, CTO MTN/ Founder DSN, asserted that skills can be validated on many recognised portals:

> *… I have seen people that just came and said I just need that certificate. It is not certificate its skills, and that is why we build our model beyond just I have gone to Edx and all that, and that is why we say OK, with this knowledge, go and practise on an industry level data platform, that anybody in the UK, Canada is also practising with and compete with them and that is where kaggle.com comes in.*

ED10, Founder/CEO Co-Creation Hub commented that:

> *…you know people want software developers, and a lot of the people who want software developers will never ask you whether you have a degree from the University of Ife or the University of Lagos. You know, all they want to know is what programming language do you know what projects have you worked on in the past.*

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ED8, MD Oracle Nigeria, had this to say:

> *...the reality is technology organisation, and Oracle is not excluded and is now building a new set of job functions that do not require a university degree. You could go through 12 weeks of intensive training. However, the criteria to pick those coming for interview and what you are being tested on is not your educational skills is really your cognitive skills is really testing your creative mind.*

4.2.5.3 International Competitiveness/Professionalism

There seems to be a significant global competition for highly skilled talent (Deloitte, 2018). This has triggered organisations to search internationally for talent, which has resulted in some young African talent working remotely. However, the remote talent has to have certain criteria. However, this has resulted in local companies having to compete for talent with the big global companies that can pay much more.

ED10, Founder/CEO Co-Creation Hub**,** stated that:

> *Companies that can afford to pay more means they have to do a lot more to keep the talent locally in Africa. But on top of that, these are companies that operate in countries where the welfare system is a lot better. You can get more for your money than you will get here in Nigeria or Africa, contrary to what people think. So, society in itself supports a better lifestyle. So, that makes it almost impossible for African companies to be able to compete. That also means that we now have to compete for talents with, say a good company, for instance, booking.com, which is probably one of the most profitable technology start-ups in Europe. So, imagine if you are an African technological company, and you are competing for talent with booking.com, I am not sure how much you have to offer to be honest to get the young people to pick you against booking.com, moving to Amsterdam to work for a couple of years.*

ED1, CTO MTN/ Founder DSN, re-emphasised how global organisations are looking for talent in African, thus influencing the acquisition of New-Collar Skills:

> *They check our model against global standard. We are better and yet cheaper, and more importantly. Every single profit we make goes back into training more kids. They gave us the second project; they gave us the third project. You know, so they are discussing the fourth project; we are just asking them to give us more time to prove ourselves on the second and third projects…. This thing is not rocket science. It's basic principle. If I can get boys who can study the same Cambridge, Oxford, or MIT videos every day, expose them to Kaggle, they can do any project anywhere in the world.*

4.2.5.4 Portfolio of Work

ED1 explained that most employers want to be able to evaluate your skills. So, they expect a portfolio of work. This obtains more in the software development and data science industry.

ED1, CTO MTN/ Founder DSN, noted that:

> *People must move from those old eras of countless certificates to tangible proof of what I would call portfolios. Portfolios – I have worked in this industry data set, and this is the model that I developed. Interestingly, even in traditional coding, there is a platform called GitHub.com, where you can have your codes also made publicly available so that people can go there and actually see your code, and that is a way of indexing you… anything we do that is our criteria: what is your Kaggle link? What is your GitHub that allows us to verify?*

4.2.5.5 Validation of Skills on Recognised Platforms

As mentioned above, employers want to be able to evaluate the skills. As testified by ED1, ED5, and ED10, there are internationally recognised platforms that will validate skills in the area of

software development and data science and other new-age skills. ED4 had an internal way of assessing skills.

ED4, CEO/Founder Sprints Egypt, asserted that:

> *We have three sources of evaluation. First are our customers; they evaluate after every project delivery. Second is the expert or the coach they evaluate the students based on their questions and the interaction that they had with them. Third, the students evaluate each other because there are group projects; so they evaluate each other. These three sources provide weekly feedback.*

ED1, CTO MTN/ Founder DSN, argued that:

> *So, anything we do that is our criteria. What is your Kaggle link? What is your GitHub that allows us to verify? So, for me, it requires you to go the extra mile. Certificates are not just enough; you must prove your skills; you must validate your skills set. And the path in doing that is quite complex and demanding.*

4.2.5.6 Proficiency in the English language

In some North African countries, like Egypt, Morocco and Tunisia, English is not the first language. There is the added requirement to show a proficiency in the English language to work, especially if working with clients remotely, as noted by ED4 and ED6.

ED4, CEO/Founder Sprints, argued that:

> *…you need to be very good in English language since you will be working with clients remotely and you need to have very good communication skills to know how to treat a customer and to know how to negotiate and be very focused and quality-oriented. There is no programme that focuses on this set of complete skills.*

This was reiterated by ED6, Regional Director, IBM Africa:

> *The language here in Morocco is a barrier to such services. These are more feasible for people who speak English because they are opportune to a larger customer space compared to Moroccans, who speak Arabic and French, which limits the opportunities, you know, for being a digital entrepreneur in this space.*

4.2.6 Employee and Corporate Motivation

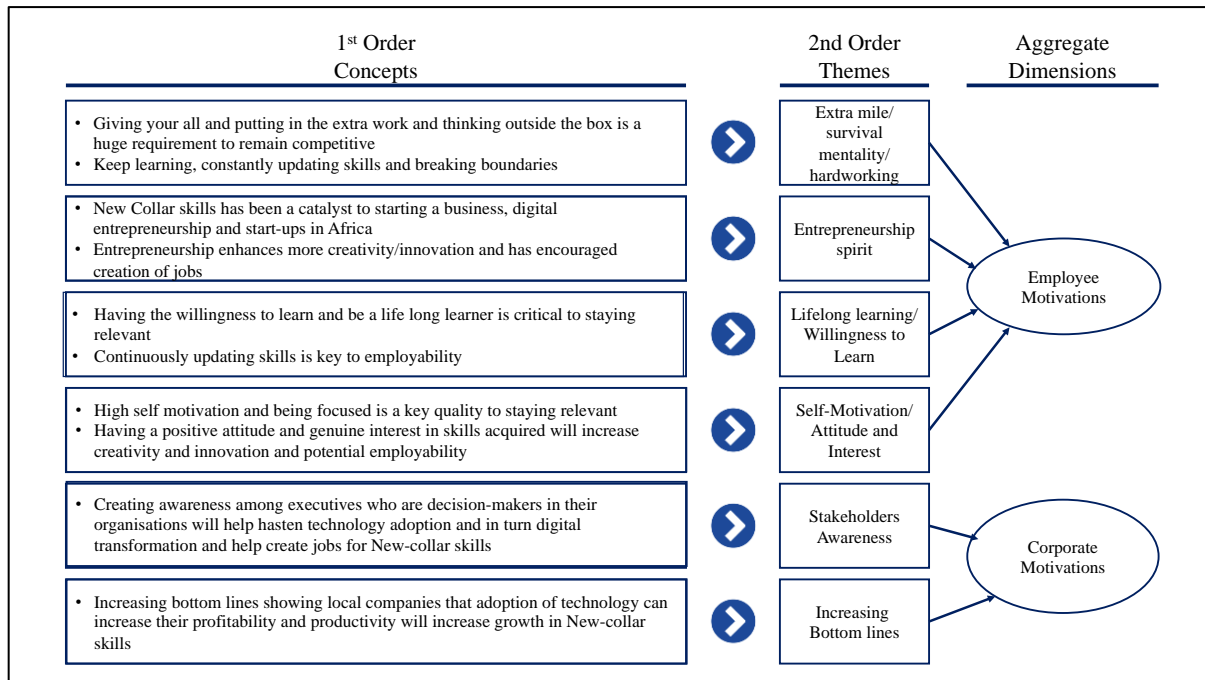This emerged as an outcome from both the participants of the intervention and the EDs

Figure 4.4: Employee and Corporate Motivations Dimension to New-collar skill

4.2.6.1 Extra-mile/Survival Mentality/Hardworking

Having the extra mile mentality toward learning and applying skills and acquiring a New-Collar job, is crucial to succeeding in this environment. According to ED1, this means having the right attitude, motivation, and drive. He calls this "extra-mile/survival mentality."

ED1, CTO MTN/ Founder DSN, asserted that:

I think our skills are driven by one extra thing, that's called survival. You know it is a different thing. There is a survival side to it, and that changes the way we learn; people almost like die there. At our hub, we just have this new policy that staff must leave there by eight o'clock. People work till 2 am because we have unlimited Internet. These guys are driven by if I do not do this, o boy, I will become poor, and things will get worse; so, that changes the quality of our work. And most people know that, if they fail, there are thousands of guys out there that will replace you.

He further noted that going that the extra mile does not mean certificates. What have you done to further your learning and knowledge, and how can this validate your knowledge and skills?

ED1 added that:

Anything we do that is our criteria. What is your Kaggle link? what is your GitHub that allows us to verify? It requires you to go the extra mile; certificates are not just enough; you must prove your skills; you must validate your skill set, and the path in doing that is quite complex and demanding.

4.2.6.2 Entrepreneurship Spirit

ED10, Founder/CEO Co-Creation Hub, asserted that:

The application of science and technology today is pervasive in every aspect of our life because everything is automated; everything is digital. There is a need for people who can actually do not just talk about it, compared to 30 years ago, where it was more analogue than digital. I think that is what is driving this. I think the implication is that the traditional form of education needs to evolve. I think globally, not just in Nigeria, even in the US, education needs to change. You find a few companies that are better because the entrepreneurship culture is quite strong, like the US; so, they can augment through their entrepreneurship ecosystem, but you find countries with weak entrepreneurship ecosystems

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4.2.6.2 Lifelong Learning/Willingness to Learn

The ability to be a lifelong learner and have a willingness to learn is essential, with the fast pace of changing technology in the Fourth Industrial Revolution. Some of the EDs commented on this.

ED5, Managing Director, Microsoft South Africa, noted that:

> *We believe all young people should have access to computer science and coding education so they can develop critical, computational-thinking, problem-solving, and employability skills. We want to create immersive and inclusive learning experiences that inspire lifelong learning.*

ED6, Regional Director IBM, Morocco Africa, had this to say:

> *P TECH is an education model where we try to bridge the gap between school and industry. It is also a model that helps a new generation of IT professionals' New-Collar jobs and the latest technologies. The aim is to teach these students how to work so that by the time they are on the job markets, they are already familiar with the industry, and they are already certified, which helps them find jobs easily even better. These are people who will be capable of continuously learning and improving their technical skills.*

ED10, Founder/CEO Co-Creation Hub, argued that:

> *I think what we look for is the ability to challenge oneself. The interest in doing innovative things, willingness to learn as well because we understand that, probably, almost all the people we hire for technical skills will not be at the optimum level of their skill. But it will be something for them to improve on their skill set. We are always conscious of the fact that all we need in, you know, technical people can-do attitude that ability to say every problem we can solve, which is the truth these days.*

4.2.6.3 Self-motivation/Attitude and Interest

Interest is an indication of a willingness to learn and will increase employability. ED4, CEO/Founder Sprints Egypt, commented that interest was a very vital part of employability as it indicates a willingness to learn and ability to problem-solve. He added that:

> *In general, we do not mandate the person to have previous experience. You do not have to have any skill related to software development or iOS development. But again, we want you to show that you are interested in the career and why you should be selected.*

ED10, Founder/CEO Co-Creation Hub also alluded to the fact that having a keen interest is also an important factor:

> *I think what we look for is the ability to challenge oneself. The interest in doing innovative things, willingness to learn as well because we understand that, probably, almost all the people we hire for technical skills will not be at the optimum level of their skill. But it will be something for them to improve on their skill set.*

This was also reiterated by ED1, CTO MTN/ Founder DSN:

> *You know, so those are some of the things that we have seen. We have seen a lot of self-motivated students who are going beyond the boundaries of learning to pick those right skills that are critical to their development. And we are lucky because a lot of them have been immediately compensated, you know, rewards, international projects freelancing for international companies, but these must become large scale if we really want to catalyse the desire and for the skill acquisition, going forward.*

Ability to motivate oneself to learn the skill and do whatever it takes to improve oneself was stressed by P4, from the NCS Workshop Intervention:

Yes, I actually studied Computer Science, but that was not where I got the skill because that was just mainly theoretical oriented and most were just like jargons; it does not really make sense, just want to cram, want to pass, and just get out of university. With the experience at IBM, we had the opportunity to do some hands-on, and after the training, there was a practical that really put us on our toes. It helped to know what it really means to have New-Collar Skill, and since then I began to do self-training and other opportunities to improve myself, which makes me what I am today.

P9, a participant from the intervention workshop, realised that the skills he learned at school were not enough as the market demanded additional skills. He was highly motivated and had a positive attitude towards learning. As a result, he was able to secure a job almost immediately. He noted that:

What motivated me is to find a place for myself and make my life better. In a country like Nigeria where there is unemployment everywhere, I was really afraid of when I finished having to join the queue of graduates searching for jobs; I felt there is something I need to do to prevent this. I started taking online courses and downloaded tutorial videos just to make something for myself even while I am still looking for jobs. So, with this motivation, I was able to understand that it is not really trying to get the 9-5 job that matters but actually making yourself relevant to having the necessary skills needed in the job market.

On the contrary, P13, another participant from the workshop intervention was not able to acquire the skill level required by further updating her skill level as P9 had done:

The major reason why I even came to IBM then was just to see it, I'm a beginner, I did not have, I am not into programming before. We were made to know that we need to have some basic knowledge before we now

embark on that programme. Hence, I was not able to capture enough

information that will be sufficient for me to take a job.

P7 expressed the view that she did not have that much interest in the skill of business intelligence; as a result, she did not develop herself further in this area but went on to explore other New-Collar Skills.

Ah no, business intelligence. I did not really get so enthusiastic about it

or so interested in it. It was just like my starting point so that I wanted to

explore some various aspects of New-Collar Skills that has to do with the

technology; so, for it was not what I wanted to go far with.

P8 admitted that she did not show enough motivation and was not proactive during and after the training:

I have mixed feelings… like I was talking about it with my husband two

weeks ago, and I felt like I wasted time on it... I felt demoralised when I

did not get a job. I do not have a system; I do not have the tool, which is

the Cognos, I do not have it.

4.2.6.4 Corporate Motivation

Corporate motivation was also identified as a theme that could influence the acquisition of New-Collar Skills; it involved stakeholder awareness and increasing bottom lines.

4.2.6.5 Stakeholder Awareness

All stakeholders need to have keen awareness of digital transformation and the skills required. These stakeholders include government, corporate organisations, and potential employees. Creating awareness among executives who are decision-makers in their organisations will help hasten technology adoption and, in turn, digital transformation, and help create jobs for NCSs. As observed by ED1 and ED2, this is a critical factor influencing the acquisition of New-Collar Skills in Africa.

ED1, CTO MTN/ Founder DSN, highlighted this point:

It is one of our greatest success by driving awareness from both the

demand side and supply side, getting industry leaders to understand what

AI is and how it can catalyse business success and productivity. We organise artificial intelligence for executives where we bring some of the world's top-class experts to come to Nigeria to teach.

The awareness on the part of potential employees would eventually result in acquiring New-Collar Skills to power the digital transformation. This was reiterated by a number of the participants that attended the New-Collar Skills workshop.

P10 had this to say:

Whoa! It helped me a lot. You know, up until then, I could not grade my CV on what exactly I wanted. So, the training was a foundation for me, and I was able to find my strength and my career path. I was able to make some important decisions for myself in my career. The training was very important to me; it was an eye-opener because it was through the training I got to know the new-age courses that are around and how I could try to fit into one of them so that I can be relevant in the nearest future in terms of profession.

4.2.6.6 Increasing bottom lines

ED1, CTO MTN/ Founder DSN, asserted that organisations had to be aware of the benefits of automation and digital transformation to their organisations and ways in which it could help increase their bottom lines and increase productivity.

I mentioned we are doing a lot on along the supply side; nobody is talking about demand … guys who are making decisions must be able to understand how AI can be linked into their bottom line. One per cent incremental use of AI can reduce my cost of operations by 50%, increase my revenue by 5%, increase my efficiency by 3%. And with this, I can drive my productivity by x%, which means that even the organisation that is doing these training must also include that in their delivery model: how do we create the learning system for big organisations?

4.2.7 Country-level Influences

The theme country-level influences emerged as a catalyst for each African country's role in fostering development by encouraging digital transformation, which will lead to the need to acquire New-Collar Skills.
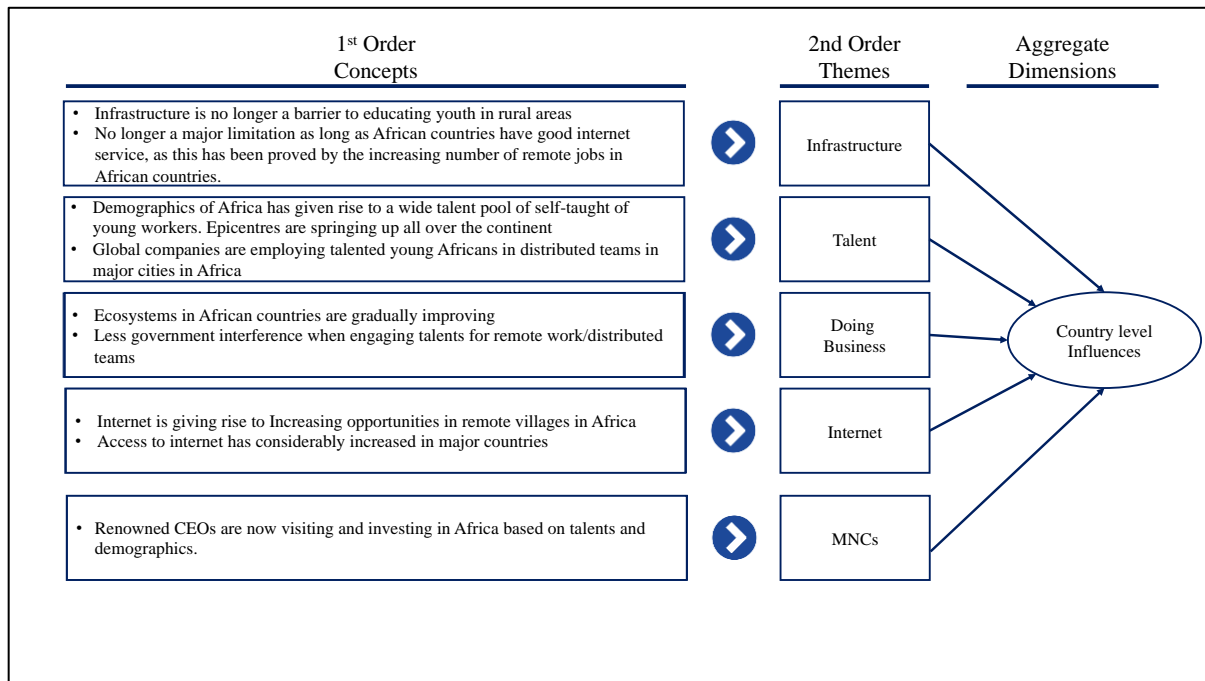

Figure 4.5: Country-level Influences Dimension to New-Collar Skills

4.2.7.1 Infrastructure

The EDs observed that infrastructure is a major factor when considering investing in Africa. However, they noted with better internet services; infrastructure may no longer be a major barrier.

ED10, Founder/CEO Co-Creation Hub, noted that Rwanda had good infrastructure quite attractive for investment, especially since the government was supportive of the technology industry. This was in contrast to Nigeria, although Kenya was slightly better:

> *Rwanda is quite different, calm, and everything works, but for instance, the Internet there is more expensive than the Internet in Nairobi or Lagos. In terms of infrastructure, you know what you get, you know the terms for renting offices is straightforward; Internet is expensive.*

However, it is not the greatest of the Internet. You know things that make life easier for your employee, like hospitals; they can find it easily. For you as a company is not sure how to interpret that. if you compare it to Lagos well, the biggest thing in Lagos will be the fact that things can change; authorities can come to your door and ask for things that you are not aware. Electricity is the biggest in Nigeria. People literally know how to project on that and accommodate in their spending. In Kenya, for instance, I think Kenya is just slightly better than Nigeria.

ED2, Executive Director, MEST Ghana, however, argued that infrastructure should no longer be seen as a barrier in Africa, as the Internet is breaking down these barriers, especially in the area of education.

This is no longer a major limitation as long as these African countries have strong Internet service, as this has been proved by the increasing number of remote jobs in African countries.

4.2.7.2 Talent

There has been an increase in interest in African talent, especially when looking at the continent's demography as having the youngest population in the world (Techpoint, 2019). This is a significant factor influencing the acquisition of New-Collar Skills in Africa, as attested to by ED10, ED1, ED2, ED3, and ED5.

ED10, Founder/CEO Co-Creation Hub, remarked that:

Nigeria, for instance, you find raw talent, a lot of people that are willing to learn but also willing to take advantage of opportunities. These are literally just people who know that there is an opportunity in technical skills, and they want to be part of it. The education system is not supported. In Kenya, for instance, you find that the education system is slightly better than Nigeria; they have a few universities that are quite strong in technical skills. There is a bit of talent, but it is not as big as

Nigeria. We have a bigger pool in Nigeria, and the attitude in Nigeria is quite strong and aggressive. You find a lot of young people that are willing to learn without letting their limitations get in the way. There is a bit of quality in Kenya, but the pool is limited and not enough. There are also lots of foreign companies in Kenya; this makes competition a bit tougher. Rwanda is a totally different case, because Rwanda is just coming out of what they have been through; it is taking a while for them to rejig the education system, and again it is a small country.

In relation to talent, MNCs are investing in epicentres across the continent. ED3, MD, Microsoft South Africa, commented on Microsoft's investment in this regard:

Today, the 4Afrika Initiative continues to develop skills across the continent and has upskilled some 1.6 million Africans to date. There are currently 19 active AppFactories, now known as Skills Labs, across the continent, in countries including Kenya, Nigeria, Malawi, Mauritius, Ghana, Botswana, Rwanda, South Africa, Ethiopia, and Egypt.

ED9, Vice President, Global Operations Andela, that has investment in six African countries providing talent for USA, Canada, Germany, and South Africa and other advanced countries, averred that there were competitive talent in Egypt, Nigeria, Kenya, and Ghana. However, the size of Nigeria made it more attractive, Egypt having more experienced engineers but lacking the same proficiency in English as countries like Nigeria and Ghana.

Talent-wise, Nigeria, and Kenya have the pool of the strongest talent we have seen so far after Egypt, but I think Nigeria and Egypt are at par talent-wise. However, considering the language, Nigeria has the English part of it, which even in Egypt you find a lot of them do not speak as great English as in Nigeria. I think in terms of integrating with customers that Nigerians integrate well.

4.2.7.3 Doing Business

This is another key consideration that has influenced acquisition of New-Collar Skills. Africa is a strong ecosystem, as a number of investors and venture capitalists are beginning to invest in start-ups in Africa, as noted by ED10, Founder/CEO Co-Creation Hub:

> *The reason why I would do business in Kenya is because the ecosystem is stronger. It is the entry point into Africa for most organisations, so you find that, almost all the top organisations in the world with interest in sub-Saharan Africa, they have a presence in Nairobi. So, that will be the attraction…. What is also quite interesting in Kenya is that foreigners also feel comfortable coming in to set up their own business; so you find a lot of foreign technology start-ups there in Kenya.*

ED9, Vice President, Global Operations Andela, said, despite Nigeria's reputation, it had been favourable for business, talent-wise with fewer government regulations:

> *Nigeria is actually quite evolved, and when it comes to something like technology, the biggest issue with Nigeria is the issue with the government when you are building infrastructure. But when you are putting people in an office, and nobody knows exactly what you are doing in there, you actually find a lot of things are available in Nigeria in the private sector. I think Nigeria is also very commercial; So, people understand; like these people training are trying to get the money. It is more like a lot of needs that you will have a business like us somebody in Nigeria could not…. So I think we found, I think, the Lagos framework here it's more around employment; more it's actually favourable for companies, you know. in a place like Kenya, they make things a little bit more complex. Sometimes, it is really hard to terminate employees in Kenya. For example, if an employee is not performing well, you want to terminate them; it could become very complex in Kenya. Nigeria is more than most similar to I think the US.*

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4.2.7.4 Access to the Internet

The Internet is increasing opportunities available to the remote corners of Africa, to villages, not just to urban cities, with the availability of online learning increasing opportunities for remote work. This is a factor influencing the acquisition of New-Collar Skills in Africa. This was the point made by ED2, Executive Director, MEST Ghana:

> *There is also an opportunity in rural areas because, with the Fourth Industrial Revolution, there is actually little infrastructure that is required. All that is needed is a good Internet service, and this is more and more the case now in I can say Sub Saharan Africa. In my town in Ilesha, which is very much rural, the Internet service there is very good.*

4.2.7.5 Multinational Corporations

Another theme that emerged is MNCs. According to some of the EDs, many renowned company CEOs of multinational corporations have started showing interest and visiting the continent to make investment decisions. These include Mark Zuckerberg, Jack Ma, and Jack Dorsey of Twitter.

ED2, Executive Director, MEST Ghana, noted that:

> *There is a lot of interest now being shown by international organisations in Africa looking for skills and looking for resources, especially around technology. And I will give you a few examples. Jack Dorsey was in Ghana and Nigeria recently and basically to scout and see what is possible, what opportunities we have. There is talk that he is actually interested in Africa because of his digital currency program that he is planning to launch. Jack Ma of Ali Baba recently visited Ghana, and I think a few other African countries. Again, he is showing interest in developing the start-up ecosystem as part of their exchange programme, economic exchange programme between China and Africa. These two are coming in the heels of Mark Zuckerberg's visit. We can see what has*

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happened: the company Mark Zuckerberg adopted, Andela, has raised in two years over 200 million dollars. And over the past two months, about three companies in Nigeria, they are Fintech companies, Interswitch, Opay and Palmpay, raised over 200 million dollars as well in the past three months in investment. There is a huge opportunity to be created by the interest of the international community in Africa.

4.2.8   Characteristics of New-Collar Skills

The characteristics of New-Collar Skills also emerged as a theme that influences acquisition of New-Collar Skills in Africa. This data structure will be used as a conceptual framework to develop and define the concept in Chapter 5.
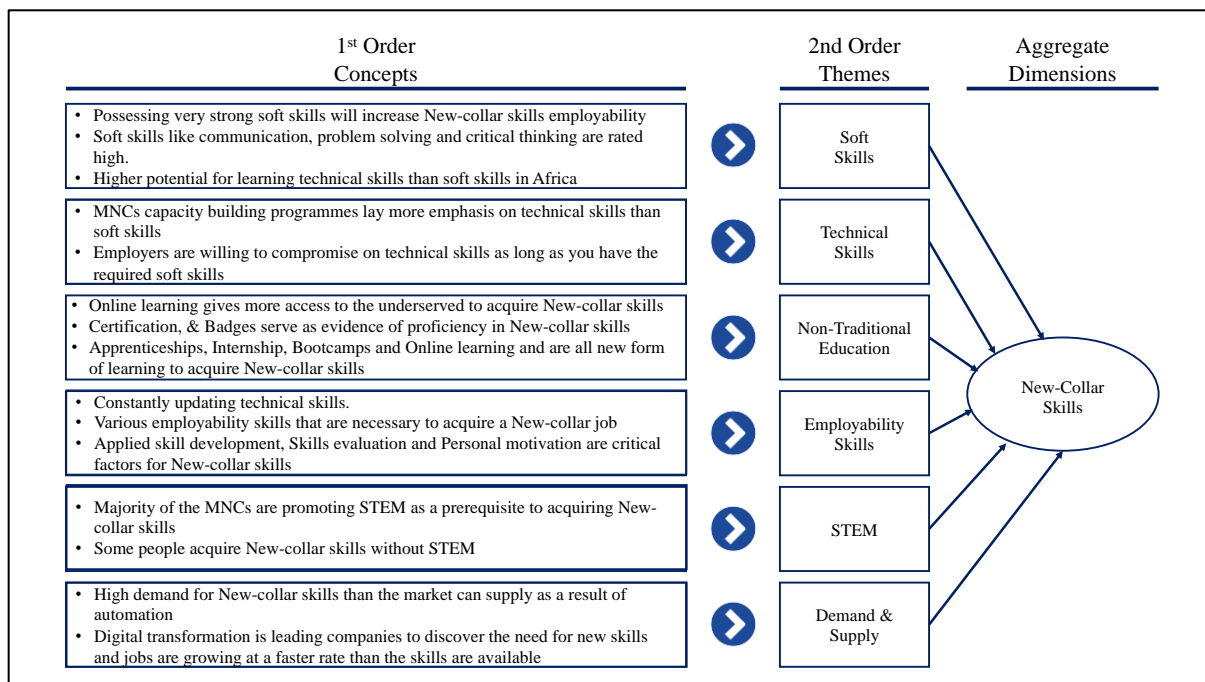

Figure 4.6: Characteristics of New-Collar Skills Dimension

4.2.8.1 Soft Skills

Soft skills came up repeatedly both from the participants of the New-Collar Skills workshop and the EDs of the organisations as one of the critical skills needed for employment and which makes it a major factor influencing the acquisition of New-Collar Skills. Some EDs remarked that the

skill could even be more essential than technical skills. It was pointed out by ED4 that technical skills can be easily improved upon once hired, which is not the case with soft skills.

ED4, CEO/Founder, Sprints Egypt, had a long list of soft skills they require before selecting candidates:

> *No matter what the field is, when someone has the technical skills, and they have very strong soft skills, they are typically more employable. So now, let us focus on the technical skills within this new age regional area, the real reason why I think people are more employable is because of demand and supply.*

In the opinion of ED7, Co-Founder, Angel Africa List and Chanzo Capital, soft skills are more important than even now because of the existence of distributed global teams. The need to interact and communicate with diverse people all over the world makes good soft skills very critical and a great determinant when hiring. This makes it a huge influencing factor when acquiring New-Collar Skills.

ED7, Co-Founder, Angel Africa List and Chanzo Capital, added that:

> *You also need a lot of soft skills. Because you want to have guys that are dedicated and are hardworking, they are willing to learn, honest, passionate, resilient, can communicate, can interact, they are team players, you know those soft skills are even more critical. Because like you cannot write a software program alone – yes, you can do it, but it is much harder, and, in most companies, you work within a team, so you must be a team player. In our world, the hard skills are important, but the soft skills are equally important.*

Quite a number of MNCs run huge capacity-building programmes in technical skills for their products in Africa but do not particularly focus on the soft skills, which becomes a huge problem for employability. All the participants below confirmed that, when they were looking for a job,

armed with what they considered they had (complete New-Collar Skills), what held them back or made the difference for them being employable or not was their proficiency in soft skills. It is crucial for employability, no matter how good you are in technical skills. This was noted by the participants from the workshop intervention, as represented by P2, P4, and P17.

P2 also reiterated how valuable soft skills are to New-Collar Skills:

> *The fact that during my interview, my line supervisor later told me about how I sold myself, how I was able to sell myself was because of the New-Collar Skills training that I got, like being able to communicate clearly, having strong EI (Emotional Intelligence), being humble about how you express yourself. So, those particular skills were soft skills, was actually the joker.*

P4 agreed with the previous participant regarding soft skills:

> *Aah, the truth of the matter is you cannot give what you do not have. Our university is not programmed to supply these skills. So, if you are not exposed to soft skills and other technical skills needed, you will be useless in the industry, and that is a simple truth. So, basically, having a degree is not enough; it is not enough.*

P17 also emphasized the importance of soft skills with New-Collar Skills when acquiring a job:

> So first, the current job is on, I was able to get in primarily through the soft skills, which was what I was expected initially, and because of the learning in BI and data analytics, I was able to get in. Without that, I would not have been able to get the current job function I'm working on now.

ED7, Co-Founder, Angel Africa List and Chanzo Capital, raised the issue of the need for our academic institutions to teach soft skills:

> *Yeah, correct. So in some sense, you will say soft skills are much more important, but that raises the question…. Does our academic institution teach soft skills? No, most of them do not. And you noticed that a lot of*

guys that are getting these soft skills are either learnt at home through family friends, and then they begin to realize that, oh, so this is how this industry works, you know, so they now have to be learning it by doing, and those that do not have are really struggling.

4.2.8.2 Technical Skills

Naturally, technical skills emerged as a theme under New-Collar Skills. There are quite a number of technical skills from emerging technologies. However, surprisingly, even though technical skills are the bedrock of New-Collar Skills. Some EDs interviewed expressed the preference for very strong soft skills over technical skills, as job seekers would still be given some sort of training at the entry-level. However, the emphasis is on being able to practically apply and validate technical skills, especially if they are not entry-level skills.

No matter what the field is, when someone has the technical skills, and they have very strong soft skills, they are typically more employable. So now, let us focus on the technical skills within this new age digital era. The real reason why I think people are more employable is because of demand and supply. These are a new industry; companies are just beginning to discover the need for the skills, and so there are going to be jobs; jobs are growing at a fast pace compared to how many talented people are growing at that space.

4.2.8.3 STEM

Similarly, STEM became an emergent theme with New-Collar Skills. It has been observed in the literature that there is a higher need for STEM skills for 21st-century jobs. Africans need to increase the number of students studying STEM subjects. The MNCs recognise the fact that if they are to scale up training, they have to work with the government, specifically the Ministry of Education, and consider the possibility of aligning the curriculum.

ED6, Regional Director, IBM Africa, observed that:

...we have worked with the Ministry of Education and specifically to the P TECH program, which is a pathway in technology to help students develop IT and STEM skills for finding New-Collar jobs and 21st-century jobs.

This theme aligns with the findings of the logit model and the cross-tabulation in Tables 4.1 to Table 4.6

4.2.8.4 Non-traditional Education

Non-traditional education was also a theme of New-Collar Skills as a result of the participants looking for alternative training to the traditional route of university degrees to acquire employable skills. It refers to the non-conventional way of obtaining skills outside the university system. Many of the respondents commented that boot camps, internships, and apprenticeships were more suited for acquiring New-Collar Skills. (Refer to Market-driven Education, Boot camps, Apprenticeships).

4.2.8.5 Employability

Employability is an essential aspect of New-Collar Skills. Many of the respondents argued that for job seekers to be employable in the New-Collar space, they should possess certain qualities. There are employability qualities that emerged from the data on the qualities a New-Collar job seeker needs to have, to increase their chances of being employed after acquiring New-Collar Skills. These characteristics are discussed below and used to develop the New-Collar Employability Quotient.

