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Digitization and unemployment in South Africa: Preparing the youth towards taking advantage of 4IR

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A research proposal submitted to the Faculty of Commerce, Law and Management, University of the Witwatersrand, in partial fulfilment of the requirements for the degree of Master of Business Administration.

Johannesburg, 2023

ABSTRACT

This study adopted a qualitative approach to assess the capabilities of South Africa to leverage the fourth industrial revolution (4IR) in addressing youth unemployment and the transformative impact of 4IR on the socio-economic landscape. Through a comprehensive exploration of youth employment dynamics, education systems, infrastructure challenges, and the overarching development trajectory, the study provides nuanced insights into the opportunities and challenges posed by the rapid technological advancements of the 4IR. The findings reveal a complex landscape, where concerns about job displacement coexist with the promise of new employment opportunities and enhanced productivity. In the realm of education, the study highlights the urgency of adapting South Africa's educational system to the demands of the 4IR. Outdated curricula and inadequate preparation for future jobs underscore the need for a comprehensive overhaul, including the integration of technology at all levels and the development of digital literacy programs from primary education onwards. The digital divide between urban and rural areas emerges as a critical issue, necessitating infrastructure upgrades and policies to ensure widespread internet accessibility, particularly in underserved regions. This study recommends a multifaceted approach to address these challenges. Initiatives encompass comprehensive education system reforms, prioritizing digital literacy, infrastructure development, and widespread internet accessibility. The promotion of entrepreneurship and youth development programs, strategic partnerships between educational institutions and the private sector, and regulatory measures adapting to the 4IR landscape are also proposed. Moreover, continuous skills development is recommended to align the workforce skills with the evolving demands of the job market. This study offers a roadmap for South Africa's policymakers, educators, and stakeholders to navigate the 4IR complexities, aiming to harness technological advancements while mitigating challenges and fostering a resilient, innovative, and inclusive future.

DECLARATION

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

Name: Humbulani Ndou

Student Number :2011329

Signature 

signed at the University of the Witwatersrand. Parktown Management Campus, Johannesburg, on the 29th day of February 2024.

DEDICATION

This research project is devoted to my cousin and guardian Captain Khathutshelo Daniel Nekhambele, who sacrificed much over the years to make today a reality.

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This report would not have been possible without the support of many people.

Firstly, I would like to thank my supervisor, Dr Jacques Totowa, for his advice, knowledge and guidance throughout this learning process. Your guidance and support gave me the strength to push through the research process and I will always be grateful.

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Thank you to my wife, Keolebogile Margret Ndou, for allowing me to undertake these studies and for taking care our children Mulalo and Phophi in my absence. Thank you to Mrs. Lydia Luambo Mbedzi, my teacher and cousin, for being the light and making today possible.

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LIST OF ACRONYMS

AI	Artificial Intelligence
4IR	Fourth industrial revolution
IT	Information system
POPIA	Protection of Personal Information Act
Stats SA	Statistics South Africa
SA	South Africa
DHET	Department of Higher Education and Training
MBA	Master of Business Administration
PDBA	Post Graduate Diploma in Business Administration

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Table 1: Sample of participants and experience levels

CHAPTER 1. INTRODUCTION

1.1 Research purpose.

This study aims to assess the capabilities of South Africa (SA) to leverage the Fourth Industrial Revolution (4IR) in addressing youth unemployment.

1.2 Background of the study

Digital technologies are perceived by some sections of society as threats to both job creation and the viability of current employment (Frey & Osborne, 2013), and it is worth noting that technological innovation has traditionally enhanced productivity, resulted in continuous gains in living standards, and created more employment than it eradicated (Blanchard, 1998). However, this progress has occasionally been hindered, notably during the transition period, by several difficulties, particularly in employment markets. (SAOUDI, 2021)

Digitization is anticipated to have varying effects on employment depending on the productive and institutional context in which it occurs: labour market structures, legislation, industrial relations, and macroeconomic situations (Evangelista et al.,2014) ;(Calvino et al.,2018); (Guerrieri & Bentivegna, 2012). However, some believe that, as with earlier technical advancements, digitation will increase labour demand in certain industries and provide fresh employment possibilities that did not previously exist, while raising incomes and living conditions (Blanchard, 1998) ; (Melainie et al.,2016).

Over time, technology has had a significant impact on the economy by utilising information and communication technologies to cover an increasing range of economic activities and create new opportunities for socioeconomic development, disintegrating some businesses and jobs while reshaping and establishing others. (Autor & Salomons, 2017); (Kravchenko et al.,2019).

In developed countries, there are considerable possibilities of some employment sectors becoming totally or partially digitised, especially those performed by low skilled individuals, especially within the manufacturing sector (Frey & Osborne, 2013) ; (Eurofound, 2024). The concern is that the transition will continue, resulting in some professions disappearing for the benefit of technology, and may also affect workplace relationships (Eurofound, 2024). Digitization has already reshaped the workplace, as evidenced by how the workforce currently embraces collaboration and fosters an open and holistic culture. Technology already has a significant impact by providing opportunities for remote and distributed work, promoting flexibility and collaboration among departments (Kramer, 2023).

Most young people globally are underemployed or jobless, while organisations are unable to fill vacant positions. This is a dilemma that emanates from the widening misalignment between youth skills and marketplace demands (Deloitte , 2018). If not solved, it will certainly worsen during the Fourth Industrial Revolution (4IR) (Deloitte , 2018).This research posits that youth in developing countries, and specifically in SA, should prepare themselves to take advantage of employment opportunities that accrue through digitization.

1.3 Research problem.

According to the first quarter 2022 labour force survey, youth unemployment in South Africa is at 63.9% for the demographic group between the ages of 15 and 24 (Stats SA, 2022), making it higher than the South African national unemployment rate of 32.7%. Although the unemployment rate is lower among graduates within the youth segment, the phenomenon of jobless graduates has become an additional and increasing challenge for society (Stats SA, 2022).Youth unemployment is a problem because the youth are the future of a country, and keeping them idle is a major risk for the nation (Autor & Salomons, 2017). Frustrated youth may feel excluded and disenfranchised, which can result in increased rates of crime and violence, adolescent pregnancies, youth dependency, substance abuse, and sexual inequality (Statista, 2024).

South Africa's high youth unemployment rate is linked to several social problems that have a significant impact on people's lives, communities, and the entire nation (Statista, 2024). Economic marginalisation, in which young people are unable to access opportunities for stable employment and income generation, is one of the major societal issues connected to youth unemployment in South Africa. In marginalised communities especially, this can exacerbate cycles of poverty and inequality (Statista, 2024)

Among the workable solutions to this problem, it has been suggested that digitization of the economy could assist with alleviating youth unemployment through a proactive strategy based on the prediction of change and the delivery of skills needed for individuals and businesses to prosper in the digital era. (Deloitte , 2018); (DBSA, 2024) . Digitisation will tackle youth unemployment by providing the South African youth with training in digital skills, allowing them to take charge of their lives and create their own jobs, as opposed to alternative solutions that are more dependent on governments for job development. (OECD, 2021)

1.4 Research objectives and research questions.

Research objectives:

- To identify the technological skills and training needs that would prepare the youth to take advantage of digitization.
- To assess the readiness of South African youth to maximise the employment opportunities that could arise through the digitization of the economy.
- Investigate the potential benefits of digitalization in South Africa and the important role that it may play in reducing unemployment.

Research questions.

- Which technological skills and training can be identified and invested in to cap the gap in youth unemployment?
- How ready are the South African youth to take advantage of new jobs that will arise through the digitization of the economy?

- What potential benefits would digitalization have in South Africa, and what role will it play in reducing unemployment?

1.5 Rationale

This study proposes the use of digitization as a tool to pull the youth out of unemployment. This research aims to improve our knowledge of the way the technological revolution impacts the nature of the economy and employment. This research shall enhance the progressive governance process by rebuilding and restructuring the economic policy frameworks, ensuring that the digital revolution is one of growth and development for everyone.

1.6 Research delimitations and justification

This research is restricted to the relationship between youth unemployment and the digitisation of the economy. This study's contribution is substantial, relevant, and useful for the efficient and effective application of this research to the problem of youth unemployment in South Africa, particularly in industries that employ many unskilled and semi-skilled labour forces. The study will also give further information on the impact of innovative technologies and innovation on youth employment in South Africa.

CHAPTER 2. LITERATURE REVIEW

2.1 Introduction

The global unemployment population, particularly among the youth, is an acute concern because of the digital economy, its potential capacity, and losses (Vivarelli, 2007). The digital economy has a huge influence on youth employment because it is built on global information and communication networks that connect all players (producers, consumers, partners, customers, young people, and adults) into a single economic mechanism (Nkosi G. , 2023). The digital economy, brought about by the 4IR, promotes national competitiveness and security, produces new opportunities for human capital development, and fosters innovation and creative industries (Vivarelli, 2007).

2.2 Empirical review

Research conducted on the South African labour market following the first democratic election focused on what happened to young people (Bhorat & Leibbrandt, 1999), by conducting a two-step Heckprobit regression analysis and probit multiple regression analysis on the probability of employment among black persons using OHS 1995 data (Bhorat & Leibbrandt, 1999). Upon investigation of differences in household characteristics and educational attainment, the research shows that many young blacks in the population group in the age category of 16 to 25 had the least risk of participating in economic activities (National Treasury, 2011).

The impact of technological advancements on youth unemployment is not always straightforward, as it affects industries and labour markets all throughout the world, accelerating economic development and cultural change. (Alfred et al.,2023). The introduction of innovative technology may lead to job losses in traditional industries, such as manufacturing and services, as well as the disappearance of certain types of jobs (Nkosi G. , 2023). The "skill-biased" shift in employment may mean that the younger, inexperienced workers may not be able to compete with their older and more experienced counterparts (Vivarelli, 2007). Therefore, while technological advancements can have a

favourable impact on youth unemployment, it is incredibly significant to consider the other potential effects of technological innovations. A 1984 British workplace industrial relations survey found that technological innovation adoption and employment are negatively correlated (Machin & Van Reenen, 1998). Furthermore, utilising microdata from 16 German industries, discovered comparable results and found that innovation in technology contributed significantly to job losses in the 1980s in Germany (Zimmermann, 1991).

2.2.1 *South African education system*

The Basic Education Department in SA had a well-planned strategy to execute the e-education and e-learning education policy, but it was not implemented because of the department's incompetence and lack of experience in training teachers (Vandeyar, 2015). For students to be able to adapt successfully in the twenty-first century and the 4IR, the education system in SA must provide them with computer skills (Mihaescu & Andron, 2019).

According to Retief (2019, most learners produced by the South African education system are not effectively and productively equipped to take advantage of employment brought about by the 4IR. The South African higher education system is graduating students who are unable to compete in the digital economy in terms of jobs that require computer literacy (Retief, 2019). Most of the schools in the country are characterised by limited or, in some cases, non-existent of computer laboratories; and the inability to execute fundamental computer activities, particularly in historically disadvantaged rural areas (De Angelis et al., 2019);(Retief, 2019). The lack of technological education in schools is partly related to the fact that the economy still heavily reliant on manual labour, as it is in several developing countries (McNully, 2018).The South African education system is graduating students who are unable to compete in the digital economy in terms of jobs which require computer literacy (Retief, 2019). The lack of technological education in schools is partly related to the economy still heavily reliant on manual labour, as it is in several developing countries (McNully, 2018).

Therefore, South African schools need to prepare students for innovative technologies for them to succeed in the digital economy, as well as recognise the way they may develop new and relevant skills that they can use to solve complex issues with innovation and collectively in accordance with 4IR demands (De Angelis et al., 2019).

2.2.2 *How other countries prepared their youth for Digitisation.*

The case study done in Indonesia on youth preparedness for transformation to a digital economy highlighted the possible effects of digitization that constituted severe labour market problems (Ezell, 2021). The study recommended that for the youth to participate satisfactorily in the international digital economy, they need to acquire the appropriate digital capabilities and training in order to succeed in the world of the digital economy (Ezell, 2021).It further stated that the expectation from individual employees is to equip themselves with enough technological skills for them to be ready to contribute value to such an economy (Ezell, 2021).