In conclusion: Assessing the Factors That Determine the Acquisition of New-Collar Skills in Africa

With regard to the factors that determine the acquisition of New-Collar Skills in Africa**,** certain issues were identified. First, access to the Internet, having an adequate source of power (electricity supply), personal computer, and awareness of the concept of New-Collar Skills are all factors that will influence the acquisition of NCS. Second, STEM is an advantage but not required. The quantitative data indicated that this was significant; however, the qualitative data

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seemed to contradict this, as P7 and P4 argued that interest was more important, as they did not do a STEM-related degree but were successful in acquiring New-Collar jobs almost immediately after the workshop. Third, market-driven education is also important. Skills that are in demand by the market (industry) will create interest in acquiring NCS. However, there must be clear interest, strong motivation, and willingness to learn, and the ability to apply the skills; there is the need to have a high New-Collar Employability Quotient (see Figure 1). The fourth is government-driven digital transformation. There are external factors that are the responsibility of the government, notably national agenda and collaboration. Fifth, at the country level, other factors include regulations about doing business, adequate Internet connection, and infrastructure. Other factors include global competition for applied skills, and corporate and employee motivation.

4.3   Assessment of the Effects of New-Collar Skills on Employability in Africa

In order to assess the effect of New-Collar Skills on employability in Africa, the logit model was deployed, using the New-Collar Skills data set and the open survey data set.

As specified earlier, each of these models was examined in terms of the following:

i.   Overall Model
ii.   Marginal effect of the individual predictor on odds ratios.

The results for each of the two data sets are presented in Table 4.7.

Table 4.7: Estimation of the Effects of New-Collar Skills on Employability in Africa using the Logit Model

	New-Collar Skills Dataset (Obs=976)			Open Survey Dataset (Obs=1,368)		
Exogenous Variables	Odds Ratio	Coef.	P>z	Odds Ratio	Coef.	P>z
Age	1.008947	0.008907	0.602	-	-	-
Gender	1.104687	0.099562	0.502	0.975316	-0.02499	0.831
HDParent	1.220564	0.199313	0.206	1.256503	0.228333	0.061*
STEM	0.996715	-0.00329	0.982	0.981653	-0.01852	0.892

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Gradyr	1.119071	0.112499	0.000***	1.037276	0.036598	0.102
AccessWeb	1.053163	0.051798	0.172	1.583384	0.459564	0.002***
AccessPC	1.398991	0.335751	0.086*	1.583384	0.459564	0.002***
Accesspwr	1.099421	0.094784	0.003***	-	-	-
AwareNCS	0.727733	-0.31782	0.053*	0.970241	-0.03021	0.837
HaveNCS	2.591214	0.952126	0.000***	1.780134	0.576689	0.000***
AwareOO	0.789504	-0.23635	0.245	1.028574	0.028173	0.837
Mentorship	-	-	-	1.549158	0.437712	0.02**
EngageOO	0.909955	-0.09436	0.556	-	-	-
AwareDE	1.436533	0.362233	0.046**	-	-	-
EngageDE	1.103312	0.098317	0.554	-	-	-
IBM	1.043891	0.042956	0.833	1.241146	0.216035	0.22
_cons	0.108646	-2.21966	0.000	0.460926	-0.77452	0.001
	LR chi2(15) = 131.53			LR chi2(10) = 62.29		
	Prob > chi2 = 0.000			Prob > chi2 = 0		
	Log likelihood = -597.57418			Log likelihood = -895.56023		
	Pseudo R2 = 0.0991			Pseudo R2 = 0.0336		

Overall Model: The goodness-of-fit test, Chi-square ($\chi2 = 131.53$) with p-value (0.000), indicated that the model was appropriate for the data.

Marginal effect of the individual predictor on odds ratios: Table 4.7 provides odds ratio and significance level for testing the hypothesized relationships. The result (Table 4.7) showed that, among the two groups of respondents, possessing New-Collar Skills, STEM, access web, employment, and awareness of New-Collar Skills are major factors influencing the chances of securing employment in the studied areas. Other factors, given by both data sets are years of graduation, access to the web, PC, power, awareness of digital entrepreneurship, and participating in the mentorship programme. The results showed that the odds ratio of someone who possesses New-Collar Skills securing employment in Africa is higher by at least 1.78 units than someone who does not have such skills.

4.3.1   Test of Hypothesis:

Ho: New-Collar Skills has no significant effect on employability in Africa.

H_1:   New-Collar Skills have a significant effect on employability in Africa.

The results indicated that New-Collar Skills had a significant effect on employability in Africa. Therefore, the null hypothesis was rejected, and the alternative hypothesis was accepted.

4.3.2   New-Collar Skills Data set

4.3.2.1 Employment Status

The sample population from the New-Collar Skills data set were all participants of the ASI and, as a result, had acquired New-Collar Skills. A total of 62% of the participants in the ten participating countries were employed. This implies that New-Collar Skills had a positive effect on employability in Africa.
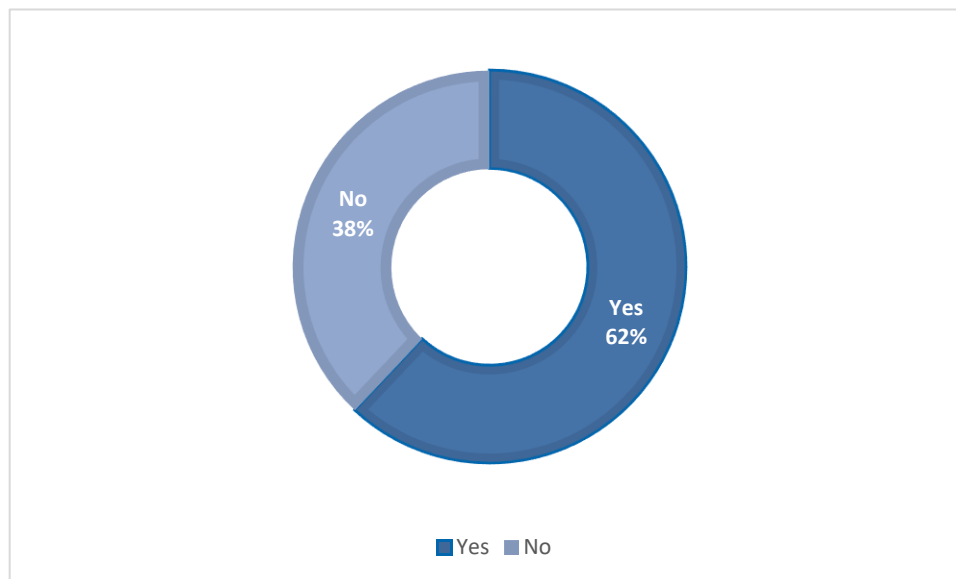

Figure 4.7: Employment Status of Respondents (New-Collar Data set)

4.3.2.2 Employment in 10 African Countries

As revealed in Table 4.8, all the countries, except Nigeria and South Africa, had over 50% of the graduates employed with New-Collar Skills, while both countries appeared to be lagging behind, with 50% and 52%, respectively. Tunisia, Ghana, and Kenya had the highest employment of New-Collar Skills graduate, with 66%, 65%, and 64%, respectively. Rwanda, Mauritius, and

Ethiopia were not rated, even though their New-Collar Skills graduate had high employability. This was because the sample sizes were not significant enough to compare with the other countries. South Africa and Nigeria, the largest economies in Africa, both had a high unemployment rate of 27.33% and 23.1%, respectively. This may account for the low New-Collar Skills unemployability rate of the graduates. At the same time, Ghana and Kenya had the lowest unemployability rate and the highest graduates employed with New-Collar Skills.

Table 4.8: New-Collar Skills Employability in 10 African Countries

Country	Sample Size	Gender	Working	Working with NCS	Engage OO	Unemployment Rate
Kenya	118	M 75%	64%	71%	77%	9.2%
		F 25%				
Nigeria	106	M 82%	50%	55%	53%	23.1%
		F 18%				
Ghana	85	M 68%	65%	52%	45%	6.63%
		F 32%				
Egypt	83	M 63%	62%	52%	37%	11.44%
		F 37%				
Tunisia	96	M 45%	66%	52%	45%	15.48%
		F 55%				
Morocco	87	M 63%	57%	59%	54%	9.04%
		F 37%				
South Africa	120	M 77%	52%	55%	33%	27.33%
		F 23%				
Rwanda	19	M 63%	74%	61%	61%	0.95%
		F 37%				
Mauritius	22	M 64%	62%	57%	33%	6.9%
		F 36%				
Ethiopia	11	M 91%	82%	91%	55%	1.81%
		F 9%				

Kenya, Morocco, Nigeria, South Africa all had more graduates working with New-Collar Skills than the other countries.

4.3.2.3 New-Collar Skills Data set – Cross-tabulation

Table 4.9: New-Collar Skills vs. New-Collar Skills Training Sufficient to Acquire a Job

Using New-Collar Skills vs. New-Collar Skills Training Sufficient to Acquire a Job

	Total	No	Yes
Total Count	499	221	278
No	204	119	85
Yes	295	102	193
No	40.9%	53.8%	30.6%
Yes	59.1%	46.2%	69.4%
Overall Stat Test	**0.00000**		

In Table 4.9, using New-Collar Skills was cross-tabulated with New-Collar Skills training sufficient to acquire a job, and shown to be highly significant, with a p-value of 0.00000. Nearly 70% of the employed respondents affirmed that the New-Collar Skills acquired from the IBM training were sufficient and instrumental to their employment. Table 4.10 shows seven of the countries, with Kenya, Egypt, Ghana, and Tunisia significant, with p values of 0.00055, 0.00674, 0.03860, and 0.04938, respectively. This shows that in these four countries, New-Collar Skills training was sufficient to acquire employment.

Table 4.10: New-Collar Skills vs. New-Collar Skills Training Sufficient to Acquire a Job

Country	Overall Stat Test	Training sufficient/Using NCS	Training sufficient/Not Using NCS	Significant
South Africa	0.15000	65%	48%	No

Kenya	0.00055	73%	38%	Yes
Egypt	0.00674	73%	37%	Yes
Nigeria	0.38894	58%	49%	No
Morocco	0.68434	55%	45%	No
Ghana	0.03860	62%	37%	Yes
Tunisia	0.04938	57%	42%	Yes

Table 4.11: Reasons for Unemployment

Reasons for Being Unemployed

	%	Count
Salary Too Low	3.23%	9
Lack of Required Skills and Knowledge	4.66%	13
Economic Recession	2.15%	6
Cannot find the Right Job	18.64%	52
Do not have Enough Experience	19.71%	55
Further Studies	29.74%	83
Housewife	0.36%	1
Applied and Rejected Numerous Times	13.62%	38
Other	7.89%	22
Total	100%	279

Table 4.11 identifies reasons for the participants' unemployment. They did not have enough experience or could not find the right job. This suggests that there are other factors or other qualities one has to have to increase employability (see NCEmQ).

4.3.2.4 New-Collar Skills Training Vs. Employment

Although New-Collar Skills led to about 60% of the participants being employed. It is clear that engaging in certain New-Collar Skills would give a much higher chance of being employed than others. As shown in Figure 4.8 below, more than 50% of the trainees were employed in the

following skills: big-data development, mobile app development, and application security. This is probably due to the market demand for these skills in that particular country or region.
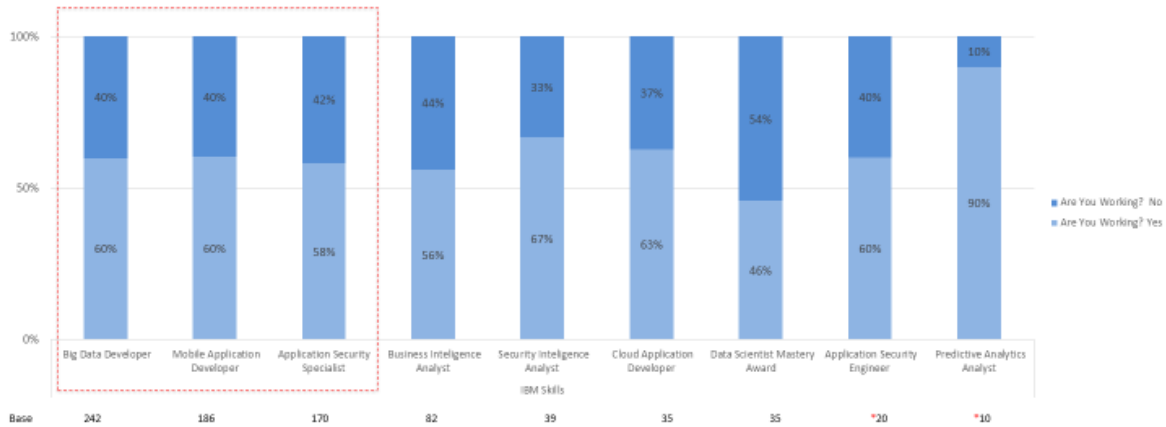

Figure 4.8: New-Collar Skills Data set – Training in 10 Countries

The findings, in Figure 4.8, showed that, even though 59% of the respondents noted that the training was sufficient to acquire a job, the participants believed that there were areas for improvement. The majority thought that they would have had a much higher chance of being employed if they had an opportunity to engage in the more practical application of the skills during the training.
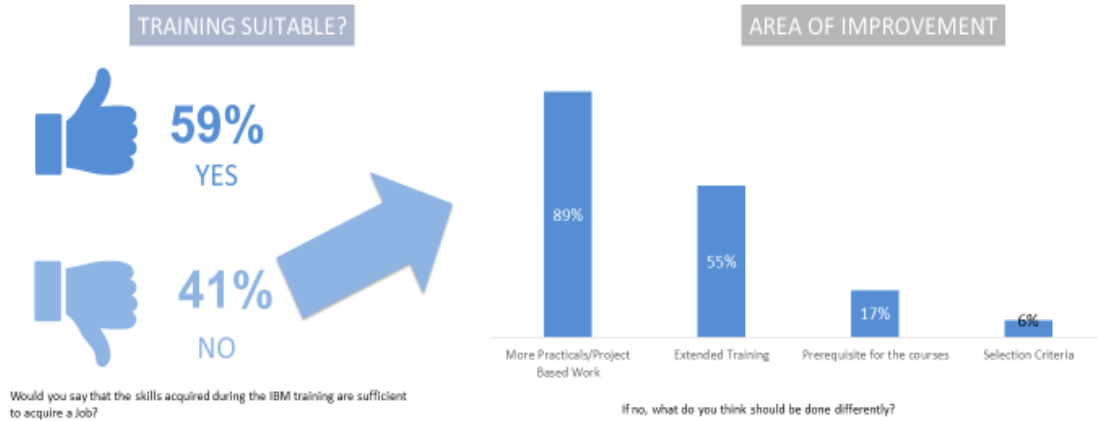
Figure 4.9: Suitability of Training in 10 African Countries

4.3.3 Open Survey Data set

The sample population from the above data set were all respondents from the Jobberman database survey. They had new -collar skills and 57% were employed.
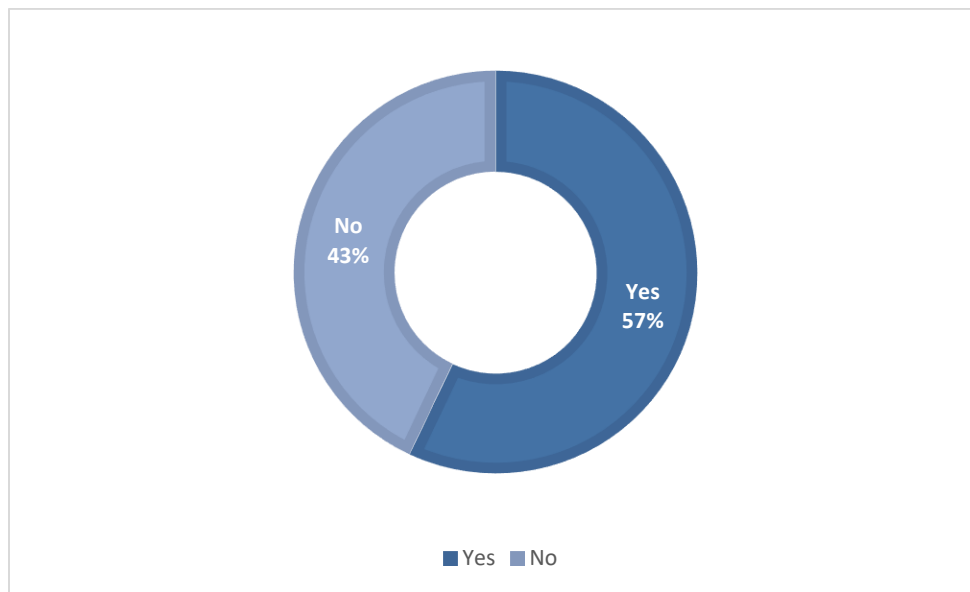

Figure 4.10: Employment Status of the Respondents (Open Survey Data set)

4.3.3.1 Open Survey Data set –Cross-tabulation

Table 4.12: Working vs. Using New-Collar Skills

Working vs. Using New-Collar Skills			
	Total	No	Yes
Total Count	816	486	330
No	348	257	91
Yes	468	229	239
No	42.6%	52.9%	27.6%
Yes	57.4%	47.1%	72.4%
Overall Stat Test	**0.00000**		
	Ghana	**Nigeria**	**Kenya**
Working	Yes 62%	Yes 53%	Yes 62%
	No 38%	No 47%	No 38%
Working with New-Collar Skills	Yes 63%	Yes 35%	Yes 52%
	No 37%	No 65%	No 48%
Overall Stat Test	**0.00156**	**0.00001**	**0.00061**

In Table 4.12, "Are you working?" was cross-tabulated with "using New-Collar Skills, and shown to be highly significant, with a p-value of 0.00000. in addition, 72% of the respondents who were currently working had New-Collar Skills compared to just 47% of the respondents who were working and did not have New-Collar Skills. Similarly, only 28% of the respondents who had New-Collar Skills were not currently employed, in comparison to 53% who did not have New-Collar Skills and were unemployed.

Kenya and Ghana had over 60% employed graduates working with New-Collar Skills, while Nigeria had just over 50%; however, they all had significant p-value: 0.00061, 0.00156, and 0.00001, respectively.

4.3.4   Intervention: New-Collar Skills Workshop Data set

Table 4.13: Status of New-Workshop Participants

	Baseline Survey	After 9 Months	After 15 Months
Employment Status	0%	57%	67%
NCS at work	0%	73%	66%
NCS sufficient for work	65%	57%	-

Table 4.13 shows the progression of the participants after New-Collar Skills training. After nine months, 57% of the 60 participants had succeeded in acquiring a job, and this increased to 67% after 15 months. The table also depicts that 73% of the participants were using New-Collar Skills at their workplace after nine months; however, this dropped to 66% after 15 months. This decrease could be explained by some of the participants opting for further studies or being self-employed. At the beginning of the survey, 65% of the participants acknowledged the fact that New-Collar Skills training was sufficient to acquire a job. However, that percentage dropped to 57% after nine months. Further investigation from the 17 participants that were interviewed revealed that there were other employability qualities a job seeker needs to possess to acquire a New-Collar job (See Employability Quotient).

Table 4.14: Reason for Unemployment

	Answer	Baseline Survey	9 Months	15 Months
1	Salary Too Low	12.50%	0%	-
2	Lack of Required Skills and Knowledge	12.50%	11.54%	17.64%
3	Economic Recession	25.00%	0%	5.88%

4	Cannot find the Right Job	3.13%	38.46%	23.52%
5	Do not have Enough Experience	6.25%	19.2%	17.64%
6	Further Studies	15.63%	15.38%	23.52%
7	Applied and Rejected Numerous Times	6.25%	3.85%	11.76%
8	NYSC	12.50%	-	-
9	Other	6.25%	11.5%	-
	Total	100%	100%	100%

Table 4.14 shows the participants' responses to reasons for unemployment after 9 and 15 months. The main reason given for unemployment was that the participants could not find the right job. This was closely followed by the participants opting to go for further studies.

4.3.5   In-depth interviews
1. **Participants of the New-Collar Skills Workshop**
2. **Corporate Executives**

4.3.5.1 Effects of New-Collar Skills on Employability
The effects of New-Collar Skills emerged as an aggregate dimension with six second-order themes.
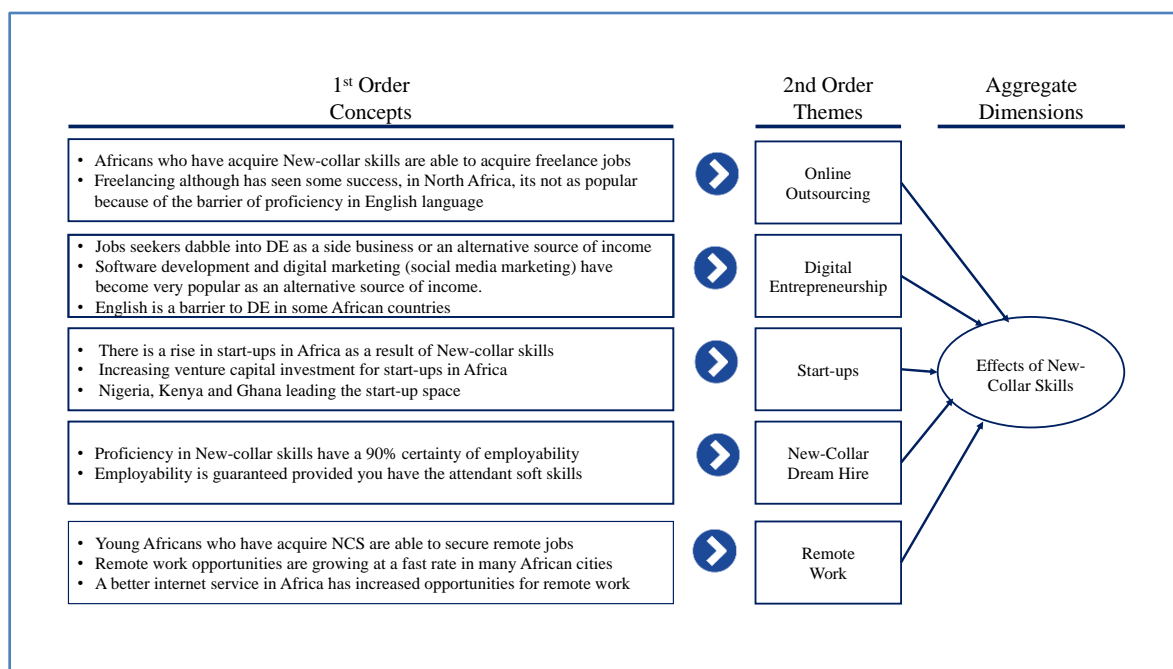
Figure 4.11: Effects of New-Collar Skills Dimension

4.3.5.2 Remote jobs

A number of young Africans who have acquired New-Collar Skills can secure remote jobs. This is one of the effects of New-Collar Skills, as noted by ED2, Executive Director, MEST Ghana:

> *I think the opportunity for African skills is coming from the deficit in skills in advanced countries. We are seeing a lot of people now working remotely from Nigeria, from Ghana, working for companies in Germany, companies in the US, in Canada, from their bedrooms, or co-working spaces. So, the opportunities are there. I believe they may not be absorbed only by local companies. I think, in fact, much more they would be absorbed by companies in the advanced countries. But in another 4-6 years, the local companies will also be forced to transform, and then the opportunity to source them locally will come up.*

ED2, Executive Director, MEST Ghana, remarked thus:

> *Yes, 100 per cent. I have met people here in Ghana, people who are working or have worked for companies in the Western world while sitting here. The remote work opportunity market is big now and getting bigger.*

Local companies are losing their highly skilled workers to companies like booking.com and cannot compete, because of better pay and incentives.

Similarly, ED10, Founder/CEO Co-Creation Hub, argued that:

> *Companies that can afford to pay more, you know, which means they have to do a lot more to keep the talent locally in Africa. But on top of that as well, these are companies that operate in countries where the welfare system is a lot better. You can get more for your money than you will get here in Nigeria or Africa, contrary to what people think. Society in itself supports a better lifestyle. So, that makes it almost impossible for Africa companies to be able to compete…. Imagine if you are an African technological company and you are competing for talent with*

booking.com, I'm not sure how much you have to offer to be honest to get the young people to pick you as against booking.com moving to Amsterdam to work for some couple of years.

According to him, there is a whole lot of remote work opportunities if a candidate fits the requirements of New-Collar Skills.

Absolutely. We do not even have enough engineers; not enough people have a background in digital skills that are required. Only a few and out of these few, some are not good enough. But the competition is so fierce that even a lot of these companies do not mind taking in junior engineers, junior digital people and then try to train them to become what they want. We just do not have enough people in that space that can mop out the opportunity.

4.3.5.3 Dream Hire

The participants from the New-Collar Intervention Workshop noted that NCS training and having ticked some of the boxes in the employability test (Employability Quotient) enabled them to succeed in acquiring a job. P4 indicated that:

Yes, it has, because for me, having attended university to study Computer Science and not being able to write software, but with the New-Collar Skill training at IBM, it gave me that push and I did some other self-development training. I was able to learn a new language C#. We currently use C# at my place of work. I am seven months old at my job now, and now am a full staff, and promoted to software developer.

As noted by P4, in addition to going through the NCS workshop in which he learned mobile app development skills, he also had to push himself further and learn an additional programming language, which was a market-focused requirement at the time. He was also able to fulfil the employability criterion – ability to apply his knowledge; he had produced an app as part of his team assignment, was self-motivated, and showed keen interest as he went ahead to teach himself C#, validated his skills, went the extra mile by being self-taught. He was able to land

himself a great job as a software developer. He became a "dream hire"; he ticked all the boxes of the New-Collar "Employability Quotient." This was also the case for P9, P2 and P1.

There was, however, those participants who acquired the NCS during the training and were not able to go the extra mile to develop themselves further.

P8 commented that she did not have the time to focus on the training; as a result, she did not acquire the necessary skills to get a job.

> *I have a mixed feeling… like I was talking about it with my husband two weeks ago, and I felt like I wasted time on it. I am not doing anything on it. I am a not using it, maybe until I find a use for it, I will feel, yes…. it helped me or something. However, right now, you know, it was during the period of my wedding and everything; so, I was more like overwhelmed at that time. However, then I was still focused. I have a strong feeling that something good was going to come out of it. I mean when I say something good, I mean a job was going to come out of it. I felt demoralized when I did not get a job.*

Acquiring New-Collar Skills will give one a higher probability of employment in this automation age as long as one is market-focused and can fulfil all the qualities and attributes needed by employers of labour in this age of automation. This means going the extra mile.

ED4, CEO/ Founder of Sprints, Egypt, remarked thus:

> *Yeah, 90% employability at the duration of three months after their graduation, we set a target that our guys must be employed in three months maximum after graduation; 90% during the duration of the three months, if you extend it to 6 months, that will be 100%.*

Potential employees who have New-Collar Skills and satisfy the employability requirement (test) are certainly employed – This was what ED4 called "Dream Hire." Some participants, P1, P2,

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P8, P9, P15 and P17, recounted their experiences after acquiring New-Collar Skills and the effects on their employability.

P2 commented that:

> *It paved the way for an opportunity for me; I got my first job to be precise. I cannot imagine the opportunity I have now. I do not think I will have gotten it if I did not get the training opportunity. So, for me, the training was more like a light that was lit in my life basically.*

P9 stated that:

> *I have been able to leverage on all these New-Collar Skills that I have mentioned, and, for the first job I got, it was based on me acquiring business intelligence skills. So, I would say that all these skills are very essential to make me relevant in my former and current job.*

P17 affirmed that:

> *So, it is the skill that most people in this generation should be looking at having if they want to stay relevant in the current workspace. So yes, it is.*

P1 commented that:

> *I understood these skills. It only got me the opportunities; it opened so many doors, and it is helping me up to now even with my own personal business now.*

Some of the participants that were not immediately employed gave various reasons why they were not employed at that time. For instance, P7 who had stated that she was not interested in that type of New-Collar Skills as she went on to do a further development on another aspect of New-Collar Skills, commented that:

> *Ah no business intelligence I did not really get so enthusiastic about it or so interested in it. It was just like my starting point, so that I wanted to*

> *explore some various aspects of New-Collar Skills that have to do with*
> *the technology; so, for it was not what I really wanted to go far with.*

P15 felt that the reason he was not able to get a job after the intervention was that he was not a graduate and felt that organizations discriminated against non-graduates.

> *Ah, because, first, I have no BSc, so I felt it would be a cover-up for my*
> *inability to have a BSc; but when you see job vacancies, all they ask you*
> *is your BSc and years of experience.*

4.3.5.4 Start-ups

There are an increasing number of start-ups this year in Africa, the highest venture capital funding in Africa, with Nigeria leading the pack, as noted by ED7, Co-Founder, Angel Africa List and Chanzo Capital.

> *This is also the reason the start-up ecosystem globally is really strong*
> *and getting attention because the work they do is not just helping people*
> *to start a start-up. They inspired these technical skills to be rampant, and*
> *some of those technical skills end up being skills that large well-*
> *established companies then acquire, not necessarily even the start-ups.*

4.3.5.5 Digital Entrepreneur

ED10 noted that digital entrepreneurship has created many opportunities and has been a catalyst for job creation, although it is not well reported.

ED10, Founder/CEO Co-Creation Hub, remarked thus:

> *Yea, I do not want to water it down because they are entrepreneurs, those*
> *are people who can set up their own even if it is using social media. So,*
> *the answer is yes. There have been many opportunities created from that*
> *angle as well, especially for those who learn, those who acquire the skills*
> *and choose not to work for a particular company but choose to be a*
> *freelancer. So, freelancing is now a well-known concept; so as a software*

engineer, you can just decide to take the contract from people, and they
pay you as against being an employee.

So, these skills as well … provide opportunities for the entrepreneurs to
create jobs…. So that is also quite significant when you look at it from
that angle. But depending on the entrepreneurship, there is probably a
thin line between start-up, you know, because a lot of people then know
how to code then decide to build apps and brought a full delivery
company of it. And you know so many things like that. And a lot of those
guys do then become a proper company raising a significant amount of
money employing hundreds of people. So, it is an interesting area on the
continent that it is creating a tremendous number of jobs, but I do not
think a great job is being done at tracking the quantity.

ED7, Co-Founder, Angel Africa List and Chanzo Capital, averred that:

King's chapter that I wrote; you notice that one of the criteria that we
look at is the entrepreneurial skills and we talk about how we are looking
at the academic and research environment to empower those skills
creation because entrepreneurial skill is a passion. However, you also
need experience, but the experience you only get it after you've done it
before. So, passion and skills are very critical in terms of execution.

4.3.5.6 Online Outsourcing (Freelancing)

In the opinion of ED4, CEO/ Founder of Sprints, Egypt, New-Collar Skills are enhancing DE
and OO; however, some drawbacks exist, like English proficiency, which affects the ability to
relate with the client.

Language is one aspect; second, you do not see your customer working
alone is very tough mentally and psychologically, and, if you are not
disciplined, it will be hard. There are a lot of challenges; so for me to be
a freelancer is very difficult than to be a paid employee. For instance, for
a freelancer, you have to be very good at research, learning new things;
so there are a lot of things that make me apprehensive of it. But there are

some people in Egypt working as a freelancer, and so far, they are very successful. I totally agree that New-Collar Skills will enhance participation in freelancing. But for the digital entrepreneurship I'm not sure, I do not have enough to answer this.

In conclusion: Assessing the Effects of New-Collar Skills on Employability in Africa

New-Collar Skills have a positive effect on employability. Over 60% (See Figure 4.7 and Table 4.8 above) of the participants from 10 African countries (New-Collar Skills Data set) were employed. This aligns with the findings from the logit model, which clearly showed that having New-Collar Skills would give you at least a 1.78 (Odds Ratio) chance at employability, compared to someone who does not acquire these skills. Besides, the employment status of the participants from the intervention at nine months was 57% and increased to 67% after 15 months. The remaining 33% were either in further education or engaged in digital entrepreneurship or online outsourcing. However, some were still unemployed. The participants that were able to secure employment exhibited certain qualities other than the New-Collar Skills learned during the intervention. They were able to develop themselves in areas required for employability (See Fig. 1: Employability Quotient).

Other effects of New-Collar Skills on employability were increase of remote jobs, workers working for companies abroad, in countries like the US, UK, Canada, and increase in start-ups. There has been a marked increase in funding for start-ups in Africa, especially in the area of FinTech. As a result of the findings above, a New-Collar Employability Quotient (NCEmQ) was developed. This shows the qualities needed to increase employability with a New-Collar Skill (See Figure 1).

4.4   Assessment of the Extent to Which New-Collar Skills Enhances Participation in Digital Entrepreneurship and Online Outsourcing in Africa

In order to assess how New-Collar Skills can enhance participation in digital entrepreneurship and online outsourcing in Africa, the logit model was deployed using the New-Collar Skills data set. The factors found to be statistically significant are indicated in Table 3 with asterisks.

Each of these models was examined in terms of the following:

    i.   Overall Model

    ii.   Marginal effect of the individual predictor on odds ratios.

The results for each of the two data sets are presented in Table 4.15.

Table 4.15: Estimation of the Factors Enhancing New-Collar Skills Participation in Digital Entrepreneurship and Online Outsourcing in Africa Using the Logit Model

| | EngageOO | | | EngageDE | | |
	IBM Participants (Obs=976)			IBM Participants (Obs=976)		
	Odds Ratio	Coef.	P>z	Odds Ratio	Coef.	P>z
Age	0.993495	-0.00653	0.651	0.975376	-0.02493	0.107
Gender	0.787745	-0.23858	0.136	1.060615	0.058849	0.717
HDParent	0.921148	-0.08213	0.635	0.997433	-0.00257	0.988
STEM	1.098419	0.093872	0.562	1.240544	0.21555	0.193
AccessWeb	1.021447	0.02122	0.627	1.050158	0.048941	0.283
AccessPC	1.17764	0.163512	0.47	1.295534	0.258923	0.279
Accesspwr	0.996181	-0.00383	0.922	1.042673	0.041788	0.303
AwareNCS	1.257815	0.229376	0.205	1.084846	0.081438	0.659
haveNCS	1.58764	0.462249	0.006***	2.209164	0.792614	0.000***
AwareOO	7.698005	2.040961	0.000***	1.050751	0.049505	0.845
AwareDE	0.473501	-0.7476	0.000***	8.188538	2.102735	0.000***
EngageDE	2.52352	0.925655	0.000***	-	-	-
EngageOO	-	-	-	3.093051	1.129158	0.000***
Nigeria	1.683056	0.520611	0.029**	1.077223	0.074386	0.746
Kenya	3.223474	1.17046	0.000***	0.824979	-0.1924	0.425
IBM	1.030957	0.030488	0.884	0.934414	-0.06784	0.752
mentorship	2.375566	0.865236	0.003	-	-	-
_cons	0.03792	-3.27227	0.000	0.023651	-3.74437	0.000
LR chi2(16) = 217.44				LR chi2(15) = 225.55		
Prob > chi2 = 0.000				Prob > chi2 = 0.000		

Pseudo R2 = 0.1718   Pseudo R2 = 0.1816

Overall Model: The goodness-of-fit test, Chi-square ($\chi2$ = 217.44 or 225.55) with p-value (0.000), indicated that the models were appropriate for the data.

Marginal effect of the individual predictor on odds ratios: The result (4.22) showed clearly the significant factors. For instance, engagement in both OO and DE was affected by possession of NCS and awareness of digital entrepreneurship. Also, engagement in OO was influenced by awareness of OO. The respondents in Nigeria and Kenya had more chances of getting engaged in OO than those in Ghana. Engagement in OO enhanced the chances of the candidates to secure employment in DE more than others.

4.4.1 Test of Hypothesis: 3 and 4

Ho: There is no significant relationship between acquiring New-Collar Skills and participation of youths in digital entrepreneurship.

H_1: There is a significant relationship between acquiring New-Collar Skills and participation of youths in digital entrepreneurship.

Ho: There is no significant relationship between acquiring New-Collar Skills and youth's participation in online outsourcing.

H_1: There is a significant relationship between acquiring New-Collar Skills and youths' participation in online outsourcing.

The results of testing of hypotheses 3 and 4 revealed that there was a significant relationship between acquiring New-Collar Skills and participating in digital entrepreneurship and online outsourcing. Therefore, the null hypotheses 3 and 4 were rejected and the alternative ones accepted.

4.4.2   New-Collar Skills Data set – Cross-tabulation

To further examine the above objective, descriptive statistics and cross-tabulation were deployed to determine how New-Collar Skills can enhance participation in digital entrepreneurship and online outsourcing in Africa.

4.4.2.1 Engaging in Online Outsourcing

As shown in Figure 4.12, the responses from the participants indicated that 63% of the participants were not engaged in online outsourcing. This may indicate that the majority of the participants were employed in New-Collar Skills jobs and therefore had no need to freelance.
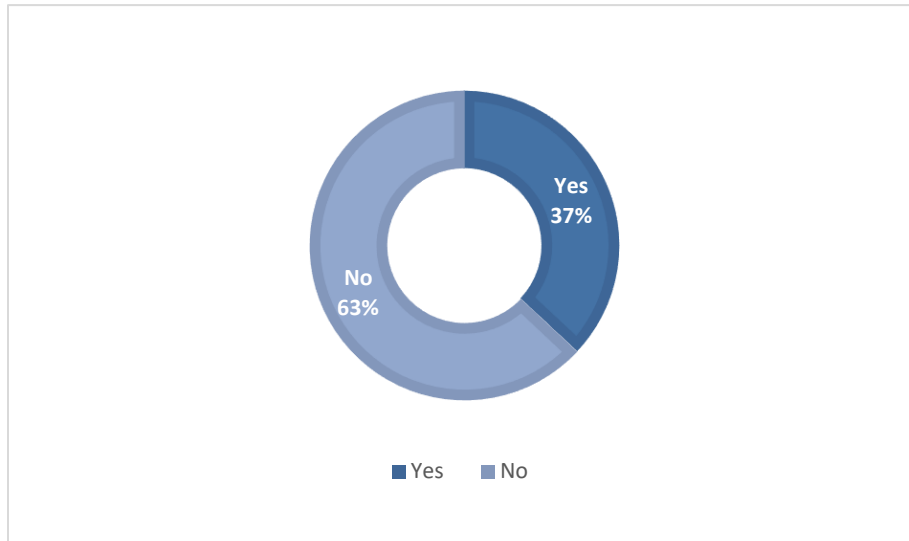

Figure 4.12: Employment Status of the Respondents

As shown in Table 4.16, the majority of the countries had low-level engagement in online outsourcing. However, Kenya had the highest level of engagement (77%). This was followed by Morocco and Nigeria, with 54% and 53%, respectively. South Africa and Egypt had the lowest level of engagement, with 33% and 37%, respectively.

Engaging in Online Outsourcing (Freelancing)

Table 4.16: Engagement in OO vs. Working

Engage in Online Outsourcing vs. Working			
		No	Yes
Total Count	498	196	302
No	250	112	138
Yes	248	84	164

No	50.2%	57.1%	45.7%
Yes	49.8%	42.9%	54.3%
Overall Stat Test	**0.01256**		

As captured in Table 4.16, despite the fact that online outsourcing, was significant, with a p-value of 0.01256, the participants did not show a high level of engagement. This was because most of the participants only considered online outsourcing if they could not find an employment opportunity.
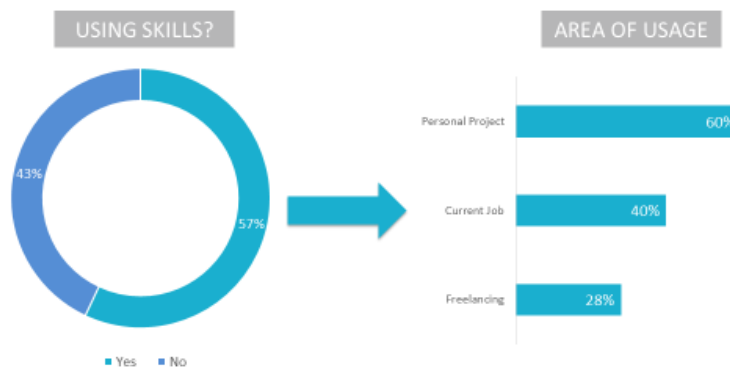
Figure 4.13: Using New-Collar Skills in 10 African Countries

The findings from the New-Collar data set also revealed that of all the trainees using New-Collar Skills, only 28% were involved in freelance activities, which can otherwise be referred to as online outsourcing. This reiterates the point that most of the participants who acquired New-Collar Skills can use these skills for online outsourcing typically as an alternative or as a second income if they are unable to get a job.

Table 4.17: Engaged in Online Opportunities: 10 African Countries

Engaged in OO vs. Using New-Collar Skills

	Total	No	Yes
Accounting and consulting	1.3%	2.5%	2.0%
Admin support	2.6%	2.9%	5.4%
Blogging	3.2%	5.4%	5.4%
Cyber security	4.1%	2.5%	9.8%
Data analytics	6.9%	4.4%	16.6%
Digital marketing	4.4%	5.4%	8.8%
E-commerce	4.7%	3.4%	10.8%
Graphic design	3.3%	4.4%	6.4%
IT and networking	7.3%	5.9%	16.6%
Software development	13.1%	19.1%	24.1%
Transcription	2.4%	3.9%	4.1%
Translation	1.8%	2.9%	3.1%
Website design	11.5%	13.7%	23.1%
Writing	7.3%	12.7%	11.9%
Other	**1.6%**	**3.4%**	**2.0%**

Table 4.17 shows work activities that participants with New-Collar Skills were engaged in online outsourcing (freelancing). The most frequent work activities were software development, website design, data analytics, and cybersecurity. This shows that, in the absence of finding permanent opportunities, most of the respondents that acquire New-Collar Skills were able to use the skills to source opportunities online, thereby enhancing employability.

Figure 4.14: Frequently Used Skills for all Data sets

Figures 4.14 captures the most frequently used skills for online outsourcing in all data sets. The findings revealed that, except in the open data sets, New-Collar Skills ranked higher in all cases. This clearly shows that New-Collar Skills increased participation in online outsourcing, at least more than the other skills considered.

Table 4.18: Awareness and Engagement in DE and OO in Kenya, Nigeria and Kenya

Country	Aware OO	Engage OO	Aware DE	Engage DE
Kenya	91%	48%	80%	36%
Nigeria	78%	31%	75%	31%
Ghana	75%	21%	74%	26%

Table 4.18 shows the awareness and engagement of Kenya, Nigeria, and Ghana in digital entrepreneurship and online outsourcing. Kenya had the highest level of awareness and engagement in OO, with 91% and 48%, respectively, and in DE, with 80% and 36%, respectively. Nigeria and Ghana had about the same level of awareness and engagement, with Nigeria slightly higher in OO and Ghana slightly higher in DE.

Table 4.19: Engaging in Digital Entrepreneurship and Online Outsourcing

Using New-Collar Skills

Engaged in Digital Entrepreneurship				Engaged in Online Outsourcing (Freelancing)			
	Total	No	Yes		Total	No	Yes
Total Count	816	560	256	Total count	816	545	271
No	486	380	106	No	486	361	125
Yes	330	180	150	Yes	330	184	146
No	59.6%	67.9%	41.4%	No	59.6%	66.2%	46.1%
Yes	40.4%	32.1%	58.6%	Yes	40.4%	33.8%	53.9%
Overall Stat Test	**0.00000**			**Overall Stat Test %**	**0.00000**		

As revealed in Table 4.19, despite the fact that both DE and OO were significant, with a p-value of 0.00000, the participants did not show a high level of engagement. Most of the participants only considered DE and OO if they could not find an employment opportunity. Also, online outsourcing had a slightly higher participation level than digital entrepreneurship, with 34% and 32%, respectively. However, the data also showed that, even though the participants were using New-Collar Skills at their places of work, they were not likely to use this skill for either DE or OO, as 68% and 66% of the participants, respectively, did not engage in either DE or OO. This is likely to be because they were using these skills for work and had no need to pursue DE or OO, as the result implies that most job seekers work in OO or DE as an alternative to having a permanent job.
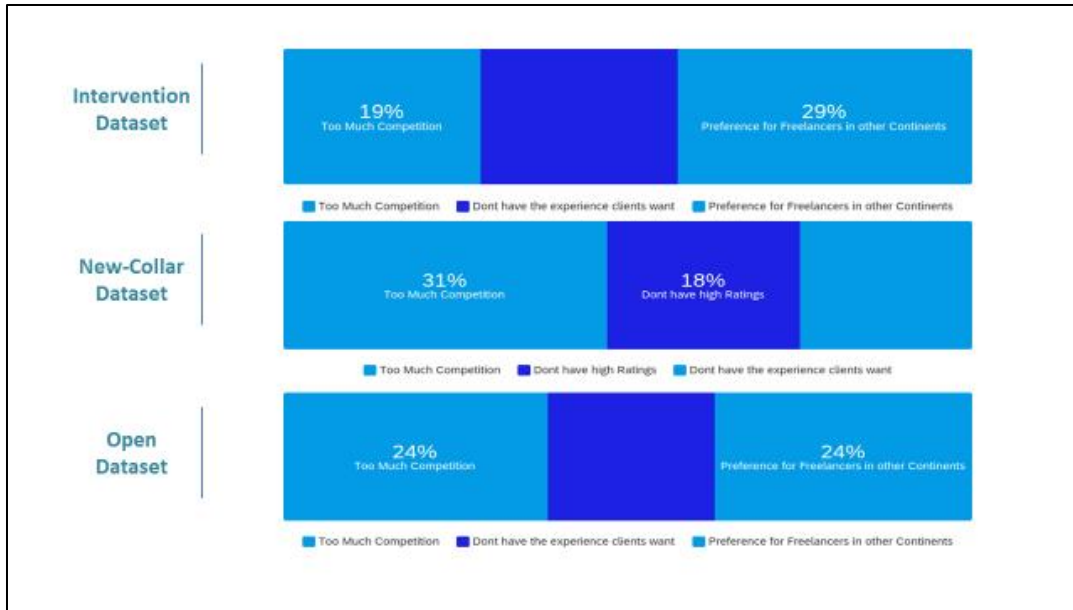
Figure 4.15: Challenges in OO for all Data sets

4.4.3   In-depth interviews – Corporate Executive

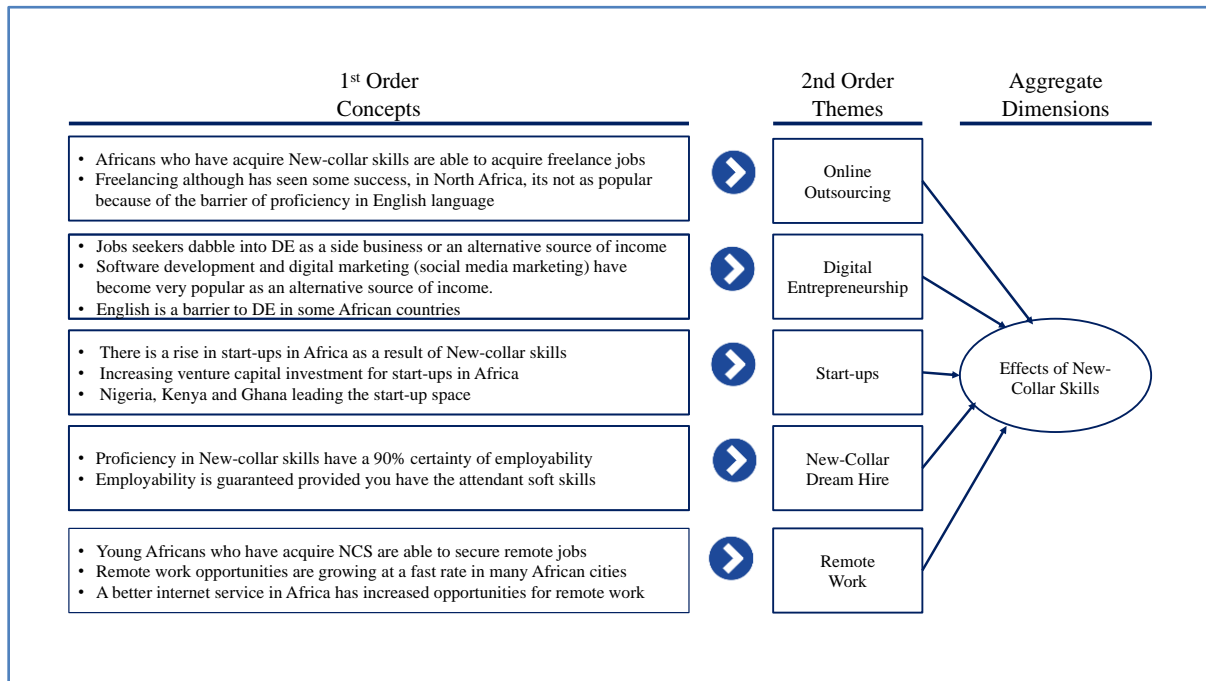For *digital entrepreneurship* and *online outsourcing*, please see Sections 4.55 and 4.56 above.

Figure 4.16: Effects of New-Collar Skills Dimension

4.4.3 In-depth interviews – Participants of New-Collar Skills Workshop

The participants' responses clearly showed that many of the participants, in their quest to find a job, engaged in digital entrepreneurship in the interim. This was done as a side business or what would eventually develop as a start-up. Similarly, the participants tried their hands at online outsourcing. However, some of them complained that it was difficult to get jobs from some platforms and would prefer to have a full-time job and engage in OO as a side business.

P9, P2, and P6 attested to this. P9 remarked that:

> *I can say that I am a digital entrepreneur because I have been able to get jobs via opportunities online. I have been able to work for people in Canada I have been able to work for people outside my state. Similarly, with digital marketing, as I explained earlier, as an entrepreneur, you just have to market your product and, to market your product, there is social media channel available to place your services online and try to publicize and market your services, and I did that, making use of existing platforms and different strategies in trying to get new customers. So, these are what I acquired on my own through tutorial videos online.*

P2 remarked thus:

> *Yes, I did. At some point, before I got a job, I was selling shoes on Instagram. As a matter of fact, that is the first point of call even for undergraduate that is not even done with school that is not even yet in the labour market looking for jobs, are already doing some kind of digital entrepreneurship just to make some pocket money.*

The opinion of P6 was not different:

> *I had people, clients; they give me jobs to do, give me jobs to do related to programming, to software development. They give us to do, and, just like a contract, I have helped develop something and was paid.*

However, some participants found it a little bit difficult to break into the online business and give up probably a little too soon, as stated by P7:

> *I tried connecting to people on Facebook to advertise my cake business, but I was not consistent.*

P10 tried the balancing act, engaging in a full-time job and digital entrepreneurship. However, she subsequently found that she could not cope:

> *It is more like a freelance project online. Then I also have a side business, although, for now, I had to stop because I was not able to balance work with it. I was into make-up artistry.*

Some of the participants were discouraged by online outsourcing and wondered whether there was bias against particular countries on some platforms.

P12 stated that:

> *The thing is that I want to go to online outsourcing where I will be getting jobs like freelancer. I tried Upwork. However, there is an issue with Upwork. I did not know if they are biased against Nigerians. I did not know, but I have tried; it is not working. Then, they say we should be paying certain amounts. I do not know I have tried getting to it, but I think I will try freelancer.com or guru.com.*

In conclusion: Assessing the extent that New-Collar Skills Enhances Participation in Digital Entrepreneurship and Online Outsourcing in Africa

The findings from the logit model clearly showed that acquiring New-Collar Skills will enhance participation in DE and OO, with odd ratios of 2.2 and 1.5, respectively. However, the overall finding from all data sets indicated that there was low engagement in DE and OO; only 37% of the participants from the ten countries were engaged in OO. This might be due to several factors, like difficulty in getting profile approved, competition from other countries, preference for workers in certain countries, proficiency in English. The findings also showed that most new job seekers would rather be employed at a permanent job at the start of the career than engage in OO and DE. Many young African job seekers only engage in OO and DE as an alternative form of income.

4.5   Summary

This chapter presents the research findings derived from the collection and analysis of the research data. This involved the deployment of a mixed-method sequential exploratory design, which consisted of quantitative surveys, an intervention, and in-depth interviews done in a sequential timeframe. The data collected were analysed and triangulated to further validate and assess the accuracy of the findings. This chapter contains the results, presentation, and discussion of findings. Hypotheses of the study were presented and tested, reliability and validity test were conducted, and the results were presented.

The results presented in this chapter are discussed in Chapter Five. More specifically, Chapter Five includes discussion of the implications and conclusions of the research as well as contributions of the study to practice. The chapter also includes reflections on the research experience and recommendations for future research.

Chapter Five: Implication of Findings and Contribution

5.1   Introduction

This chapter presents the implications of the findings of the study. The aim of the study was to examine how acquiring New-Collar Skills could increase employability and lead to enhanced or increased participation in digital entrepreneurship (DE) and online outsourcing (OO) by African youths. In this chapter, the implications and contributions are presented in line with the research questions for the study.

5.2   The Factors Influencing the Acquisition of New-Collar Skills in Africa

In assessing the implications of the findings from the quantitative data, for the factors influencing the acquisition of New-Collar Skills in Africa, the null hypothesis (Ho), which states that, there is no significant factor influencing the acquisition of New-Collar Skills, was tested. With reference to odds ratio, the regression results indicated that those who studied STEM courses, those who have access to the Internet, the employed, those aware of NCS, those engaged in OO and DE had higher chances of acquiring NCS by about 1.5, 1.1, 2.6, 4.7, 1.6 and 2.21, respectively, than those who did not. Therefore, the null hypothesis (Ho) was rejected. The implication of this is that there are underlining factors that influence the acquisition of New-Collar Skills in Africa. To further corroborate this, some factors were also identified from the open data set using crosstab and descriptive statistics. An adequate source of power (electricity supply), access to a personal computer, and awareness of the concept of New-Collar Skills were some of the critical factors that will influence the acquisition of New-Collar Skills.

In addition, the findings from the quantitative data also revealed several other factors; some validated the findings of the qualitative data. In addition, six aggregate dimensions and twenty-six themes were derived from interviews from 10 executive directors in 8 African countries and 17 participants purposely drawn from the New-Collar Skills Intervention Workshop. The implications of the outcomes are discussed below alongside the quantitative data.

5.2.1 Market-driven Education

This major aggregate dimension evolved from the in-depth interviews along with the following six themes: market focus, apprenticeships, impactful training, online education, certificates and badges, and communities/networks and relationships.
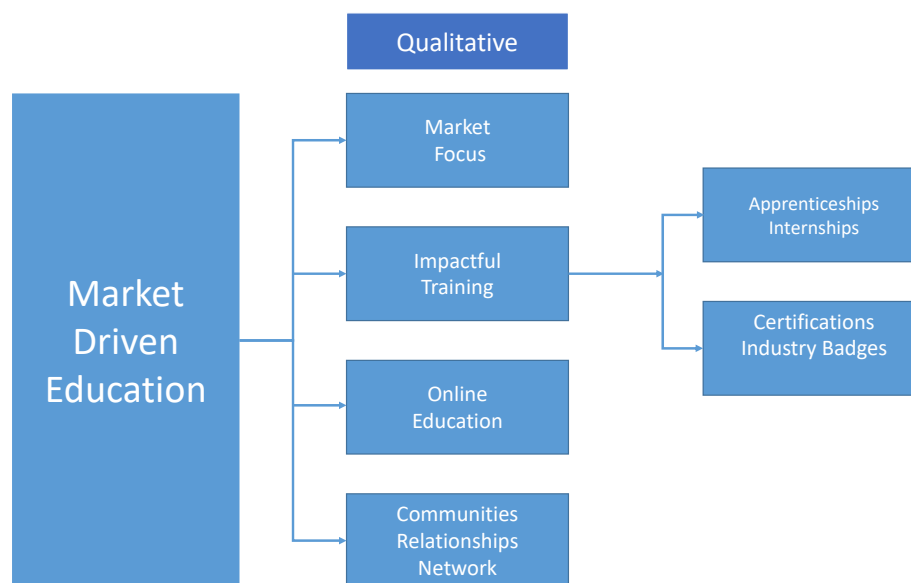

Figure 5.1: Market-driven Education Aggregate Dimension

5.2.1.1 Market Focus

This finding implies that, if there is a market for New-Collar Skills, the demand for these skills will influence their acquisition. This theme was also confirmed in the literature. The IFC (2019) report notes that there is demand for intermediate and advanced digital skills in the African market, which is influencing their acquisition, although not enough to fill the gap in skills. Similarly, Mckinsey (2012) emphasises that market conditions from industry have to trigger demand for there to be a demand for skills. Without students having a thorough understanding of the market and what it needs, many students and job seekers chose to acquire skills blindly (Mckinsey, 2012; McCowan, 2015).

The findings also noted that 40% of the youth were unfamiliar with market conditions and the requirements for even the known professions. Having awareness and the data to make informed decisions about the market would definitely influence the acquisition of New-Collar Skills.

Filmer and Fox (2014) also confirm this point, stating that skills training needs to be influenced by market signals. Apprenticeships and other job training help in influencing skills acquisition, provided the programmes are tied to market signals (Filmer and Fox, 2014).

5.2.1.2 Apprenticeships, Internships, and Impactful Training

The study found that apprenticeships and internships are an indisputable way of influencing the acquisition of New-Collar Skills. The Executive Directors from Microsoft, Oracle IBM, Sprints, and Think IT all confirmed that it is the most effective way for potential job seekers to acquire skills. This aligns with the literature, as experts agree that apprenticeship and internship programmes are the most effective ways to transition job seekers into employment and influence the acquisition of skills (Mckinsey, 2012; Filmer and Fox, 2015; Boisvert 2018; Lager 2020). Job seekers are encouraged to acquire these skills through various apprenticeship programmes. Some of these programmes are being implemented in Africa by MNCs and other tech companies. Examples are the P-TECH program run by IBM, which is now in twenty-four countries (Kanter and Malone, 2014), And AppFactory run by Microsoft in a number of African countries (Endurance, 2019). Delta Airlines is also running aviation-specific apprenticeships at community colleges in the United States (Spector and Cappetta, 2017). This enables the airline industry to find the right skills.[2] Apprenticeship is particularly popular for both employers and employees because it enables the employees to gain the valuable hands-on practical experience needed by the employer. It also allows the company to mould the job seeker into precisely what is required for the job at hand. However, according to some reports (Mckinsey, 2012; McCowan, 2015), the main challenge here is scalability, especially in Africa. There are so many young people looking for these scarce opportunities and very few apprenticeships and internships available. This makes acquiring New-Collar Skills through this route difficult for the hundreds of thousands of young African job seekers to acquire skills through this particular avenue.

Impactful training also evolved as a factor that influences the acquisition of New-Collar Skills. ED1 stated that training that is impactful and delivers on the objectives of actually allowing the job seeker to acquire hands-on experience and the skill that would influence the acquisition of New-Collar Skills. This is mainly because a job seeker will see it as a pathway to employability, especially if the participant can perform simulations and work on real live practical projects. There are several forms of non-traditional educational training available, like boot camps. These

are an excellent way for training because they emphasise practical training, and participants receive practical experience on a project. However, there is some kind of training that is merely a "Ticking the Box" exercise, as referred to by ED1, where companies run youth programmes for employment just to show that they are making an impact community, but are not really effective, nor impactful when it comes to acquiring the actual skill for employability. This aligns with the IFC report, which argues that the best training tackles multiple constraints, offering business and technical skills together. This has become popular as a non-conventional way for job seekers to acquire the skills they need in a very short period. It is very effective because the main emphasis is on practical experience, rather than the theoretical side (IFC, 2019).

Certificates and badges are also a means of validating New-Collar Skills training. They validate the level of proficiency a participant has obtained in a particular skill. Some participants from the NCS workshop remarked that having a badge or a certification from a reputable organisation to show to an employer confirms not only that they possess the skills but also the level of proficiency. This confirms what the IBM P-TECH programme promotes; skills may be developed through industry certification programmes. This is a big incentive for acquiring New-Collar Skills (Kanter and Malone, 2014). However, most times, this is not enough. Some of the EDs asserted that a certificate does not really show if the candidate has the skill so that it might open the door to an interview. Unless the candidate has other essential qualities needed to acquire a New-Collar job, the candidate might not be able to walk through the door.

5.2.1.3 Online Education

Online education is a major theme, recognised as a real game-changer in education and in acquiring New-Collar Skills. It has served as an inclusive tool for education for many young Africans (including the underserved) who would not usually have access to digital education (Agrawal, 2018). This was reiterated overwhelmingly by the EDs, as represented by the excerpt below:

> *I think the biggest thing that's changing skill acquisitions today is the fact*
> *that knowledge in itself is more readily available.*

ED1 further remarked that the Internet is increasing opportunities available to the remote corners of Africa, in villages and rural areas, not just the urban cities, increasing the availability of online education to more Africans to learn New-Collar Skills. This sentiment was echoed by several intervention participants who had self-educated themselves in order to acquire the skills that were not taught at the university. ED2 noted that online education bypasses the challenge of lack of infrastructure in Africa, arguing that all that is required is good Internet service and a personal device. He further noted that online education was becoming pervasive in the rural areas too. ED1 remarked that even "the semi-urban areas of Zaria have access to education materials used by MIT, therefore giving them equal advantages… gives them a great opportunity to learn emerging skills no matter what side of the globe they are on".

The findings also revealed that many participants noted that, after attending the workshop, they could augment their skills by going online to enhance their skills to improve their chances of employability. This was corroborated by the World Bank report stating that:

> *The Internet is an enabler for education, providing unparalleled access to information and acceleration connection to educational resources. It has opened the way for exponentially expanding the physical limits of the school, giving both teachers and students access to online learning resources from all around the world" (World Bank, 2017: XXVI).*

5.2.2 Government-driven Digital Transformation

Government-driven digital transformation evolved as an aggregate dimension along with the following five themes: national agenda, diffusion of technology, lack of data, mismatch of skills, and collaboration. It was observed that government support is critical, helping to shape the digital transformation agenda and indirectly influencing the acquisition of the relevant skills needed to adopt this agenda.
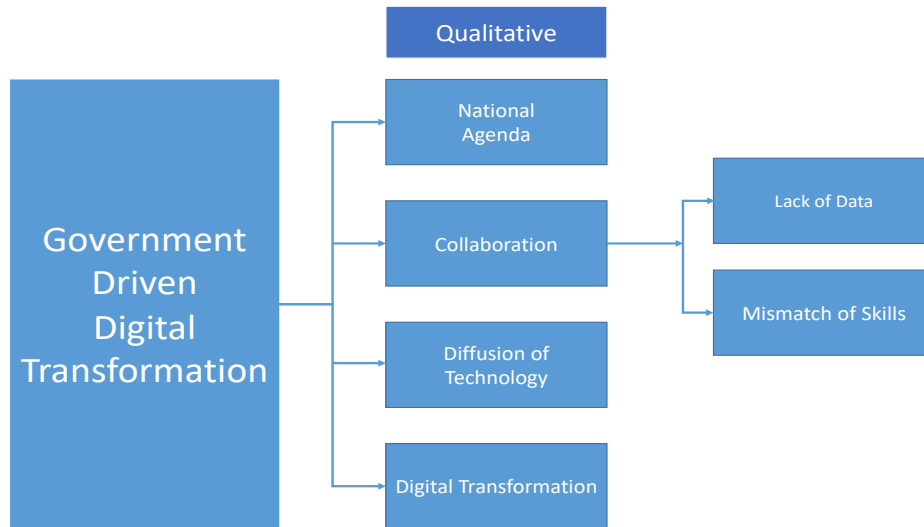
Figure 5.2: Government-driven Digital Transformation Aggregate Dimension

5.2.2.1 National Agenda and Diffusion of Technology

A government whose national agenda is supportive of the technology industry will encourage digital transformation in the private sector. This will indirectly encourage the creation of jobs for the sector, which will indirectly influence the acquisition of New-Collar Skills (Ndemo and Weiss, 2016). In this regard, ED1 was concerned that the government in most African countries have not adopted a national agenda that encourages the adoption of technology, neither have these countries made a concerted effort to upgrade the curriculums of the state-owned universities to match the skills required by industries. A large percentage of the universities in Africa are government-owned and government-funded, and many of these institutions have outdated curriculums. ED10 stated this as he remarked that this had had an adverse effect on influencing the acquisition of NCS in universities. However, he noted that the reverse had been the case in countries like Rwanda, where the government has a supportive agenda on digital transformation and the technology industry. This has influenced the acquisition of New-Collar Skills. According to ED7, the national agenda of Rwanda is firmly focused on digital transformation; this has encouraged many investors and attracted the inflow of skills.

Gaus and Hoxtell (2019) argues that, in most African countries, regulatory policies do not adhere to digital transformation. The laws in some of the countries in SSA have introduced labour market regulations in an attempt to reduce job losses. Such laws make organisations cautious

about the hiring process and, as a result, do not encourage digital transformation. Countries like South Africa, Kenya, and Nigeria have industrial policies that are not conducive to automation, and this has an adverse effect on the acquisition of New-Collar Skills. These views contradict the findings of this study. This is because, despite these policies, many African youths are acquiring these skills, as they are convinced it is the best means of getting a job and pulling them out of poverty. Some of them are creating their own jobs by developing start-ups and are certainly not waiting on the government. In addition, as there is a shortage of tech skills in the world, a number of companies are looking to hire reasonably priced remote workers from around the globe, and African seems to be a destination some employers are willing to consider (World Bank, 2017; Deloitte, 2018). There is even a stronger case during this pandemic, as more and more companies are adopting a remote work strategy.

However, according to ED2, the adoption of technology in African countries will be a lot faster if there are more technology visionaries in government. He noted that the adoption of technology is somewhat slow in many parts of Africa because of the leadership issue; there are too many generation Y at the helm of affairs. He was of the opinion that one of the reasons diffusions of technology has been slow is the lack of young, forward-thinking tech-savvy leaders in most African countries. Many young people are learning New-Collar Skills, but the diffusion of technology is slow. This is because governments are slow to adopt these technologies; the will to acquire these skills is not as encouraging as it should be if the government were more proactive in this area.

The rate at which society embraces technological change is a major determinant of the progress of adoption (Schwab, 2016). Choi, Dutz and Usman (2019) aver that digital technology, if harnessed successfully, has the potential to help Africa leapfrog into the Fourth Industrial Revolution and transform the nature of work in Africa. This will inevitably influence the acquisition of New-Collar Skills, as these are the skills required for emerging technologies. Choi et al. (2019), however, indicate that the development, adoption, and diffusion of skill- based workers will be facilitated by accessible and affordable Internet for all. Digital diffusion has been very slow in most parts of Africa for many reasons. However, despite the slow adoption and

diffusion of digital technology on the continent, there has been a rise of young people adopting digital and New-Collar Skills.

5.2.2.2 Collaboration, Lack of Data and Mismatch of Skills

Lack of current data to predict the needs of industry was a recurrent theme cited by ED4, CEO/Founder, Sprints Egypt and other ED's. He remarked that one of the reasons for the wide skills gap is lack of proper data to help solve the problem. There is a lack of current data to forecast the needs of the market to align with supply from universities (Annunziata and Kramer, 2017). This has become a central challenge influencing the acquisition of skills in Africa. This is seen as a global problem, according to Mckinsey (2012), who states that one of the key challenges preventing the smooth transition from education to employment is lack of data for all stakeholders. Stakeholders, industry, government, and job seekers are often working in silos without communicating with each other. As a result, there is no clear data or insights to signal the skills industry needs, and job seekers do not know what skills are in demand at the time of enrolling in college.

The stakeholders are on a different path, and when they get to an intersection, they do not have a clue where to go. ED4 reiterated this as one of the reasons for the skills gap or skills mismatch. This is corroborated by many scholars (Annunziata and Kramer, 2015; Samans and Zahidi, 2017; Abdychev et al., 2019), who agree that this is a challenge affecting the acquisition of skills. ED4 argues that, to help solve the problem, trainers and educational institutions need to start to reach out to employers and organisations to find out what skills they require. ED4's organisation does this by reaching out to the employers and working with them to design the curriculum. This ensures that the employers get the skills they want, and the job seekers do not waste time studying skills that are no more in demand in the market. ED4 noted that this would ensure a more natural transition from education to employability. He also emphasised the importance of the government getting involved, as most of the universities are government owned.

The collaboration theme emerged as a result of a consensus of the EDs from all the major technology organisations interviewed agreeing that collaboration with the government in African countries to build the much-needed technical skills for industry is imperative**.** To close the skills gap and influence the acquisition of skills, this is essential (Mckinsey, 2012). In Africa, several

MNCs have started collaborating with Ministries of Education (MoE) and universities to influence the acquisition of skills. These organisations recognise that, to have the skills to run their business in Africa, they need access to a pipeline of skills. This will inevitably influence the acquisition of New-Collar Skills in Africa (Annunziata and Kramer, 2015). These organisations are collaborating through Ministries of Education with universities in African countries to align the curriculums with the requirements of industry. As stated by ED6, Director from IBM Morocco, "We have worked specifically with the Ministry of Education on our P-TECH programme, which is the pathway to technology…." This was also reiterated by the MD of Oracle, Nigeria, whose organisation has also taken a similar stance.

Because of the lack of collaboration between stakeholders, there is an apparent mismatch of skills between what the higher educational institutions are producing and what is required by industry. However, a number of technology companies have taken up the task of helping to update the curriculums of educational institutions on the continent to enable them to be compliant with 21st-century skills. This was confirmed in the report from the IFC. It was also stressed by ED4, CEO/ Founder of Sprints, Egypt, whose organisation addresses the mismatch of skills in the market. He used his personal story to emphasise the fact that he had spent five years studying subjects that were neither beneficial nor useful in the market. He argued that, in this automation age, there should be a better way, arguing that the education sector should be disrupted or reinvented. The number of years spent in the university should be reduced. He remarked that out of the five years he spent in the university, probably only one was useful for him in his working life. He observed this in Egypt, which necessitated having to retrain several university graduates in his boot camps to prepare them for jobs.