Furthermore, the demand for technological expertise, emotional and social competencies, and greater intellectual capacity associated with the digital revolution is expected to increase dramatically by 2030 (McKinsey & Company , 2018). The successful method for the adaptation of a progressively technological advancements is dependent on the training of upcoming generations of talents (Frankiewicz & Chamorro-Premuzic, 2020). Making sure that most of the youth possess the necessary skills for an increasingly technological and interconnected globe is critical for promoting equitable employment opportunities and spurring creativity, efficiency, and economic expansion (OECD, 2016)

Though Romania improved slightly in all the classifications examined by the Digital Economy and Society Index (DESI), its position in the rankings remained steady since its overall growth was modest. Romania ranks first in the connection factor, owing to the widespread accessibility of reliable and speedy fixed-line internet connections (DESI, 2019).Yet, Romania's economic digitalization is behind, with over fifty percent of Romanians hardly accessed internet access and a fraction of a third possessing basic computer abilities.

2.2.3 *Linking 'change' digitization to professions*

Digitization has emerged as a transformative force across various sectors, reshaping professions and redefining the nature of work (Brynjolfsson & McAfee, 2011). The advent of digital technologies has not only introduced new tools and methodologies but has also led to the creation of entirely new job roles while altering existing ones (Topol, 2019). From the integration of artificial intelligence in healthcare to the rise of fintech in the financial sector, the impact of digitization is pervasive and profound (Gomber, Koch, & Siering, 2017).

The essence of contemporary technical progress is defined in terms of the extent to which it impacts the need for specific labour groups, for specific jobs. "Profession" refers to a disciplined group of individuals who adhere to ethical standards and possess specialised knowledge and skills, acquired through extensive education and practical experience, to serve the public or specific clientele. (Sullivan & Rosin, 2008). Technological development invariably causes economic adjustments, which manifest themselves in the labour market as work structural reorganisation. Job characteristics differ, where some require advanced qualifications, others necessitate a low level of worker competence; some relate to high pay, while others are associated with low pay; and some have appealing work environments, while others have unpleasant working circumstances (Frankiewicz & Chamorro-Premuzic, 2020)

Naturally, the exact nature of the consequences of advancements in technology on workforce structure varies over time. Research in the early 1990s concentrated on the impact of the personal computing renaissance and the dissemination of technological advancements, which influenced the need for a specific skill set. The most basic version identified two types of staff members: unqualified and bright-skilled (Machin & Van Reenen, 1998). This was related to disparities in the job market. In the meantime, the largest movements in favour of highly skilled individuals have been observed in the organisations and industries most impacted by automation and digitization (Petit, 1993) . However, even among workers from the same qualification group, the scope of professional obligations might vary substantially (Autor et al., 1998).

The greatest emphasis was directed to Frey and Osborne (2013) who forecasted alterations to the profession composition among the American work force population. Their general assessment was extremely judgemental, in the coming 10 to 20 years an extensive spectrum of overall professions will find themselves facing complete automation, which constitutes over forty percent (47%) of the professions in the US (Frey & Osborne, 2013). Given that the duties executed within these professions are not currently expressed using language acquisition, technological displacement compromises a lot more than those professions within which automation comes across technical fields (Schwab C. , 2016).

2.3 Identification of research gaps

The population's employment, particularly among its youth, is becoming a major concern because of the digital economy, its potential capacity, and losses. The digital economy has a huge influence on youth employment because it is built on global information and communication networks that connect all players (producers, consumers, partners, customers, young people, and adults) into a single economic mechanism (Svetlana & Tetiana, 2019). The digital economy, because of the 4IR, promotes national competitiveness and security, produces new chances for human capital development, and fosters innovation and creative industries (Odegov & Pavlova, 2018).

Before studying the influence of innovative technologies and innovations on unemployed South African youth, it is important to highlight South Africa's demographic and unemployment tendencies.

2.4 Theoretical Framework

Most previous research has focused on the hurdles that technology adoption creates (Parente & Prescott, 1994); (Leung & Tse, 2001); (Greenwood & Yorokoglu, 1997) and all supported the idea that there are obstacles that come with the adoption of technology. There is evidence of delays in the adoption and distribution of innovative technologies at

the empirical level, and estimate a 45-year gap before a new advanced technology is developed and fully adopted throughout countries (Comin & Hobijn, 2010); (Leung & Tse, 2001).

However, current innovation-alarmist statements indicate that most of these economists are aware of the existence of such relationships and continue to employ disagreements that have been demonstrated by economic theory two centuries before the start of the eighteenth century (National Treasury, 2011); (Greenwood & Yorokoglu, 1997).In fact, traditional economists conveyed their primary philosophical concepts regarding persistent joblessness resulting from digitization and automation (Vivarelli, 2007). Economists throughout subsequent eras were more inclined to clarify, refine, and codify their beliefs than to deepen or change them (Parente & Prescott, 1994).

According to Ricardo (2001) "O Machinery" in the most recent version of the fundamentals of political economics. The findings demonstrated inside the confines of the conventional school are still applicable. Ricardo sparked debate among orthodox economists whenever he introduced an additional part in the same publication. Classical economists N. Senior, J. McCulloch, J.B. Say, and J. S. Mill (2017) were among many he provoked, who responded angrily to Ricardo's assumption that the implementation of automation would bring about a long-term drop in labour demand (Ricardo, 2001). Secondly, the investment incentive is that greater productivity means higher revenue and greater competitiveness for organisations that engage in digitization and automation (Wicksell, 1961).

Employees who have kept their jobs should see their wages rise as a result, and because their higher incomes translate into higher demand for services and products, supplementary employment opportunities are generated to meet the new demand. Most of the above-mentioned marketplace compensating techniques explain the possible consequences of technological advances or modifications to manufacturing methods. Traditional economists, on the other hand, have not overlooked the potential implications of industry innovation that relate to the emergence of fresh kinds of services and goods into the marketplace, and such discoveries need a large amount of work; they should result in an expansion as opposed to a decrease in general job opportunities (Marx, 1960). Marx

(1960) also highlighted the “friendly” nature of product innovations. A study has established that the possibility of an everlasting drop in overall employment because of innovative technologies was never realised and that, given this, we should at the very least reject the current techno-alarmists' catastrophic predictions (Mokyr et al., 2015).

According to Acemoglu & Zilibotti (2001), the percentage of people working in the middle class has decreased significantly in developed economies. Such hollowing is connected to a decrease in job opportunities in regular jobs, which are centred on a limited set of tasks that are capable of being done by completing a well-defined procedure and process, Because these jobs are regular, they are ideal candidates for automation (Autor & Salomons, 2017). The fragmentation of the job market has stimulated discussions around regulatory solutions designed to assist workers who have been affected by technological advancements (Acemoglu & Zilibotti, 2001).

2.5 Conceptual Framework

Technological development can cause an increase in youth unemployment levels not just by reducing the number of people required by job labour markets, but also by complicating and slowing the practice of pairing employees with employment (Schumpeter, 2003).To resolve the inequalities between the compositions of demand for labour and the labour market; occupational, geographical, and interfirm reallocation of labour becomes essential. According to Schumpeter (2003), some professions grow redundant, while new ones develop; innovations in technology raise the bar for workers' training and abilities; the workforce must relocate from areas where demand is low to areas where demand is high; non-innovative firms begin layoffs, whereas innovative businesses create new job opportunities, so job opportunities begin to drift from non-innovative organisations to those with advanced digitization and automation.

The most significant issue arises if it goes beyond the bounds of regular unemployment caused by friction; if it is found to be accurate, how significantly; how well it is resolved over time; and by what means is the velocity. Feldmann (2013) utilised information from 21 industrialised nations in the period 1985 to 2009, to demonstrate how digitization and

automation create a transient increase in joblessness within the initial three years of execution, but thereafter it recovers to its original, reduced level. It is crucial to highlight that such a temporary rise in redundancy can occur even when innovation in technology provides a stimulus for a longer-term increase in labour demand (Feldmann, 2013).

Many variables interact in many ways. Many factors are examined that are related to the general rise in youth unemployment, which is of greater importance and might endure further in any of the following hypothetical circumstances (Journal Economics 5, 2019):

(a) The greater the much-needed reorganisation of employment, which means, the more rapidly, more deeply, and greater the technical improvements that provide it an additional boost.

(b) The greater disparity among the expectations enforced by old and new innovations on the level of quality of workforce human capital.

(c) The greater flexibility of the job market interferes with and delays the technique of reorganisation. Furthermore, assuming that we are not speaking about isolated disbelief but an instance in which the momentum of advancement in technology continuously surpasses the measure of adaptation required from organisations and staff members, unemployment due to innovation and digitization may be discovered not solely in the immediate future, but additionally in the years to come.

According to Mortensen & Pissarides (1998), In cases where the subsequent impact is stronger than the former, the implementation of innovative technology will result in a rise in the "unnatural" percentage of unemployed. Nevertheless, this outcome cannot be considered predetermined. They further stated that; evolution in technology can occur in several forms: it may need the abolition of current occupations, or it may just demand their rehabilitation (Avdeeva, et al., 2019) Professionals in the previous instance learned to cope with the demands of innovative technology, upgrading and refilling their knowledge and abilities, while continuing in their prior occupations (Mortensen & Pissarides, 1998).

Technological innovation was justification for the consistently high rate of unemployed people in the United States economy for some time following the Great Recession (Brynjolfsson & McAfee, 2011). Nevertheless, given that unemployment within the United States has dipped less than 5%, technological advances played no part (Spitz-Oener A. , 2006). According to research by Spitz-Oener (2006), this decrease was 99% attributed to an overall decrease in everyday tasks executed by personnel inside existing professions and only 1% because of the elimination of entirely standard jobs. However, as previously stated, this type of advancement in technology is more probable to be linked to employment expansion rather than contraction. Most pessimistic estimates depend on categorising workers within two categories: lower and higher-skilled. Automation pushes out those who are unqualified to do dense-skilled tasks (Spitz-Oener A. , 2006).

The split of employees into two polar groups, on the other hand, is only a standard method for simplifying the study (Auguiar et al., 2017). There are several gradations based on the quality of work. Absolutely nothing is unattainable given that, assuming circumstances, staff members on the bottom of an occupational ladder can move upward one level: employees that occupied this position previously also moved up a single position and continuing all through up to the top (Auguiar et al., 2017). Auguiar et al. (2017) shown that throughout the United States the labour market outlines, especially in every age group, changed downwards following the impact of digitization and automation, but the most significant changes are amongst young males' population segment aged between 21 and 30 who possesses only basic education where job opportunities plummeted by10% throughout 2000 and 2015.

2.6 Rationale of theories

At the end of the eighteenth century, economists and politicians have been concerned about advancement in technology and the consensus that it is responsible for the creation and drive of significant joblessness. Many instances that demonstrate the devastating impacts of such fear may be found in past times, including the renowned Luddite revolt in the United Kingdom, which is discussed in works by (Cohen, 1995) and (Petit, 1993). The link between advances in technology and joblessness, on the other hand, is certainly

not a historical one, and several recent developments to economic theories have attempted to investigate this relationship in a variety of ways.

The present worth of new jobs is reduced because of creative destruction. Soon following the shortage of jobs, agents offer fewer jobs' opportunities as they expect a decline in the profits. When there are fewer new employment opportunities available, existing ones become more valued. Moreover, quicker technical progress delays their extinction by lowering the opportunity cost of older couplings. Existing occupations are thus "insulated", (Caballero R. , 1993). The level of employment increases as the pace of job destruction decreases. This study examines and assesses whether South African youth are equipped to capitalize on the career prospects presented by digitization and 4IR. Furthermore, researching potential probable training requirements that SA might identify to close the skills gap to address the problem of youth unemployment.

2.7 Conclusion of Literature Review

In conclusion, the jobs created by changes in technology should play a significant role in reducing the South African youth unemployment problem, as clearly demonstrated in the literature study, particularly in the South African setting. The preparedness of South African youth to take advantage of these opportunities has also been thoroughly investigated. The literature study also investigated the ability of South African education in training and providing South Africans with technology skills to enable them to participate in the digital economy, as well as how other nations prepared their young for 4IR. The present investigation will determine how prepared and what training is needed to address this problem.

CHAPTER 3. RESEARCH METHODOLOGY

This chapter investigated all aspects of the research methodology which were adhered to in achieving the objectives of this research study.