The issue of skills mismatch was reiterated by ED10, Founder/CEO, Co-creation Hub, according to him, enough engineers are not coming out of the universities. As a result, they do not have the background knowledge for the kind of digital skills/New-Collar Skills needed. The competition for engineers is so fierce that local companies do not mind training. However, there is so much competition within international markets, offering better remunerations and incentives. This results in these companies having the first pick of the crop to the detriment of the development of local companies (Ekwealor, 2019). This skills mismatch has stimulated the acquisition of New-

Collar Skills. Nevertheless, the issue of this being a skills mismatch has been contested by Oppong and Sachs (2015), who argue that the problem in most African universities is not one of skills mismatch, but more of skills oversupply; there are simply not enough jobs to go round.

5.2.3   Country-level Influences

Country-level influences emerged as another aggregate dimension influencing the acquisition of New-Collar Skills along with the following five themes: infrastructure, talent, doing business, the Internet, and MNC programmes. The infrastructure theme was reinforced by qualitative data, specifying access to power, the Internet and a personal computer as factors influencing New-Collar Skills.
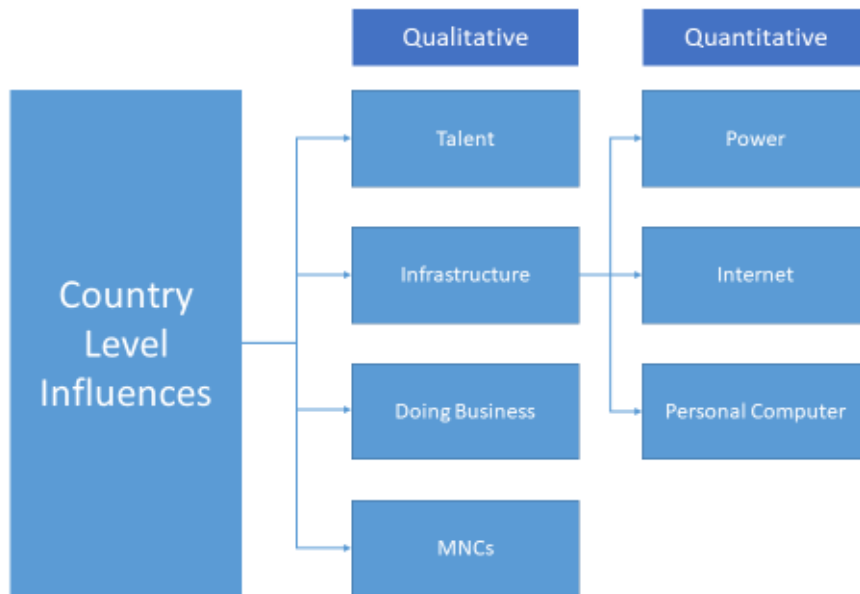
Figure 5.3: Country-level Influences Aggregate Dimension

5.2.3.1 Infrastructure

Access to adequate infrastructures includes the following: (i) access to the Internet, (ii) access to power (electricity), and (iii) access to a personal computer. The availability and access to reliable Internet and uninterrupted power supply was a strong finding from both qualitative and quantitative data sets. Most of the scholars who investigated digital transformation and skills in Africa seem to agree that, having a strong skill base and reinventing the education sector are

crucial Africa to compete with other emerging economies (Filmer and Fox 2014; Annunziata and Kramer, 2015; WEC 2018; Abdychev et al., 2019; Poulsen and Hjort, 2019). Access to a reliable Internet and uninterrupted power supply are essential to enable Africa to develop the skills needed to digitally transform and compete with the rest of the world. This is stressed by several scholars (Samans and Zahidi, 2017; Gaus and Hoxtell, 2018; Abdychev et al., 2018).

While they all agree that Africa needs to improve its skills base, none suggests a pathway to achieving this and what specific skills are required. A report by the IFC stated that Africa lacks intermediate and advanced digital skills but did not offer any solutions to address this. However, it notes that the training on these skills is a great business opportunity that is worth about $130 million, as over 625 million Africans need some form of digital training (IFC, 2019). However, Gaus and Hoxtell (2019) remark that Africa would have to clear up a whole lot of other issues before it could address this. The IFC report also noted that, in most of the weaker African economies, many young people do not have access to the digital tools and learning opportunities as their counterparts do in other parts of the African region (IFC, 2019). This aligns with the findings of this study, that access to a personal device is also a significant challenge.

5.2.3.2 Talent

It has been stated in a report from the World Economic Forum that, in 2025, Africa will be home to 33% of the global workforce because of its ever-growing youth population (Samans and Zahidi, 2017). This has resulted in a keen interest in African talent and has indirectly resulted in the acquisition of New-Collar Skills, as many young Africans are excited at the opportunity to work for a remote company, especially if it offers better remuneration (IFC, 2018). This is significant factor influencing the acquisition of New-Collar Skills in Africa, as noted by ED 10:

> *Nigeria, for instance, you find raw talent a lot of people that are willing to learn but also willing to take advantage of opportunities. These are literally just people who know that there is an opportunity in technical skills, and they want to be part of it.*

This, coupled with the fact that there is a growing demand from Western companies for remote workers in Africa, is a factor influencing the acquisition of New-Collar Skills. As ED 10 noted, these companies are paying better and providing better conditions of work, in some cases, as

seen with Andela. This software company trains young African talent in six countries in Africa and outsources them to various developed countries (IFC, 2019). The company is inundated with applications from young Africans eager to train, acquire, and work with valuable New-Collar Skills and be placed with international companies. It has been suggested that getting into Andela is more difficult than being accepted at Harvard, as the acceptance rate is less than 7% (Vaselinovic, 2015). Thus, the demand for talent is an influence on the acquisition of New-Collar Skills.

5.2.3.3 Doing Business

Doing business is another critical factor influencing the acquisition of skills. It is also a key consideration for foreign investors and venture capitalists. This was noted by ED10, Founder/CEO Co-Creation Hub. He asserted that having a robust ecosystem in Africa is essential, as several investors and venture capitalists are beginning to invest in start-ups. A number of investors and venture capitalists have shown willingness and are beginning to invest in start-ups in Africa, as emphasised by ED10 and ED7. Forbes also confirmed this (Shapshak, 2019). However, in most African countries, the doing business index is still low. There are challenges with regulatory policies in some African countries that are still quite restrictive, in addition to the other constricting factors mentioned above, like lack of adequate infrastructure, lack of a functional ecosystem, and regulatory policies (Gaus and Hoxtell, 2019; Abdychev et al,. 2019; Choi et al., 2019).

5.2.4   Global Competition for Applied Skills

The following six themes evolved from this outcome: ability to apply skills, emphasis on skills not certificates, international competitiveness, portfolio of work, validation of skills on a recognised platform, and proficiency in English. There has been a global shortage of high-skilled workers all around the world as a result of the rapid pace of digital transformation since the advent of automation and the Fourth Industrial Revolution (Samans and Zahidi, 2017; Deloitte, 2018). This has resulted in significant demand and interest in influencing the acquisition of New-Collar Skills for a specific focus on practical application.
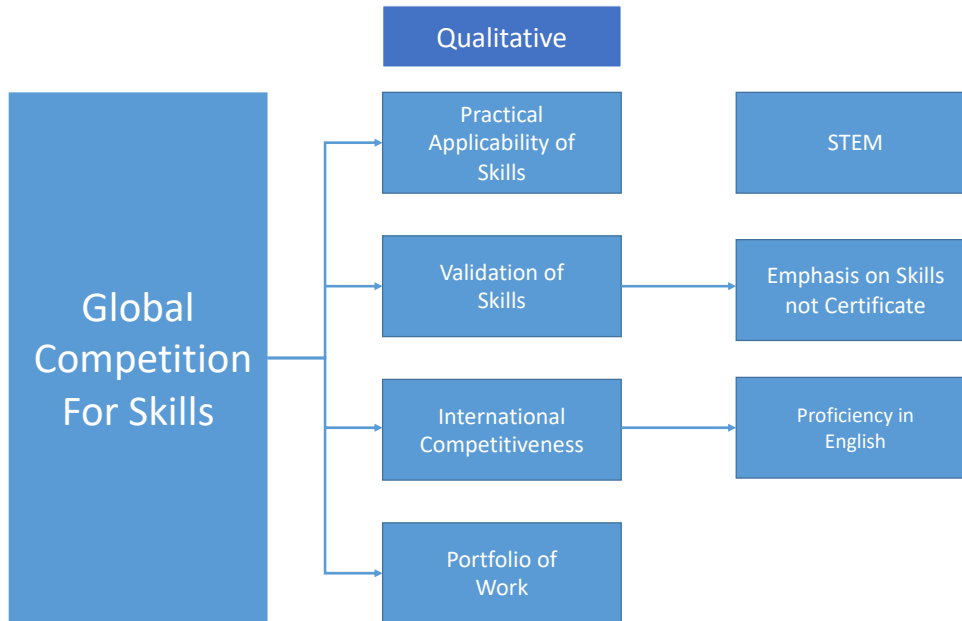
Figure 5.4: Global Competition for Skills Aggregate Dimension

5.2.4.1 Ability to Apply Knowledge and Practical Use of Skill

The intervention participants and the EDs emphasised that the practical application of skills is essential. ED1 and ED10 noted that acquiring skills is one thing, but being able to apply them to solve problems practically is the distinguishing factor. A few employability frameworks mention this attribute as a requirement for employability (Evans et al., 1999; McQuaid and Lindsay, 2005). For New-Collar Skills, this is far more essential. In this automation age, organisations are looking for individuals that can use these skills to solve problems. The EDs argued that the emphasis should be on practical skills and how they can be applied rather than a qualification, like a four-year university degree. Several scholars have reiterated this, most notably Mona Mourshed, Partner and Co-leader of Global Education Practice of McKinsey and Co (Cornelius, 2011). She argued that graduates entering the workplace are generally unable to produce immediate results. About 70% of the graduates leaving school lack practical experience. Only 20% of the unfilled 7.2 million jobs require a university degree, and most of these jobs require high technical skills and experience (Cornelius, 2011).

Many companies are leaning toward skills; they are more interested in if the candidate can do the job. ED 1 stressed this fact, noting that it is common practice for young people in Africa to stack up certificates with no experience. Validation of skills on these certificates is critical. This point

reinforces the next theme – *emphasis on skills, not certificates.* Tertiary education will have to be reinvented so that graduates can transition into employment with the practical experience necessary to do the job. Graduates might not have to go to boot camps or any other non-conventional educational institution to acquire practical skills to develop skills further in order to acquire a job (Cornelius, 2012). In line with the emphasis on skills increasing, there are some companies offering jobs to job seekers with non-traditional education and do not mainly require a university degree. This is influencing the acquisition of New-Collar Skills. The participants from the intervention workshop that were able to practically apply the skills were more successful in acquiring jobs requiring New-Collar Skills after the workshops than those who were not (Heatmaps Fig 5.22).

5.2.4.2 Portfolio of Work and Validation of Skills

Portfolio of work and validation of skills are qualities or skills that are necessary to increase employability in NCS. A candidate looking for a job will most likely aspire to have a portfolio of work and validate their skills if this will improve the chances of employability. As explained by ED1, one of the criteria of being part of Data Science Nigeria (DSN), is that, before they accept a candidate, they will have to see evidence that the candidate can perform the work. The candidate has to show a portfolio of work, and have some way to prove that they possess the skills. How does a candidate who has never worked in this field validate their skills? This would corroborate the claim that they have significant experience for the job.

Another factor is the candidate's ability to validate the proficiency of the skill. According to ED1, and ED3, this can be done for a majority of New-Collar Skills, like data science, big data, business intelligence, and other data-related technologies. Skills can be validated on Kaggle, to assess the candidate's skill level with other people around the world to show the employer the level of proficiency of skills (Jung, 2019). For software developers and designers, according to ED 9, StackOverflow and GitHub can also be useful for this (Fecak, 2020). Some of the candidates from the intervention workshop were able to validate these skills and show a portfolio of work; these candidates were able to find work faster than those who were not able to do so (See Heatmaps Fig 5.22).

5.2.4.3 International Competitiveness

This theme refers to international competitiveness for high-skilled workers; this has prompted the influence of the acquisition of New-Collar Skills in Africa. The theme, however, demands a certain standard from African youth. International companies have started recruiting highly skilled workers from all over the world, including Africa, and local companies have to compete with them. These international companies offer better incentives and higher remuneration. ED 10 asserted that, "It makes it almost impossible for local companies to compete…" This was confirmed by Techpoint that describes a particular entrepreneur who shared his story about how difficult it is to find the right local talent. This is mainly because of the lure to work with an international company is high. This is influencing the acquisition of NCS and increasing international competitiveness and standards of work in Africa countries (Ekwealor, 2019).

5.2.5   Employee Motivation

Employee motivation emerged along with four themes: extra-mile mentality/perseverance, entrepreneurial spirit, willingness to learn/lifelong learning, interest/attitude, and self-motivation.
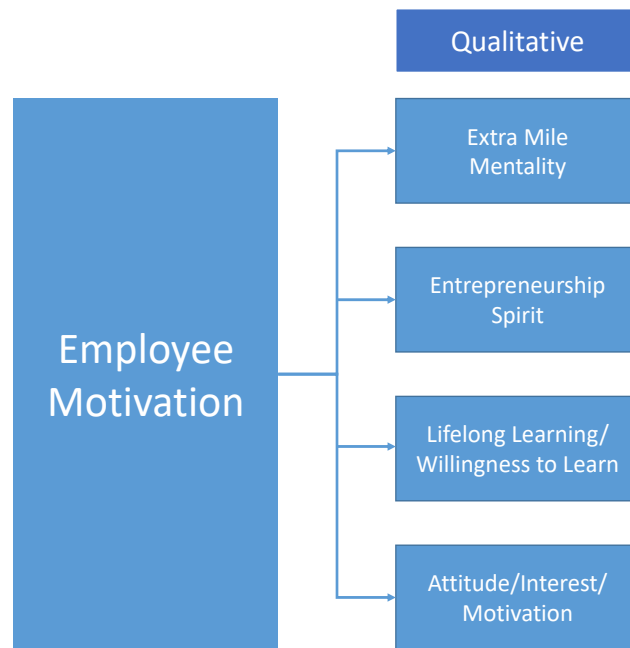
Figure 5.5: Employee Motivation Aggregate Dimension

5.2.5.1 Extra-mile Mentality/ Self-Motivation/Attitude and Interest

As noted by some of the EDs interviewed, having the right attitude and motivation toward learning is crucial to succeeding in the work environment and is an enormous driver to acquiring the skills. ED1 remarked thus:

> *I think acquiring skills is driven by one extra thing, that's called survival.*
> *You know, it is a different thing. There is a survival side to it, and that*
> *changes the way we learn; people almost like die there.*

ED1 explained that, in Africa, most young people see leaning tech skills (New-Collar Skills) as a way to survive, to feed their families, and to have a decent standard of living. As a result, they put all they have into making sure they have the right skills that will ensure they are employed. Self- motivation is also an attribute included in the employability framework of McQuaid and Linsey (2005). They note that self-motivation is one of the factors to be considered for employability. However, in the African context, according to ED1 and ED7, it is a little bit different. The drive for employability is survival, as there is so much competition and, in some cases, getting a job can be the difference between sustaining the welfare of a job seeker and going hungry. There is no social security net in many countries in Africa as a consequence this becomes an important factor in acquiring NCS.

Interest also emerged as a significant factor influencing NCS. The findings showed that the participants that were genuinely interested in the skills were more successful because they were able to go the extra mile to do what it takes through self-motivation to acquire a New-Collar job. As seen in the heatmaps below, the participants that recorded a high level of interest in the skills were all working in New-Collar jobs.

5.2.5.2 Lifelong Learning/Willingness to Learn/ Entrepreneurship Spirit

Willingness to learn and the ability to become a lifelong learner is a crucial factor influencing the acquisition of skills, especially in the technology age, when skills change very fast (Deloitte, 2017). This was reiterated by the ED 3, ED 2 from Microsoft and Oracle respectively.

We want to create immersive and inclusive learning experiences that inspires lifelong learning.

I think what we look for is the ability to challenge oneself. The interest in doing innovative things, willingness to learn.

The participants from the intervention who displayed willingness to learn were able to further self-educate themselves and gain as more knowledge on the NCS. These participants were more successful than those that did not. Willingness to learn and having the spirit of lifelong learning has long been a key factor mentioned in many employability frameworks. This was confirmed in the IFC report the McQuaid and Lindsay (2005) employability framework. The entrepreneurial spirit has also become a factor which influences the acquisition of NCS in Africa. With the rise of technology and start-ups, many young African have embraced this. Three of the participants from the 17 that were sampled were able to set up their start-ups.

5.2.6 Corporate Motivation

Corporate motivation was also identified as an outcome that could potentially influence the acquisition of New-Collar Skills; the themes identified were stakeholder awareness and increasing bottom lines.
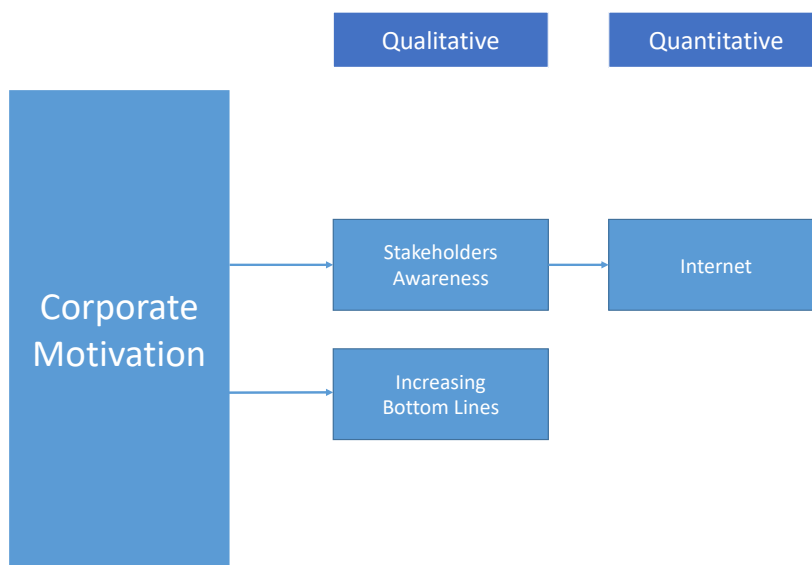
Figure 5.6: Corporate Motivation Aggregate Dimension

5.2.6.1 Stakeholder Awareness and Increasing Bottom Lines

According to ED1 and ED2, stakeholders in Africa need to have a keen awareness of digital transformation and the skills required. The stakeholders include government, corporate organisations, and potential employees. Creating awareness among executives who are decision-makers in their organisations will help hasten technology adoption and, in turn, digital transformation and help create jobs for NCS. This is a critical factor influencing the acquisition of New-Collar Skills in Africa.

ED1 asserted that giving stakeholders awareness of how automation and artificial intelligence can reduce cost, increase efficiency and increase bottom lines will go a long way in encouraging the adoption of these technologies (Gaus and Hoxtell, 2019; IFC, 2019). This will influence the acquisition of New-Collar Skills in local companies. Referring to data science and big data, ED1 noted that several local organisations do not know how "data" could benefit their organisations. This applies to the supply side too. Although a large number of young Africans have strong awareness of many of the emerging technologies, many are still unaware of the enormous benefits. The increase in this awareness will further influence the acquisition of the skills, most especially if they enhance employability. However, there is a bit of a caveat: young Africans are not well informed on how to transition from education to employability. Many young people do not have a clue on how to transition. This is a gap in the literature (Mckinsey, 2012).

5.3   The Effects of New-Collar Skills on Employability in Africa

In assessing the implications of the findings on the effect of New-Collar Skills on employability in Africa, the null hypothesis (Ho) "there is no significant effect on employability in Africa" was tested with reference to odds ratio. The results indicated that the odds ratio of someone who possesses New-Collar Skills securing employment in Africa is higher by at least 1.78 units than someone who does not have such skills. The implication is that New-Collar Skills have a significant effect on employability in Africa. Therefore, the null hypothesis was rejected, and the alternative hypothesis was accepted. The logit model also revealed that STEM, access to web, employment, and awareness of New-Collar Skills (NCS) are major effects. Other effects are years of graduation, access to a personal computer, access to power (electricity) awareness of

digital entrepreneurship and participating in a mentorship programme. The qualitative data findings also revealed other effects, and some validated the findings of the quantitative data. However, the qualitative data were broader and more robust. Five themes were derived from the interviews.
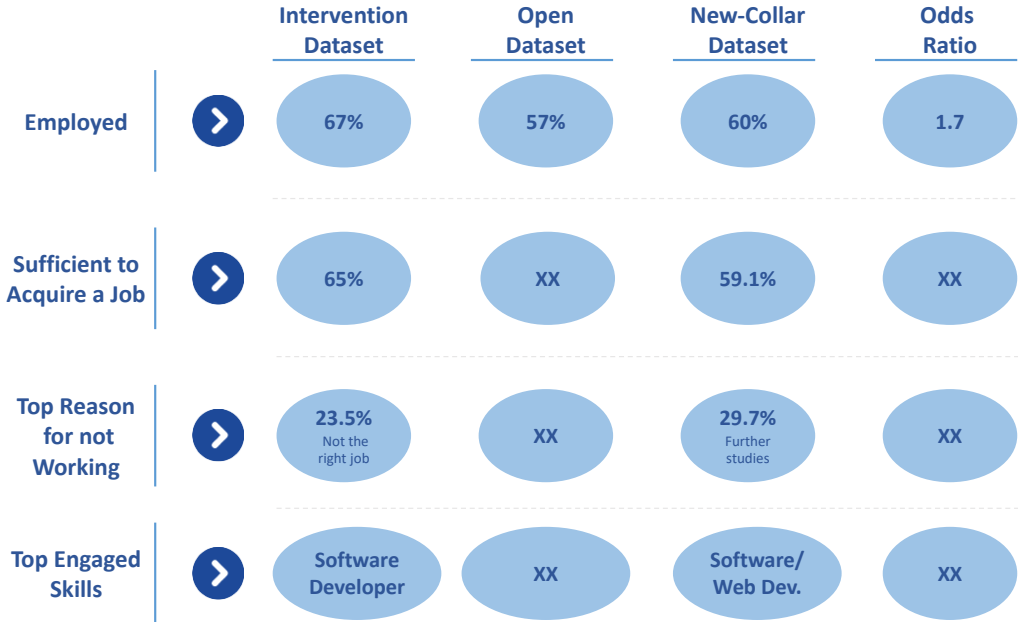
		Intervention Dataset	Open Dataset	New-Collar Dataset	Odds Ratio
Employed	>	67%	57%	60%	1.7
Sufficient to Acquire a Job	>	65%	XX	59.1%	XX
Top Reason for not Working	>	23.5% Not the right job	XX	29.7% Further studies	XX
Top Engaged Skills	>	Software Developer	XX	Software/ Web Dev.	XX

Figure 5.7: Effects of New-Collar Skills on Employability in Africa (Data sets)

The quantitative data from all the four data sets revealed that there was a positive effect on New-Collar Skills and employability. The odds ratio from the regression model indicated that there is a 1.78 chance of someone with a New-Collar Skill being employed. The New-Collar Skills data revealed that, from 10 African countries, 60% of the participants from the IBM African Skills Initiative programme were employed. This was further corroborated by the open data set in Kenya, Ghana, and Nigeria. In these three countries, among those who had acquired the skills, 57% were employed. These findings were further validated by the New-Collar Skills Intervention Workshop, which delivered training in New-Collar Skills for 14 weeks; 67% of the participants were able to get a job after 15 months. This proves that New-Collar Skills have a positive effect on employability. The findings align with the literature, as there is a demand for a new kind of skill. It is clear that the advancement in technology has had an effect of

increasing the demand for New-Collar skills /workers needed for business to thrive (Lager, 2020). The labour market is overflowing with jobs requiring special skills, typically related to digital technology and do not necessarily need a university degree. These are now referred to as New-Collar skills (Koenig and Pham, 2018; Lager, 2020).

The participants from the open data set and the intervention acknowledged the fact that training in New-Collar Skills was sufficient to acquire a job. However, this is not overwhelmingly conclusive. A participant who was not employed cited various reasons from this, notably not being able to find the right job, not enough experience and having to go for further studies.
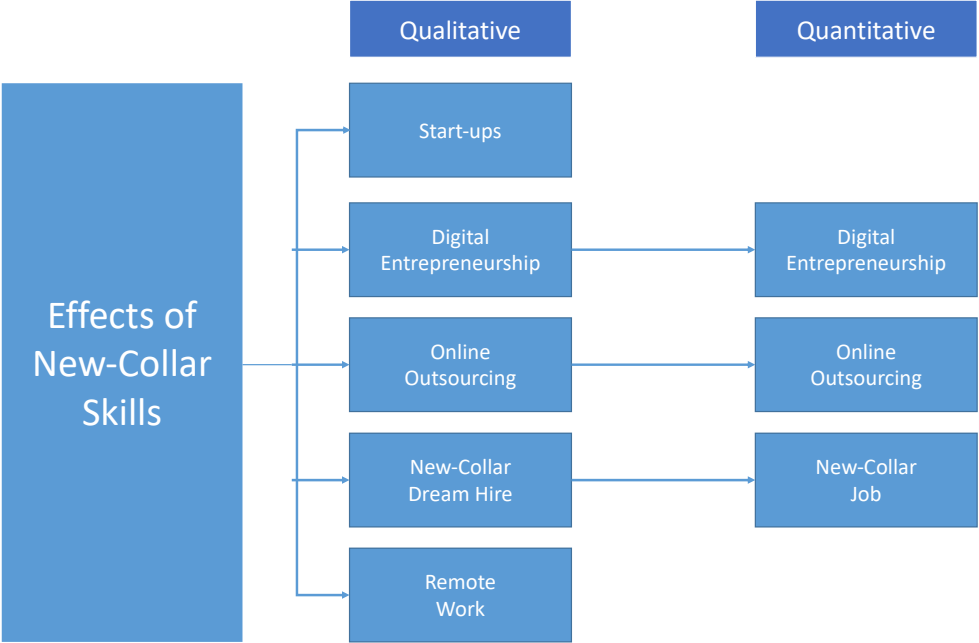
Figure 5.8: Effects of New-Collar Skills Aggregate Dimension

The qualitative data also validated these findings. The themes identified from the qualitative data were start-ups, DE, OO, new-collar dream hire, and remote work. Three of the above themes were corroborated by the quantitative data in the logit model.

5.3.1 Start-ups/ Digital Entrepreneurship

A number of start-up enterprises have sprung up in Africa, especially in 2019. Africa witnessed the most substantial investment in start-up in recent times from venture capitalists. According to Forbes, the African start-ups raised a record amount of seed funding in 2019, attracting a record

high of $1.34 billion in venture capital, with FinTech receiving the lion share of about $678.73 million and Nigeria attracting the significant sum (Shapshak, 2020). This was noted by ED10 and ED7, Founder of Angel Africa and Chanzo Capital. It was also noted that one of the reasons for the start-up ecosystem getting so much attention is because of the technical skills (New-Collar Skills) that young Africans are acquiring.

Digital entrepreneurship and start-ups are definitely on the rise in Africa. This has been as a result of a number of factors. According to Work Bank (2019), globalisation, has been a key factor. Even the smallest and youngest of companies could achieve a global vision with a model built on digital technologies. After quite a number of success stories of digital businesses, like M-Pesa, Paga, and Jumia, many new technology success stories have been created as a result of acquiring the skills (Taura, Bolat and Madichie, 2019). Techpoint noted that start-ups and digital entrepreneurship in Africa are thriving, driven by the rise of mobile payments, fast Internet connectivity, and the widespread use of smartphones. This has created a high demand for experienced software developers in Africa. Africa does not have enough high-quality talent to meet the needs of companies locally, as African developer talent are in high demand all over the world (Paul, 2019). Lately, experienced developers trained locally prefer working for start-ups and companies abroad because of the better compensation, improved work conditions, and opportunities provided by Europe and the US to start their career. This has unfortunately resulted in shortage of talent in Africa (Paul, 2019).

The foregoing clearly shows one of the effects of New-Collar Skills. These new skills and technologies are being deployed to invest in start-ups and digital entrepreneurship. However, the research findings revealed that, although DE was significant in the logit model, only 39.6% of the participants from the intervention workshop and only 31% from the open data set were engaged in DE. This might be because they did not develop the proficiency in the skill or lack of finance needed to invest in a start-up. However, the fact remains that having the skill and developing the skill to a specific proficiency could eventually lead to participation in DE or a start-up. This was confirmed by the UN report of 2019. The report listed the various challenges of digital entrepreneurship on the continent, which include limited entrepreneurial knowledge, lack of a highly skilled workforce –developers, designers, and data scientists – and limited access to finance (UN Digital Economy Report, 2019).

5.3.2 Online Outsourcing

Online outsourcing is an emerging industry that could contribute to tackling the youth unemployment challenge (Kuek et al., 2015). The findings from the data sets revealed that, although there is a keen awareness of OO of over 80%, only a third of the participants were engaged in it. It was shown to be significant with a high probability of engaging in it if the job seeker processes New-Collar Skills. However, only 37.9% of the participants from the intervention said they had engaged in OO, with 36.6% from the New-Collar Skills data set and only 33% from the open data set. Although New-Collar Skills encourage participation, it does not appear that many of the participants would choose to engage in OO as their first option when looking for a job. Many of the intervention participants stated that they would rather look for a job first and consider OO as an alternative if they could not find employment or would consider OO as the second job to augment their income (Kuek et al., 2015).

The participants reported that when they tried to engage in OO, it was difficult getting a contract or getting their profile approved. In all the data sets, the participants cited reasons for not being able to participate. These included too much competition, not having high enough rankings, and preference for freelancers from other countries. The most frequent New-Collar activities that the participants engaged in were software development, website design, data analytics, and cybersecurity. This finding is also confirmed in the literature. According to Kuek et al. (2015), software and web development still account for a large percentage of demand for OO services. This shows that, in the absence of finding permanent opportunities, most of the respondents that acquired New-Collar Skills were able to use these skills to source opportunities online, thereby enhancing employability.

Kuek et al. (2015) assert that, in most cases, OO is used as a supplementary rather than a primary source of income or, sometimes, job seekers turn to OO after spending a long time being unemployed or searching for professional/traditional work. There are still significant barriers for disadvantaged young people to benefit from OO. These include lack of access to the infrastructure required and, more critically, lack of skills necessary to procure work. In some parts of Africa, there are also trust issues. Some participants in the report noted that some clients did not trust them because of their country of origin. In the final analysis, although New-Collar Skills increase participation, there are still many challenges.

Malik, Nicholson and Heeks (2018), describe the level of participation. The job seekers looking to participate in OO opportunities can be classified into four, about 60% do not take up any freelancing opportunities; they are referred to as the *sinking.* Secondly, there are some who struggle to find work at all because of the competitive nature of OO work. They are unable to get a required profile of work experience and, therefore, unable to work. They are referred to as the *strugglers.* Thirdly, there are the *survivors.* This group represents those who found work but were just persisting at a low level of activity due to the high level of competition. Lastly, there are the *swimmers.* They are the OO workers who have been able to acquire and build on their experience, reputation, and create valuable contacts, and, as a result, earn a realistic wage. This sums up the challenges faced by job seekers looking to participate in OO. In addition to this, the EDs from the North African countries noted that participation in OO is further limited by the barrier, as Arabic is the first language in the region. However, despite encouraging developments in the outsourcing sector in Africa, less participation could be attributed to the working conditions and inequalities. African workers occasionally put in unsociable hours and sometimes face the threat of non-payment of salaries (Anwar and Graham, 2020).

5.3.3   Remote Work and Dream Hire

The findings revealed that one of the effects of having New-Collar Skills providing the right market conditions, along with other factors, is a higher probability of being employed. The probability of a job seeker with New-Collar Skills acquiring a dream or remote job is higher than that of a job seeker who does not possess New-Collar Skill. Several young Africans who had acquired New-Collar Skills were able to secure remote jobs. This is one of the effects of New-Collar Skills, as noted by ED2, Executive Director, MEST Ghana:

> *We are seeing many people now working remotely from Nigeria from Ghana working for companies in Germany, companies in the US in Canada from their bedrooms or co-working spaces…. I have met people here in Ghana, people who are working or have worked for companies in the Western world while sitting here. Remote work opportunity market is big now and getting bigger.*

In the view of ED10, this is happening to the detriment of local companies that are losing their highly skilled workers to foreign companies, like booking.com. The local companies are finding

it hard to compete because the foreign companies pay better incentives. There are many remote work opportunities if a candidate fulfils the requirements of New-Collar Skills. The participants of the intervention attested to the effects of New-Collar Skills. P1 stated that:

> *I really understood the power of these skills. It got me the opportunities,*
> *it opened so many doors, and it is helping me with my business now.*

Many of the participants testified that the New-Collar Skills gave them an edge. However, there were other factors that the successful candidates had, which gave them an edge and enabled them to get a New-Collar job, as some other candidates were not as successful. For example, P7 said:

> *Ah no, business intelligence I did not really get so enthusiastic about it or*
> *so interested in it. It was just like my starting point, so that I wanted to*
> *explore some various aspects of New-Collar Skills that have to do with*
> *the technology; so, for it was not what I really wanted to go far with.*

Despite the New-Collar Skills training, not all the participants were able to secure jobs. P7 and P8, 15 months after attending the training, had still not managed to secure a job. Several participants from the intervention workshops were in firm agreement, that New-Collar Skills gave them a higher probability of employment. However, despite this fact, the participants overwhelmingly agreed that, although New-Collar Skills gave them a better chance of securing a good job, other factors came into play. The in-depth interviews revealed that acquiring New-Collar Skills alone was not enough to guarantee a New-Collar Job (NCJ). A pattern emerged among the participants that had managed to secure a job. Many qualities and attributes that most participants who secured an NCJ had worked in their favour; these qualities and attributes are listed below.

5.4   The New-Collar Skills Qualities or Attributes

These are employability qualities and attributes that emerged from the from the data from the in-depth interview with the participants of the intervention and the Executive Directors as the characteristics New-Collar job seekers need to possess to increase their chances of employability after acquiring New-Collar Skills (some may be qualities that they possess already).