3.1 Research approach

In this research study, a qualitative research approach was used to evaluate how ready are the South African youth to take advantage of the digitization of economy. The method of qualitative research entailed gathering non-numerical data through interviews to analyse a group of people's behaviour, attitudes, and observations (Bhandari, 2023). This study endeavoured to understand what digitization means to the current south African problem of unemployment and considering digitization as possible solution to the problem, the qualitative approach allowed me to review and gain an in depth understanding of the topic.

3.2 Research paradigm

The research paradigm provides advice about how scholars could position their study inside the framework and the reason required for framework selection (Proofed, 2022).. It is a theoretical framework that specifies the patterns of beliefs and in-depth understanding of the theories and practices in which the study functions (Proofed, 2022).

Given the nature of undertaken study, the constructivism paradigm was used to analyse and comprehend the readiness of South African youth to take advantage of work prospects brought about by the digitalization economy. Constructivism was chosen as it is based on the belief that knowledge is constructed rather than discovered, meaning that individuals construct their own understanding and knowledge of the world through experiences and reflecting on those experiences which was what this study required (Adom et al., 2016).

3.3 Research design

In this research study a structured interview approach was utilised, consisting of a sequence of pre-defined questions that all participants answered in precisely the same sequence. Interviews were an important research design method for qualitative research because they provided in-depth, flexible, and extensively detailed data. They were especially useful for delving into such difficult subjects, gathering unique and subjective views, and comprehending the social and cultural backgrounds of participants' experiences. Interviews provided me with a complete and nuanced perspective of the study problem by allowing for open-ended questions and participatory discourse.

3.4 Data collection methods

These processes include gathering, analysing, and evaluating data on qualities from populations using well-organized techniques that offer answers to an array of research problems, testing of theories, and outcome evaluation (Debois, 2022).The data collection was conducted through interviews with Human Resource specialists, ICT senior managers and underemployed youth and the process was carried through online Microsoft teams interviews. It was significant that all three categories of participants be considered for the study: human resources specialists, who oversee bringing in talent into the organisations, ICT specialists, who are at the forefront of the digitisation process and underemployed graduates, who are the focus of this study.

3.5 Population and sample

The purpose of population sampling is to collect a fair number of individuals or populations that may be examined to reach a conclusion for research, and it is done at random from a broader population (Ben-Shlomo et al., 2013). in the case of this study as supported by the literature review in how the South African youth can take advantage of job opportunities presented through digitization of the economy. The sample was divided

into three segments, four Human resources specialists, five Senior ICT personnel and three underemployed youth as shown below:

Table 1: Sample of participants and experience levels

Participants no	Role	Years of experience	Participants segment
Participant 1	Head of technology	+10 years	ICT specialist
Participant 2	Human resources Senior officer	+20 years	Human resources specialist
Participant 3	Human resources Senior lecturer	+10 years	Human resources specialist
Participant 4	ICT Manager-Contracts	+15 years	ICT specialist
Participant 5	Senior business partner	+15 years	Human resources specialist
Participant 6	Research assistant	+2 years	Underemployed graduate
Participant 7	Data architect and Developer	+10 years	ICT specialist
Participant 8	Operations and HR manager	+20 years	Human resources specialist
Participant 9	Administrative assistant	+6 years	Underemployed graduate
Participant 10	SAPS analyst	+0 years	ICT specialist
Participant 11	ICT Manager	+10 years	ICT specialist
Participant 12	Post doctoral fellow	+2 years	Underemployed graduate

3.6 Sampling design

In this study a purposeful sampling was utilised, which is a commonly used approach for qualitative studies (Ben-Shlomo et al., 2013). The targeted population were the Human resources specialists, Senior ICT personnel and unemployed youth and the sampled population was adequate to provide insightful data which supported the research study.

3.7 The research instruments and data collection procedures

In the past few decades, the utilization of the sorts of interviews has become the most popular approach of gathering information for study results throughout a wide range of areas, and this pattern is projected to continue (Aaker et al., 1995).

The design of the interviews was as follows:

- The interview questions were unbiased and interesting and stimulated the participants to complete the interviews.
- The interview questions were applicable to the research study and gave the participants the opportunity to express themselves fully.

3.8 Data analyses

The data was collected through semi structured interviews which were conducted through MS teams systems. The data was transcript into word documents before it was analysed. Thematic analysis method was used in analysing these data where codes and themes were developed. The data was analysed manually using Microsoft excel in developing themes which were used in establishing findings and formulating results.

3.9 Ethical considerations

As defined by Bhandari (2021), research ethical principles are a set of standards that guide study designs and approaches. When acquiring information from members of the general population, researchers and scientists are required to follow a particular standard of behaviour. Research done in academic and corporate contexts must always comply with ethical research norms (Bhandari, 2023). The interviews were performed under well-defined ethical principles that were tailored to present ethos, values, requirements, and expectations of all the stakeholders.

3.9.1 *Informed consent*

This process is a core cornerstone of ethical research practice. Its purpose is for individuals to take part in the study voluntarily, having full awareness of the implications it involves, especially to express permission prior to participating in the study (Bhandari, 2023). Permission was obtained prior to the participants starting the research procedure, and there was no undue influence on participants willingness to get involved. The participants were properly informed that participating was comprehended that the study was and what they were subscribing to Voluntary participation.

3.9.2 *Confidentiality and anonymity*

The ethical rules of confidentiality and anonymity are intended to protect human subjects' personal information during the gathering of data, evaluation, and dissemination procedures (Bhandari, What Is Qualitative Research?, 2023). When the study was undertaken anonymity was maintained and confidentiality was guaranteed to the participants. Participants' identities were not disclosed in the research findings and the interview data will remain confidential until it is officially destroyed.

3.9.3 *Data management*

In conducting the study, I followed all mandatory rules established in the Data Protection Regulation and the Personal Data Act pertaining to the processing of specific data and protecting it. The security of participants' personal information was protected throughout the research design stage. All collected data was stored into a safe pin coded drive and only used for this research study, and it will be destroyed officially after one year.

3.10 Validity and reliability

The validity of the data obtained demonstrates the extent to which it represents the real field of inquiry (Ghauri & Gronhaug, 2005).and Reliability is that degree that occurs when an assessment of a phenomena gives reliable and consistent results (Carmines & Zeller, 1979). Keeping track of dependability is required given that it refers to the

accuracy and consistency of a measuring instrument's elements (Huck, 2007). In using Likert scales, this is the least reliable indication of reliability (Whitley, 2002).The participants were chosen based on being experts in their field for work and experience which was needed in supporting this study.

CHAPTER 4. - ANALYSIS AND INTERPRETATION OF FINDINGS

4.1 Introduction

This chapter consolidates the findings, analyses, and interprets data from various participants to elucidate the research problem, addressing the main research questions and objectives. It explores the perceptions, meanings, and interpretations of the Fourth Industrial Revolution (4IR) in the South African context. The chapter discusses the readiness of South African youth to embrace 4IR employment opportunities, addressing the challenges of balancing digital aspirations and unemployment, the effectiveness of the South African education system in equipping youth for 4IR employment, and the discrepancy between educational curricula and industry demands. The chapter also addresses the inadequacy of pre- and post-matric educational systems integration and the absence of 4IR-related awareness campaigns. The findings are analysed in relation to existing literature evidence and the study's theoretical frameworks.

4.2 Perceptions, significations, and interpretations of the Fourth Industrial Revolution (4IR)

Numerous definitions of the 4IR cover a range of digitization and technological areas. It includes AI and virtual realities along with other aspects like digital transformation falling under its purview but discussed superficially without being specific. The 4IR introduces an innovative method for tangible materials to be coded and administered through virtual platforms with minimal human reliance (Danylevych & Poplavska, 2020). The use of technology for problem-solving has become an inseparable part of contemporary life, from manual labour to automation, beyond the academic context. This notion is further debated by Burma (2016), cited in Mukondeleli Kanakana-Katumba et al. (2022) in suggesting that progress can be made by broadening our perspectives on convergence technologies, focusing not just on economic benefits as in the past iterations but also investigating their physical applications for biological and social impacts. The study

findings (Participant 4) further draw the definitions based on understanding the 4IR concept.

> *"The Fourth Industrial Revolution is no longer about just the enhancements and advancement of ICT; it's also about the newer way of working with technology and the newer way within which the old infrastructure and technological way of doing things can be brought up to date, so fourth industrial revolution is about machine learning, Is about getting things done, It's about agility, It's about shortening ways of doing things, It's also about entrepreneurship insofar as changing the manual way of doing business and also going about Implementation of simpler and seamless processes through latest technology and other means within which technology can intervene"* (Participant 4)

The 4IR's significance lies in improving efficiencies and cutting costs across various domains as it gains recognition globally. Chala & Poplavska (2017), cited in Mukondeleli Kanakana-Katumba et al. (2022), asserts that business demands drive the move towards 4IR to attain global excellence, enable swift adaptation and minimize errors effectively.

4.3 The 4IR as a holistic transformation in the approach to technology

The 4IR presents multi-dimensions on how it will change life. The study findings draw attention to automation and digitization, as vital components in the definition of the 4IR. The concept of 4IR fuses reality and a more significant contribution of machines co-existing realistically with humans. This notion finds expression in Mukondeleli Kanakana-Katumba et al. (2022), who contend that the 4IR blends technologies that break down barriers between the physical, digital, biological, and social realms, setting itself apart from previous industrial revolutions due to its reach beyond production into governance, management, living standards and work practices and influencing the economies.

> *"What comes to my mind? Two things really are artificial intelligence, it is digitization, it is your automation, and I think Some of the things that come to my*

mind around that is things like virtual reality" (Participant 5). *"If you are looking at 4IR which is more about digitization and automation, quite a few things, right. But it is around technology"* (Participant 1). *"I will have to say is the virtual realities because now we are able to make these engagements online. and we are also able to have workshops and seminars online "(*Participant 6)

This revolution refers to significant technological progress and more comprehensive framework as it facilitates advanced tech solutions for diverse areas beyond academia alone (Mukondeleli Kanakana-Katumba et al., 2022). The study findings concur with various conceptualisations of the 4IR, which is less scientific but provides a layperson's understanding of the 4IR as it comes optimized efficiencies – thereby reducing costs across various industries, such as automotive production lines, whilst increasing understanding thereof (Mukondeleli Kanakana-Katumba et al., 2022).

4.4 Categories of 4IR: digitisation, automation, AI, and virtual realities

Bhorat et al. (2023) notes the economic changes and the increasing growth of the digital economies in Africa. This must be considered part of the overall framework for structural economic transformation. The study also finds that the changes will affect how customer management is organised.

"Render services to our clients in a more efficient and digital way, where they can interact with us on our social platforms or even operation platforms like our banking apps and others" (Participant 10)

Previously, developed nations have followed a comparable trajectory towards progress, commencing with agriculture and progressing to manufacturing-focused growth entrants to eventual industrialization, resulting in service-oriented economies (Bhorat et al., 2023). However, the view of the public notice's eminent replacement of human participation and manual labour. Although it seems a new trend, evolution carries life changes to humankind and the functioning of everyday life.

"So 4IR is a very trendy word that everybody throws around loosely. In my understanding is that like I said, I mentioned that technology is never evolving, it is the next phase of it where it is headed. there is fear that Robots want to take over, we will not have anything to do, there is artificial intelligent software that can serve that are self-sufficient, they can self-maintain, but you still need human beings to implement those things." (Participant 7)

4.5 The readiness of South African Youth to Embrace 4IR Employment Opportunities

4.5.1 *Youth knowledge, attitudes, and agility towards technology*

The study by Oke & Fernandes (2020) highlights the impact of students' knowledge of 4IR-related technologies on their preparedness for the 4IR era and interpersonal skills, highlighting that 4IR knowledge enhances learning experiences and equips them with essential workplace skills. In addition, Maskari, Riyami, & Ghnimi (2022) found that organizational factors like curriculum, academic programs, training courses, and technological infrastructure significantly impact students' preparedness for the 4IR era. They suggest that schools and universities should ensure adequate training programs to equip students with necessary 4IR characteristics, such as creativity, emotional intelligence, analytical thinking, and decision-making. Training should also focus on developing skills related to 4IR, such as high-impact technology proficiency, entrepreneurial mindset, digital skills, and a combination of technical and soft skills.