Practical application of the skill – It is crucial that, after acquiring the skills, the potential job seeker can apply the skill. Most of the EDs emphasised this point, particularly ED1, ED10, and ED7, who noted that it is more about application skills and less about certificates. P9, P4, P17, and P1 all attested to this, too, and narrated what they had to do to make sure the skills were at a certain level of proficiency. This is corroborated by the literature, particularly IFC (2019) and the employability framework of McQuaid and Lindsay (2005). An example of this is, if the job seeker has received New-Collar Skills training on mobile apps development, they should be able to create a functional mobile application.

Portfolio of Work – The second attribute or quality is that the job seeker will require something to showcase their ability, a portfolio. ED 1 attested to this. Is there a mobile application somewhere that can be referred to, a portfolio of work? Or have they been part of any assessment competitions online that can be showcased?

Interest/Motivation **–** This is an essential attribute that emerged. It seems that it is very important that the participant can demonstrate genuine interest in this area or New-Collar Skill that they want to make a career out of. High self-motivation, determination, and being focused are a crucial quality to staying relevant, as there is much competition out there, and being able to last the distance will determine success at getting a New-Collar job. Interest kept the participants hooked, gave them the motivation to keep learning. It is so important to ask the "why" question. The findings showed that the participants who had enough of why did well.

Research Skills – This attribute has become a very critical skill in the 21st century, both when job seekers are looking for a job and when employed. In this information age, the ability to be updated at all times is critical because skills sets change very quickly; new ideas are created and developed.

Lifelong Learner/Willingness to Learn – With things changing so fast in this automation age, software and technologies change very rapidly; the ability and willingness to learn quickly and be a continuous learner is a key attribute. This was an attribute noticed among the participants;

they would always be going online to do one course or the other related to the chosen New-Collar Skill. This was also strongly reiterated by the EDs of tech companies like IBM, Oracle, and Microsoft

International Competitiveness – The world has become interconnected; skills are very competitive; companies are willing to cross borders to hire talent. As a result, a good work ethic and professionalism are very much required.

Entrepreneurship Spirit –This is a quality that is required more and more today as corporations aspire for a competitive advantage in the technology age. Innovation and creativity are crucial. Having an entrepreneurship spirit in this age of start-ups and disruption is a considerable employability advantage. How the job seeker shows their creativity is critical.

Extra Mile/ Survival Mentality – Challenging oneself, putting in the work, and thinking outside the box is a huge requirement to remaining relevant. Constantly updating oneself and breaking boundaries, learning, being creative, standing out, and going the extra mile to ensure the end goal is reached are important. Quite a number of the participants from the workshop showed this quality – the tenacity to keep going, and keep improving oneself till they are the last man standing.

Validation of Skills – Being able to assess skills on professionally ranked platforms like Kaggle, GitHub, and StackOverflow is important. GitHub is a great place to showcase work, and it is also a great tool to contribute to open-source projects, thus providing the avenue to practice the skill with other software developers. There are now sites which job seekers can go to online to gauge their level of proficiency.

Proficiency in English – English is the universal business language. To be a global remote worker, a job seeker must have a good command of the English language. The ability to communicate, present, negotiate, and write in English is a critical skill required, especially if one is to work online or as a remote worker. The participants from North Africa seemed to think this was the only drawback for them as their first language is Arabic.

5.5 New-Collar Employability Quotient - NCEmQ

As a result of discovering these ten attributes and qualities among the participants from the intervention and interviews with the ED's, the New-Collar Skills Employability Quotient was developed. These are qualities that a New-Collar job seeker needs to possess to improve their chances of acquiring a New-Collar job.

Figure 5.9 New-Collar Employability Quotient

Various employability frameworks are found in the literature. According to McQuaid and Linsey (2005), debates of employability cannot be limited solely to the supply side and demand side of the economic theory. There have been different efforts to develop a more explicit definition of the concept that have stressed the need to understand the interaction of individual and external factors affecting the individual's ability to operate effectively within the labour market. The focus of such analyses is on "interactive" employability – this is the dynamic interaction of individual attributes, personal circumstances, labour market conditions, and other "context" factors. In their employability framework, the authors give a thorough and holistic account of the many factors that interact when identifying components and attributes of employability. The framework considers all the possible factors that may arise when considering employability. In considering skills for the new automation age, these factors and components are still very relevant. However,

the employability framework to consider for New-Collar Skills requires a more specific approach. The New-Collar Skills employability framework is specific to emerging technologies.

The NCEmQ extends the literature and contributes further to the employability framework in New-Collar Skills. It not only lists the factors that are relevant for employability in New-Collar skills and develops an employability quotient. This NCEmQ assesses, evaluates, and identifies actions and gaps that could assist in increasing the level of employability of a New-Collar job seeker.

5.6   The Extent to Which New-Collar Skills Enhance Participation in DE and OO in Africa

In assessing the implications of the findings on if New-Collar Skills enhance participation in DE and OO. The null hypothesis (Ho) "there is no significant relationship between the acquiring of New-Collar Skills and participation of youths in digital entrepreneurship and online outsourcing" was tested in reference to odds ratio. The results indicated that the odds ratios of someone who possesses New-Collar Skills participating in DE and OO in Africa are higher by at least 2.5 and 3.0 units, respectively, than those of someone who does not have such skills. The implication of this is that New-Collar Skills have a significant effect on participation in both DE and OO in Africa. Therefore, the null hypothesis was rejected, and the alternative hypothesis was accepted.

		Intervention Dataset	Open Dataset	New-Collar Dataset	Odds Ratio
Engaged in OO	>	37.9%	33%	36.6%	3.0
Engaged in DE	>	39.6%	31%	XX	2.5
Awareness in OO/DE	>	96.5% 81%	81.3% 76.3%	XX	7.7 8.2
Top Engaged Skill in DE/OO	>	Digital Marketing	Digital Marketing	Software/ Web Dev.	XX
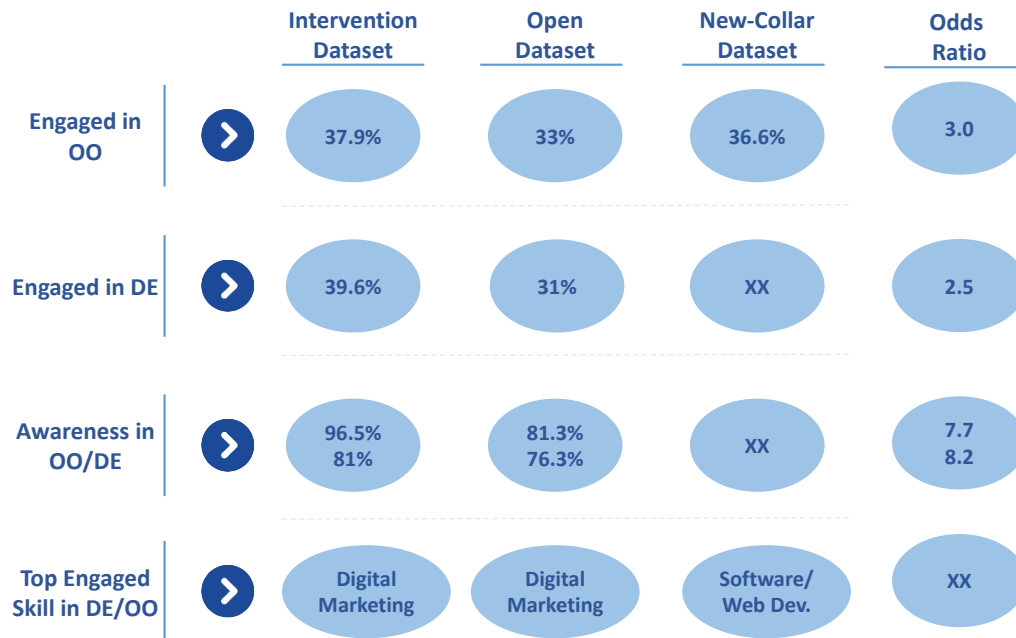
Figure 5.10: Engaged in DE and OO (Data sets)

As captured in Figure 5.10, the findings from all the data sets revealed that there is very high awareness of DE and OO and that New-Collar Skills enhances participation in OO and DE. However, as discussed in Section 5.3, despite awareness of nearly 80%, the engagement in both OO and DE was just above 30%. It has also been shown in the previous section that New-Collar Skills enhances participation in DE and OO to a certain extent; however, there are some challenges.
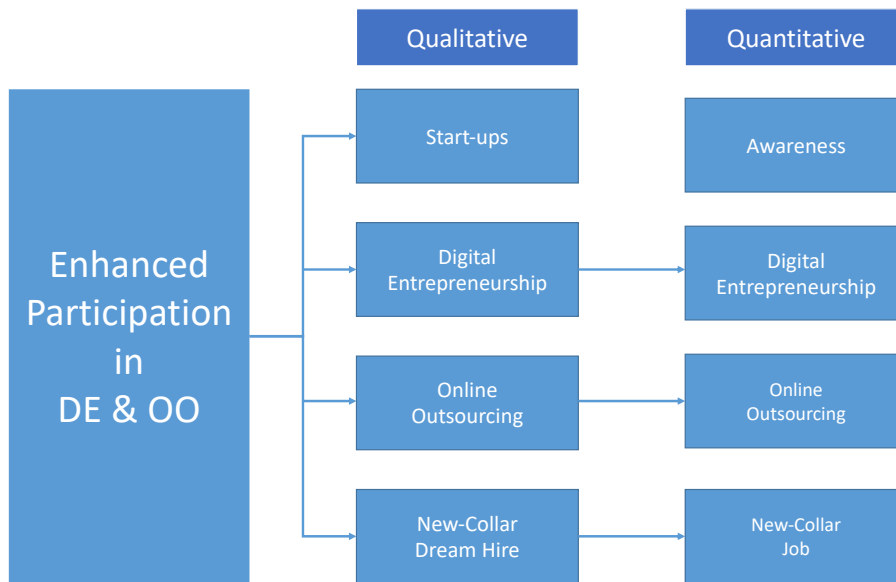
Figure 5.11: Participation in DE and OO Aggregate Dimension

Figure 5.11 indicates that there is a level of participation in DE and OO. However, delving deeper to assess the extent of participation in some of the key African countries researched – Nigeria, Kenya, and Ghana, is important.
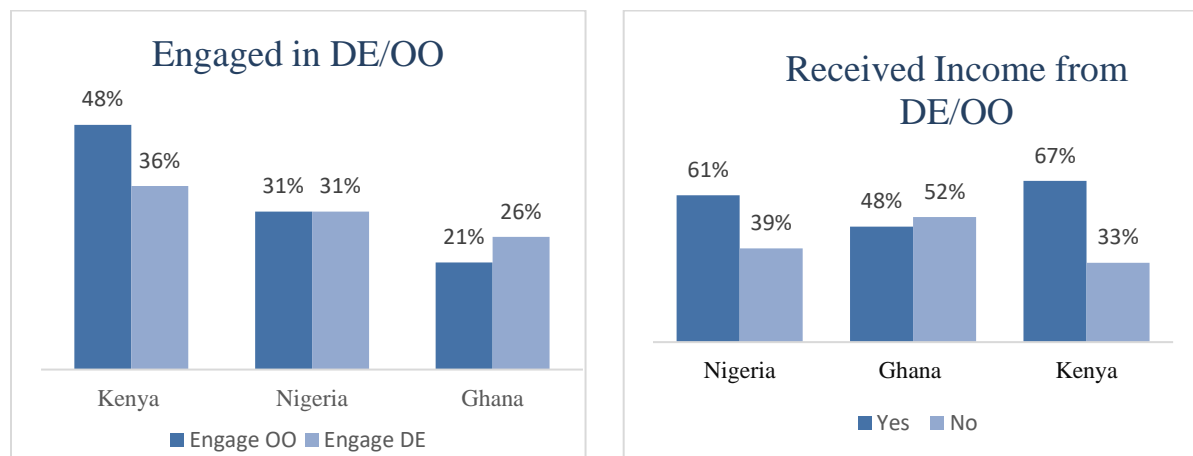
Figure 5.13: Engaged in DE and OO

As evident in Figure 5.13, Kenya is more engaged and has the highest percentage participation in both DE and OO than Nigeria and Ghana. Kenya is regarded as the hub of digital innovation in Africa. It has a vibrant telecommunications sector, which has become very competitive. The

dramatic increase in bandwidth has not only sufficiently reduced the cost but also has led to access to a large percentage of the population, including the underserved, thus increasing the number of Kenyans participating in the digital economy, thereby increasing digital entrepreneurship (Ndemo and Weiss, 2016). However, the findings also revealed that all three countries encountered several challenges in engaging in OO; nearly 60% of those surveyed in all three countries reported various challenges
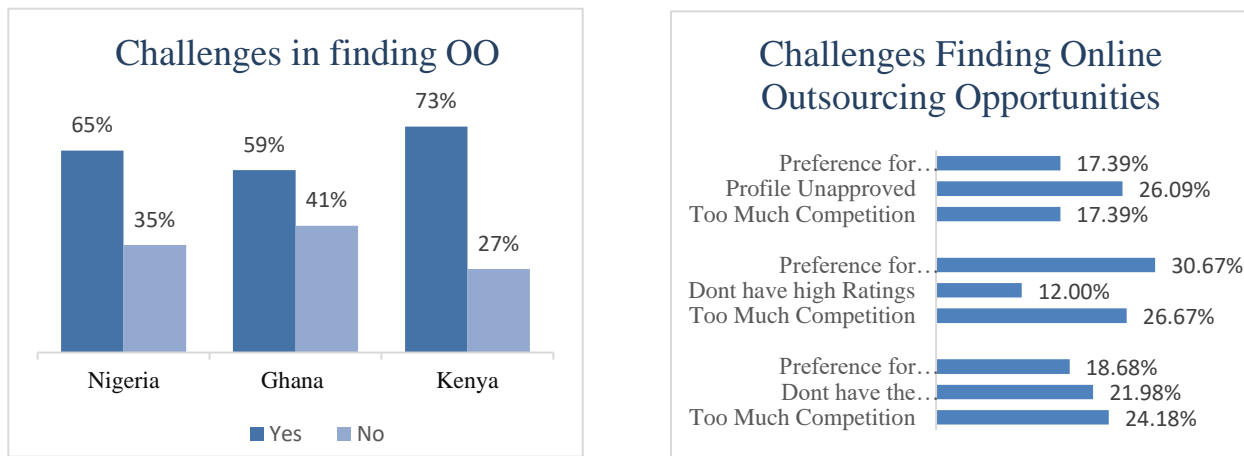
Figure 5.14: Challenges of OO

All the respondents from the three countries reported that there seems to be preference for freelancers from other countries or that there is a lot of competition for the opportunities online. The consensus seems to be that OO is rather challenging to earn a regular income because of the high number of freelancers competing for the same opportunities (Kuek et al., 2015). Digital entrepreneurship is somewhat different. It seems to be the norm in the three countries, especially in Nigeria, that a participant would engage in some kind of ecommerce, digital marketing, or social media marketing. Quite a number of the youth in all these three countries have something on the go. Social media and the Internet have opened the floodgates for most youth to go digital to do something, from engaging customers to do make-up online, to selling all kinds of products to make commissions, to be an Uber driver. The majority of the respondents used social media platforms, especially Facebook and Instagram, to earn an income. Young Africans are finding ways to start a business online, and this is what many of them call digital entrepreneurship (Fig.

5.15). Nigeria has just been nominated by the Economist as the most entrepreneurial country in the world. These young Africans are using DE as a way to earn a living and create jobs for themselves in the absence of paid employment (Mckinsey, 2018; World Bank, 2018). This is depicted in Figure 5.15 for all three countries.

Figure 5.15: Word Cloud of DE Activities

However, one of the reasons not mentioned in the findings that could be a reason for the low participation level is the issue of inequalities with regard to the working conditions that most African youth have had to endure on digital platforms. As observed from the findings, some of the respondents reported that these platforms were very competitive, however, according to Anwar & Graham (2020), despite these encouraging developments in opportunities on digital platforms, some of the working conditions and the inequalities are still quite stark. In the outsourcing sector, African workers put in unsocial hours and are under strict managerial control. They are sometimes under physical and psychological pressure, and other forms of labour insecurities. They also face the threat of non-payment of salaries, as some platforms allow clients not to pay for work that is unsatisfactory (Anwar and Graham, 2020).

Another issue worth noting that seems to be prominent in all the findings is the issue of gender bias. There is an obvious skew of male participants in all the data sets in this research. Despite attempts to engage a more balanced female participation, the intervention still only had 25% female representation. This aligns with Howcroft and Rubery's (2019) comment that history is inundated with missing women and warned that if we fail to intervene and make it right, women will be missing in our future.

Table 5.1: Gender Distribution of all Dataset Collected

Dataset	Table	Female %	Male %
Phase 1	3.2		
New-Collar Skills			
Nigeria		21	79
South Africa		25	75
Kenya		22	78
Tunisia		53	47
Ghana		33	67
Morocco		36	64
Egypt		39	61
Mauritius		36	64
Rwanda		37	63
Ethiopia		9	91
Phase 2	3.3		
Open Survey			
Ghana		35	65
Nigeria		36	64
Kenya		42	58
Phase 2	3.4		
New-Collar Skills			

Ghana		17	83
Nigeria		19	81
Kenya		31	69
Phase 3	3.7		
Intervention			
Nigeria		30	70
Phase 4	3.9		
Corporate Interview		10	90

In Table 5.1, the average female participation is about a third in most data sets, sometimes even as low as 10% in the case of Ethiopia. Only Tunisia and Kenya seem to be close to some sort of a balance in gender. According to Howcroft and Rubery (2019), the current debate concerning the future of work essentially neglects the implications for gender relations. Work is highly unequal and. if this foundation is the basis on which the future of work is built, we can only assume existing inequalities will be intensified. We have the opportunity to institute a number of changes to address these inequalities so that when facing the next wave of "disruptive innovation" it will be affected from a more level playing field (Howcroft and Rubery, 2019).

5.7   Contributions to Practice

With regard to contribution to theory and practice, this research contributes to a better understanding of labour economics in the area of skills for the emerging technologies, by defining and introducing the concept of New-Collar Skills and analysing the effects of NCS on employability and entrepreneurship. The study also contributes the New-Collar Skills Employability Quotient and recommends a skills road map for the job seeker in New-Collar Skills. A skills road map for MNCs looking to train and hire New-Collar Skills, and a skills strategy for governments looking to develop and encourage an increased New-Collar skill base.

5.8   Characteristics of New-Collar Skills

The characteristics of New-Collar Skills emerged as a theme that influences the acquisition of the skills. The study examined the essential skills and attributes required to have the skills that

will be relevant for the new automation age or the Fourth Industrial Revolution. There is no clear definition of the skill at the moment, apart from the definition coined by the former CEO of IBM, Ginni Rometty. Consequently, based on the themes that emerged from the literature, an empirical framework has been developed.
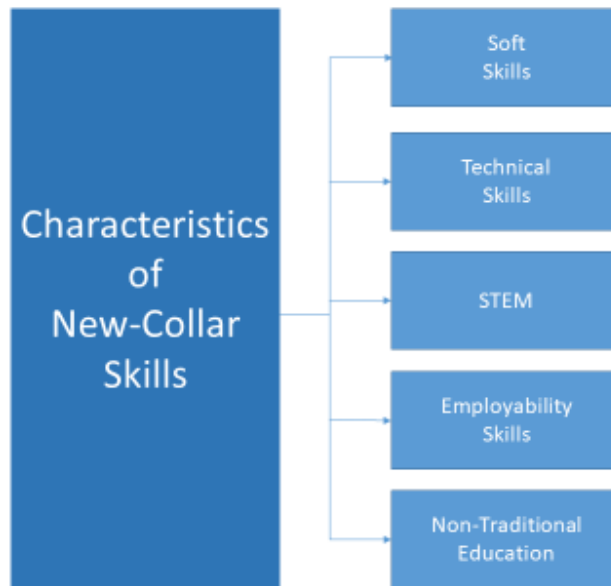
Figure 5.16: Characteristics of New-Collar Skills Aggregate Dimension

As shown in Figure 5.16, five themes emerged from the interviews and one from the logit model. The three-skills required for New-Collar Skills are soft skills, which have become very critical; technical skills; and, in order to increase employability, specific employability skills. Employability skills are skills necessary in addition to technical skills that are essential to hone the New-Collar Skills to ensure employability. These are the qualities or attributes that are referred to above. STEM emerged as a significant factor for New-Collar Skills in both date sets. However, it appeared that, from the in-depth interviews, a few of the participants that had not studied a STEM-related course were still able to effectively study a New-Collar Skill and secure employment successfully. This indicates that having a related STEM degree can be an advantage and beneficial, but not a necessity.

The findings also revealed that, typically, New-Collar Skills are taught or learned in a non-traditional or non-conventional setting, most times outside the university system, in boot camps, corporate organised training, online training, apprenticeships, internships, hackathons and other forms of vocational training. Table 18 displays a conceptual and empirical framework developed for New-Collar Skills; it identifies the individual aspects of New-Collar Skills in the empirical context to develop a definition for New-Collar Skills.

Table 5.2: Empirical Framework for New-Collar Skills

Core Components	Conceptual Definition	Empirical Definition
Soft Skills	Soft skills are special characteristics and abilities that distinguish a person from other individuals who have similar professional backgrounds and experience Perreault (2004). Soft skills are interpersonal and intrapersonal abilities that help individuals master performance in particular social contexts (Hurrell et al., 2012). According to Robles (2012), there are seven soft skills: (a) communication skills, (b) critical thinking and problem solving, (c) lifelong learning and information management, (d) teamwork, (e) entrepreneurship, (f) leadership, (g) work ethics and morals, and (h) leadership	Soft skills are very critical skills for the new age; it is essential that they complement technical skills for emerging technologies. They are as indicated by the empirical data (a) problem solving, (b) critical thinking, **(c)** creativity, (d) collaboration, (e) communication, (f) listening skills, (g) presentation skills, and (h) teamwork

Technical Skills	The skills to use (mobile) devices and applications to accomplish practical tasks and recognise specific online environments to navigate and maintain orientation (van Laar et al., 2016)	Employability skills represent the qualities or characteristics job seekers require to increase their probability of being employed in this new age of technology. They are (a) practical application of skills, (b) portfolio of work, (c)attitude/self-motivation/interest, (d) research skills, (e) international competitiveness (f) Lifelong Learning, (g) proficiency in the English language, (h) entrepreneurship spirit, (i) extra mile mentality, and (j) evaluation of skills
Employability Skills	Messum et al. (2015) define employability skills as the skills required not only to gain employment but also to progress within an enterprise to achieve one's potential and contribute successfully to enterprise strategic directions	From the empirical data, STEM will give a certain advantage, but it is not an essential requirement for emerging technologies.
STEM	The four strands of STEM – Science, Technology, Engineering, and Mathematics – have been staple forms of all students' academic careers, particularly science and mathematics (White, 2014).	Non-traditional education refers to non-conventional way of obtaining skills outside the university system, such as (a) boot camps, (b) apprenticeships/internship, (c) online education, (d) hackathons, and (e) vocational training.
Non-traditional Education	Non-traditional education is education that is offered in ways other than common daytime college classrooms. There are many versions of non-traditional education, such as college-prep education, evening courses, independent learning, online learning, residencies, cross-registration, and one-on-one learning (learn.org).	

This conceptual framework and empirical findings lead to the development of a conceptual definition of New-Collar Skills.

5.9   Definition of New-Collar Skills

New-Collar Skills *are a combination of technical, soft, and employability skills needed to work in the contemporary technology industry, gained through non-conventional education, like boot camps, vocational training, or industry apprenticeships.*

This is in contrast to a traditional academic degree. It is also different from digital skills, which is defined as technical skills, information management, communication, collaboration, creativity, critical thinking, and problem-solving, all within the context of digital technologies (Leahy and Wilson, 2014; van Laar et al., 2017).

5.10   New Collar Skills Employability Quotient

The New-Collar Skills Employability Quotient was developed to assess the qualities, attributes, or additional skills required to increase the probability of employability in a New-Collar job. The following qualities or attributes are evaluated to assess the readiness of a New-Collar job seeker to transition into employability. A fourth and final questionnaire was administered to the 17 participants of the New-Collar Skills Intervention Workshop to assess their New-Collar Employability Quotient, NCEmQ. Table 5.2 displays a summary of the questions asked and how each job seeker was assessed. The Low Quotient is given a score range of 0-2, depending on the interest level as represented by the response to the question. The High Quotient is given a score range 3-4, depending on the interest level. Each of the 10 Quotients are assessed in this way. The full questionnaire is included in Appendix A.

Table 5.3: NCEmQ Assessment

Employability Quotient	Low Quotient (0-2)	High Quotient (3-4)	Comment (Assessment)
Interest	Heard IBM was conducting a free training (1) My Friend was on the training thought I would	I have been interested in this New-Collar Skill for a long time and done various things to acquire the skill (3)	Assessing the level of interest will determine if the NCS job seeker will be rated a 3 or a 4

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	do it too (0)		
	It has Great earning potential once the skill is mastered (2)	Explain (4)	
Practically Applicability	Simulations (1) Team Project (2) Explain	Developed App or Model (3) Experience gained at work -If related (3) Client Work – If related (3) Explain	Assessing the level of work produced will determine if it is a 3 or 4
Portfolio of Work	Certifications Others Explain	Kaggle GitHub StackOverflow Explain	Have a Portfolio of work you can show employers? Access to their GitHub/ Kaggle account will lead to an assessment of a 3 or 4
Validation of Skills	Certifications Others Explain	Kaggle (3) GitHub (3) StackOverflow (3) Explain	Can you validate work on a recognised platform? Access to their GitHub/ Kaggle account will lead to an assessment of a 3 or 4
Entrepreneurial Spirit	Risk- Adverse (0-1)	Risk Taker Explain	Describe a work situation where you exhibited your risk-taking level. Explain an event or time when you lack the knowledge to complete a task
Lifelong Learning	Reading	Working on Open Source projects (3) Accessing Relevant	Describe what you do to continuously upgrade your skill?

		Online Courses (3) Teaching and mentoring on Relevant Skill (3)	Mentioning at least 2 options gives a 3
Extra-Mile Mentality	Average Explain	Above Average Explain	Describe an outcome where perseverance level helped overcome a huge obstacle and resulted in a successful outcome
Research Skills	Asking the right questions Internet search	Regularly using data and research skills and tools to solve problems. Explain	What do you understand by having good Research skills and how would you demonstrate this
Proficiency in English	Beginner (0 -1) Intermediate (2)	Advanced (3) Written English in Text Boxes	Explain what you do to improve your communication and writing skills
International Competitiveness	Upgrading my skillset	Improving my skillset to meet global standard Working with Global workers on open source programmes on international platforms Professional work Ethic Remote work Explain	Would you describe yourself as an international Competitive worker, explain

The participants were scored based on their responses. Each attribute is given a score ranging from 1 to 4. A participant scores 1 if the interest level is low and 4 if the participants' interest in that particular New-Collar Skills is deemed outstanding. This assessment is applied to all the other nine attributes. If the participant scores 24 points or above across the board, this should include an average score in the five key attributes: interest, practical applicability, portfolio of

work, validation of skills, extra-mile mentality. This means they have a very high chance of being employed. If, conversely, the participant or job seeker scores below the 24 points, this means some gaps need to be addressed, especially if these gaps are in the five key attributes mentioned above to increase the job seeker's chance of being employed.

5.11 The New-Collar Skill Employability Quotient Assessment Scorecard
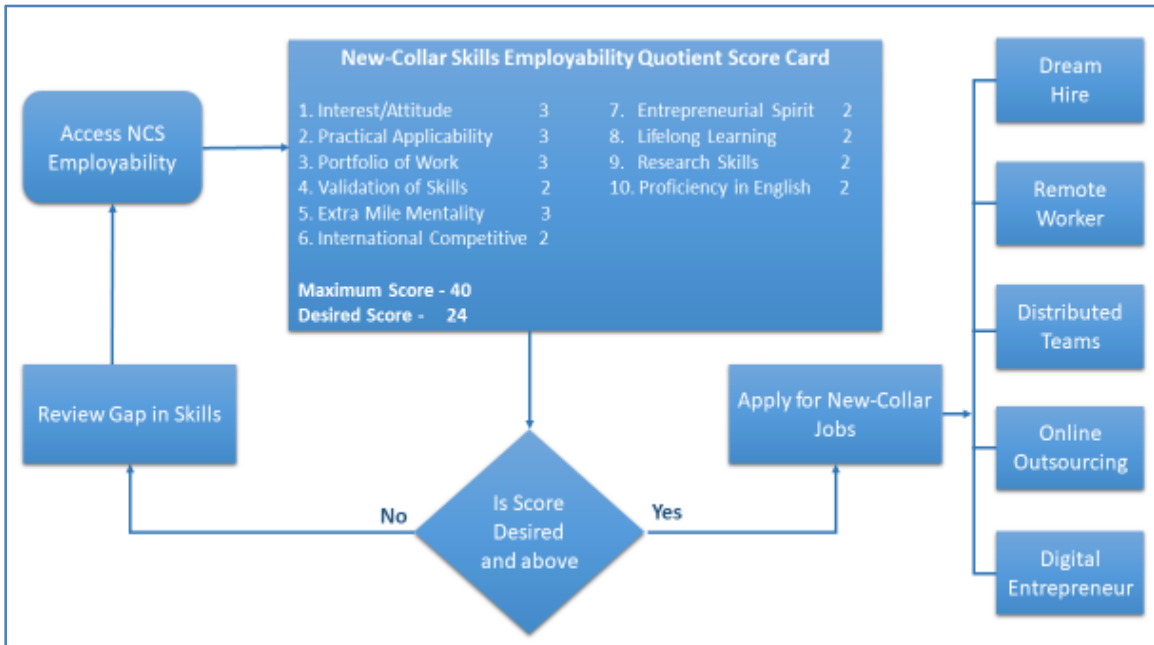
Figure 5.17: New-Collar Skill Employability Quotient Assessment Scorecard

Figure 5.17 shows the flow for a job seeker to assess their New-Collar Skill Employability Quotient. The job seeker begins by accessing their NCEmQ scorecard, by assessing every attribute (or quotient) that will help increase employability. If they attain the desired score, which is 24 and above, they have a higher probability of being successful at finding a New-Collar job. If the job seeker receives a score lower than 24, most especially if they have not achieved an average of 2 in the key attributes, they are advised to review gaps in these attributes. For example, if the participants have a gap in their level interest, the job seekers will probably have to examine if they really want to pursue this particular New-Collar Skill or interested in another. Alternatively, if they are having challenges showing a portfolio of work or practical applicability; they could create an account with GitHub and participate in open-source coding or

on a project. There are various ways, depending on the skill or attribute gap, by which a job seeker can increase the NCEmQ score.

5.12   Status of the Participants from the New-Collar Skills Intervention Workshop

Table 5.4 shows the 17 participants, their employability status, their role at the companies where they are working, if they are using the NCS they were trained for at the workshop and the New-Collar Skill Employability Score; NCEmQ. The table further shows that 12 participants were employed, 3 were self-employed and had set up their start-ups, while 2 remained unemployed.

Table 5.4: Status of Participants of the New-Collar Skills Intervention Workshop

Participants	Gender	Course	Status	Role	Using NCS	Employability Quotient
P1	Male	Business Intelligence	Self Employed	Co-Founder Saya	Yes	24
P2	Male	Business Intelligence	Employed	Project Data Analyst Jobberman	Yes	26
P3	Female	Business Intelligence	Employed	Product Specialist Cowrywise	No	14
P4	Male	Mobile App Development	Employed	Citti Nuvola Software Developer	Yes	30
P5	Male	Mobile App Development	Employed		No	9
P6	Male	Mobile App Development	Employed	Finchglow companies Software Developer	Yes	25
P7	Female	Business Intelligence	Employed	Semicolon Product Designer	No Further Education	19
P8	Female	Business Intelligence	Unemployed	N/A	NO	10

Participants	Gender	Course	Status	Role	Using NCS	Employability Quotient
P9	Male	Business Intelligence	Employed	Nigeria Education Foundations Program Admin	Yes	29
P10	Female	Business Intelligence	Employed	Lonzec Technology Ltd Project Manager	Yes	20
P11	Female	Mobile App Development	Employed	Qucoon Ltd Product Manager	Yes	25
P12	Male	Mobile App Development	Self Employed	Rytegate Technology Product Manager	Yes	23
P13	Male	Mobile App Development	Self Employed	Co-Founder, TechGen, Startup	Yes	24
P14	Male	Mobile App Development	Employed	Newhomes Ng LeadSoftware Developer	Yes	27
P15	Male	Business Intelligence	Employed	Plat4om.co Social Media Manager	No	12
P16	Female	Business Intelligence	Employed	Suntory Beverage & Food Service Desk Engineer	No	15
P17	Male	Business Intelligence	Employed	Chi group Product Manager	Yes	26

5.13 NCEmQ Assessments of the Participants of the Intervention Workshop

To further explain the NCEmQ, a heatmap was used to chart scores of the participants from the intervention workshop from each attribute to help determine their employability level. The maps in Figures 5.18-5.22 show the scores of each of the participants. The red square denotes a gap in the skill; yellow denotes that the skill is on the low end; the green square denotes that there is no gap; and the blue square denotes the overall employability score –the New-Collar Employability Quotient of the participant.

5.13.1 Participants' Heatmaps

The figures (Figs. 5.18-5.21) are the heatmaps of the 17 participants from the New-Collar Skills Intervention, depicting the proficiency level in each attribute and the New-Collar Employability Quotient Score.
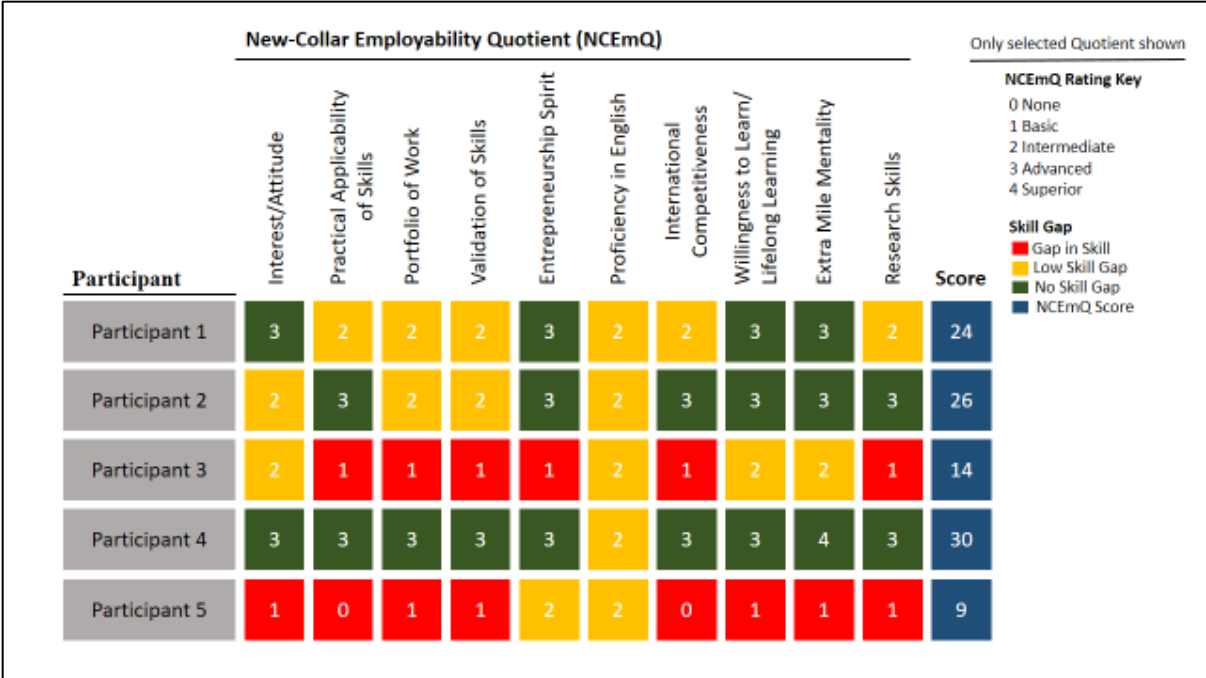
Figure 5.18: Participants' NCEmQ Heatmap (a)

Figure 5.18 indicates that three of the participants had crossed the threshold of employability, by scoring 24 and above in the NCEmQ. All three of them had no gap in skill level in any of the attributes or quotients and were all employed in New-Collar jobs. Participants 1 and 3 had a high-interest level quotient of 3, while Participant 2 had an interest level of 2. This interest level did not prevent him from being employed, as he compensated for this in other attributes. The participants who studied Mobile App Development had a greater requirement to fulfil attributes 3, 4, and 5: practical application of skills, validation of skills, and portfolio of work, respectively.
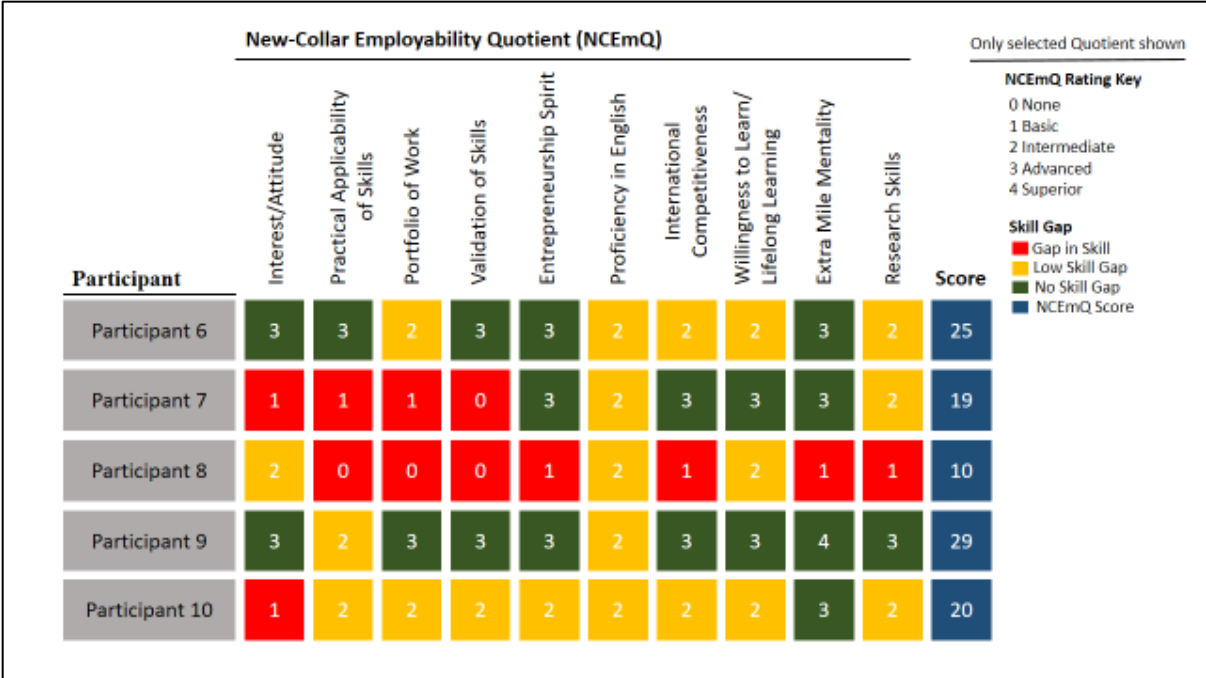
Figure 5.19: Participants' NCEmQ Heatmap (b)

In Figure 5.19, only two of the participants scored above 24, Participants 6 and 9. Both had a high-interest quotient. P6 did MAD; this means practical applicability is a critical quotient to acquiring a job, while P9 did BI. P7 stated that she did not have a real interest in BI; as a result, she decided to do something else. She had higher scores in the other attributes, like Willingness to Learn and Extra Mile Mentality. P8 scored low in many of the attributes; she remained unemployed. She stated that the reason she was unable to acquire an NCJ was her inability to practise the skill because she did not own a device. She scored very low and had gaps in attributes like Research Skills, Interest Level, and Extra Mile Mentality. This meant she had low self-motivation, which is usually one of the drivers that give participants the perseverance to go the extra mile.
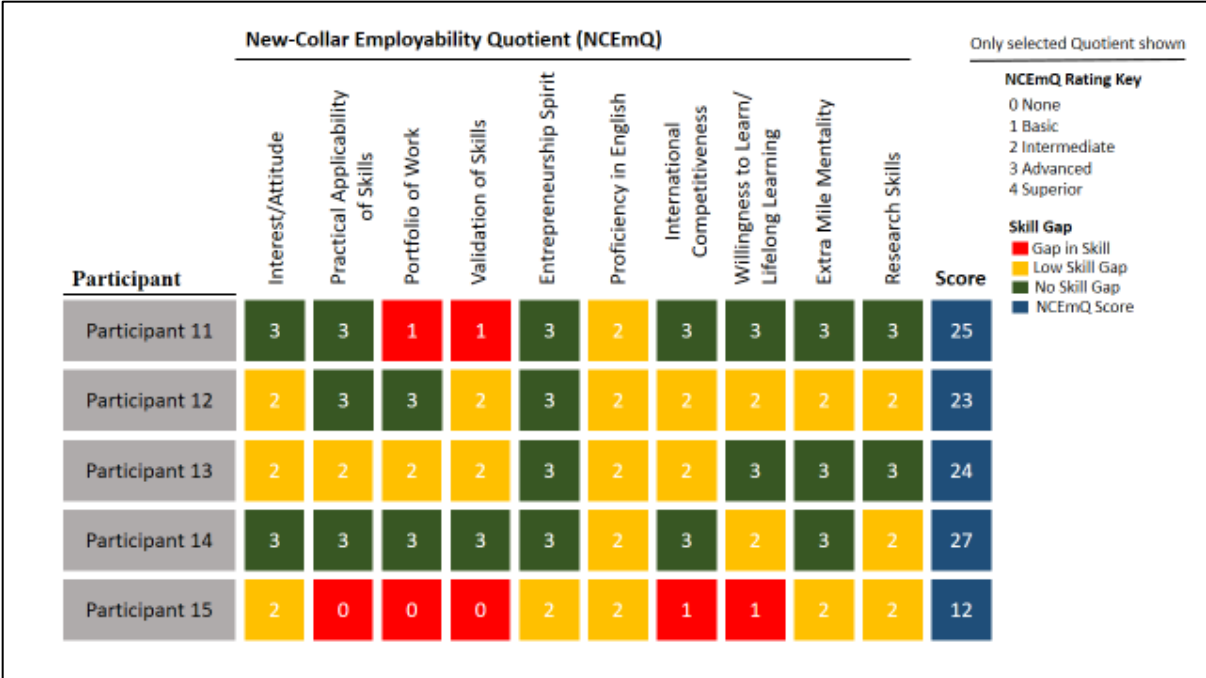
Figure 5.20: Participants' NCEmQ Heatmap (c)

In Figure 5.20, three of the participants scored the desired 24 – Participants 11, 13, and 14. Participant 12 just missed the cut-off by one point. P12 was employed in an NCJ. He had no skill gap. As a software developer, he scored high in all the essential attributes, had a portfolio of work, and could practically apply the skills. The only participant that scored low in this heatmap was P15. He studied BI and scored low in all the essential attributes, like portfolio of work, practical applicability, validation of skills, and willingness to learn. For a while, he was unable to use the skill to get a job. He said it was difficult getting a job because he did not have a degree. He was, however, able to find a job later as a social media marketer, which is pretty much what most young Africans do when they are at a loose end. They participate in some kind of digital entrepreneurship, as they call it.
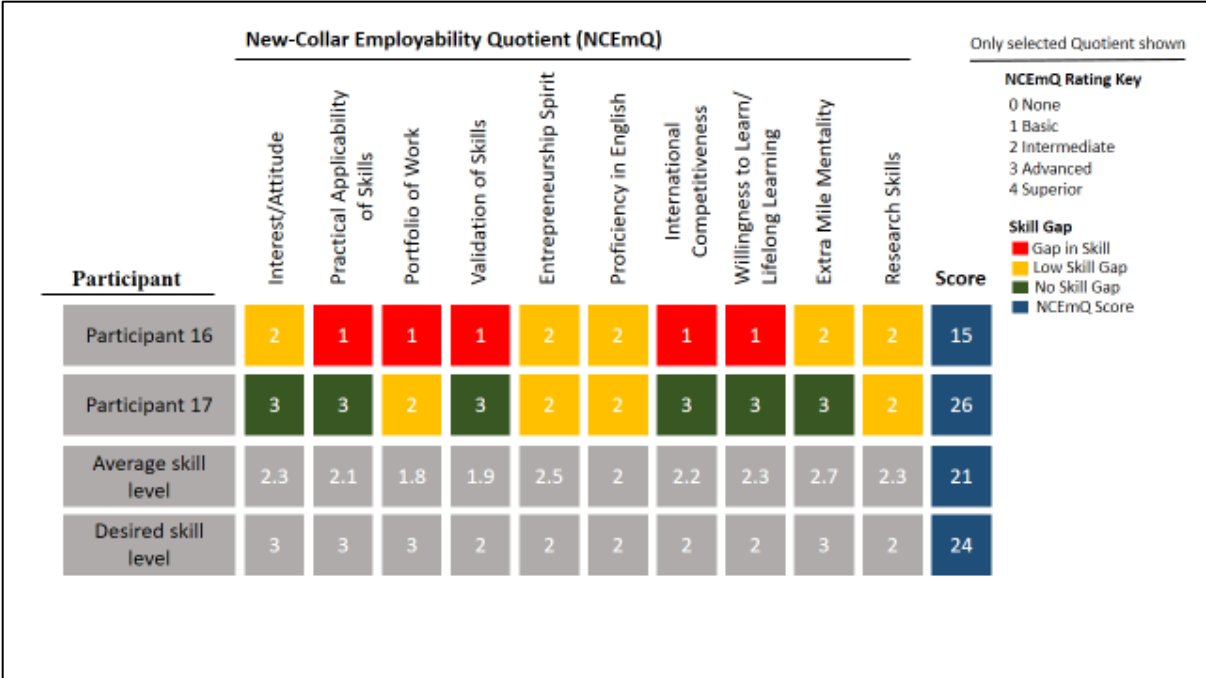
Figure 5.21: Participants' NCEmQ Heatmap (d)

The final heatmap shows Participant 17 as reaching the cut-off of 24. His interest level was high and he scored high in most of the essential skills. P16 had skill gaps in most of the essential skills, like practical applicability, validation of skills, and willingness to learn. P16 had a job, although she was not working with her NCS, as a service desk engineer in a food and beverage company.
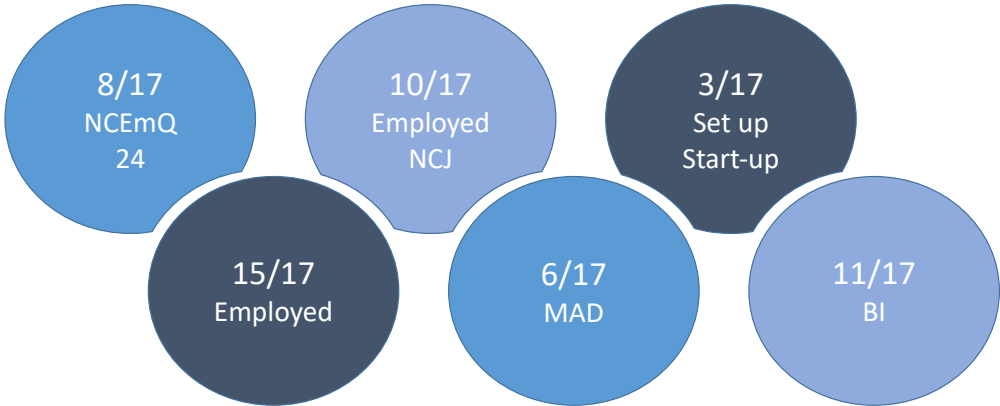
Figure 5.22: The 17 Intervention Participants

5.13.2 Summary of the Heatmaps

As shown in the four heatmaps in Figures 5.18, 5.19, 5.20, and 5.21, 8 of the 17 participants achieved a score of 24 and above. These participants achieved a high employability quotient and therefore would have a higher probability of being employed in a New-Collar job. However, as indicated in Figure 5.22, 15 out of these 17 participants were working. Only 10 of the participants were using New-Collar Skills at their places of work; these included the eight participants that achieved the required employability score of 24 on the NCEmQ. The other two participants P10 and P12 received a score of 20 and 23, respectively. P10 was a project manager and used her business intelligence skills sparingly. P12 was a software developer, who fell short of the cut-off by one point. This does not mean that P12 would have less competence at using the skill; the NCEmQ is just a guide to help the employer and the job seeker to assess the possible gaps in skills needed to work in a New-Collar job. P12 could choose to address this gap by working on validating his skills or one of the other attributes that he fell short of. The other 5 participants were able to acquire jobs but not in New-Collar jobs.

There could be several reasons, like not having enough experience in New-Collar Skills to get a job in this space. For example, P3 opted to work as a product specialist in Cowrywise, a Fintech. She said she was not able to use her New-Collar Skills of business intelligence at the job. P5 was also not using the skill because he was unable to get enough practical experience. P7 was not using the specific New-Collar Skill of business intelligence because she realised after the training that she was not interested in that particular New-Collar Skill. She decided to enrol at Semi-Colon, a boot camp to become a front-end designer/developer. P8 remained unemployed; she said she was unable to get a job because she had no computer and was not able to do much with the skill. Her interest level was low, and so was her motivation. These attributes are crucial to being able to keep up with the competitive nature of the skill and jobs to drive the effort needed to be successful in acquiring a New-Collar job. P10 ended up accepting a job as a project manager. P11 was one of the first participants to secure an internship right after the Intervention. The unique thing about P11 is that she had never done any form of coding or mobile app development; she came from an accountancy background. However, her interest level, motivation, and drive were very high. After spending nine months in an internship, she was able to secure a job as a product manager. P15 was finally able to secure a job as a social media

manager. He had previously complained that not having a university degree had been a drawback for him to securing a job. He noted that employers were reluctant to offer him a job despite his IBM certification in New-Collar Skills. However, he was able to get a job in digital marketing. P17 was able to get a job at a multinational beverage company, running the sales division. He said he used his New-Collar Skill of business intelligence to analysis sales data to help achieve sales targets of the product he managed.

It is clear from the analysis of the two-year journey of the 17 participants after the completion of the New-Collar Skills Training Intervention that a few patterns emerged regarding the employability of the participants. After accessing the Employability Quotient of the 17 participants, the following observations were made:

1. Having a **high interest** level is paramount to success in a New-Collar Skill. It is very competitive and requires focus, perseverance, and hard work in training and preparing to seek employment. All 8 participants who scored 3 in interest level and a high score in extra mile mentality on the heatmap were employed in New-Collar jobs, as they had a high level of interest and were passionate about the skill.

2. Being able to show **practical applicability** and **validate the skill** level is imperative to being employed at NCJ. A job seeker needs to be able to use the skill, or there is no point, and this requires either getting an internship, working on projects with friends, or the Internet. In the case of software development, having a GitHub account will certainly help.

3. Assessing the level of **market demand** for that particular skill in the market: It still boils down to the demand in the market. If there is no demand in the market for the skill, then no amount of interest, practical applicability, and extra mile mentality will lead to employment. It was discovered later that the software (IBM Cognos) learned by the participants used in business intelligence was not in demand in certain regions. However, the participants that had **extra mile mentality** used the principles learned to teach themselves another software (Tableau) that was in demand in the market to enable them to get a job. In the age of remote work, a New-Collar worker is a global worker and might be able to go online and find work in another part of the world where the skill is in demand, this is where international competitiveness would come in handy.

These findings led to the development of the following skills road maps for the job seeker, organisations and government leaders that train and hire in New-Collar Skills in developing countries.

5.14 Skills Road maps

The various road maps were developed as a result of this research. The first road map is one developed as a pathway for job seekers fresh out of college or university (first-time non-graduates job seekers) who would like to explore the emerging technology space and acquire a New-Collar Skill.
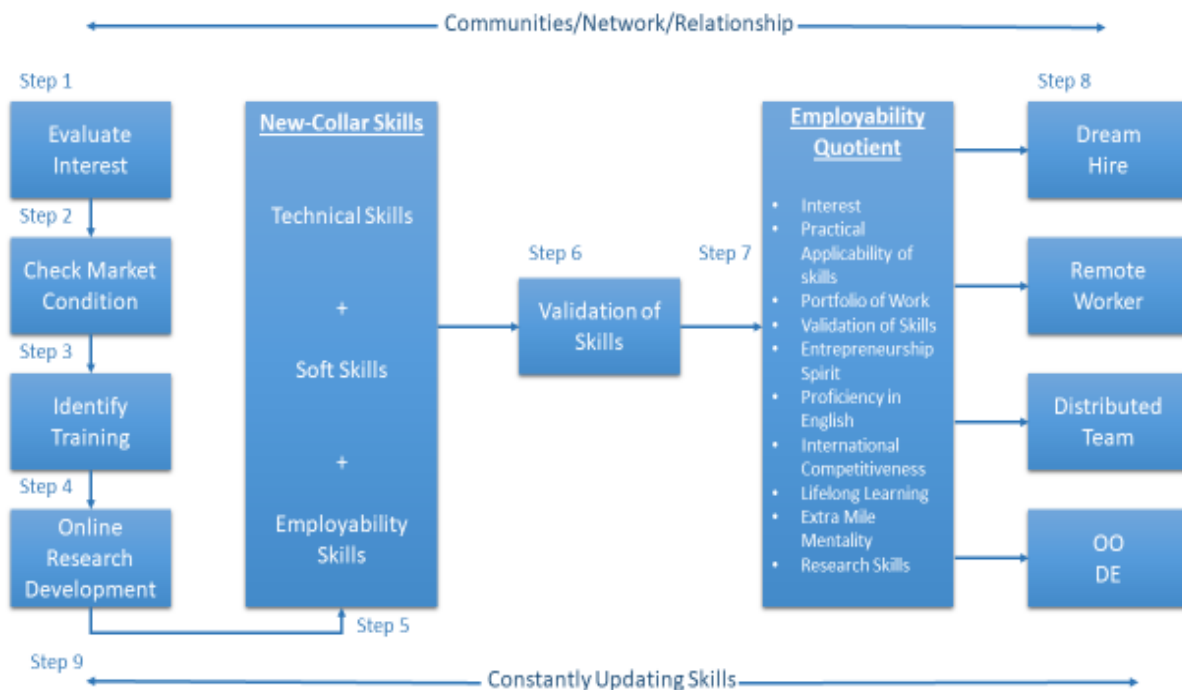
Figure 5.23 Job seeker Skills Road map

5.14.1 New-Collar Skills Road map – Job Seeker

1. ***Step1: Assess Interest in New-Collar Skill*** – Before deciding to acquire a particular New-Collar Skill, participants have to assess their interest level. Emerging technologies span many different areas; a participant would be better off choosing what technology to engage in based on their passion. Is there a preference to be a developer, an analyst, or a designer? If the job seeker really wants to excel and reach their highest potential in this skill, they must have real passion and interest. They must do some research about the various emerging New-Collar Skills in the market before making a decision on what

training or skill to opt for. Find out all about the skill and what it takes to be proficient in the skill, what work is to be done; seek out someone who is working with the skill already. Have a thorough understanding of all the intricacies that may come up before embarking on the training. Job seekers are advised to fully consider all the options and not decide to acquire a New-Collar Skill because it is popular or it is the current top-paid skill.

2. *Step2: Market Focus* – Market insights should be considered before embarking on training or acquiring a particular NCS. Survey the market of the skill you are interested in. Is there a demand for that particular New-Collar Skill in that region, state, or country? Is the job seeker prepared to travel to another part of the country where there is a demand? Or could these skills be applied online? Is it possible to be a remote worker? However, it is also imperative to make sure the job seeker is passionate, interested and sufficiently motivated before they decide to study a New-Collar Skill, as they will be challenged throughout the journey.

3. *Step 3: Identify Training* – Identifying a suitable training path is extremely critical to acquiring relevant and appropriate skills. This could be a non-conventional educational path, like a boot camp or vocational training, an apprenticeship or internship. Whichever path is chosen, it must be one that gives sufficient hands-on training that allows adequate practical application of the New-Collar Skill, encourages group projects where all the members of the team can practise the skill. Another thing to look out for is the possibility of working on a live project. This could be either as a member of a team or solely. This is to enable the participant to have something (portfolio of work) to show their potential employer as evidence that they can apply the skill, which helps showcase innovation and creativity.

4. *Step 4: Online Research and Development* – The online community is an incredible resource for learning and development. There are many online sites that have excellent resources for learning New-Collar Skills and augmenting the current skills of the job seeker. Researching and exploring the Internet to explore how the job seeker can boost

their skills and knowledge in that particular area are critical. This also includes joining relevant communities, taking part in competitions that test one's skills against other job seekers with the same skill set in other geographies –learning the latest updates. This can be used to compare the level of international standards expected and find the gaps to assess if any further learning is required to be proficient in that particular NCS.

5. ***Step 5: Assessing other New-Collar Skills***– New-Collar Skills include technical, soft, and employability skills. It is essential to be proficient in all three. However, most training outfits place more emphasis on technical skills and do not give enough weighting to soft skills and employability skills. It is becoming extremely important that the job seeker is competent in these skills, as most employers are beginning to play greater emphasis on these skills in evaluating the NCS proficiency level before hiring.

Soft Skills – Soft skills, like communication, presentation skills, critical thinking, problem-solving, are critical because most New-Collar jobs emphasise being a member of a team. Becoming a global or remote worker requires excellent soft skills and these soft skills are crucial to becoming a valuable member of the team. The job seeker may want to join organisations, like Toastmasters that help hone one's communication, leadership skill and other skills to improve one's chances of being employed.

Employability Skills – See New-Collar Employability Quotient

6. ***Step 6: Validation of Skills*** – After acquiring New-Collar Skills, the job seeker must test out these skills, assess proficiency level before seeking employment. There are various platforms online where skills can be validated. There is *Kaggle,* an online community of data scientists and machine learning practitioners. *StackOverflow* is the largest online community for developers to share programming knowledge and build their careers, *GitHub* is also bringing together a community of developers to discover, share and build better software. All these communities are readily available free to anyone to improve their skill set. They also help to validate and recognise a New-Collar Skill set by obtaining a certification or a badge for the skill from a reputable organisation. These badges can also be found on other online learning portals.

7   *Step 7: Access your NCEmQ score*– The New-Collar Employability Quotient, NCEmQ, is a tool that enables the job seeker to assess their employability level and skills. Where does the job seeker rank on the scale of employability? (See Figure 5.17). The job seeker should try to improve their ranking and close any gaps in the attributes. A score of 24 and above gives the job seeker a higher probability of being employed. However, this does not mean that if a job seeker scores are slightly lower, they do not have a good chance of being employed. There are five essential attributes which if the job seeker score high in they will more than likely have high employability ranking. It is important that, if the job seeker has some gaps, they work to improve on the gaps and then retake the assessment. Besides, soft skills need to be assessed.

8   *Step 8: Constantly Updating Skills* – The job seeker must always plug into new learning; these skills need to be refreshed and updated regularly. A New-Collar job seeker has to be a lifelong learner; these skills and emerging technologies are constantly changing and being updated. To stay relevant, continuous learning is essential.

9   *Step 9: Join a Community* – Being an active part of a community or network of people with similar skills, background and like minds will help to enhance the development and growth of the job seeker career.

10 *Apply for a New-Collar job* – Decide if the job seeker would like to work online, remotely, or join a team of distributed workers.

5.14.2 New-Collar Skills Road map – Corporate Organisations
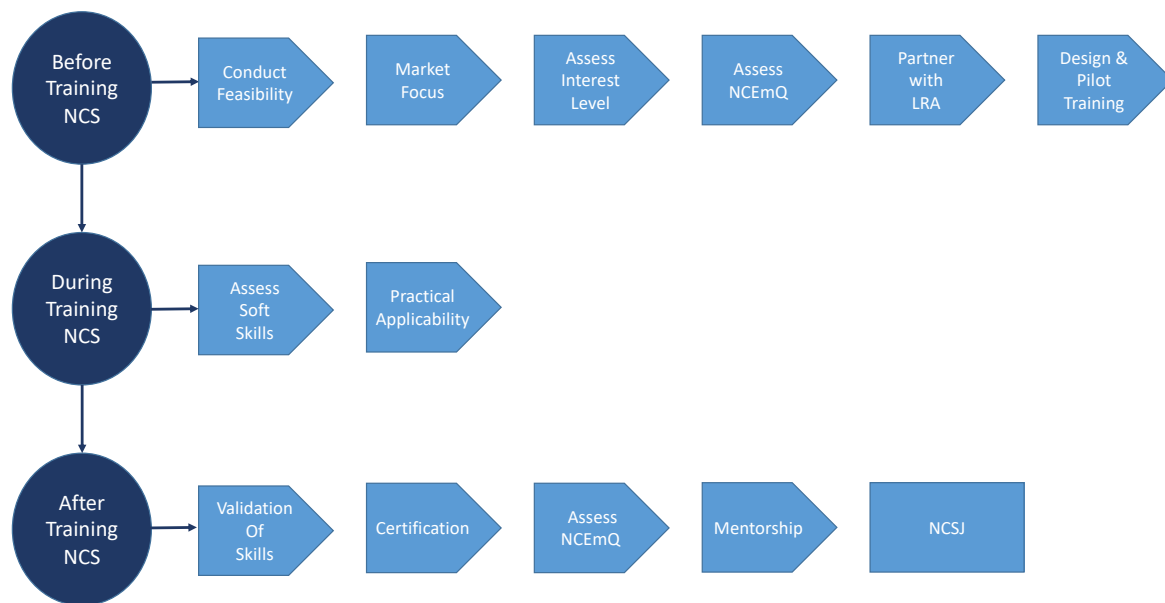
Figure 5.24 MNCs' Skills Training Road map

Conduct a Feasibility Study

In order for MNCs to achieve maximum benefit to deliver training on New-Collar Skills it is important that, before embarking on extensive training in New-Collar Skills (especially if the idea is to change the skill level significantly), first assess the following factors in each country:

Before Training

Step 1: Market Focus – Before embarking on training, establish the need or future need for the New-Collar Skills in the particular region or country.

Step 2: Establish and assess level of interest – Review the level of interest in the particular skill and communicate to potential participants, explaining exactly how, when and why the skills will be useful to the participant and society. Assess the interest in acquiring the skills among potential participants. What is their objective of acquiring these skills? This can be done by sending out a short questionnaire to assess the level of interest. Is there a passion and interest among potential participants to acquire these skills for the right reasons, or is it because it is the available in the

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organisation and can be delivered at a very low cost? Are the participants taking the course because it is free?

Step 3: Assess the New-Collar Skills Employability Quotient (NCEmQ) **–** This can be used to identify any gaps and the level of proficiency in the various quotients as well as the perseverance level of the candidate.

Step 4: Partner local recruiters **–** Partner local recruitment agencies to establish needs and gaps in the market. Most times, the local recruitment agencies will know what skills are in demand in the current market. It is always a good idea to work with these agencies.

Step 5: Designing Training and Pilot Training – Design training programme based on responses and data collected, bearing in mind market focus in that region, as well as the participants' present skill level and the cultural attitudes in the different countries. Test by delivering a pilot training first to ensure that the objectives are being achieved.

During Training

Step 6: Proficiency Skills **–** Assess the participants' proficiency in other key skill sets, especially in the essential soft skills.

Step 7: Practical Applicability **–** Ensure that training includes hands-on practical training and that participants get to practise working with the skills as they would do in an office environment. Enact simulations close to the work environment, like working on real-live projects in teams, ensuring that all team members participate. Encourage the participants to work on platforms that can help the participant evaluate the proficiency and give them visibility. Platforms like GitHub and Kaggle are now available for participants to get hands-on experience and to work with diverse groups of people that share similar interests. These platforms allow work projects to get out in front of the public and give wide exposure.

After

Step 8: Validate Skills **–** Ensure the participants can validate the skills. This can be done via online platforms and competitions.

Step 9: Certification – Organisations can issue a certification once the participant has completed training and passed the examination and all assessments in soft skills and technical skills and obtained a substantial Employability Quotient.

Step 10: Assess Employability Quotient – Assess the participant's Employability Quotient before and after training.

Step 11: Mentorship – Provide mentorship and direction to the new job seekers.

5.14.3 New-Collar Skills Strategy – African Government

This is a recommendation to African government leaders, which is a snapshot skills strategy to guide government leaders on the key areas that need to be in focus to develop a strong base or pipeline of New-Collar Skills in Africa.
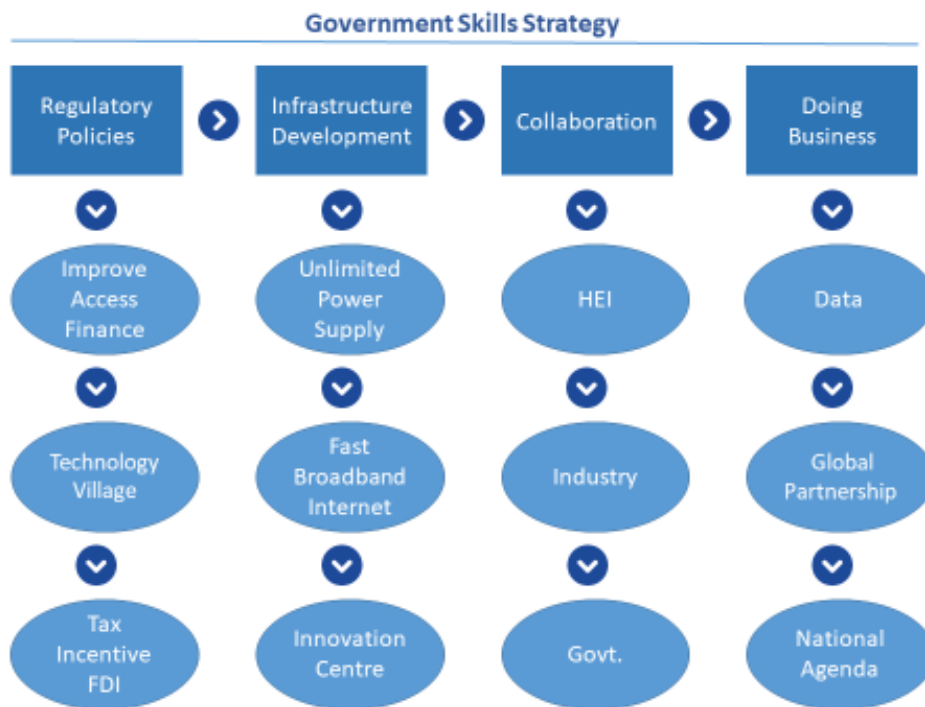
Figure 5.23: African Government Skills Strategy

To take advantage of the many opportunities regional and global markets offer for growth, jobs, and equality, African governments need to adapt their strategies to the new economic reality. It is clear from the findings of the study that African leaders have a huge role to play in developing

the skills agenda across the African continent. Although the patterns of growth and job creation are complex and differ in each region, there seems to be a recurring need across the regions (OECD, 2018). A general-strategy recommendation is proposed. This includes four significant recommendations that African leaders should focus on, namely infrastructure, regulatory policies, collaboration, and a doing business agenda that encourages FDI and global partnerships.

Regulatory Policies: African governments need to address various regulatory policies in order to facilitate growth in skills on the continent. They need to formulate policies that enhance social protection programmes and invest in education and skills development.

Infrastructure Development: This is crucial in particular sectors, especially in the rural areas of African, where most Africans reside. If young Africans are to compete on a skill level or realise their demographic dividend, it is crucial that the proper infrastructure is in place. This includes improved access to an uninterrupted power supply, improved Internet facilities, primarily in the semi-urban areas, as well as the availability of centres where young Africans who do not have the tools and devices can go to have access to these. Countries can promote social development through universal access to an improved quality of education and technical and vocational skills training. It is important to facilitate national and regional infrastructure investments, especially in electricity, Internet access, and transportation. This will foster a stable business environment to attract long-term investment

Collaboration: This is crucial to the government skills strategy. If African countries are to produce the skills needed for industry and government in this new automation age, there should be more collaboration between the government, higher institutions of learning, and industry. The market needs should be considered and re-evaluated frequently if the African government wants to achieve the goal of reducing unemployment and underemployment. Seeking greater synergies with the private sector would align skills with market needs.

Doing Business: Doing business index is not very impressive in many Africa countries, and this has had an impact on FDI, which has indirectly affected entrepreneurship. The government should have specific national agenda that would encourage digital transformation and innovation and encourage global partnerships. Fostering stronger linkages between FDI firms and the local economy is crucial to creating more jobs and better knowledge transfer and technology.

Simplified administrative procedures and reduced start-up and operational costs could make the business environment more attractive.

5.15   Summary

This chapter presented the implication of the research findings derived from the analysis of the data. It presented the contributions of the study to theory and practice. The contributions include the definition of New-Collar Skills, the development of an assessment tools –the New-Collar Skill Employability Quotient, NCEmQ, and Skills Road map. Chapter Six will present the recommendations, limitations of the study, suggestions for further research, and the conclusion.

Chapter Six: Conclusion

6.1   Introduction

Chapter six presents recommendations to African government leaders, corporate organisations, university leaders, and the job seeker in Africa. The chapter also presents suggested areas for further research, limitations of the study, and concludes the research with a summary.

6.2   Recommendation

The following are the recommendations to the different stakeholders to help build a strong pipeline of New-Collar Skills in Africa.