The readiness of the South African youth to capitalize on emerging job opportunities in the digitized economy is notably high. Furthermore, the swift adoption of technology by the youth speaks to a favourable attitude, creating an environment conducive to aligning educational curricula with the dynamic needs of the users. Participant 3 alluded to the readiness and agility of youth towards technology and stated that:

"... The youth agility and adeptness to adapt to the innovative technology they are already using Internet day-to-day experience. I mean, they carry the

technology wherever they go. they are ready and then even their attitude. I mean in the swiftness with which they adopted this technology, it makes it easier for the alignment of the curriculum to the user needs..." (Participant 3)

The youth's readiness to embrace digital technology, knowledge, attitudes, and agility preparedness are intertwined with their apprehension due to high unemployment rates. Schools and universities should provide comprehensive training programs to equip students with 4IR skills, including creativity, emotional intelligence, analytical thinking, decision-making, high-impact technology proficiency, and entrepreneurial mindset. Participant 4 pointed to the challenges faced by youth and their preparedness for 4IR, indicating that:

"*There is some level of adaptation but not good enough to can write home about, so the youth of the country have a focus that is divided. On the one hand, they are embracing this digital era, and on the other hand, they worry about what the future has got for them. It is my contention that half of our youth, and I am saying it based on no other facts except that it is an observation that there is a handful of youth that are happy to venture into this era and are ready to take up jobs that are brought about by the digital era. However, the rate at which unemployment is growing is also making them think that it will take a long route to get to be ready for the digital era than doing the shortcut"* (Participant 4)

In the era of the 4IR, the employment landscape is marked by unconventional opportunities, exemplified by roles such as content creation. The study reveals a trend of young South Africans using platforms like TikTok and social media as content creators for income generation, demonstrating the potential of digitization. This indicates that the youth are well-prepared for job opportunities in the digital era, as they are adaptable to digital platforms and are actively participating in unconventional roles. This proactive approach to creating jobs through digital platforms demonstrates a promising readiness for the 4IR in SA. This view was stated by Participant 5 as follows:

"The type of jobs that the digitization in the 4IR era presents it is Unconventional jobs, for example, content creation, literally so many people and so many young people are on TikTok. They are on social media; they are being content creators, and for me, that is digitisation at work right there, creating jobs because people can get paid out of being content creators and all of that. So, if I had to use that example as the yardstick of evaluating their readiness, then yes, the South African youth is ready for jobs that are brought about by digitization" (Participant 5)

4.6 The Efficacy of the South African Education System in Equipping Youth for 4IR Employment Opportunities

The education system plays a crucial role in preparing individuals for the 4IR, as it introduces a paradigm shift in society's operations. TechUK (2018) cited in Sikhakhane, Govender & Maphalala (2021) emphasize the need for South African schools to transform their education system to prepare the millennial generation for the 4IR. This transformation requires schools to equip the millennial generation with contemporary skills, including deep learning and digital wiseness, across various curricula. Like the study by TechUK (2018) cited in Sikhakhane, Govender, & Maphalala (2021), findings reveal that South Africa's current education system is inadequate in preparing youth for 4IR employment opportunities, despite the need for adaptability to the evolving technological landscape, as discussed below.

4.6.1 *Disparities in exposure to 4IR: The rural and urban dichotomy*

The findings show significant disparities in technological education exposure between rural public and urban private schools in SA, with a significant deficiency in foundational technological education readiness due to resource scarcity, particularly the absence of computers in most public and rural schools. This finding was stated by Participant 1 as follows, highlighting the inefficiencies of the education system to prepare youth for 4IR employment opportunities adequately:

> *"But if you are looking at public schooling, in some schools' kids do not have access to computers, how do you then Start teaching them about computing, because that is what fourth industrial revolution is about…. and if we say some of the kids have never actually had access to a computer today in 2023, we have a challenge, especially if you are looking at rural schools, therefore, I do not think our education system has prepared kids for the 4th Industrial Revolution. Not at all, in pockets, but not broadly"* (Participant 1)

The elucidation as mentioned above, undeniably highlights substantial challenges and the lack of readiness of the South African education system to adequately prepare secondary school pupils across the country for 4IR opportunities. The findings align with scholarly reports highlighting a technological disparity between urban and rural schools in SA. Researchers such as Meyer and Gent (2016), as well as Oke & Fernandes (2020), referred to in Moloi & Mhlanga(2021), have similarly emphasized the existence of a pronounced digital divide in the country. This divide underscores a substantial gap between individuals with access to technology and those without, underlining the challenges rural schools face compared to their urban counterparts.

The research by Retief (2019) cited in Sikhakhane, Govender & Maphalala (2021) reveals that South African educational institutions are producing graduates who are not equipped to navigate the digital world effectively, particularly in the context of the 4IR. The education system, particularly for secondary schooling, is incapable of providing grade-appropriate education, which could help youth prosper in the 4IR. Carrim (2022) also highlights the global South's deficit in computer technology exposure within educational institutions. In SA, most schools lack computers, internet connectivity, and sufficient infrastructure, leading to less advanced computer literacy.

Carrim (2022) highlights the need for integrating the 4IR principles into primary education for job readiness. However, SA 's primary education faces challenges due to a lack of incorporation in early learning stages. Participant 5 highlights a lack of preparedness within the foundational education system, highlighting the need for alignment with the evolving digital landscape.

"I think 4IR alone needs to be built into the delivery of the education itself. So, it means that the kids must be exposed to 4IR in the space of basic education level. For example, if we are so serious as a nation to prepare the youth to take advantage of employment opportunities that are brought about by the 4IR, it means that we need to be now teaching the youth things like coding, things like data science, things like Artificial intelligence. We need to expose and get them used to the concept of 4IR at the basic education level, and I do not think that we are doing that yet. So no, I do not think we are that ready…" (Participant 5)

4.6.2 *Misalignment between educational curriculum and industry demands*

Carrim (2022) highlights the importance of academia in implementing the 4IR and defining its parameters. He states that universities in Africa must develop well-educated, socially conscious citizens with skills for the current era, as the 4IR significantly impacts educational programs, research focus, and societal advancements. However, the 4IR elements face challenges in both primary and secondary education and higher education systems. The current framework lacks practical exposure to these concepts, indicating a gap between theoretical knowledge in higher learning institutions and its application in real-world digital economy scenarios. Participant 3 emphasized this issue.

"We are far from ready. As I said that we need to recalibrate our systems and our technologies to thoroughly prepare our youth for absorption and citizenship in the economy. Yes, one of the best ways to do it is the preparation of the Academic content, so that it is aligned to the economic realities on the ground…" (Participant 3)

The gap between theoretical knowledge and practical experience in higher education is due to insufficient alignment of curricula with the rapidly evolving demands of the 4IR, and limitations in traditional teaching methodologies, which may not adequately develop skills essential for navigating the complexities of the 4IR. This finding is supported by

the contention of Reaves (2019), cited in Moloi & Mahlanga (2021), stating that SA 's current higher education structure may not be suitable for the volatile, uncertain, complex, and ambiguous environment of the 4IR, necessitating a restructuring to align degrees and diverse disciplines with 21st-century skills.

Moreover, Reaves (2019) cited in Moloi and Mhlanga (2021) suggest that universities should revamp online learning methodologies to ensure effective teaching and practical application of skills in a cosmopolitan human condition. Similarly, the findings of this study also emphasize the need for a paradigm shift in higher educational frameworks to align with the demands of the 4IR era, including restructuring traditional disciplines and reimagining pedagogical approaches. This is crucial for equipping youth for seamless integration and active participation in the evolving economy. Participant 3 emphasizes the importance of aligning academic content with economic dynamics and skills for 4IR. This was also stated by Carrim (2022) suggests strategic repositioning of universities to enhance their role in SA's future, focusing on development, employment, and skills production.

The success of the 4IR depends on acquiring new skills tailored to the revolution's technological requirements. Despite universities focusing on technologically inclined degrees, the South African higher education system is still failing to adequately prepare youth for the opportunities arising from the 4IR. This misalignment between higher institutions' skills and industry demands is exacerbated by socioeconomic challenges, creating obstacles to adaptability.

> *"I will take it from the university that I work for, which I am sure is not ready, and there is much still to be done. There is just a whole lot of gaps. For me, we have quite a lot of interns that we get to utilise. And it is only theory which I have realised that it is all they are taught. They do not know what is it that is being done in the in the workforce. My view is they are not ready. There is still a whole lot of. Learning on the job that the companies need to invest in, there is a whole lot of training that we must do Before people can say that they are ready to do the*

kind of work that we do want in the places. We are not yet there. The industries are the ones that should have to dictate whatever that is required…." (Participant 11)

In line with the above assertion, Moloi & Mhlanga (2021) argue that millions of young people are becoming unemployed or underemployed due to a misalignment between university-produced skills and industry needs. Employers struggle to fill jobs due to the unavailability and supply of required skills. The growing mismatch between youths' skills and employer needs will intensify with the rapid pace of the technological revolution.

4.6.3 *Lack of integration between pre-matric and post-matric educational systems*

The South African education system is inadequate in preparing youth for the 4IR, exacerbated by socioeconomic challenges. This lack of adaptability is due to misaligned academic syllabuses and curricula, limiting exposure to 4IR concepts in pre-matric and foundational phases. This misalignment undermines the development of skills necessary for the technologically advanced landscape of the 4IR. Socio-economic issues like access to quality education, economic inequality, and insufficient infrastructure further impede the system's adaptability.

The study suggests a comprehensive approach is needed to bridge the gap between pre-matric and post-matric educational systems. It calls for a strategic realignment of curriculum content, pedagogical approaches, and educational resources. Implementing technology-focused education at an early stage can strengthen students' preparedness. The study also emphasizes the need for seamless integration, with introductory courses, awareness programs, and entrepreneurship-focused 4IR modules becoming integral components of the educational journey. This was emphasised by Participant 4 as follows:

"But if you are saying does the system prepare the young graduates and the future leaders of our country? It is not supposed to start at post-matric. Therefore, we

need to integrate the two systems. The pre-matric and the post-matric education systems need to work hand in hand in preparing the world of technology in such a way that young graduates, when they crossover to high school and eventually to the post-matric level, they have already done some introductory courses, some awareness, some entrepreneurship based fourth industrial revolution courses, so the pace is that of a snail and we could do better. So, we are not doing very well..." (Participant 4)

4.6.4 *Educational And Sector Specific 4IR Related Awareness*

Vandeyar (2015) sheds light on the failed implementation of the e-learning policy by SA's Basic Education Department due to inadequacy in training teachers and general incompetence. There has been inadequate preparation of youth for the 4I revolution within the mainstream schooling system in SA. Lack of awareness is further stated in this research as having been little as 4IR has received minimal attention. The attempts made to raise awareness among the educational system and society at large about how unemployed youth and graduates may be impacted by the 4IR seem notably inadequate, and insufficient efforts to raise awareness may be causing a lack of understanding among young people and recent graduates about the challenges and opportunities presented by the changing job market. This assertion is further stated by Participant 4 from the study findings as indicated below:

"Efforts to cultivate awareness within the educational system and broader society regarding the implications of the Fourth Industrial Revolution (4IR) for unemployed youth and graduates appear notably insufficient" (Participant 4)

A deeper analysis of the subject of awareness is further alluded to by Sikhakhane, Govender & Maphala (2021) further state that although the Human Sciences Research Council comprehensively reviewed the obstacles and job demands brought about by the (4IR), the general insufficient attention was given to SA 's educational system's unpreparedness against these challenges. Awareness as a crucial component of the 4IR

installation is made by Sikhakhane et al. (2021) and further supported by Dwolatzky (2022) in emphasising that stakeholders, including educational institutions from schools to universities, training providers, professional organizations, and employers, play an essential role in this aspect. Incorporating these critical components will enable consistently superior outcomes while also narrowing both the digital divide and skill gaps in society at large.

4.7 Training needs and capacities for empowering youth in digitization

In the context of youth readiness for digital economy transformation, Ezell's (2021) Indonesian case study revealed potential repercussions arising from digitization in labour market challenges. For participation in this global shift towards a digitalized industry, was proposed that young people must acquire adequate training and essential capabilities to prosper within such an environment. Additionally, individuals were advised to equip themselves with sufficient technological skills in the digitizing workplace.

4.7.1 *Digitisation and skills disparities*

The mismatch between the rapidly developing digital economy and today's job market illustrates the shortcomings in technical vocational education. A complete revamp of infrastructure and educational programming must be prioritized; this includes a renewed focus on equipping students with innovative skills necessary for success within the digitally driven 4IR (McKinsey & Company 2018). The SA youth that can adapt effectively to future demands while also meeting current gaps in expertise related to enabling digitization trends across industries from Wall Street analysts all over the globe right down plumbers around suburbs locally. This is emphasised by Participant 4.

> *"The question of how that it matches the needs of the digital economy is seen in the jobs that you find in the market, and the answer is that there is some level of*

mismatch in the sense that if the digital economy is moving so fast and there is a need take along the technical vocation education system…" (Participant 4)

These shortcomings can manifest as inadequacies in cognitive capabilities such as problem-solving, language proficiency and literacy Dwolatzky (2022). This is clear between rural and urban youth, with the former encountering obstacles such as insufficient opportunities for exploration, inadequate amenities, and the absence of crucial infrastructure and technological proficiency. In SA, the significant economic challenges facing the SA economy, are two significant obstacles: income inequality and unemployment to afford technological hardware for learning and personal development.

"There is for the ones who are sitting back in the rural areas. They do not have enough exposure, they do not have the right facilities, they do not have the digital literacy. They do not have the infrastructure, you know, they do not have basic things like access to bandwidth for them to even do their homework, do their own research, and they come to university, they are ten steps behind" (Participant 2)

McKinsey & Company (2018) predicts a substantial rise in the need for technological proficiency, emotional and social skills, and heightened cognitive capabilities linked to advancements brought about by the digital age by 2030 and Dwolatzky (2022) highlights on the delay in integrating innovative technologies into developing economies like SA. Technological advancements are becoming affordable, encouraging companies to prioritize capital over human workers. Sham (2023) asserts that despite youth making up 35% of the population, only a fraction of SA 's youth aged between 15-24 have found employment, contributing to vulnerable workers' susceptibility and emergent digitally driven technologies (Dwolatzky, 2022). Moreover, Sham (2023) further alludes that long-standing scarcity of skilled labour impedes the industry's growth, resulting in costly workforces and limited access to talented personnel.

"To the extent that it must directly produce graduates with the capacity to manoeuvre in the era of 4IR, but the system only produces for fewer sectors…It is a struggle because if you look at the manufacturing sector, you do not have the

means within which 4IR could bring about new way of doing things. That is one bigger sector for the country that is lacking in terms of attracting newer graduates. The other sector that is also struggling is agriculture, which is one key economic sector in the country that is supposed to assist" (Participant 4)

The significant disparity in the distribution of graduates among different sectors within the SA education system reveals a severe discrepancy between developed skills and industries' demands. This incapability stresses upon immediate targeted interventions to counterbalance workforce disproportionality. Participant 4 alludes to a need to create relevance between the industry skills needs and what the universities produce.

"The mineral sector is one sector that should be attracting graduates, but because those sectors are yet to transform and have been neglected over time either by private or the public sector, it becomes difficult for even the system to be sending graduates in those sectors. If you are talking digital economy, the banking sector is flourishing..." (Participant 4)

The job market is undergoing a significant transformation and without incorporating the 4IR and digitization into basic education programs, graduates will be ill-equipped for upcoming workplace demands. Bridging this gap requires proactive measures encouraging upskilling through exposure opportunities focused on intentional youth development within emerging technical areas. Although there is no straightforward resolution, a need to target critical gaps is a mandatory step towards closing skills deficits.

4.7.2 *Youth choices and digital skills development*

The educational system in SA produces graduates who lack the necessary computer literacy skills required for employment opportunities within the digital economy (Retief, 2019). This debate is argued in the discussion from Participant 1, that unskilled labour is left out of opportunities due to a lack of 4IR skills. However, the current generation of young people is displaying an apparent inclination towards specialized educational pursuits in data engineering, artificial intelligence, and computer science, towards

personal development and career choices. Careers outside technology are at risk, with fewer opportunities and less job security. Participant 1 sheds inherent contrast to scenarios that exist in the career choice of the less privileged and the cohort that enacts different career choices inclined towards 4IR.

> *"Kids or our youth today are going for data engineering degrees, they are going for artificial intelligence, they are going for much more like computer science degrees, which would enable them to take jobs which are technologically inclined. I can conclude that 4IR has jobs which favour skilled labourers and unskilled labour, where does that leave them? What way does it leave the petrol attendances because they are unskilled labour"* (Participant 1)

The study further aligns with the view by Nkosi (2023) that providing equal access to digital skills is crucial for creating opportunities and breaking down socio-economic barriers for young people across the country. In addition, vocational training institutions must introduce specialized programs highlighting essential aspects of these fields' intricacies. Also, collaborating between public and private sectors can facilitate internships; apprenticeship creates mentorship chances, helping youths gain practical experience alongside theoretical education and providing optimal solutions for their requirements (Nkosi G. , 2023). However, reducing youth unemployment in SA requires a comprehensive approach, with closing the digital divide as a critical and investing in educational initiatives that prioritize teaching relevant technical abilities (Nkosi G. , 2023).

4.7.3 *Mentorship and capacity building*

The study findings allude to a need for industrial partnerships to create mentorship opportunities. This argument is supported by Frankiewicz & Chamorro-Premuzic (2020), stating that to adapt to constantly evolving technological advancements successfully, upcoming generations of talent must receive adequate training, to acquire essential skills (OECD, 2016). Participant 2 asserts that mentorship and capacity building are crucial for youth digital development in the ever-changing technological era.

> *"…I do think that when we have partnerships with industry, then we can bring in these mentors, right? Who can help to mentor these young people who can help and enable them to seize the opportunities that come through the tech sector, because they would save as sponsors to these young people, they can help them to build or at least guide them to build their own career path, to expose them to entrepreneurship and help alleviate the idea that young people should go looking for job; I think mentorship sponsorship will be invaluable in assisting our young people and guiding them in their career paths, and exposing them to digital literacy."* (Participant 2)

Even individuals with existing exposure require mentorship and continued exposure. Mentorship is crucial in guiding youngsters, shaping their career paths, and navigating the complexities of the tech field. The notion that mentorship is not solely about job-seeking but facilitates entrepreneurship highlights a change in young people's attitude toward creating opportunities rather than only seeking employment. The study findings further shed light on mentorship and capacity building, which is asserted by Marwala (2019), cited in Olaitan et al. (2021), stating that to prevent the potential loss of jobs in the age of 4IR, it is advisable that retraining, upskilling and transforming employees' skills should be prioritized to stay ahead and meet evolving labour market demands.

4.7.4 *Shortage of skills and digital job opportunities*

The low intake of digital skills among South African youth sets the country back in youth employment and development compared to other countries with programmes created for youth development (Katz & Murphy 1992). Participant 3 argues that there is a need to match the digital skills developed amongst the South African youth with those needed by the industry to curb youth unemployment.

> *"It is only that the preparation of the youth for informal education that needs to be strengthened so that there is that resonance, between the innovative*

technologies and the new roles and the skills that the students and the youth bring to bed so that they are easily absorbed into the economy" (Participant 3)

Petit (1993) & Autor et al. (1998) support this notion by stating that the most prominent trends supporting highly skilled individuals have been seen in industries and organizations affected by automation and digitization. The discussion surrounding the scarcity of skills and abundance of digital opportunities for young people in SA is a complex one that reflects the nation's intricate socioeconomic landscape. As such, calls have been made for educational reform and increased investment into STEM (Science, Technology, Engineering, and Mathematics) subjects (Science, Technology Engineering & Mathematics), emphasizing the necessity of fostering technologically savvy workforces from as early on as possible throughout their academic journeys. Participant 3 further proposes restructuring the South African education curricula to meet the market skills deficit.

"The curriculum needs to be repackaged. And then recalibrated so that it is aligned to the digital technology, the to the needs of the technological era. So, if authorities in higher education system and the academic community. Can accommodate and facilitate digitization of the delivery of their content and the digitization of the content itself, that would a remove all the handicaps and the obstacles towards the youth citizenship in the economy" (Participant 3).

4.8 The effects of digitisation on youth employment and unemployment

The adoption of the 4IR technologies is increasingly rapid in developing nations, and scholars like Schwab (2017) argue that their integration could boost production and service delivery. The 4IR is a transformative approach that aims to reduce costs, simplify daily life, and revolutionize industries. The transformative nature of 4IR can foster human-machine collaborations, stimulate economic growth, and create new market opportunities (Olaitan, Issah & Wayi, 2021). This study sought to assess and analyse the

potential effects of digitization on reducing youth unemployment in SA. The resultant findings are comprehensively deliberated upon and interpreted in the subsequent discussion.

4.8.1 *Digitisation and job creation*

The 4IR has the potential to significantly impact SA's employment landscape, creating new job opportunities through diverse products and services (Alexander,2021). This study supports Alexander's argument, highlighting the potential of digitization to combat unemployment. Digitization can reduce youth unemployment, by equipping them with essential digital skills. The evolving nature of employment requirements in the digital era necessitates a workforce with contemporary skill sets. Fostering these skills among the youth can facilitate their relevance and employability in a rapidly transforming economic landscape. The continuous integration of technology into various sectors necessitates a workforce equipped with contemporary skill sets. According to Participant 3:

> *"...digitization can help in reversing unemployment because youth now will have new digital skills that are easily required in the economy. digitization can expedite the reduction of unemployment in the country, through empowerment of youth, by way of introducing them to the innovative technologies and the new 4IR technologies that are relevant for the new economy…." (Participant 3)*

Digitization is expected to create new jobs, with technological advancements potentially making some jobs obsolete while new opportunities emerge, especially in technology maintenance, as highlighted by Participant 3:

> *"You see, as we are seeing the onset of this innovative technologies, but then again, the maintenance of those technologies would be the new roles where our youth can still find a job…"* (Participant 3)

This perspective aligns with the 4IR transformative impact, where innovative technologies disrupt existing economic structures and create novel opportunities. Technology maintenance is crucial for sustaining and optimizing innovative infrastructures, requiring a skilled workforce capable of developing and troubleshooting innovative technologies. This shift in employment dynamics requires adapting educational and training initiatives, emphasizing the importance of cultivating skills relevant to maintaining and supporting emerging technologies.

The findings further pinpoint the profound impact that digitization could have, particularly in fostering interconnectivity across diverse realms and generating an array of employment opportunities. This argument aligns with the assertions of Svetlana & Tetiana (2019), who argue that the digital economy has a considerable influence on youth employment because it is built on global information and communication networks that connect all players (producers, consumers, partners, customers, young people, and adults) into a single economic mechanism. The 4IR also promotes national competitiveness, security, human capital development, and innovation while fostering creative industries (Odegov & Pavlova, 2018). Digitization offers employment opportunities, especially for youth, through interconnected and remote work capabilities. Digitization is expected to unlock numerous opportunities on the continent, free from traditional constraints, attracting a growing number of youths to explore opportunities beyond national borders, as per participant 4.

> *"...Digitisation will bring about more opportunities on the continent, with less limitations of how people should be operating and therefore more youth will be attracted by those opportunities…. Will be attracted to even go beyond the borders of the country to want to explore the opportunities created by digitization…." (Participant 4)*

Digitization can potentially address youth unemployment in SA, but it is not a complete solution. Systemic issues like electoral system, education, public service, and healthcare contribute to the problem. Digitization is a step forward, but a comprehensive approach

is needed to tackle the interconnected challenges at the heart of SA 's unemployment. A comprehensive approach is crucial for addressing the country's unemployment issue.

4.8.2 *Effect of digitisation on phasing out of traditional jobs*

The 4IR in SA presents both positive and complex employment opportunities. The country's elevated levels of inequality and poverty make unskilled and manual labour vulnerable. The social impact of job displacement is also a concern, as seen in the traditional role of petrol attendants. The lack of a well-defined transition strategy raises concerns about unemployment and employment, necessitating proactive measures to re-skill and reposition the workforce.