6.2.1   African Government Leaders

African governments have a pivotal role to play in improving education and the development of skills on the continent. This is even more pertinent in recent times with the rapid change of events prompted by the COVID-19 pandemic. Digital and New-Collar Skills are at the forefront of this change. However, the standard of education in most African countries has steadily declined, because of the reduction in public expenditure on education, especially in regions where the governments control higher institutions. There are several challenges including the lack of proper infrastructure, inadequate power supply, unreliable broadband, and lack of data to make crucial decisions. The list goes on. This study recommends that governments improve the provision of infrastructure to support the delivery of New-Collar Skills in the education and technology sector. Secondly, the study recommends a more collaborative approach in the education space between industry and government in African countries. This will yield better results that will help create jobs and reduce unemployment. The study also suggests that the government should encourage the learning of STEM-related courses to enable faster technological innovation on the continent.

The study further recommends that African government leaders consider regulatory policies that will encourage digital transformation and help grow entrepreneurial and start-up space by introducing policies that encourage FDI. This will encourage further investment on the continent, which will facilitate cheaper broadband and uninterrupted power supply. This will further reduce

the cost of accessing these utilities and encourage many African youths to acquire New-Collar Skills. This will lead to a positive effect on employability, as these skills give the African youth access to global opportunities. This may help to reduce the unemployment challenges that most African governments grapple with. Also, it will lessen the brain drain that has become a significant challenge to economic growth and technical development on the African continent. Finally, the study recommends that African government leaders should make a conscious effort to promote the acquisition of both digital and New-Collar Skills, not only by providing the resources, but by being the change they want to see; they should start the process of digitally transforming governmental institutions step by step. It has become apparent during this pandemic that the civil services of some African regions were ill-prepared for remote work, as they were not digitally set up. They were unable to function, as they could not even provide the basic form of technology for the offices to function. This is a wakeup call for all African governments to embrace New-Collar Skills, technology, and the new way of working.

6.2.2   Corporate Organisations

Organisational leaders at all levels all over the globe, especially start-ups, are increasingly dealing with talent shortages, especially when it comes to upskilling and hiring new tech talent, particularly in the area of New-Collar Skills. With the global shortage of top software engineers, real estate costs, immigration, and retention challenges, many companies have realised the benefits of hiring remote talent as this provides a larger global talent pool and also closes the opportunity gap. As a result, more organisations are realising these benefits and are turning to global hiring. This has been increasingly the case in the light of recent global events. With a growing population of youths, Africa has increasingly become the focus of many large training programmes for New-Collar Skills, not just for large MNC's, but also because of the global demand for these skills, as many companies particularly in Silicon Valley have switched to global hiring and remote work. However, assessing these skills and hiring remote global talent can be tough: many of the usual procedures that individual companies rely on when hiring cannot be used; schools attended by the applicants may not have been heard of; nor the companies they previously worked for; and there may be no way of checking references and competencies. This study recommends a new approach for an organisation that may be considering upskilling in Africa, or any other developing countries that need to upskill their

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youth with 21st-century skills, especially New-Collar Skills. The study provides a skills road map on best practices for selecting talent and training in New-Collar Skills. It introduces a step-by-step approach to the stages that a company can adopt to achieve better results. The road map may assist organisations to save resources by using this approach to focus on training specific candidates who possess specific attributes, qualities, and interests to learn and acquire these NCS skills. Companies wishing to hire talent may also use the New-Collar Skills Quotient as a first step in the hiring process. By using these tools organisations will achieve better results from their training, and more participants will be able to use the skills either to work in their companies or to apply for New-Collar jobs either locally or globally.

6.2.3   University Leaders

According to the British Council, universities in Africa will turn out at least 11 million graduates every year into the job market for the next decade. However, many of these graduate's struggle to find a pathway to employment. One of the biggest challenges facing Africa youths today is how to find jobs. Even though many young people go to universities to enable them to have better chances of getting jobs, the university system in many African countries has not been able to achieve this objective. One of the reasons suggested is mainly that the university curriculum, especially in the area of technology, has not been able to keep up with the market needs of the industry. The study also suggests that if universities start to collect data and collaborate with industry to develop and update the curriculum and programmes in emerging technologies needed by industry, there might be an improvement in employability prospects. It is also suggested that universities should also place emphasis on the practical applicability of skills, and perhaps in collaboration with industry, devise an approach where students can have a prior relationship with industry through internships and apprenticeships during the 3-4-year term in the university. Alternatively, universities can perhaps collaborate with MNCs or industry to run programmes that simulate the work environment in higher institutions in order for them to stay relevant in Africa. There is a dire need for HEIs to reinvent themselves or run the risk of becoming outdated as some graduates in Africa are no longer considering the university as a place to help them transition to employment, especially with the growing demand for online education.

6.2.4 The New-Collar Job Seeker

Unemployment rates are very high in most countries in Africa, especially Southern Africa. The good news for New-Collar job seekers is that there are many New-Collar Skill jobs available globally, and thanks to recent events, more companies are considering remote hiring. The caveat is the job seeker needs to be highly proficient at using the skill and be able to prove it (Validation of Skill and a portfolio of work). These are just two of the attributes that are assessed in the New-Collar Skills Employability Quotient, NCEmQ. This tool is recommended along with the skills road map for the job seeker to assess their proficiency level and the various qualities needed to increase their chances of employment. One of the more obvious gaps in the literature is a pathway to transition from education to employability in Africa. These tools will help to close this gap in emerging technologies by providing assessments that will help job seekers to identify their skill gaps and the additional work and attributes required to move them closer to employability. The study recommends that job seekers interested in working in emerging technologies and/or considering remote opportunities should consider using the New-Collar skills road map to assess their skill level and what skill gaps they may or may not have that might lead to/hinder their ability to acquire New-Collar Skill jobs. The New-Collar Skills Employability road map is also a useful tool that will help them identify the gaps in their skills. This will enable them to work on these gaps to achieve a level of skill proficiency that will result in employability.

6.3 Limitation of the Study

This study was limited by the number of participants who completed the survey in different phases of the study. The study was also limited to participants who consented to take an interest wilfully. Although the study applied approved survey instruments, the participants may have experienced issues translating the survey questions. It appeared that some participants attributed different meanings to some of the terms used in the survey. For example, in the Open Data survey, some participants who had never heard of New-Collar Skills completed the survey; despite the term being defined and explained in the survey, some participants were still confused about it and did not regard their skills as New-Collar Skills. Secondly, there was some misconception about the term 'Digital Entrepreneurship' in some African countries; it was given different meanings depending on the country. A few countries or participants attributed the term

to setting up a tech start-up while others attributed it to e-commerce, social, media marketing, etc. Thirdly, there was a misconception about what is defined as being employed or having a job, and it appears that some participants do not consider being self-employed as having a job. When asked if they were employed, some participants said 'no', even though they were self-employed and earning an income.

6.4 Delimitations

This study was delimited to a survey of graduates and non-graduates from ten African countries, not the whole continent of Africa. Although data was collected from countries in all other regions of Africa, Central Africa was not represented. Participants for the New-Collar Phase of the study were selected from only universities that participated in the African Skills initiative from 2014 to 2017. Participants were selected only if they had passed the IBM certification exams with a minimum score of 60%, which is the IBM pass mark. Participants in some African countries must have completed the mandatory National Youth Service. Delimiting the participants to only those who participated in the African Skills initiative lessens the generalisation of the results in other African countries. Participation in the Open Data phase of the study was limited to participants who had at some stage applied for jobs on the Jobberman data platform in the three selected African countries. Participation in the Intervention phase was limited to candidates that fitted the criteria in section 3.73, and participation in the in-depth interview was limited to participants who were executive directors in technology companies in the eight selected African countries.

6.5 Suggestions for Further Research

The findings of the study constitute a foundation for future research focusing on assessment tools in emerging technology skills in Africa and their effect on employability, especially as this relates to the area of global remote work opportunities. Skills acquisition in Africa is still very much unexplored territory; there is still quite a bit of research to be done in this area. The transition of education to employment in developing countries could be further explored considering the possibility of more excellent opportunities for remote global work, specifically in New-Collar Skills. This can be extended to any part of the globe if the candidate has the required skills. We are currently at an inflexion point where the way we work and educate ourselves is changing rapidly, especially with an increasing number of collaboration tools; it is easier than

ever before to run a company as a combination of local and remote workers. Exploring remote opportunities for African youths will benefit from further research, providing further tools that will enable the African youth to gain exposure to the criteria for assessment and thus become able to compete on a global scale. This will benefit both advanced and developing countries, as developed countries will not only have access to a bigger and better talent pool, but also possibly achieve reduced operational costs of real estate. On their part, developing countries and Africa will benefit from greatly increased employment opportunities, decrease in emigration, and reduction in brain drain, as young African talent will be encouraged to stay on the continent and develop their communities. The study covers most of the key English-speaking African countries, but does not include Francophone countries in Central East Africa. Perhaps further studies may consider the effect of New-Collar Skills on Employability in this region.

6.6   Conclusion

Chapter six concludes this mixed-method sequential exploratory study, that examined the effects of NCS on employability and entrepreneurship in Africa with recommendations, suggested areas for further research, and the limitations of the study. The findings of the study show that there is a positive effect of NCS on employability and entrepreneurship. However, this is subject to proficient knowledge and applicability of the skills and other attributes as shown in the study's contribution of the New-Collar Employability Quotient (NCEmQ) and the skills road maps.

The most significant influence and catalyst on the future of work in recent times has been the COVID-19 pandemic. In the light of current global events, the use of technology in our everyday lives has become more pervasive than ever before. Having to live our lives and work remotely has become the order of the day. Remote work, remote education, remote social interaction – the pandemic has encouraged the use of technology and data in ways we have never conceived. Never before has having a technology-skilled 21st-century workforce meant more than it does today. This has created the demand for digital and innovative transformation, which basically will lead to the demand for learning and acquiring New-Collar Skills.

Organisations may not likely revert to business as usual when the pandemic is over, because most of them may have discovered new ways of working and realised the benefits, whether cost or otherwise. Real estate agents are already reporting a decline in demand. Higher education

experts are also predicting a disruption in traditional classroom teaching and a massive transition to online learning. Retail is flourishing online as high street store brands are losing out to efficiently set up e-commerce organisations. All social interaction has gone online. All this points to the fact that the world is eventually going to adopt a new way of working. This is the new normal and will certainly necessitate the acquisition of New-Collar Skills in emerging technologies as these skills are the driver of this new way of working. Since work has now gone remote, all roads will lead to where the talent is available. This time Africans may be at the forefront of this with 33% of the global workforce by 2050. It looks like *The Economist* is right in predicting that Africa is rising!

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Appendix

Appendix A: Survey Instruments and Consent Form

IBM New-Collar skills Africa (10) Survey

CONSENT

Transition of New-Collar skills to Employability

1. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

2. I understand that my information will be held and processed for the following purposes:

- To provide feedback for IBM training purposes.
- For the purpose of completing DBA research.
- Where relevant, for the writing of associated academic journal articles or monographs.

3. I agree to take part in the above study and I am willing to be interviewed and have my interview audio/video recorded.

4. I understand that my participation is completely confidential.

Yes, I consent

No, I do not consent

First Name

_____

Last Name

_____

Age
- o 18 - 21
- o 22 - 26
- o 27 - 30
- o 31 - 35
- o Above 35

Gender
- o Male
- o Female

What is the highest qualification of your parents?
- o Leaving School Certificate
- o First Degree
- o Masters' Degree
- o Other (please specify) _____

What University did you attend?

▼ 6 October University

Please specify the University you attend

_____

What course did you study?

▼ Accounting

Please specify the course you study
_____

What other educational qualification do you possess?

- ☐ CCNA
- ☐ CCNP
- ☐ Certificate in Data Processing
- ☐ Certified Ethical Hacker
- ☐ Certified Information Systems Security Professional
- ☐ Certified Information Technology Professional
- ☐ Certified Internet Web Professional
- ☐ Certified Penetration Testing Engineer
- ☐ Certified Social Engineering Prevention Specialist
- ☐ Certified Software Development Professional
- ☐ Certified software manager
- ☐ Certified Wireless Network Administrator
- ☐ Certified Wireless Network Expert
- ☐ Cisco certifications
- ☐ None
- ☐ Other _____

What other vocational skills do you possess?

| ▼ Electrical and Electronics Repairman |

Skip To: Q14 If what other vocational skills do you possess? = Other
Skip To: Q15 If what other vocational skills do you possess?!= Other
----

Please specify the vocational skills you posses

_____

Which of these skills did you acquire from the university you attended? (Check all that apply)

- ☐ Communication skills
- ☐ Networking skills
- ☐ Creative Thinking skills
- ☐ Team Work skills
- ☐ Problem solving skills

- ☐ Decision making skills
- ☐ Leadership skills
- ☐ Presentation skills
- ☐ Technical skills
- ☐ Other, please specify _____

What are the specific technical skills you acquire from the university?

_____

How often do you use the internet?

▼ Daily

Which of the following devices do you often use to access the internet? (Check all that apply)

- ☐ Desktop Computer
- ☐ Personal Digital Assistant (PDA)
- ☐ Laptop Computer
- ☐ Computer Tablet
- ☐ Mobile Phone
- ☐ Third Party Device
- ☐ Cyber/internet cafe
- ☐ Other (please specify) _____

Are you working presently?

- o Yes
- o No

Skip To: Q24 If Are you working presently? = No

In what type of industry do you work?

▼ Healthcare

Skip To: Q21 If In what type of industry do you work? = Other
Skip To: Q22 If In what type of industry do you work?!= Other

Please Specify the Industry where you work

_____

How did you secure your Job?

▼ Employee Referral

Please specify

_____

Why are you not working?

- ☐ Salary Too Low
- ☐ Lack of Required Skills and Knowledge
- ☐ Economic Recession
- ☐ Can't find the Right Job
- ☐ Don't have Enough Experience
- ☐ Further Studies
- ☐ Housewife
- ☐ Applied and Rejected Numerous Times
- ☐ Other_____

Have you had any work experience prior to graduation?

- o 1-2 years' work experience prior to University
- o Summer Internship
- o Industrial Training
- o One Year Mandatory National Youth Service
- o Other (please specify)_____

What course did you take on the IBM Training?

- ☐ Big Data Developer
- ☐ Business Intelligence Analyst
- ☐ Predictive Analytics Analyst
- ☐ Security Intelligence Analyst
- ☐ Application Security Specialist
- ☐ Mobile Application Developer
- ☐ Cloud Application Developer

- ☐ Data Scientist Mastery Award
- ☐ Application Security Engineer
- ☐ Business Process Analyst
- ☐ Cloud Enterprise Developer

Why did you sign up for the IBM training?

- o Personal Interest
- o Free Program
- o My friend signed up
- o IBM Certification
- o Other (please specify) _____

Are you using any of the skills from the IBM training?

- o Yes
- o No

If yes, how are the Skills been used?

- ☐ Current Job
- ☐ Freelancing
- ☐ Personal Project
- ☐ Other (please specify) _____

Would you say that the skills acquired during the IBM training are sufficient to acquire a job?

- o Yes
- o No

If no, what do you think should be done differently?

- ☐ More Practical
- ☐ Extend Training
- ☐ Project Based Work
- ☐ Selection Criteria

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- ☐ Prerequisite for the Courses
- ☐ Other (please specify)_____

Have you ever considered freelance online opportunities?

- o Yes
- o No

What freelance online opportunities have you been contracted to do? (Check all that apply)

- ☐ Data analytics
- ☐ Cyber security
- ☐ Digital marketing
- ☐ Software development
- ☐ Website design
- ☐ Writing
- ☐ Transcription
- ☐ Graphic design
- ☐ Admin support
- ☐ Accounting & consulting
- ☐ Translation
- ☐ IT & networking
- ☐ Blogging
- ☐ E-commerce
- ☐ Other (please specify) _____

On what platform(s) have you found online opportunities? (Check all that apply)

- ☐ Upwork
- ☐ Fiverr
- ☐ Guru
- ☐ Freelancer
- ☐ PeoplePerHour
- ☐ 99Designs
- ☐ TopTal
- ☐ Craigslist
- ☐ College Recruiter
- ☐ GetACode
- ☐ iFreelance
- ☐ Project4hire
- ☐ SimplyHired
- ☐ Other (please specify)_____

Did you experience any challenges finding freelance online opportunities?

- ☐ Too Much Competition
- ☐ Profile Unapproved
- ☐ Dont have high Ratings
- ☐ Communication Gap
- ☐ Dont have the experience clients want
- ☐ Preference for Freelancers in other Continents
- ☐ Other (please specify) _____

Have you ever had any of the following career guidance?

- ☐ Menthorship
- ☐ Workshop/Training
- ☐ Career Talk
- ☐ Career Counselor
- ☐ None of the Above
- ☐ Other (please specify)

What are your career goals and where do you see yourself in the next two or five years (career goals)?

_____

Any comments, Suggestions

_____

Open Survey

<div align="center">

CONSENT

</div>

How New Collar Skills can Enhance Employability in Digital Entrepreneurship and Online Outsourcing.

The objective of this survey is to understand if and how New Collar Skills can accelerate employability in Africa and how it can expand digital entrepreneurship and online outsourcing on the continent.

We would like to obtain some information to help us with this process.

1. I understand that my participation is voluntary.

2. I understand that my information will be used for the following purposes:

- To assist in research on youth employability especially in the area of Digital Entrepreneurship and Online Outsourcing.
- For the purpose of completing DBA research.
- Where relevant, for the writing of associated academic journal articles or monographs.

3. I agree to take part in the above study and understand that my participation is completely confidential.

The survey will only take 5-7 minutes of your time

- o Yes, I consent
- o No, I do not consent

Skip To: End of Survey If   How New Collar Skills can Enhance Employability in Digital Entrepreneurship and Online Outsourc... = No, I do not consent

First Name

_____

Last Name

_____

Could you please tell us how old you are? (Years)

_____

Gender

- o   Male
- o   Female

What is the highest qualification of your parents?

- o   Degree holder
- o   Non degree holder

What University did you attend?

- o   Private University
- o   Public University

Did you study a STEM related degree?

A STEM degree is a degree in either Science, Technology, Engineering or Mathematics fields. Some STEM courses may include the following:
Aerospace, Engineering, Astronomy, Biochemistry, Biology, Chemical engineering, Chemistry, Civil engineering, Computer science, Electrical engineering, Mathematics, Mechanical engineering, Physics, Psychology, Statistics.

- o   Yes
- o   No

What year did you graduate?

_____

How would you rank your access to internet as a tool to work? (1 is little or no access and 10 is access all the time)

- o   1
- o   2
- o   3
- o   4
- o   5
- o   6
- o   7
- o   8
- o   9
- o   10

Do you have access to a personal laptop/computer?

- o   Yes
- o   No

How would you rank your access to power supply for work (1 is little or no access and 10 is access all the time)

- o   1
- o   2
- o   3
- o   4
- o   5
- o   6
- o   7
- o   8
- o   9
- o   10

Are you working presently?

- o   Yes
- o   No

Skip To: If Are you working presently? = No

How long have you been working (Years)?

_____

In which Industry do you work?

▼ Healthcare

Are you aware of the concept of New Collar Skills?

- o Yes
- o No

Are you using New Collar Skills at your place of work?

Note: New-Collar skills are technical and soft skills needed to work in the technology industry, and could be gained through vocational training and industry apprenticeships. A set of skills that you can work with in the technology space or interaction with technology to do your job. E.g. Artificial intelligence, Big data, Machine learning, Cyber security, Digital marketing, Web development, Software development, Data science, business intelligence, Cloud computing, predictive analysis etc.

- o Yes
- o No

Are you aware of the concept of online outsourcing or freelance opportunities on online platform?

- o Yes
- o No

Have you ever engaged in online outsourcing or freelance opportunities on online platforms?

Note: Online platforms such as Upwork, Freelancer, and Fiverr enable employers to contract freelance workers located in different parts of the world to supply services or perform tasks online. Freelancers can create profiles and showcase their skills and previous work on online platforms. These platforms enable performance, coordination, quality control, delivery and payment of such services online.

- o Yes
- o No

What freelance online opportunities have you been contracted to do? (Check all that apply)

- ☐ Data analytics

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- ☐ Cyber security
- ☐ Digital marketing
- ☐ Software development
- ☐ Website design
- ☐ Writing
- ☐ Transcription
- ☐ Graphic design
- ☐ Admin support
- ☐ Accounting & consulting
- ☐ Translation
- ☐ IT & networking
- ☐ Blogging
- ☐ E-commerce
- ☐ Other (please specify) _____

On what platform(s) have you found online opportunities? (Check all that apply)

- ☐ Upwork
- ☐ Fiverr
- ☐ Guru
- ☐ Freelancer
- ☐ PeoplePerHour
- ☐ 99Designs
- ☐ TopTal
- ☐ Craigslist
- ☐ College Recruiter
- ☐ GetACode
- ☐ iFreelance
- ☐ Project4hire
- ☐ SimplyHired
- ☐ Other (please specify)_____

Did you experience any challenges finding freelance online opportunities?

- o Yes
- o No

Skip To: If Did you experience any challenges finding freelance online opportunities? = Yes
Skip To: End of Block If Did you experience any challenges finding freelance online opportunities? = No

----

Which of the following challenges did you experience when searching for freelance online opportunities?

- o Too Much Competition
- o Profile Unapproved
- o Don't have high Ratings
- o Communication Gap
- o Don't have the experience clients want
- o Preference for Freelancers in other Continents
- o Other (please specify) _____

Why have you not considered online outsourcing opportunities?

- o Don't know about it
- o Don't have the right knowledge/skills
- o Don't have the device to work
- o Don't have passion for it
- o Have never needed to considered it
- o Other

Are you aware of the concept of digital entrepreneurship?

- o Yes
- o No

Have you ever engaged in digital entrepreneurship?

Note: Digital entrepreneurship is the joining of traditional entrepreneurship with an emphasis on leveraging new digital technologies in novel ways, such as social, mobile, analytics, cloud and cyber-solutions, all in order to shift the traditional way of creating and doing business in the digital era.

- o Yes
- o No

How are you engaged in digital entrepreneurship? (Check all that apply)

- ☐ Digital Marketing
- ☐ Data Science

- ☐ Website Design
- ☐ Cyber security
- ☐ Artificial Intelligence
- ☐ Software development
- ☐ Premium WordPress Theme/Plugins development
- ☐ Machine learning
- ☐ Freelancing
- ☐ Uber
- ☐ Affiliate Marketing
- ☐ Blogging
- ☐ Sell Products & Services (e-commerce)
- ☐ Web hosting reselling business
- ☐ Email marketing
- ☐ Content Marketing
- ☐ Graphics Design Business
- ☐ Social Media Marketing
- ☐ Other (please specify)_____

In no more than one sentence briefly describe what you do as digital entrepreneur

_____

Have you received income from digital entrepreneurship/online freelance outsourcing?

- o Yes
- o No

If Yes, how often

- o Weekly
- o Monthly
- o Contract basis

Why are you not engaged in Digital Entrepreneurship?

- o Don't have information about it
- o Don't have the right knowledge/skills
- o Don't have the device to work
- o Don't have passion for it

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- o Have never needed to considered it
- o Other

Were you given practical mentorship or tips of the trade on how to successfully make income as a digital entrepreneur?

- o Yes
- o No

If yes, in one sentence tell us how and the source. E.g. friend, role model, mentorship programme etc.

_____

WARWICK BUSINESS SCHOOL
THE UNIVERSITY OF WARWICK

New Collar Skills Intervention Baseline Survey

Consent

The objective of this workshop is to provide you with additional New-Collar skills to enhance your probabilities for New-Collar job opportunities.

 NOTE: Attending this workshop does not guarantee a job placement.

- o Yes I Understand/Consent
- o No I don't Understand/Consent

Skip To: End of Survey If IBM New Collar Skills Workshop   the objective of this workshop is to provide you with addition... = No I don't Understand/Consent

First Name

_____

Last Name

_____

What is your Age?

- o   18 - 21
- o   22 - 26
- o   27 - 30
- o   31 - 35
- o   Above 35

Gender

- o   Male
- o   Female

What is your marital status?

- o   Single
- o   Married
- o   Widowed
- o   Divorced

What is your State of Origin?

▼ Abia

What is the highest qualification of your parents?

- o   Leaving School Certificate
- o   First Degree
- o   Masters' Degree
- o   Other (please specify)_____

How often do you use the internet?

▼ Daily

Which of the following devices do you mostly use to access the internet?

- o Desktop Computer
- o Personal Digital Assistant (PDA)
- o Laptop Computer
- o Computer Tablet
- o Mobile Phone
- o Third Party Device
- o Cyber/internet cafe
- o Other (please specify) _____

What is the highest level of school you have completed?

▼ No schooling completed

Skip To: End of Block If What is the highest level of school you have completed? = No schooling completed

Skip To: End of Block If What is the highest level of school you have completed? = WAEC/GCE/NECO O levels

Skip To: Q16 if what is the highest level of school you have completed? = NCE

Skip To: Q16 if what is the highest level of school you have completed? = OND

Skip To: Q15 if what is the highest level of school you have completed? = HND

Skip To: Q13 if what is the highest level of school you have completed? = Bachelor degree

Skip To: Q13 if what is the highest level of school you have completed? = Master degree

Skip To: Q12 if what is the highest level of school you have completed? = Other

Other (please specify)

_____

Skip To: Q15 If Condition: Other (please specify) Is Not Empty. Skip To: Have you completed your NYSC service.

What University did you attend?

▼ Abia State University

Skip To: Q14 If What University did you attend = other

Skip To: Q15 If What University did you attend! = Other

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If Other Please Specify the University you attend

_____

Have you completed your NYSC service?

- o   Yes
- o   No
- o   Exempt

What year did you graduate?

- o   Before 2010
- o   2010 - 2012
- o   2013 - 2015
- o   2016 - 2017

What course did you study?

▼ Accounting

If Other Please Specify your Course

_____

How did you hear about this workshop?

- o   Email
- o   Word of Mouth
- o   Text Message
- o   WhatsApp Group Chat
- o   Other_____

Employment Status: Are you currently…

▼ Employed

Why are you not working? (Rank all including other, 1 being the most important reason while 9 being the least important)

- o   Salary Too Low
- o   Lack of Required Skills and Knowledge
- o   Economic Recession
- o   Can't find the Right Job
- o   Don't have Enough Experience
- o   Further Studies
- o   Applied and Rejected Numerous Times
- o   NYSC
- o   Other

Have you had any work experience prior to graduation?

- o   1-2 years' work experience prior to University
- o   Summer Internship
- o   Industrial Training
- o   One Year Mandatory National Youth Service
- o   Other (please specify) _____

What is your work/Job Preference? (Rank all including other, 1 being the most important reason while 5 being the least important)

- o   Self-Employment (Entrepreneur)
- o   Work for Organisation
- o   Work from Home
- o   Work Online (Digital Entrepreneurship/ Online contract)
- o   Other (Please Specify)

Have you ever considered freelance online opportunities?

- o   Yes
- o   No

Did you experience any challenges finding freelance online opportunities? (Rank all including Other, 1 being the most important reason while 7 being the least important)

- o   Too Much Competition
- o   Profile Unapproved
- o   Dont have high Ratings
- o   Communication Gap

- Dont have the experience clients want
- Preference for Freelancers in other Continents
- Other (please specify)

Which of the following programming languages do you have basic knowledge of?

- C
- C++
- Java
- Python
- Ruby
- Perl
- Javascript
- PHP
- C#
- Swift
- Haskel
- GO
- Visual Basic
- None
- Other (Please Specify)_____

Which of the following IBM Training have you taken before?

- Big Data Developer
- Business Intelligence Analyst
- Predictive Analytics Analyst
- Security Intelligence Analyst
- Application Security Specialist
- Mobile Application Developer
- Cloud Application Developer
- Data Scientist Mastery Award
- Application Security Engineer
- None
- Other(Please Specify) _____

Which course are you interested in?

- Business Intelligence Analyst
- Mobile Application Developer

Why are You Interested in the New-Collar job Workshop? (Rank all including other, 1 being the most important reason while 8 being the least important)

- Learning the skills will help me get a job
- It's my dream profession
- My friend signed up
- Personal Interest

- It's a free program
- IBM certification
- Increased income
- Other

Would you say that the skills acquired during the New Collar Job Workshop are sufficient to acquire a job?

- Yes
- No

If no, what do you think should be done differently? (Rank all including other, 1 being the most important reason while 6 being the least important)

- More practical
- Extend training
- Project based work
- Selection criteria
- Prerequisite for the courses
- Other (please specify)

What do you expect to achieve from this workshop?

- Skills to help secure a Job
- Experience working with the New Skill
- A Job Placement
- To increase my Knowledge
- All of the above
- Other (please specify)_____

If you are not able to secure a job after this training, what are your options? (Rank all including other, 1 being the most important reason while 7 being the least important)

- More training in the same field
- Get more work experience
- Keep looking for any job to sustain my living
- Go back to school to increase my chances of getting a job
- Will consider any job
- Entrepreneurship
- Other (please specify)

Is there a particular reason you are having difficulty getting a job? (Rank all including other, 1 being the most important reason while 7 being the least important)

- o Not enough experience
- o Have not really searched well.
- o Too many applicant chasing few jobs
- o Lack the skills needed
- o Don't know how to look for jobs
- o Haven't considered online opportunities
- o Other (please specify)

Have you ever had any of the following career guidance?

- o Mentorship
- o Workshop/Training
- o Career Talk
- o Career Counselor
- o None of the Above
- o Other (please specify)

What are your career goals and where do you see yourself in the next two or five years (career goals)?

_____

Any Other Comments/Suggestion

_____

New Collar Skills-Intervention 9 Month Survey

Consent

The objective of this survey is to understand how digital skills (New Collar Skills) can accelerate employability in Africa and how it can increase digital entrepreneurship/online outsourcing in Africa. Furthermore, it will assist participants of the New-Collar skills workshop with information and insights to help gain possible digital opportunities

1. I understand that my information will be held and processed for the following purposes:

- To provide feedback and insights on digital employment opportunities in Africa.
- For the purpose of completing DBA research.
- Where relevant, for the writing of associated academic journal articles or monographs.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I agree to take part in the above study and I am willing to be interviewed and have my interview audio/video recorded.

4. I understand that my participation is completely confidential.

- o Yes I Understand/Consent
- o No I don't Understand/Consent

Skip To: End of Survey If   New Collar Skills Intervention   The objective of this survey is to understand how digital s... = No I don't Understand/Consent

First Name

_____

Last Name

_____

What is your Age?

- o   18 - 21
- o   22 - 26
- o   27 - 30
- o   31 - 35
- o   Above 35

Gender

- o   Male
- o   Female

What is your marital status?

- o   Single
- o   Married
- o   Widowed
- o   Divorced

What is your State of Origin?

▼ Abia

What is the highest qualification of your parents?

- o   Leaving School Certificate
- o   First Degree
- o   Masters' Degree
- o   Other (please specify) _____

What main device do you use to access the internet for work?

- o   Desktop Computer
- o   Laptop Computer
- o   Computer Tablet

- o Mobile Phone
- o Third Party Device
- o Cyber/internet cafe
- o Other (please specify) _____

What is the highest level of school you have completed?

▼ No schooling completed

Other (please specify)

_____

What University did you attend?

▼ Abia State University

If Other Please Specify the University you attend

_____

What year did you graduate?

- o Before 2010
- o 2010 - 2012
- o 2013 - 2015
- o 2016 - 2017

What course did you study?

▼ Accounting

If Other Please Specify your Course

_____

Are you working?

- o Yes
- o No

Where do you work?

_____

How long have you been working?

- o 6 months
- o 6 - 12 months
- o 1 - 3 years
- o Over 3 years

Why are you not working? (Choose the option most applicable)

- o Salary Too Low
- o Lack of Required Skills and Knowledge
- o Companies are not employing these skills
- o Economic Recession
- o Can't find the Right Job
- o Don't have Enough Experience
- o Further Studies

- o Applied and Rejected Numerous Times
- o Other _____

How long have you been unemployed?

- o 1-3 months
- o 6 - 12 months
- o 1 - 3 years
- o Over 3 Years

Are you using New-Collar skills in your place of work?

Note: New-Collar skills are technical and soft skills needed to work in the contemporary technology industry through non-traditional education paths.

- o Yes
- o No

Skip To: Q23 If   Are you using New-Collar skills in your place of work?   Note: New-Collar skills are technical... = Yes

Have you considered digital entrepreneurship?

Note: Digital entrepreneurship is the joining of traditional entrepreneurship with an emphasis on leveraging new digital technologies in novel ways, such as social, mobile, analytics, cloud and cyber-solutions, all in order to shift the traditional way of creating and doing business in the digital era.

- o Yes
- o No

Skip To: End of Block If Have you considered digital entrepreneurship?   Note: Digital entrepreneurship is the joining o... = No

Skip To: Q24 If Have you considered digital entrepreneurship?   Note: Digital entrepreneurship is the joining o... = Yes

What digital entrepreneurship are you doing?

- o Digital Marketing
- o Website Design
- o Premium WordPress Theme/Plugins development
- o Freelancing

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- o Uber
- o Affiliate Marketing
- o Blogging
- o Sell Products & Services (eCommerce)
- o Web hosting reselling business
- o Email marketing
- o Content Marketing
- o Graphics Design Business
- o Social Media Marketing
- o Other (please specify) _____

In no more than one sentence briefly describe what you do

_____

Have you ever considered freelance online outsourcing opportunities?

 Note: Online outsourcing refers to the contracting of third-party workers and providers (often overseas) to supply services or perform tasks via internet-based marketplaces or platforms. These platforms allow clients to outsource their paid work to a large, distributed, global labor pool of remote workers, to enable performance, coordination, quality control, delivery and payment of such services online.

- o Yes
- o No

What freelance online outsourcing have you been contracted to do? (Check all that apply)

- ☐ Data analytics
- ☐ Cyber security
- ☐ Digital marketing
- ☐ Software development
- ☐ Website design
- ☐ Writing
- ☐ Transcription
- ☐ Graphic design
- ☐ Admin support
- ☐ Accounting & consulting
- ☐ Translation
- ☐ IT & networking
- ☐ Blogging

- □ E-commerce
- □ Other (please specify) _____

On what platform(s) have you found online outsourcing opportunities? (Check all that apply)

- □ Upwork
- □ Fiverr
- □ Guru
- □ Freelancer
- □ PeoplePerHour
- □ 99Designs
- □ TopTal
- □ Craigslist
- □ College Recruiter
- □ GetACode
- □ iFreelance
- □ Project4hire
- □ SimplyHired
- □ Other (please specify) _____

Did you experience any challenges finding freelance online opportunities? (Choose the most applicable option)

- o Too much competition
- o Profile unapproved
- o Don't have high ratings
- o Communication gap
- o Don't have the experience clients want
- o Preference for freelancers in other continents
- o Other (please specify) _____

Which course did you take at the workshop?