> *"…. But in South Africa, we employ people to do exactly that, to pour fuel in your car; in other words, those jobs do not exist anymore….. the question is, how do you then have a transition, how do you then create employment for petrol attendants, where would they work? For instance, even account accountant, 20 years from now, if we are now in full 4IR, if we have embraced the 4th Industrial Revolution in South Africa, we have artificial intelligence automation. the question is, how have you transitioned people who are doing accounting today, 'Because if you have not planned, they will be unemployed…"* (Participant 1)

Oke & Fernandes (2020) observations project the advent of the 4IR to introduce a notable reduction in the demand for numerous occupations, particularly those reliant on manual skills and physical capabilities. Oke and Fernandes (2020) posit that the transformative effects of 4IR will usher in a shift away from roles traditionally characterized by manual labour, thereby reshaping the employment landscape. Literature (Oke and Fernandes, 2020 & Alexander, 2021) also confirms the sentiments shared by these findings that there are feelings that technology will displace and replace humans, especially in jobs that require low-level skills, which may have detrimental effects on nations' social and economic stability.

The study reveals that digitization, particularly automation and artificial intelligence, is causing youth unemployment in SA. Participants believe these advancements could lead to the displacement of human labour by intelligent machines, posing a threat to their employment prospects. The lack of proactive measures could result in diminished job opportunities for the youth.

> *". But then again, the problem is with the impact of this 4IR technologies on job opportunities for the youth, because the youth find themselves being replaced by these innovative technologies. There are chances of getting jobs. I mean, the jobs and the role that they are supposed to be playing in the economy are now actually performed by these artificial intelligence technologies…*'' (Participant 3)

Alexander (2021) warns that 4IR poses employment risks due to automation and AI potentially decreasing human labour needs. Intervention plans are needed for workers who may lose their jobs in the short term. Automation requires more sophisticated skills for remaining jobs, especially in SA, where high unemployment rates are prevalent among less formalized workers.

Employment disparities among diverse groups are a significant concern, with regional access to opportunities varying widely. The uneven distribution of opportunities across regions is a concern, as 4IR has the potential to exacerbate or amend existing disparities. Without strategic planning and intervention, 4IR could widen the gap between regions, creating a scenario where certain areas benefit disproportionately from technological advancements (Alexander, 2021)

4.9 The role of government in creating an enabling environment to promote digitisation employment opportunities for youth.

South Africa is not spared from the disruptive changes eminent in the job market because of a growing technological revolution. Magwentshu et al. (2019) assert that the discussion

among the public regarding automation in SA and worldwide often centres around a decline in job opportunities rather than an increase. Peters (2017), cited in Rapanyane & Sethole (2020), argue that in SA, there should be an intentional understanding of the eminent conflicts brought about by the 4IR, and the magnitude of the limitation for better understanding the challenges and addressing them.

Contrary to this view, the Accenture (2019) report cited in Rapanyane & Sethole (2020) paints a grim picture of SA and future employment, asserting that 1in 3 of the current 5.7 million jobs will be fully automated. In the case of SA, this will be a reality before matters improve. However, Magwentshu et al. (2019) further argue that digitization could improve productivity and create about 1.8 million jobs. The South African policy and decision makers from various sectors must take courageous measures in regulating the playing field and shaping incentives for innovation, re-skill the current workforce, reintegrate the workforce and enhance the education system's capacity to produce new technology-based and essential skills.

4.9.1 *Infrastructure upgrades and internet access in rural and township schools*

Suburban areas benefit from advanced easy integration into the digital world. Conversely, limited access to reliable internet services via airtime hampers educational and socioeconomic opportunities in rural towns and townships. A comprehensive governmental initiative is crucial to bridge this gap by extending infrastructure development beyond urban areas towards rural areas. Participant 1, in the study findings, argues that internet access should be made a basic need and should be accessible across all areas.

> *"I would think it is access to computing, access to Internet and again for me even the basic, if you are living in suburbs within South Africa, you have access to fibre and limited Internet And go to townships, they still actually buying airtime and data to get access to Internet which It is limited. you must upgrade infrastructure Within rural Areas, Township and those are the basic things. Having to make sure*

that all schools have access to computer and Internet and then from there I think then you are starting off on a good base" (Participant 1)

CeSTII (2020), cited in Alexandre (2022), alludes to the infrastructural challenges facing SA such that the inadequacy affects businesses in different sectors, such as connectivity services and manufacturing, manifest differently. Alexandre (2022) argues that customised solutions can be created for the unique infrastructural challenges in SA, and creative systems can be built with varying levels of infrastructure.

4.9.2 *Reconceptualization of basic and higher educational system*

The OECD (2016) states that SA should ensure that its youth is skilled and enjoys an increasing global interconnection to increase the prospects of equitable access to job opportunities. Nonetheless, the study findings assert that global participation would need enforcement of the youth skills certification for better adaptation.

"...So, enforce international certification on some of the qualification so that our youth can adapt to international level certification they do not limit themselves to a South African market, we need to globalise our education" (Participant 7)

South Africa should explore various innovations to introduce technology at the elementary education levels through various learning platforms. Students can utilize online self-study options to acquire international certification instead of relying solely on traditional educational approaches. This argument is debated in the study findings, further discussed in the findings of Participant 7.

"The South African education curriculum is poor but then if you look at private school students tend to be more ready but most of the families are poor and cannot afford private education and are less ready than those in the in private schooling system. The education system is so far behind in that by the time the textbook that we are using to study gets published the information is outdated, no, our system is in ready or does not prepare our students for 4IR jobs." (Participant 7)

Magwentshu et al. (2019) further argue that the possibility exists for a re-evaluation of SA's core education system that focuses on bolstering the significance of teaching proficiency, literacy, and STEM fields –and facilitate an increase in conversion rates among graduates within SA's educational structure.

SA must revisit the entire curriculum at the high school, primary, or tertiary levels and explore how to train students to make it easier for them to get jobs afterwards and exploring entrepreneurship. SA youth are introduced to digitalization significantly late in their schooling journey. Participant 8 in the study findings further argues that late adoption of 4IR at the school level has a negative effect on how youth is prepared for future opportunities.

> *"I think we should be looking at our curriculum, looking at on job training. When I say on job training is while students are still in class, they must be able to be taught how to be entrepreneurship, to be able to open businesses, to find innovative ways of encouraging youth to be entrepreneurs. And to also look at on job training for, for students while they are still actually in their classes. it is not just about getting the qualification and then after that you try and look for a job. No, because like we are still stuck on textbook theory"* (Participant 8)

As emphasised in the study findings by Participants 2 & 8, One significant initiative would be incorporating digital literacy into early education, following the compelling examples of China and Japan.

> *"I think it can go far back as even in the primary education, not only secondary education, not only when they are in tertiary, but still when they still use it in their primary education. If we were to compare two countries like, China and Japan, you can see that the young people are exposed to are exposed to digital literacy at a much earlier Age. And I guess that would explain why they thrive in in business world"* (Participant 2). *"Students learning about AI or machine learning at primary school level"* (Participant 8).

A growing shift is visible in higher education as the universities have started to transition towards the 4IR as part of mainstream college and tertiary education. Participant 10 asserts this view in the study findings.

> *"There is a growing focus by the universities on the 4IR programmes in the form of artificial intelligence and technologically inclined programmes."* (Participant 10)

With the growing uptake of the 4IR, Rapanyane & Sethole (2020) argue that the future of higher education in SA will also be disrupted, and changes will also be evident in mainstream school-level education, universities and in turn, the labour market demands. This argument is further stated in the study findings by Participant 1, as quoted below:

> *"What universities are focusing on? For me, what you see is now a lot of our universities have data engineering degrees. They are pushing artificial intelligence. That is the right Area to focus on, especially considering 4IR, because you are talking about data. We know that as individuals while we on the Internet or wherever we are producing a lot of data analytics, you do data science, you do artificial intelligence and all those things. So, if the focus is shifting in a way, but we are adding this new degrees or discipline within the areas of technology, then We are going in the right direction, I do believe that we are doing quite well in South Africa"* (Participant 1)

The study findings (Participant 3) further argue a need for designing curriculum that offer technical proficiency and directly respond to evolving demands in industries involving advanced 4IR technology.

> *"Well, first there need to be the recalibration of the curriculum in such a way that it resonates with the economic realities on the ground, so that when the youth complete their degrees and studies at the higher education, they must have readily and easily been absorbed by a few industries due to the resonance between the technology and the curriculum taught at our institutions."* (Participant 3).

Participant 2 in the study finding further argues a need for building networks that present skills for youth opportunities across various sectors.

> *"They should harness relationships with businesses and organisations. these organisations must be able to equip young people whether it is through social investment That they do on their own but also linking it to some form of relationship with the government and private sector. I think they should build that form of network, but they need to build partnerships and be able to skill the young people which can come in the form of giving them mentors, exposing them to mentors, people who are experienced in those areas"* (Participant 2)

These developments will promote the creation of innovative curricula to support the 4IR changes and reshape the labour market demand for skills, which are critical for economic growth.

4.9.3 *Establishment of youth development programmes and entrepreneurship*

Digital entrepreneurship fosters economic growth, wealth creation, and improved living standards in launching new ventures, contributing to employment, and the economy's competitiveness. Vibrant digital entrepreneurship ecosystems are needed to support entrepreneurs, including support organizations and early-stage financing (The World Bank, 2018).

The traditional employment in established corporations or SMEs should be replaced with a focus on entrepreneurial thinking. Governments should invest in education and support youth start-ups for job creation. The 4IR presents unique opportunities for innovation and new industries, and governments should adapt policies to facilitate this transition. Focusing on cultivating a culture of entrepreneurship can lead to youth small companies contributing to economic growth and employment opportunities. This was stated by both Participant 1 and Participant 8 as follows:

"…. the government must play a role and create an environment where people can be able to start small companies which will create employment. If we can create an environment that allows our people to start small organisations, there is a lot of opportunities…." (Participant 1)

…The governments need to focus on is entrepreneurship. …. They need to look at that as well on job training. I know they have currently been doing that, and I think they could do much better, but for me, what stands out to the most is to encourage entrepreneurship, to fight unemployment, that is where the government needs to invest in if they want to get rid of the unemployment. Gone are the days where everybody just goes into a company and look for a job…." (Participant 8)

The study emphasizes the need for the government to create a conducive environment for programs addressing the demands of the 4IR, particularly incentivizing Medium and Small Enterprises (SMEs). Strategic measures like tax rebates can stimulate corporate engagement in youth-oriented programs, fostering corporate social responsibility and aligning with broader societal interests. This collaborative approach reflects a shared responsibility between the government and corporations in steering societal progress within the evolving technological landscape. Participant 1 alluded to the importance of youth development programs and collaboration between government and private sector

"…. but the government must create an environment where these things can happen. For instance, I know big corporates do have these types of programmes, but the question is how government can incentivize Medium small enterprises and big corporates as well to start these programmes, but again, you must incentivize them Even from a tax perspective, give them tax rebates and suddenly, if companies realise that you if I have these programmes for the youth, I am going to get a certain percentage, then that would help and That goes a long way……"(Participant)

4.9.4 *Strategic partnerships, mentorships, and networks*

Integrating the private sector in shaping educational curricula is crucial, as it provides significant insights into the specific skill sets and qualifications required in the workforce. Additionally, regulatory bodies play a crucial role in coordinating this synergy between the private sector and institutions of higher learning, establishing an updated workforce aligned with evolving job market requirements. The study findings (Participant 3) further assert a need for the government to regulate education and skills relationships and the contribution of various role players. This argument is further supported by Magwentshu et al. (2019) in stating that noting the importance of SA to augment and strengthen its human capital and retaining skilled personnel for long term learning benefits, the country would need to undergo fundamental changes from its existing education and training approach. One such change could be moving away from emphasizing one-time degrees to offering separate certifications targeting specific skills.

> *"The private sector needs to influence and inform the content of our curriculum, because the private sector knows what type of graduate they are looking for, so that the universities can prepare those graduates and the government also will also need to regulate that space by way of influencing universities. The universities need to package their curricula in a certain way, and again also make it mandatory for companies to accommodate our students so that there is a working relationship in the interim phases or preparatory phases to prepare and ready our youth for absorption in the economy"* (Participant 3)

Changing how education is offered, assessed, and recognised would encourage flexibility and more extended recognition of critical skills within specific fields. Magwentshu et al. (2019) further suggest that such a shift would change quality assurance from traditional frameworks to a new way of applying skills and away from theories alone.

4.9.5 *Government regulatory measures and legislation*

For SA to be adequately prepared for the 4IR, it must establish and execute contemporary policies. Labour laws require extensive revision in response to changing technological advancements and employment structures. Through regulatory frameworks, companies would be obliged to provide structured residency periods conducive to integrating university graduates into the professional sphere. This can establish a standardized system and foster collaboration, ensuring graduates acquire practical experience aligned with industry needs. The study findings further suggest the development of new and specific policies and legislation of the 4IR depending on the new developments it will present for the SA conditions.

> *"But I think this will require new policies and in particular labour policies and legislations, government needs to introduce new legislations that will need to respond to the 4IR and the future way of work. We need new policies towards that will be able to respond to this. And I think after that the country will be, there will be a way forward in terms of 4IR"* (Participant 6).

Through its powers, the government may require companies to offer designated accommodation periods for university graduates through regulatory measures and laws, thereby fostering a mutually beneficial relationship among the public sector, private entities, and higher education institutions. The innovations around regulation are further debated with flexible and innovative ideas by Magwentshu et al. (2019), stating that support could be made available to small and medium enterprises (SMEs) participating in production and agro processing. Magwentshu et al. (2019) further argue that regulatory efforts may be beneficial in an organized collaboration that aligns educational goals. The study findings, in tandem with this argument, are stated by Participant 3 in stating that:

> *"The government can, through regulation and legislation, make it mandatory on the part of companies for resident period to accommodate university graduates, so in that way we can improve the working relationship between the government, the private sector, and our higher education institutions" (*Participant 3)

4.9.6 *Skills development*

Magwentshu et al. (2019) hold a view that supports the study findings (Participant 5) that by reimagining the education and learning ecosystem, SA could take significant measures to invest in human capital for enhanced participation in future employment opportunities. There ought to be a clear delineation of necessary skills that will be required by the economy moving forward, with support given to educational institutions' efforts towards meeting this need.

> "*So, if we talk of the impact in terms of what impact would it have? It would be a profound impact if we are intentional in terms of continuously upscaling our workforce profile, the youth, and our people to ensure that they are ready to meet the new skills demands. So, for example, if we, if we roll out robots in the workplace to deal with the repetitive work, there is a role that a person can play to aid the robots, it could the person could be operating the computer box that Navigates the robot we need. We then need to upskill people on how to mind or how to administer or manage that computer box Because automation is here to stay. We need to be continuously upskilling and reinventing our skills"* (Participant 5)

While technological progress may decrease demand for some low-skill jobs, ignoring this category presents challenges. The priority should shift towards creating employment and promoting economic growth that creates both skilled and non-skilled positions. Magwentshu et al. (2019) propose a rethinking of the education and learning ecosystem, as SA has an opportunity to make significant investments in human capital that could enable a broader range of individuals to access job opportunities, and the study findings hold a supporting view of this argument alluded to by Participant 5.

> *"So, it is important for us to focus While we focus on creating jobs, our focus should be on main growing the economy and stimulating the economy to create*

> *both skilled and unskilled jobs. And if we focus on stimulating the economy to create both skilled and unskilled jobs, what that would mean is it will create a balanced ecosystem. Or else we risk leaving behind the person who is unskilled. And that will create a Social Security Baden for the taxpayer"* (Participant 5)

In achieving the goal of creating job opportunities for youth through up-skilling, Magwentshu et al. (2019) suggest steps must be taken toward creating greater transparency regarding future economic needs for specific skills so educational institutions can prepare accordingly.

> *"Commit thousands in investments in human capital firstly in the education system. companies through re-skilling of the unskilled for them to be able to take those jobs which require technological skills to be performed" (Participant 12)*

Magwentshu et al. (2019) further contend that the country must acknowledge that certain job positions in high demand a decade from now may not currently exist. Hence, individuals must possess quick learning skills and be capable of adjusting to new professions. Tapping into various digital education opportunities can be beneficial to accomplish this goal.

4.10 Conclusion

The discussion surrounding SA's 4IR is multifaceted and complex, encompassing structural changes to education systems, transformations in employment markets, and the societal and economic consequences of technological advancements. Various scholars stress that cultivating skills relevant to 4IR should start early through innovative teaching techniques while fostering collaboration between academic institutions and industry leaders.

CHAPTER 5. - CONCLUSION AND RECOMMENDATIONS

5.1 Introduction

This chapter provides and unpacks the research, highlights key recommendations, and provides conclusions from the findings. The study examined South African youth's readiness for 4IR, focusing on reducing high unemployment and the impact of the digital economy. It assesses their skills and capacities for digitisation and unemployment reduction, while considering government intervention to create a conducive environment for growth in this technology-driven era. The study explored perceptions, interpretations, and significations of 4IR, revealing digitisation automation, AI, and virtual realities. It examines youth's readiness to take advantage of opportunities while balancing unemployment concerns. The report recommends mentoring programs, entrepreneurship initiatives, raising awareness of the fourth industrial revolution, and developing industry-specific skills to reduce job losses and boost productivity. It advocates for research and development investment in technological innovations and emphasizes social equality and economic progress.

5.2 Summary of findings

The study further focused on training and capacities necessary to equip the youth with the requisite skills and capacities to effectively navigate and harness the potential prospects emerging within the digital economy landscape. It examined the effectiveness of current educational pedagogies, vocational training initiatives, and skill development programs in equipping the youth with the knowledge and competencies needed for the digital age. The research also explored the potential transformation of digitisation in mitigating youth unemployment, considering the complex interplay between technological advancement, economic restructuring, and South African labour market dynamics. The study aimed to uncover the existing conditions for digitisation to foster sustainable employment opportunities and alleviate high youth unemployment rates. This section presents a

summary of key findings under the broad categories of thematic areas arising from the study objectives and research questions.

5.2.1 *Perceptions, significations, and interpretations of the fourth industrial revolution (4IR).*

The study explored perceptions, significations, and interpretations of the 4IR. Findings reveal that the 4IR is a significant technological shift involving digitization, automation, AI, and virtual realities. It involves coding tangible materials through virtual platforms with minimal human reliance and involves innovative approaches to technology and infrastructure updates. The 4IR focuses on ICT enhancements, machine learning, agility, shortening processes, and fostering entrepreneurship through seamless processes using the latest technology. Its significance lies in improving efficiencies, cutting costs, and responding to business demands for global excellence. The transformation extends beyond production to governance, management, living standards, and work practices, influencing the economy and addressing job displacement and automation fears.

5.2.2 *Readiness of South African youth to embrace fourth industrial revolution employment opportunities*

The South African youth's readiness for the Fourth Industrial Revolution (4IR) is a subject of study. It found that while knowledge of 4IR enhances workplace skills, organizational dimensions like curriculum and infrastructure significantly impact preparedness. The youth display remarkable agility in adapting to innovative technologies, especially in daily internet use. However, escalating unemployment rates have divided them, leading to concerns about the uncertain job market. The study suggests targeted interventions to address technological aspirations and employment challenges. The South African education system is criticized for not adequately preparing youth for the 4IR, with disparities in technological education exposure between rural public and urban private schools and limited resources. Challenges include disparities in technology exposure, misalignment between curriculum and industry demands, and insufficient integration between pre-matric and post-matric educational systems. The study calls for

comprehensive restructuring and strategic realignment, emphasizing the role of stakeholders in shaping youth development.

5.2.3 *Skills and capacities to prepare youth for 4IR*

Findings highlight the mismatch between the rapidly evolving digital economy and outdated technical vocational education, particularly in fields like plumbing. This creates skills disparities, necessitating infrastructure upgrades, modern equipment, and a renewed focus on innovative skills. The Digital Skills Gap Index reveals a disparity between African nations and the global average, emphasizing the need for South Africa to develop systems for its youth to progress. The job market is transforming due to the digital economy, requiring innovative skills and strategies. However, completing an educational program does not guarantee employment, emphasizing the importance of incorporating 4IR advancements into basic education programs. The study also highlights the perception that South African graduates lack computer literacy skills for the digital economy. Providing equal access to digital skills is crucial for breaking down socio-economic barriers. The study suggests educational reform, increased investment in STEM subjects, and holistic solutions addressing broader structural challenges. Initiatives promoting entrepreneurship, vocational training, and apprenticeships aim to empower youth with diverse skills adaptable to digital landscapes.

5.2.4 *Potential effects of digitisation on youth unemployment reduction*

Several key findings emerge regarding the effects of digitisation on youth employment and unemployment. Digitisation and artificial intelligence (AI) are expected to significantly impact employment landscapes, particularly in South Africa. The Fourth Industrial Revolution (4IR) and these technologies can boost production, service delivery, and economic prosperity. However, infrastructure, education, digital technologies, and literacy are needed for these gains to be realized. Digitisation presents a substantial opportunity for job creation, especially for youth, by equipping them with essential digital skills. The study also highlights the potential for phasing out traditional jobs, particularly those reliant on manual skills, and the need for proactive measures to reskill and

reposition the workforce. Digitisation can also reduce bureaucratic hurdles, enhancing efficiencies in businesses and industries. Overall, the study suggests that digitisation can serve as a catalyst for job creation and industrial efficiency, but it is crucial to upskill the workforce, particularly the youth, to meet evolving skill demands and ensure a smooth transition in the employment landscape.

5.2.5 *The role of government in creating an enabling environment for youth to embrace 4IR opportunities*

The findings emphasise the need for the South African government to address digitisation and employment challenges through comprehensive strategies. Infrastructure upgrades, particularly in rural and township schools, are crucial to bridge the digital divide and ensure equal opportunities. The education system needs reconceptualization, incorporating technology at early education levels and focusing on STEM fields and digital literacy. Youth development programs, entrepreneurship initiatives, and partnerships between the government and private sector are essential for job creation in the digital economy. The government's role in creating an environment conducive to small business development is key. Regulatory measures and legislation, such as revising labour laws and mandating companies to accommodate university graduates, are also suggested. The study emphasizes ongoing upskilling of workers, particularly youth, to unlock the full potential of 4IR.

5.3 Recommendations

5.3.1 *Targeted interventions in the education system*

Findings highlights the need for a restructuring of South Africa's educational system and digital literacy initiatives to prepare youth for the 4IR challenges. The study suggests integrating knowledge related to 4IR into academic programs, supporting creativity and practical training, and aligning learning content with industry needs through partnerships. It also emphasizes developing computer skills, enabling entrepreneurial potential, and

providing equal technology resources. These strategies aim to bridge the gap between traditional education models and new-age jobs in a tech-driven society.

a. ***Restructuring of educational curriculum***

The study suggests that South African youth's readiness for the 4IR era is significantly influenced by their knowledge of 4IR-related technologies. To address this, targeted interventions in the education system are needed, including a comprehensive restructuring of curricula, academic programs, and training courses. This should focus on integrating 4IR-related knowledge and skills, fostering creativity, emotional intelligence, analytical thinking, and decision-making. Collaboration between educational institutions and industry stakeholders is also crucial, integrating 4IR-related modules into pre- and post-matric education systems. Organizational factors also play a crucial role in students' preparedness, requiring investment in technological infrastructure and practical exposure to bridge the gap between theoretical knowledge and real-world application.

b. ***Enhance digital literacy programs.***

The study highlights the divide among South African youth, driven by both enthusiasm for digital technology and apprehension about rising unemployment. To address this, policy interventions should focus on enhancing digital literacy and creating a conducive environment for job creation. This includes establishing digital literacy programs that extend beyond basic computer skills, focusing on content creation, social media management, and other relevant digital skills. The curriculum should be adapted from primary education to include modules focusing on 4IR-related technologies, content creation, and digital entrepreneurship. Collaboration between educational institutions and industry stakeholders can facilitate mentorship programs, apprenticeships, and internships. Investing in digital literacy will help the youth thrive in the evolving job market shaped by the Fourth Industrial Revolution. Digital literacy initiatives should ensure equitable access to technological resources, particularly computers and internet connectivity, in public and rural educational institutions, addressing disparities and the rural-urban dichotomy in exposure to 4IR, and collaborating with government bodies and private organizations.