- o Business Intelligence Analyst
- o Mobile Application Developer

Skip To: If which course did you take at the workshop? = Business Intelligence Analyst

Would you say that the skills acquired during the New Collar Job Workshop are sufficient to acquire a job?

- o Yes
- o No

Skip To: End of Block If   would you say that the skills acquired during the New Collar Job Workshop are sufficient to acquire... = Yes

If no, what do you think should be done differently? (Choose the option most applicable)

- ☐ More practical
- ☐ Extend training
- ☐ Project based work
- ☐ Provide more training on how to look for opportunities online
- ☐ Selection criteria
- ☐ Prerequisite for the courses
- ☐ Other (please specify) _____

Is there a particular reason you are having difficulty getting a job? (Check all that apply)

- ☐ Not enough experience
- ☐ Have not really searched well
- ☐ Too many applicants chasing few jobs
- ☐ Lack the skills needed
- ☐ Don't know how to look for jobs
- ☐ Have not considered online opportunities
- ☐ Have not considered digital entrepreneurship
- ☐ Other (please specify) _____

Have you ever had any of the following career guidance?

- ☐ Mentorship
- ☐ Workshop/Training
- ☐ Career Talk
- ☐ Career Counselor
- ☐ None of the Above
- ☐ Other (please specify)

What are your career goals and where do you see yourself in the next two or five years (career goals)?

_____

Any Other Comments/Suggestion

_____

New Collar Skills Intervention 15 Months Survey

CONSENT

The objective of this survey is to understand if and how New Collar Skills can accelerate employability in Africa and how it can expand digital entrepreneurship and online outsourcing on the continent.

 We would like to obtain some information to help us with this process.

1.   I understand that my participation is voluntary.

2.   I understand that my information will be used for the following purposes:

- To assist in research on youth employability especially in the area of Digital Entrepreneurship and Online Outsourcing.
- For the purpose of completing DBA research.
- Where relevant, for the writing of associated academic journal articles or monographs.

3.   I agree to take part in the above study and understand that my participation is completely confidential.

 The survey will only take 5-7 minutes of your time

- o   Yes, I consent
- o   No, I do not consent

Skip To: End of Survey If   How New Collar Skills can Enhance Employability in Digital Entrepreneurship and Online Outsourc... = No, I do not consent

First Name

Last Name

Could you please tell us how old you are? (Years)

Gender

- o   Male
- o   Female

What is the highest qualification of your parents?

- o   Degree holder
- o   Non degree holder

What University did you attend?

- o   Private University
- o   Public University

Did you study a STEM related degree?

A STEM degree is a degree in either Science, Technology, Engineering or Mathematics fields. Some STEM courses may include the following:
Aerospace, Engineering, Astronomy, Biochemistry, Biology, Chemical engineering, Chemistry, Civil engineering, Computer science, Electrical engineering, Mathematics, Mechanical engineering, Physics, Psychology, Statistics.

- o   Yes
- o   No

What year did you graduate?

How would you rank your access to internet as a tool to work? (1 is little or no access and 10 is access all the time)

- o 1
- o 2
- o 3
- o 4
- o 5
- o 6
- o 7
- o 8
- o 9
- o 10

Do you have access to a personal laptop/computer?

- o Yes
- o No

How would you rank your access to power supply for work (1 is little or no access and 10 is access all the time)

- o 1
- o 2
- o 3
- o 4
- o 5
- o 6
- o 7
- o 8
- o 9
- o 10

Are you working presently?

- o Yes
- o No

Skip To: If Are you working presently? = No

How long have you been working (Years)?

_____

In which Industry do you work?

▼ Healthcare

Are you aware of the concept of New Collar Skills?

- o Yes
- o No

Are you using New Collar Skills at your place of work?

Note: New-Collar skills are technical and soft skills needed to work in the technology industry, and could be gained through vocational training and industry apprenticeships. A set of skills that you can work with in the technology space or interaction with technology to do your job. E.g. Artificial intelligence, Big data, Machine learning, Cyber security, Digital marketing, Web development, Software development, Data science, business intelligence, Cloud computing, predictive analysis etc.

- o Yes
- o No

Are you aware of the concept of online outsourcing or freelance opportunities on online platform?

- o Yes
- o No

Have you ever engaged in online outsourcing or freelance opportunities on online platforms?

Note: Online platforms such as Upwork, Freelancer, and Fiverr enable employers to contract freelance workers located in different parts of the world to supply services or perform tasks online. Freelancers can create profiles and showcase their skills and previous work on online platforms. These platforms enable performance, coordination, quality control, delivery and payment of such services online.

- o Yes
- o No

Skip To: If Have you ever engaged in online outsourcing or freelance opportunities on online platforms? Note: ... = No

What freelance online opportunities have you been contracted to do? (Check all that apply)

- ☐ Data analytics

- ☐ Cyber security
- ☐ Digital marketing
- ☐ Software development
- ☐ Website design
- ☐ Writing
- ☐ Transcription
- ☐ Graphic design
- ☐ Admin support
- ☐ Accounting & consulting
- ☐ Translation
- ☐ IT & networking
- ☐ Blogging
- ☐ E-commerce
- ☐ Other (please specify) _____

On what platform(s) have you found online opportunities? (Check all that apply)

- ☐ Upwork
- ☐ Fiverr
- ☐ Guru
- ☐ Freelancer
- ☐ PeoplePerHour
- ☐ 99Designs
- ☐ TopTal
- ☐ Craigslist
- ☐ College Recruiter
- ☐ GetACode
- ☐ iFreelance
- ☐ Project4hire
- ☐ SimplyHired
- ☐ Other (please specify)_____

Did you experience any challenges finding freelance online opportunities?

- o Yes
- o No

Skip To: If Did you experience any challenges finding freelance online opportunities? = Yes
Skip To: End of Block If Did you experience any challenges finding freelance online opportunities? = No

Which of the following challenges did you experience when searching for freelance online opportunities?

- o Too Much Competition
- o Profile Unapproved
- o Don't have high Ratings
- o Communication Gap
- o Don't have the experience clients want
- o Preference for Freelancers in other Continents
- o Other (please specify) _____

Why have you not considered online outsourcing opportunities?

- o Don't know about it
- o Don't have the right knowledge/skills
- o Don't have the device to work
- o Don't have passion for it
- o Have never needed to considered it
- o Other

Are you aware of the concept of digital entrepreneurship?

- o Yes
- o No

Have you ever engaged in digital entrepreneurship?

Note: Digital entrepreneurship is the joining of traditional entrepreneurship with an emphasis on leveraging new digital technologies in novel ways, such as social, mobile, analytics, cloud and cyber-solutions, all in order to shift the traditional way of creating and doing business in the digital era.

- o Yes
- o No

How are you engaged in digital entrepreneurship? (Check all that apply)

- ☐ Digital Marketing
- ☐ Data Science

- ☐ Website Design
- ☐ Cyber security
- ☐ Artificial Intelligence
- ☐ Software development
- ☐ Premium WordPress Theme/Plugins development
- ☐ Machine learning
- ☐ Freelancing
- ☐ Uber
- ☐ Affiliate Marketing
- ☐ Blogging
- ☐ Sell Products & Services (e-commerce)
- ☐ Web hosting reselling business
- ☐ Email marketing
- ☐ Content Marketing
- ☐ Graphics Design Business
- ☐ Social Media Marketing
- ☐ Other (please specify)_____

In no more than one sentence briefly describe what you do as digital entrepreneur

_____

Have you received income from digital entrepreneurship/online freelance outsourcing?

- o Yes
- o No

If Yes, how often

- o Weekly
- o Monthly
- o Contract basis

Why are you not engaged in Digital Entrepreneurship?

- o Don't have information about it
- o Don't have the right knowledge/skills
- o Don't have the device to work
- o Don't have passion for it

o   Have never needed to considered it
o   Other

Were you given practical mentorship or tips of the trade on how to successfully make income as a digital entrepreneur?

o   Yes
o   No

If yes, in one sentence tell us how and the source. E.g. friend, role model, mentorship programme etc.

_____

In-depth Interview Questions with Intervention Participants

Consent Form

Title of Project:	**The New-World of Work: The Emergence of New-Collar skills**
Name of Researcher:	**Remi Abere**
Name of Lead Supervisor:	**Panos Constantinides**
Date:	**December, 2019.**
Aim:	**The purpose of this study is to explore the effects of New-Collar skills (NCS) on employability in Africa**

Dear Participant,

You are invited to act as research participant for the above project. Your participation in this project is entirely voluntary. You may withdraw from participating in this project at any time, with no negative consequence to yourself or the organisation for which you work.

It is not expected that you will experience any risks through participating in this project. Data will be anonymised from the start, with no names or specific positions recorded as part of the interview material. Your consent form will be stored in a locked office at the University of Warwick, and transcripts of interview data will be anonymised before being printed and stored in the same place. The transcripts will also be stored electronically on my password-locked laptop. All material may be destroyed after 10 years from the completion of the research. The material from this research may be published. You can request a copy of the publication

Explanation of the Interview Process

The interview will consist of open-ended questions and normally range between 30-60min.

If you permit me to, I would like to record the interview. The rationale for recording interviews is it enables verbatim transcription, rather than transcription based on notes and recall, facilitating more robust analysis.

A copy of the transcript will be provided to you for review.

I will run through all of the agenda points again at the start of our recorded conversation, however if you have any concerns please let me know before we start.

1. I confirm I have read and understand the information above dated [January 2020] for the above study. I have had the opportunity to consider the information, ask questions of a member of the research team and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I understand that that my information will be analysed by the researcher for the purposes of completing their Dba research and, where relevant, for the writing of associated academic journal articles or monographs.

4. I agree to take part in the above-named study and I am willing to be interviewed and have my interview audio recorded.

_____	_____	_____
Name of participant	Date	Signature

Remilekun Abere		*Remi Abere*
Name of Researcher	Date	Signature

1. **How does New-Collar skills accelerate or impact employability in Africa?**

   a. What do you understand by New Collar Skills? (**Explain if not properly answered then ask**….)

   b. What New Collar-skills do you currently have?

   c. How did you get them?

   d. How would you say your training helped you?

   e. Would you say New-Collar skills helped you get your job? How have they helped you?

2. **What are the primary motivations / factors that influence youth's employability in Africa?**

   a. How did you hear about the New-Collar skills you now have?

   b. What motivated you to learn them?

   c. Was your training what you expected?

   d. In your opinion what are the factors you have experience will enable you to get a job

3. **How can New-Collar skills enhance increased African Youth participation in Digital Entrepreneurship?**

   a. What do you understand by Digital Entrepreneurship?

   b. Do you engage in Digital Entrepreneurship? Explain what you do?

   c. Why did you decide to start the business?

   d. How did you get into the business?

   e. Did your training help you with this in any way? Please explain

4. **How can New-Collar skills enhance increased African Youth participation in Online Outsourcing?**

   a. What do you understand by online outsourcing? (Explain if not understood)

   b. How do you go about online outsourcing? What platforms do you use?

   c. How did you know about online outsourcing?

   d. Have you been able to get jobs with New-Collar skills you have? How?

   e. What skills do you advertise? Why?

   f. Has your training helped in any way with getting jobs from online outsourcing platforms?

In-depth Interview Questions with Corporate Executives

Consent Form

Title of Project:	**The New-World of Work: The Emergence of New-Collar skills**
Name of Researcher:	**Remi Abere**
Name of Lead Supervisor:	**ProfessorPanos Constantinides**
Date:	**December, 2019.**
Aim:	**The purpose of this study is to explore the effects of New-Collar skills (NCS) on employability in Africa**

Dear Participant,

You are invited to act as research participant for the above project. Your participation in this project is entirely voluntary. You may withdraw from participating in this project at any time, with no negative consequence to yourself or the organisation for which you work.

It is not expected that you will experience any risks through participating in this project. Data will be anonymised from the start, with no names or specific positions recorded as part of the interview material. Your consent form will be stored in a locked office at the University of Warwick, and transcripts of interview data will be anonymised before being printed and stored in the same place.

The transcripts will also be stored electronically on my password-locked laptop. All material may be destroyed after 10 years from the completion of the research. The material from this research may be published. You can request a copy of the publication

Explanation of the Interview Process

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I will run through all of the agenda points again at the start of our recorded conversation, however if you have any concerns please let me know before we start.

1. I confirm I have read and understand the information above dated [January 2020] for the above study. I have had the opportunity to consider the information, ask questions of a member of the research team and have had these answered satisfactorily.

2. I understand that my participation is voluntary and that I am free to withdraw at any time without giving any reason.

3. I understand that that my information will be analysed by the researcher for the purposes of completing their Dba research and, where relevant, for the writing of associated academic journal articles or monographs.

4. I agree to take part in the above-named study and I am willing to be interviewed and have my interview audio recorded.

_____	_____	_____
Name of participant	Date	Signature

Remilekun Abere	_____	_Remi Abere_
Name of Researcher	Date	Signature

1. What is the impact of automation and technological progress/ innovation on businesses in Africa?

2. Would you say technological progress/automation will complement or substitute labour in Africa? Explain.

3. What are the factors you would consider when employing an employee into your organization (considering the demand for New Age skills).

4. What do you understand by New-Collar skills; (Technical Skills and soft skills needed to work in technology jobs acquired through non- traditional educational paths, like boot camps, community or vocational colleges? They do not necessarily have to have a degree).

5. What would you say will be the impact of NEW Collar skills on your organisations.

6. What are the factors influencing the acquisition of New Collar Skills in Africa (Nigeria, Ghana, Kenya, Rwanda, SA).

7. What is the effect of New Collar skills on employability in Africa

8. How does New Collar Skills enhance Participation in DE and OO in Africa?

Assessment of Employability Quotient

Introduction

The objective of the survey is to assess your "Employability Quotient" in New Collar skills. An Employability Quotient is a tool that measures different qualities that increase one's employability. It also helps to show the gaps in skills that will need to be worked on to increase employability.

Please answer the questions below as completely as possible, especially the text boxes. I will send everyone their individual assessment report once completed.

Thanks so much for your cooperation.

Name

_____

Interest/Attitude

Why did you decide to study Business intelligence/ Mobile App Development - New-Collar skills?

- o   I heard that IBM was conducting free training and decided to go for it
- o   It has great earning potential once the skill is mastered
- o   My friend was doing it so I decided to join
- o   I have been interested in Mobile App Dev/ BI for a while

If there is other reason, please explain why you are interested

_____

Practical Applicability

Have you practically applied the New-Collar skills you have?

- o   Yes
- o   No

In what way(s) have you practically applied the New-Collar skills you have?

- o   Team Project work
- o   Piece of work for a personal client
- o   Experience gained at my job
- o   Developed an app, or a model
- o   Simulations
- o   Other (please specify in the text box below)
       _____

If no why? Please explain

_____

Portfolio of Work

Do you have a portfolio of work to show your employers you can apply the New-Collar skill?

- o Yes
- o No

Which of the following portfolio of work do you have?

- o Team Project work
- o Piece of work for a personal client
- o Experience gained at my job
- o Developed an app
- o Simulations
- o Other (please specify in the text box below)
  _____

If no, why? Please explain

   _____

Validation of Skills

Q11 Have you been able to validate the skills acquired on a recognised platform?

- o Yes
- o No

On which recognised platform(s) have you been able to validate your New-Collar skills

- o Kaggle
- o StackOverflow
- o GitHub
- o Certifications
- o Other (please specify in the text box below)

_____

If no, why? Please explain

_____

Lifelong Learning

Explain what you do to continuously upgrade your skill and personal development

_____

Extra Mile Mentality

How would you describe your perseverance level?

- o Above average
- o Average
- o Below average

Please describe an event or outcome when your perseverance made you overcome a huge obstacle or achieve success

_____

_____

Research Skills

What do you understand by having good research skills and how would you demonstrate this?

_____

Entrepreneurial Spirit

How would you describe yourself?

- o Risk Averse
- o Risk Taker

Describe a situation at work where you exhibited whether you're a risk taker or risk averse

_____

Could you explain a time you lacked the skills or knowledge to complete an assignment?

_____

Proficiency in English

How would you rate your level of English Language Proficiency?

- o Beginner
- o Intermediate
- o Advanced

What do you do to improve your communication and writing skills?

_____

International Competitiveness

Would you describe yourself as an international competitive worker?

- o Yes
- o No

Skip To: End of Block If Would you describe yourself as an international competitive worker? = No

If yes, please explain.

_____

Pilot Questions

Introduction

The objective of this interview is to understand if and how New Collar Skills can accelerate employability in Africa and how it can expand digital entrepreneurship and online outsourcing on the continent.

We would like to obtain some information to help us with this process.

1. I understand that my participation is voluntary.

2. I understand that my information will be used for the following purposes:

   - To assist in research on youth employability especially in the area of Digital Entrepreneurship and Online Outsourcing.
   - For the purpose of completing DBA research.
   - Where relevant, for the writing of associated academic journal articles or monographs.

3. I agree to take part in the above study and understand that my participation is completely confidential.

NAME: _____

AGE:_____ MARITAL STATUS:_____ GENDER:_____

Telephone Number _____ Email _____

Part 1: Personal Information

1. Background: Tell me about your background, family - your parents, siblings, educational qualification and occupation etc. Do you have a role model? Who do you look up to as a role Model:

2. What University did you attend and what did you study? What was your (GPA)?

3. What other educational qualification(s) or vocational skills do you possess?

4. What specific skills did you acquire from the University you attended? Are you applying these skills

Part 2: Work Experience

5. Are you working presently? If so, where do you work? What is your job title? How long have you been working?

6. Would you classify your current job as a New-Collar job?

7. How did you secure a job? Did you encounter any challenges?

8. Do you have any previous working experience? If yes, enumerate your working experience? If no why

Part 3: African Skills Initiatives (ASI)

9. When did you participate in the African skills initiative? Why?

10. What track did you take and why? What peaked your interest and why? Is this your passion?

11. How long did the training last? Why and how long after training, did you attempt the IBM certification? Did you pass?

12. What skills are you using in your current job? Did you acquire any of these skills from the Africa Skill Initiatives (ASI)? What are the other skills that were needed for your present job that you acquired outside ASI?

13. Would you say that the skills acquired during the ASI training was sufficient to acquire a job? If not, what do you think should be done differently? Did you find any online opportunities?

14. Have you ever attended a career planning seminar or workshop?

15. Have you had any career advice or mentorship?

16. What are your career goals and where do you see yourself in the next two or five years (career goals)?

17. What if anything prevents you from reaching your career inspirations today?

18. What skills you wish you had been trained on to reach your career aspirations?

19. Do you have any questions or comments that you feel will be relevant to this study?

20. . Do you have a smartphone, laptop and access to the internet

Questions for the lecturers in the Universities

1. How were you involved with the IBM African Skills (IBM training)?

2. Did you take any of the courses?

3. Were you a 'Train the Trainer' Facilitator? If so how did you find the experience?

4. How many classes (Tracks) have there been so far in this university

5. What course have been delivered?

6. Would you say these courses represent market demand? if not, what courses would you recommend?

7. Which courses have been the most popular and why?

8. What would you say has been the biggest advantage or benefit from having the IBM training?

9. Were there any challenges delivering the programme

10. What would you change about the programme to achieve a better impact?

11. Would you recommend a selection criterion? and if so, what criteria?

12. What has been the outcome of the programme with regards to students acquiring skills to be part of the workforce

13. Do you agree with the concept of New Collar skills – that the future of work & Industry is laying more emphasis on skills and internship rather than a college degree

14. Do you have any comment or suggestion on how we can improve the programme?

Key Informant Interviews

Recruitment Agencies (Below are the three top ranked recruitment sites in Nigeria)

- Jobberman Nigeria Limited
- Hot Nigerian Jobs
- My Job Mag

Questions

1. What are the three top most sought after jobs and skills in the IT industry in Nigeria?
2. What are the qualities Nigerian employers look for in a graduate hire
3. How many daily and annual registrations on your portal?
4. What are the qualities that are lacking in Nigerian graduates?
5. Do you understand what is meant by the term "New Collar Jobs"?
6. What is the salary range for a graduate hire for a New-Collar job?
7. Would say that the market is ready for emerging technologies, (New Collar jobs) if yes where why how do we deploy and in what sectors
8. If no would you say that we are behind in the rest of the world and if so would you suggest a solution
9. Would you say that employers would consider skills rather than qualifications?
10. Would a job seeker (non – graduate) who has the require skills get the job over a job seeker who has no skill but has required qualification.
11. Do you do both local and virtual placements?
12. If not, why have you not explored the wider global market online?
13. What are the biggest challenges in placing Nigeria graduates
14. What are the biggest challenges in Working with Nigerian employers
15. Would you say there is a big mismatch between Skills and employer's needs, explain?
16. What are the basic skills in demand from employers
17. What kind of data do you collect and how do you use this data to improve your placement rates
18. What would you say is your percentage placement rate?

315

19. If has been said that Nigerian graduates are not job ready, would you agree with this and if so why and do you have any suggestions to improve this

20. In the developed countries, especially in countries like Germany, and now USA (that recently announced investing in apprenticeships) there has been more emphasis on apprenticeships, would you say that this is an area we should be considering in Nigeria now to reduce skills mismatch and train more people for job specific roles, if so could you suggest how we should go about achieving this.

Appendix B: **Definition of Terms**

Key Terms	Definition
Digital Entrepreneurship	It can be defined as the creative production and distribution of digital software and applications by skilled and opportunity-oriented individuals and ventures (Taura et al., 2019).
Digital Skills	Digital skills involve the knowledge and ability to determine information needs from digital technology sources, and to use digital tools and facilities to input appropriately, access, organise, integrate and assess digital resources as well as to construct new knowledge, create media expressions, and communicate with others. Digital skills include both technical skills associated with understanding and using digital systems, tools, and applications, as well as information processing skills, which are the cognitive underpinnings of digital proficiency (Human Resources and Skills Development Canada).
Distributed Teams	Distributed teams are made up of employees working in a variety of different locations. Most often, distributed teams consist of a group of remote workers dotted in different cities or countries. Sometimes, distributed teams also include employees who work in an office as well as remote team members.
Emerging Technology	This is a radically novel and relatively fast-growing technology characterised by a certain degree of coherence persisting over time and with the potential to exert a considerable impact on the socioeconomic domain(s). This is observed in terms of the composition of actors, institutions and patterns of interactions among those, along with associated knowledge production processes. Its most noticeable impact, however, lies in the future, and so in the emergence phase is still somewhat uncertain and

ambiguous (Rotolo et al., 2015).

Employability	This is 'a set of achievements – skills, understandings, and personal attributes – that makes graduates more likely to gain employment and be successful in their chosen occupations, which benefits themselves, the workforce, the community and the economy' (York, 2006)
Fourth Industrial Revolution	The Fourth Industrial Revolution is a way of describing the blurring of boundaries between the physical, digital, and biological worlds. It is a fusion of advances in artificial intelligence (AI), robotics, the Internet of Things (IoT), 3D printing, genetic engineering, quantum computing, and other technologies (Schwab, 2016).
Future of Work	The growing adoption of artificial intelligence in the workplace and the expansion of the workforce to include both on- and off-balance-sheet talent (Delloite, 2017).
New-Collar Worker	A New-Collar Worker is an individual who develops technical and soft skills needed to work in the contemporary technology industry through nontraditional education paths.
Non-Traditional Education	Non-traditional education is education that is offered in ways other than common daytime college classrooms. There are many versions of non-traditional education, such as college-prep education, evening courses, independent learning, online learning, residencies, cross-registration, and one-on-one learning (learn.org).
NVivo	NVivo is a qualitative data analysis (QDA) computer software package produced by QSR International. NVivo helps qualitative researchers to organise, analyse and find insights in unstructured or qualitative data like interviews, open-ended survey responses, journal articles, social media, and web content,

	where deep levels of analysis on small or large volumes of data are required
Online Outsourcing (Freelancing)	Online Freelancing where a more substantial task is given to an identified individual as for Upwork or Freelancer. Examples of the variety of online freelancing work include software development, web development, translation, transcription, data analytics, administrative support, and sales and marketing (Agrawal et al 2013, Margaryan, 2016).
Remote Work	This is a work arrangement in which employees do not commute or travel (e.g., by bus, bicycle or car, etc.) to a central place of work, such as an office building, warehouse, or store.
Soft Skills	Soft skills are unique characteristics and abilities that distinguish a person from other individuals who have similar professional backgrounds and experience Perreault (2004). Soft skills are interpersonal and intrapersonal abilities that help individuals master performance in particular social contexts (Hurrell et al. 2012).
STEM	The four strands of STEM; Science, Technology, Engineering, and Mathematics, have been stapled forms of all students' academic careers, particularly science and mathematics (White, 2014).
Qualtrics	Qualtrics is a simple to use web-based software for enterprise data collection and analysis products for academic research, market research, the voice of the customer, and employee performance.

Appendix C: **New-Collar Employability Quotient (NCEmQ)-Assessment**

How New- Collar Employability Quotient was assessed

NCEmQ	Assessment
Interest	To gauge the level of participants', interest the participants are asked what motivated them to acquire a New-Collar skill. If the participants responded by saying my friends was doing it so I decided to join or they were doing it because IBM was conducting a free training or a response along these lines- the response was considered as a lower interest level. However, if the participants answered that they had been interested in this particular New-Collar skill for quite a while and they've been doing things pertaining to this skill- then this attracted a high level of interest score
Practical Applicability	The participants were asked how they had practically applied the skills and given the following options (i)Team project, (ii)Piece of work for a personal client (iii) Experience gained at my job (iii)Developed an app, or a model (iv)Simulations (vi) Other (please specify in the text box below). They were given a score based on what they had done.
Portfolio work	Participants was asked if they had a portfolio of work, they could share with employers and given options. If the participants had developed an app and the codes can be seen on GitHub or some other platforms, this attracted a higher score than someone who had just used simulations.
Validation Skills	Participants was asked how they had validated their skills. If they had used any of the platforms, this attracted a higher score than someone who had done nothing or just relied on a certification- they were asked to specify and explain and possible send a link.
Lifelong Learning	The participants were asked what they do to continuously upgrade and update their skills. This was an open question, if the participant just said reading, this would be graded lower than someone who uploads his projects or codes to StackOverflow or participates in projects on this site, or does online courses etc.
ExtraMile Mentality	The participants were asked to describe their perseverance level, if it was average, above average or below average. Then they were asked to describe an event or outcome when their perseverance resulted in overcoming a huge obstacle to achieving success. This was an interesting one to rate

Research Skills	Participants were asked what they understood by having good research skills and how they would demonstrate this.				
Entrepreneurial Spirit	Participants were asked how they would describe themselves, Risk Averse or Risk Taker. Then asked to describe a situation at work where they exhibited being a risk taker or risk averse. Secondly, they were asked to explain a time they lacked the knowledge and skills to complete an assignment and what they did.				
Proficiency English	Participants were given the option to rate their proficiency level and also asked what they do to improve their communication and writing skills.				
International Competitiveness	Participants was asked if they would describe themselves as a competitive worker and to explain their response.				

Assessment of New-Collar skills Employability Quotient – P9

Employability Quotient	Participant	Gender	Age	STEM	Degree	Status
	P9	Male	25	Yes		Employed
Practical Application of Skills	I realised that there are lot of opportunities in the IT space so I deem it fit upon myself to learn and then I download tutorial videos on web development and I got on with the skills with that I was able to get project to work on					
Portfolio of Work	I download tutorial videos on web development and I got on with the skills with that I was able to get project to work on					
Research Skills	I have been able to see that opportunities are bound everywhere, I have been able to see that there is even freelance job that some can get to do online and these are opportunities that you just only need your internet and computer to get on with it and you get paid by people from different countries.					
Attitude/Self-	What motivated me to find a place for myself and make my life					

Motivation/Interest	better. In country like Nigeria where there is unemployment everywhere I was really afraid about it coming out of school and when I finished school I also join the queue of graduates searching for jobs and suffered many experiences of no jobs then I felt there is something I need to do thereafter ….it's not really trying to get the 9-5 job that matter but actually making yourself relevant having the necessary skills needed in the job market and eventually you are going to get more than enough if you have the necessary skills.
International Competitiveness	
Lifelong Learning/Willingness to Learn	I started taking online courses and downloaded tutorial videos just to make something for myself even while I am still looking for jobs.
Proficiency in English language	
Entrepreneurship Spirit	Similarly, with digital marketing, as I explained earlier an entrepreneur you just have to market your product and do you market your product there are social media channel available to place your services online and try to publicize and market your services and I did that making use of existing platforms and different strategies in trying to get new customers. So these are what I acquired on my own through tutorial videos online.
Extra-Mile Mentality	I never got the chance to be exposed to real experience in computer science field. So, when I finished from school and I was like what is next for me to do, I realize that there are lot of opportunities in the IT space so I deem it fit upon myself to learn and then I download tutorial videos on web development and I got on with the skills with that I was able to get project to work on
Evaluation of Skills	

Assessment of New-Collar skills Employability Quotient – P4

Employability Quotient	Participant P4	Gender Male	Age 30	STEM Yes	Degree	Status Employed

Practical Application of Skills	I studied computer science but that was not where I got the skill because that was just mentally theoretical oriented and most of was just like jargons, it does not really make sense, just want to cram, want to pass, and just get out of university, the experience then at IBM, we had opportunity to do some hands-on and after the training there was a practical that really put us on our toes to know that we have something ahead of us to plan for that's beyond what, um, what the industry needs now not just the paperwork
Portfolio of Work	I studied computer science but that was not where I got the skill because that was just mentally theoretical oriented and most of was just like jargons, it does not really make sense, just want to cram, want to pass, and just get out of university, the experience then at IBM, we had opportunity to do some hands-on and after the training there was a practical that really put us on our toes to know that we have something ahead of us to plan for that's beyond what, um, what the industry needs now not just the paperwork
Research Skills	I want to do something new and I saw that as a kind of emotion for me to launch into that,, yes, this is it,,, if am able to develop my skill in this,,, I researched into it and I saw what it means for me,,, yes before now, I wanted to but I didn't have the opportunity in the sense of the money demanded then, but when you have opportunities, a lot of materials online, and one of the reasons I needed back then was just the push which I gathered at IBM and since then it has always been a never looking back
Attitude/Self-Motivation/Interest	The network I made there was, I was able to leverage on that to acquire more skills in some other training
International Competitiveness	
Lifelong Learning/Willingness to Learn	I made up my mind, I had to do a lot of self-training, self-training and I was able to link up with Mr Shada then as trainer, so, I got a place then for internship but I was not,,, since I was not good at it yet, they still need to give me more time to practice so then I will do trainings, trainings, trainings upon trainings, in summary, I was able to get another opportunity to train, also that place is software worker

| | I did some other self-development training, I was able to learn a new language C#, we currently use C# at my place of work, am like seven months old there now, so that's a training, and now am a full staff and, promoted to software developer |
| | The network I made there was, I was able to leverage on that to acquire more skills in some other training |

Proficiency in English language

Entrepreneurship Spirit

Extra-Mile Mentality — ok, yes, it has, because for me, haven attended university to study computer science and not been able to write a software wonders the challenge because you know that you can't get a job related to that, but the new collar skill, after it stopped given computer ,,,,name,,,, the training at IBM, once it gave me that push and I did some other self-development training, I was able to learn a new language C#, we currently use C# at my place of work, am like seven months old there now, so that's a training, and now am a full staff and promoted to software developer

Evaluation of Skills

Assessment of New-Collar skills Employability Quotient – P15

Employability Quotient	Participant P15	Gender Male	Age 25	STEM NO	No Degree	Status Self - employed
Practical Application of Skills	I expected more because it wasn't really, really broken down for people like,,, it was just assumed that all of us knew some of those terms used in technologies, it wasn't properly broken down for some of us					
Portfolio of Work Research Skills						
Attitude/Self-Motivation/Interest	Well, I think, is it, should I say it's a mistake on my own part because of connecting and investing. So when I had an admission to go to a universities I was like, not, it's not what I wanted, like, when you didn't get admission and they offer you a different course I					

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	didn't take it then so I was waiting for a later time and by the time I could go to university, the, the price was too high for me, so, then I had to drop, you know, because I was very low in confidence.
International Competitiveness	
Lifelong Learning/Willingness to Learn	like, but, I have not worked on, Power BI and tableau since I left here, I am working on, data science with python
Proficiency in English language	
Entrepreneurship Spirit	I do digital marketing like, online PR, and working in social media, I create content for people…..
Extra-Mile Mentality	And some of us had to go and do the extra mile to understand some words and, I expected more, it wasn't what I expected
	Currently am, am, working as a digital marketer for a particular client of mine and its going to end by march, that is when the contract will end and (in audible) I just go from home to the island, look for work as a digital marketing of course, I've also being… I know that sometime in the long run I will put this my skills in data science as in,,,, I've, I've been keeping myself up in data science learning about how to, because em, right now around the world, programming is the next thing, (in audible), so programming or data science or data management is going to be key requirements needed for the job right now. So am updating myself, so when the time comes up, I know am ready for any opportunity
Evaluation of Skills	

Assessment of New-Collar skills Employability Quotient – P8

Employability	Participant	Gender	Age	STEM	Degree	Status
Quotient	P8	Female	29	NO		Unemployed
Practical Application of Skills	I tried to get myself a system, like I was trying to get support from someone to get a system but then because the Cognos, the latest version I get I was told to hold on that we need like 16Gig RAM, a laptop of about 15 Gig rams, that was expensive to get in the market, it as ranging from 180 thousand to 250 thousand					
Portfolio of Work						

Research Skills	You know, when we were been trained we had to, ok I think you were there also when we asked that question, and you said, you said there are other tools but then if we understand the IBM Cognos it wouldn't be difficult to use other tools so those tools were not mentioned to us, I have no idea though it's not an excuse anyway because am very sure if I did a research on it I would have known what other tools are used for business intelligence and can manipulate them
Attitude/Self-Motivation/Interest	I have a mixed feeling… like I was talking about it with my husband two weeks ago and I felt like I wasted time on it, I am not doing anything on it, I am a not using it, maybe until I find use for it, I will feel, yes,,, it helped me or something, but right now, you know, it was during the period of my wedding and everything so I was more like scathed at that time, but then I was still focused, I have a strong feeling that something good was going to come out of it, I mean when I say something good, I mean a job was going to come out of it. I felt demoralized when I did not get a job
International Competitiveness	
Lifelong Learning/Willingness to Learn	Digital marketing is something I am learning on my own
Proficiency in English language	
Entrepreneurship Spirit	I have actually not started doing digital marketing on it yet because I am still waiting on the graphic designer to make my logo, and try to boost my page
Extra-Mile Mentality	I don't have a system, like from that time I don't have a system, I don't have the tool which is the Cognos, I don't have it
Evaluation of Skills	