5.3.2 *Mentorship and entrepreneurship programs*

The unemployment issue in South Africa necessitates a comprehensive strategy involving economic policies to create a conducive environment for businesses and startups. Encouraging entrepreneurship among the youth and providing financial support for innovative ventures can contribute to job creation in the digital economy. Targeted programs for reskilling and upskilling, focusing on high-demand areas, can enhance the employability of the youth. Mentorship and entrepreneurship programs should be established to provide guidance, support, and practical insights for aspiring content creators and digital entrepreneurs. Industrial partnerships can create mentorship opportunities, facilitating a smoother transition into the tech sector. The mentorship approach should not only be job-oriented but also focus on fostering an entrepreneurial mindset among the youth. Entrepreneurship programs can offer resources, funding, and networking opportunities to empower young individuals to turn their digital creativity into sustainable ventures.

5.3.3 *Comprehensive 4IR awareness programs*

There is a pressing need for a broader awareness campaign to acquaint South African youth with the opportunities and challenges presented by 4IR, promoting a positive attitude towards embracing digital advancements. Recognising the need for increased awareness about the implications of the 4IR, educational institutions, government bodies, and industry stakeholders should collectively design and implement comprehensive awareness programs. These programs should target both the educational system and the general society, emphasising the challenges and opportunities the changing job market brings. Efforts should be made to train teachers, engage students in awareness campaigns, and integrate 4IR-related concepts into mainstream education. Stakeholders, including schools, universities, training providers, professional organisations, and employers, should collaborate to enhance awareness and understanding of 4IR challenges and opportunities. Collaboration between educational institutions, government bodies, and industry leaders can promote a positive mindset for digital advancement by promoting

awareness of the 4IR, integrating it into coursework, and forming strategic alliances to understand its challenges and opportunities.

5.3.4 *Industry-relevant skills development*

The digital economy and job market are intertwined, requiring a significant overhaul of infrastructure and educational programs. Modern equipment upgrades and skills enhancements are crucial for the 4IR demands. The South African government should mobilize stakeholders from various sectors, including civil society, the private sector, educational institutions, and governmental bodies, to create sustainable solutions to address skills shortages and improve digital job opportunities for South African youth. This includes introducing industry-relevant curricula, fostering partnerships between educational institutions and industry players, and addressing the imbalance in the distribution of graduates among different sectors. This will help prepare South African youth for future demands.

5.3.5 *Mitigating strategies for job displacement due to digitisation*

The study suggests that digitization could negatively impact traditional jobs, particularly in manual labour sectors. To mitigate job displacement, a multifaceted strategy is recommended, including reskilling, collaboration between industry, educational institutions, and policymakers, apprenticeships, vocational training, and career counselling. A comprehensive national strategy is needed to develop a skilled workforce capable of adapting to technological advancements. Policymakers should also implement inclusive measures to address employment disparities and ensure equitable access to opportunities from the 4IR. This will contribute to a more balanced distribution of the transformative effects of the 4IR on SA's employment landscape.

5.3.6 *Strategies for enhancing industrial efficiency through digitisation*

The study highlights the potential of digitization and the 4IR to improve industrial efficiency by reducing bureaucratic hurdles. It recommends implementing policies to

streamline administrative processes and create a more agile economic environment. Human capital development is crucial for maximizing efficiency impacts of digitisation on the workforce. Upskilling routine processes, particularly for youth, is recommended. Policymakers should prioritize investments in digital infrastructure to overcome historical bureaucratic complexities in SA. Collaboration between government agencies and private enterprises can drive the development of digital solutions that enhance business efficiency and innovation.

5.3.7 *Promotion of research and development (R&D) in technology*

In fostering a conducive environment for the 4IR, SA must prioritise Research and Development (R&D) technological initiatives. The study findings emphasised the significance of investing in R&D to remain competitive globally. R&D plays a pivotal role in staying at the forefront of technological advancements. It enables the country to contribute to global innovation, develop its intellectual property, and create solutions that cater to its unique challenges. Governments, alongside the private sector, should allocate resources to support R&D initiatives, fostering a culture of innovation and technological advancement. This boosts economic growth and prepares the workforce for the evolving job market driven by technology.

5.3.8 *Promoting social and economic inclusivity*

As SA adapts to the 4IR, ensuring that the benefits are distributed equitably across society is crucial. Addressing socio-economic inequalities is a key consideration. The study findings highlighted the importance of inclusivity in the digital transformation. Policies and initiatives should be designed inclusively, ensuring that marginalised communities can access education, training, and opportunities in the digital economy. Bridging the digital divide and promoting equal participation in the 4IR will contribute to sustainable development.

5.4. Conclusion

The study highlights the importance of preparing South African youth for the challenges and opportunities of the 4IR, focusing on perceptions, readiness, skills development, potential effects of digitisation on youth unemployment, and government role. The study highlights the need to address educational inequality, digital proficiency, and job stability concerns. Measures include curriculum redesign, digital literacy programs, mentorship, and entrepreneurship initiatives. A conducive environment is needed for youth to fully embrace opportunities, requiring cooperation between government, educational institutions, and industry stakeholders. Proactive steps include reskilling and repositioning the workforce to minimize the negative effects of digitisation on traditional jobs, advance technology research, and promote social and economic inclusivity.

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APPENDIX (A) Interview Questions

Numbering	TASK
1.	**Preamble**
1.1	Request permission to record the interview
1.2	Copy right waiver
2	**INTRODUCTION**
2.1	What company do you work for and is your position title?
2.2	What are your roles and responsibilities within your current position?
2.3	Kindly provide me with a brief description of your experience within the sector.
3	**QUESTION 1: Which technological skills and training can be identified and invested in to cap the gap in youth unemployment?**
3.1	What is your understanding of the 4IR in your sector of activity
3.2	Do you think the south African education system effectively prepares the youth to take advantage of employment opportunities brought about by the 4IR.?
3.3	According to you what should be the investment focus of the country if they want to adequately prepare the youth to transition into the digital economy brought about by the 4IR,

3.4	In your own view do you think the South African education system is graduating students who are able to compete in the digital economy in terms of jobs which requires computer literacy?
3.5	How long do you think it would take for south Africa education system to be ready to build capacity to produce graduate who are ready to take advantage of jobs coming with 4IR?
4	**QUESTION 2: How ready is the South African youth to take advantage of new jobs arise through the digitization of the economy?**
4.1	How ready are the south African youth for the Jobs brought about by the Digitization. What is your view?
4.2	Do south African youth skills capacity and training match the jobs which are brought about by the digital economy and if there are gaps or mismatch, what are the gaps and how do you think we can overcome them?
4.3	Do you believe that there are no jobs in south Africa or are the south African youth not ready to take advantage of jobs which are available because of 4IR?
5	**QUESTION 3: What impact could digitization have in reversing youth unemployment in South Africa?**
5.1	According to Petit (1993), the largest improvement in job creation is in favor of highly skilled individuals, as opposed to unskilled work. This was observed in the organizations and industries most impacted by automation and digitization. Do you think South Africa should adopt this strategy of focusing on jobs that caters for skilled labour to address the challenge of youth unemployment?
5.2	What role do you think the digitization of the south African economy may play in reversing the major challenge of youth unemployment?

5.3	Which professions and training do you think should be prioritized by South Africa to gain rapid traction in dealing with the problem of youth unemployment?
6	**CONCLUSION**
6.1	Kindly be in touch should you have more information to share regarding the interview or subject
6.2	Thank you for your time and much appreciated

APPENDIX (B) Consent Form



Consent Form

Title of project: Digitization and unemployment in south Africa: Preparing the youth towards taking advantage of 4IR.
Name of researcher: Ndou Humbulani

I, ……., agree to participate in this research project.

I agree to the following:
(Please circle the relevant options below)

The research study was explained to me. I understand what this study is about.	YES	NO
I understand that I can volunteer to take part in the study.	YES	NO
I agree that the interview/focus group/other activity may be recorded on Zoom or MS Teams	YES	NO
I agree that direct quotations from my interview activity may be used by the researcher in their research report.	YES	NO
I agree that my participation will remain anonymous (my name or other identifying data will not be used by the researcher in their research report)	YES	NO
I agree that other researchers may use the information I provide in my interview activity (depending on their own ethics clearance being obtained) but my name and any personal information will not be used or passed on.	YES	NO

…… (signature)
…… (name of participant)
…… (date)

…… (signature)

…… (name of researcher/person seeking consent)
…… (date)

APPENDIX (C) Participation Information Sheet

Dear Sir / Madam

My name is Humbulani Ndou. I am an MBA (Master of Business Administration) student at the Wits Business School of the University of the Witwatersrand, Johannesburg. My supervisor is Dr Jacques Totowa. I am conducting a research study about Digitization and unemployment. The study title is Digitization and unemployment in south Africa: Preparing the youth towards taking advantage of 4IR.

I am inviting you to take part in an interview. If you decide to take part, your participation in this research study will last about 100 minutes. The interview will take place on zoom or Ms teams or in person where possible and this interview will take place after hours.

With your permission, I would like to record the interview activity. This data will be stored in teams or zoom for 6 Months and deleted after the same period. Only myself and my supervisor will have access to the data.

During the interview activity, I will need to ask for some personal information about you, including your company name, your position, and responsibilities in your current position.

The interview will be confidential and anonymous. When I share the results of the research study, I will not include your name or anything else that could identify you. With your permission, other researchers may use the data collected from this research study, but your name and any personal information will not be used or passed on.

If you decide to take part in the research study, it should be because you want to volunteer. You do not have to take part. You can stop being in the study at any time. You do not have to answer any questions if you do not want to. You will not get any direct benefits if you choose to join the research study. You will not lose any services, benefits, or rights you would normally have if you decided not to join. Taking part in the research study will not cost you anything. You will not be paid for being in this research study.

The risks for this research study are no more than what happens in everyday life / some of the questions asked may make you feel miserable. If this happens, I will stop the interview and continue another time. If you need some support or counselling services following the interview, these are available free of charge at Wits University the Counselling and Careers Development Unit and to contact CCDU (COUNSELLING AND CAREERS DEVELOPMENT UNIT) call 011 717 9140 / 32, or email: info.ccdu@wits.ac.za.

This research study will be written up as a research report. The report will be available in the university library. If you want to receive a summary of this report, I will happily send it to you.

If you have any questions during or afterwards about this research study, feel free to contact me or my supervisor on the details listed below. If you have any concerns or complaints about the ethical procedures of this research study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrecnon-medical@wits.ac.za.

Yours sincerely,
Humbulani Ndou

Researcher:
Humbulani Ndou, Humbulani.Ndou@wits.ac.za , 0605006858

Supervisor:
Dr Jacques Totowa, Jacques.Totowa@wits.ac.za , 0117174853

APPENDIX (D) Ethics Approval Letter

Graduate School of Business Administration
University of the Witwatersrand, Johannesburg

Wits Business School

Wits Business School Ethics Committee
Constituted under the University Human Research Ethics Committee (Non-Medical)

Ethics Clearance Certificate

Ethics protocol number: WBS/BA2011329/314

This certificate is only valid with a legitimate ethics protocol number and signed by the Researcher (below).
This certificate is only valid if permission has been granted by the Registrar's Office of Wits University.

Project title	Digitisation and unemployment in south africa :Preparing the youth towards taking advantage of 4IR
Investigator / Researcher	Mr Humbulani Ndou
Nature of Project	MBA (Research Article)
Decision of the Committee	Approved, provided stakeholders and participants are guaranteed confidentialty.
Issue Date of Certificate	9/4/2023
Expiry date	Date of submission of the project / research report
Chairperson	Dr Pius Oba ☎ +27 11 717 3976 +27 82 733 6587 pius.oba@wits.ac.za

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Declaration by Researcher

One copy must be signed by the Researcher and returned to the Chairperson of the Wits Business School Ethics Committee.

I fully understand the conditions under which I am authorized to carry out the abovementioned research and I guarantee to ensure compliance with these conditions. Should any departure to be contemplated from the research procedure as approved I undertake to resubmit the protocol to the Committee.

Signature

18/09/2023
Date: